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**Marine Mammal and Seabird Survey of
Southern California Bight Area. Volume II
Detailed Synthesis of Findings**

California Univ, Santa Cruz

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Marine Mammal and Seabird Survey
of the Southern California Bight Area

Volume II - Detailed Synthesis

The Regents of the University of California
University of California, Santa Cruz
Santa Cruz, California 95064

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PREFACE

Man's large-scale activities are always accompanied by environmental impact. Some kinds of impact, such as those resulting from episodic or catastrophic events (so-called short-lived phenomena), are obvious and immediate in effect; others, of a chronic, low-intensity nature, may be difficult to detect due to the small increments of change over time. The ocean environment has an enormous capacity for recovery from changes brought about by man's activities. Essentially, this resilience is due to the action and interaction of dynamic elements in marine ecosystems--the plant and animal populations and their supporting medium. However, this ability for recovery can be overtaxed. Therefore, it is imperative to determine how, and to what extent, a given activity will influence its environmental context. Inasmuch as the higher marine vertebrates (whales, seals, birds) comprise one of the most conspicuous elements in the environmental context of oil resource development on the southern California Outer Continental Shelf (OCS), prudent planning dictated the need for studies of this fauna prior to further human intrusion.

Along with man, higher marine vertebrates are the top consumers in offshore food chains. They are important as major elements in energy cycling and also serve as indicators of the relative "health" of the food chains upon which they depend. Some populations are now, or recently have been, near extinction as a result of human activities (whaling, seal ing, egg co1 letting, introduction of predators, chemical pollution). Additionally, public awareness of issues affecting the well-being of marine mammal and bird populations is great. In short, there are compelling reasons to seek to understand the status of these animals prior to and during the process of OCS resource development.

Despite its proximity to major population centers, the waters and coasts of the Southern California Bight (SCB) have not been adequately studied. No broad, systematic surveys of the marine mammals and birds in the open water had been attempted prior to the present study. Censuses of bird nesting areas or seal rookeries on islands were carried out only when a biologist chanced to visit, not always at the most propitious time of year, and usually were limited to one island or a 'rt of an island. With a few notable exceptions, the literature on the ale, seal, and bird populations in the SCB is widely scattered, often anecdotal, and has provided only a sketchy picture of the total fauna. With the prospect of accelerated OCS petroleum resource development, we undertook studies to provide the Bureau of Land Management with an adequate fund of information on abundance, distribution, movements, seasonality, and reproductive status of the higher marine vertebrates. Such information is requisite to OCS managers as they consider the impact of resource development on these animals.

This volume provides an abstract and synthesis of significant findings resulting from the first year of our study. Necessarily, the description that follows is a "snapshot" of the animal populations as they existed in the 1975-1976 survey year, and consequently, is only

part of a larger baseline--one that gives indication of natural variations in these parameters from year to year. However, because it sets the stage for whatever may follow, this initial study is perhaps the most significant part: for the first time, the population characteristics of the whales, seals, and birds of the SCB have been described throughout the year with intensive, detailed survey and rigorous methodology.

Our intent is to make the findings of this study as useable and comprehensible as possible to persons charged with the task of managing the resources of the OCS. The broadest and most obviously relevant features of the extensive and detailed data base have been synthesized into this volume. A complete treatment of the detailed information gathered in the 1975-1976 study year may be found in Volume III: Principal Investigator's Reports.

Our study is designed to provide answers to the following questions: How many animals are present? When are they present? Which species, ages, and sexes may be found in a given area at a given time? What are the seasonal trends in these features of the populations? What are "normal" reproductive characteristics of the populations? Further, the study is designed to estimate year-to-year variation in each of the above measures and identify important unidirectional trends occurring prior to OCS resource development (i. e., population increase or decline over a number of years). Ideally, the baseline study should also identify and describe the processes that govern the items above. These include mortality (rates, causes, seasonal and yearly variation), natality (rates, contributing factors, yearly range of variation), immigration and emigration (rates, sources, age and sex structure), the role of major environmental fluctuations (water mass distribution, temperature, seasonality of currents, changes in breeding habitat), and biotic factors (predators, prey, competitors). However, due to their complexity, some of these processes are so difficult to study that significant baselines and a range of variation will be impossible to establish. (This is particularly true of cetaceans, animals that are wholly aquatic and difficult to study under the best of circumstances.) Finally, the study is designed to use consistent, replicable methods that are the best available for each particular task. Obviously, to measure changes occurring during OCS oil exploitation, the same tools must be used both before and after exploitation takes place. For this reason, considerable effort was made to standardize, document, and refine existent methodology.

Organization of the Contents

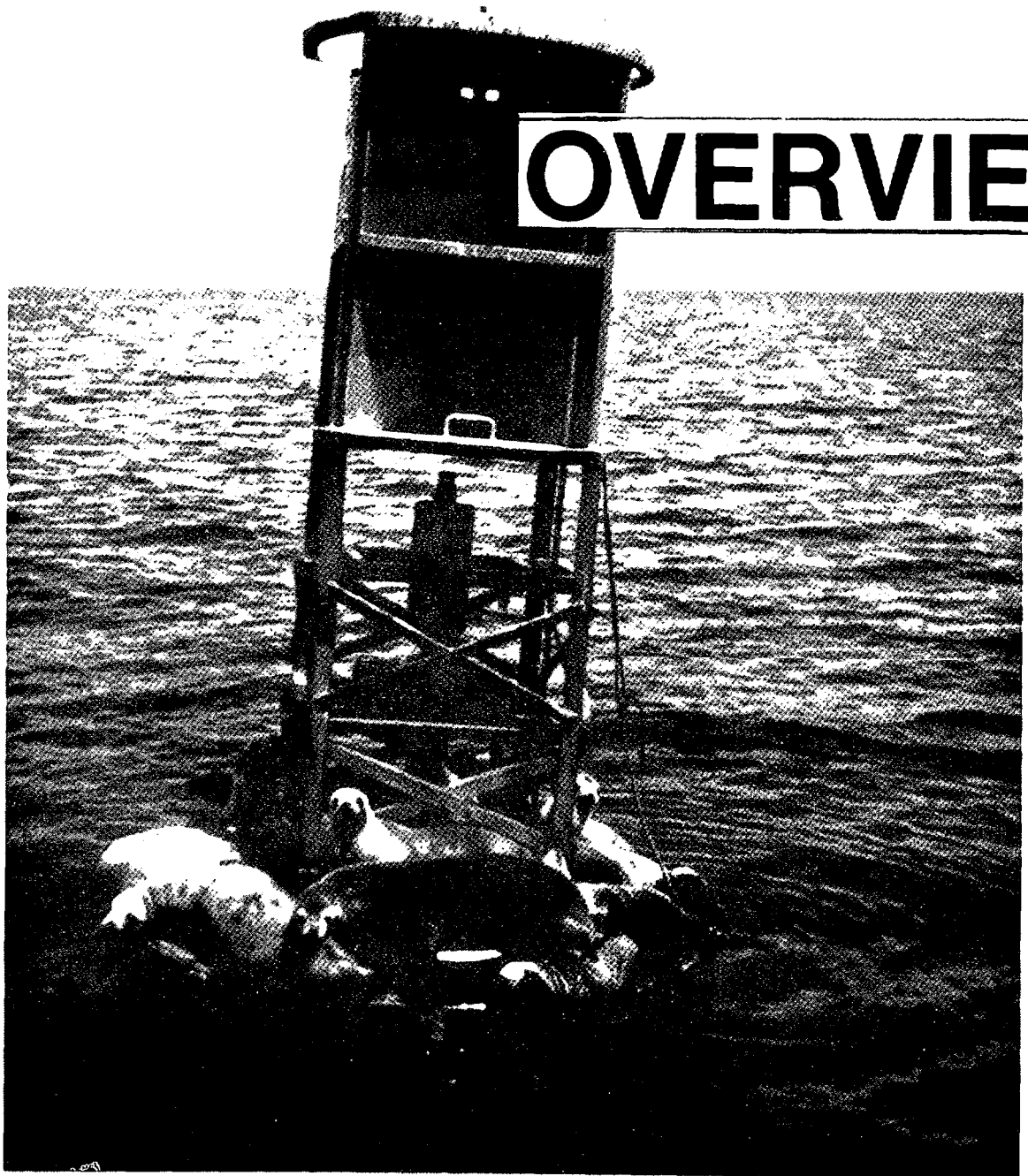
This Synthesis of Findings is organized into three sections. The first section provides an overview of the Southern California Bight (SCB), its pinniped, cetacean, and seabird inhabitants, and the mechanisms at the oil-animal interface. In a table entitled THE RED FLAGS, the species or populations that are particularly vulnerable to impact are identified.

The second section presents an integrated synthesis of the findings of the 1975-1976 survey year, organized by season and geographical zone to permit rapid access to specific information. The major features of population dynamics in each season are summarized in four INTEGRATED SEASONAL SUMMARIES that precede the more detailed accounts.

The third section presents conclusions and recommendations concerning animal numbers and distribution relative to offshore oil development. Here are identified geographic AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE within which pinniped, cetacean, or bird populations could be seriously threatened by oil development activities.

Summary or interpretive statements of particular importance to resource planners are included in each of the three sections. These statements, shown above and in the tables of contents in UNDERLINED CAPITALS, focus on application of this study's findings to the task of guiding the course of oil resource development on the southern California OCS.

OVERVIEW



Section I.A
Overview

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Overview:
**THE
STUDY
AREA**

OVERVIEW

The Study Area

Description of the Southern California Bight

The Southern California Bight (SCB) encompasses nearly 55,000 km² of open ocean. The surveyed area extends along the mainland shore from Point Conception to the Mexican border and offshore to the 1,500 m (4920 ft.) depth contour. The Bight is not a simple, narrow continental shelf. In fact, it is so topographically complex the term "continental borderlands" was coined by Shepard and Emery (1941) to distinguish it from other continental shelf areas in the world.

Essentially, the sea floor consists of a series of ridges and basins paralleling the coastline and similar in shape and structure to the mountains and valleys of the nearby mainland (Fig. II-1). Undersea ridges break the surface as eight major islands and many offshore rocks. The combination of numerous islands set in a broad expanse of highly-productive continental shelf waters provides a habitat for marine birds and mammals that is virtually unequalled in north temperate waters. For birds and seals, the island and mainland cliffs, rocks, and beaches are used as roosts, rookeries, and hauling grounds; the shallow island shelves, inter-island passages, and water overlying banks, ridges, and basins are used as foraging and feeding grounds. In addition to resident populations, the SCB straddles the migration routes of many species, such as the gray whale, the shearwaters, and the northern fur seal.

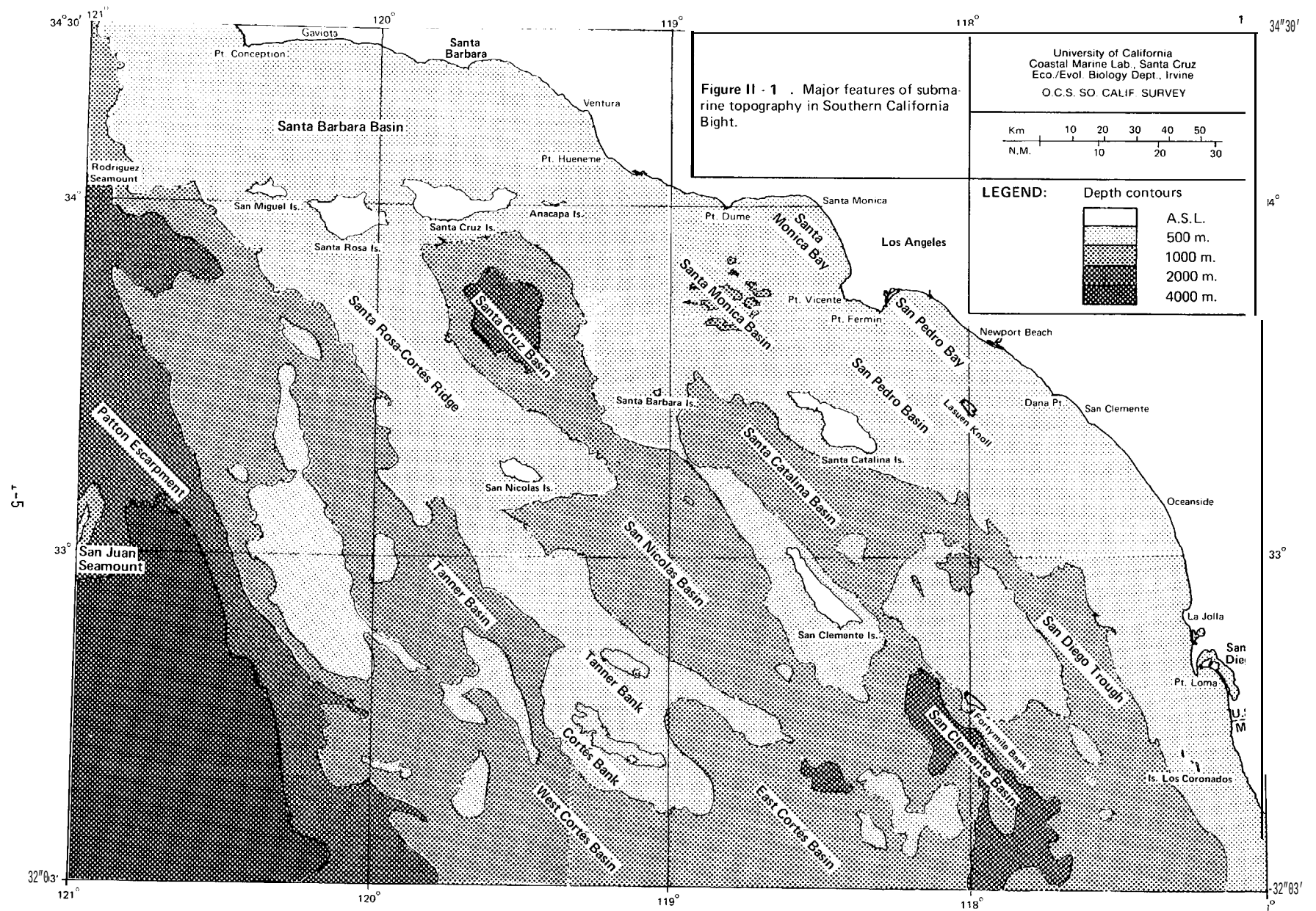
The Lease Areas

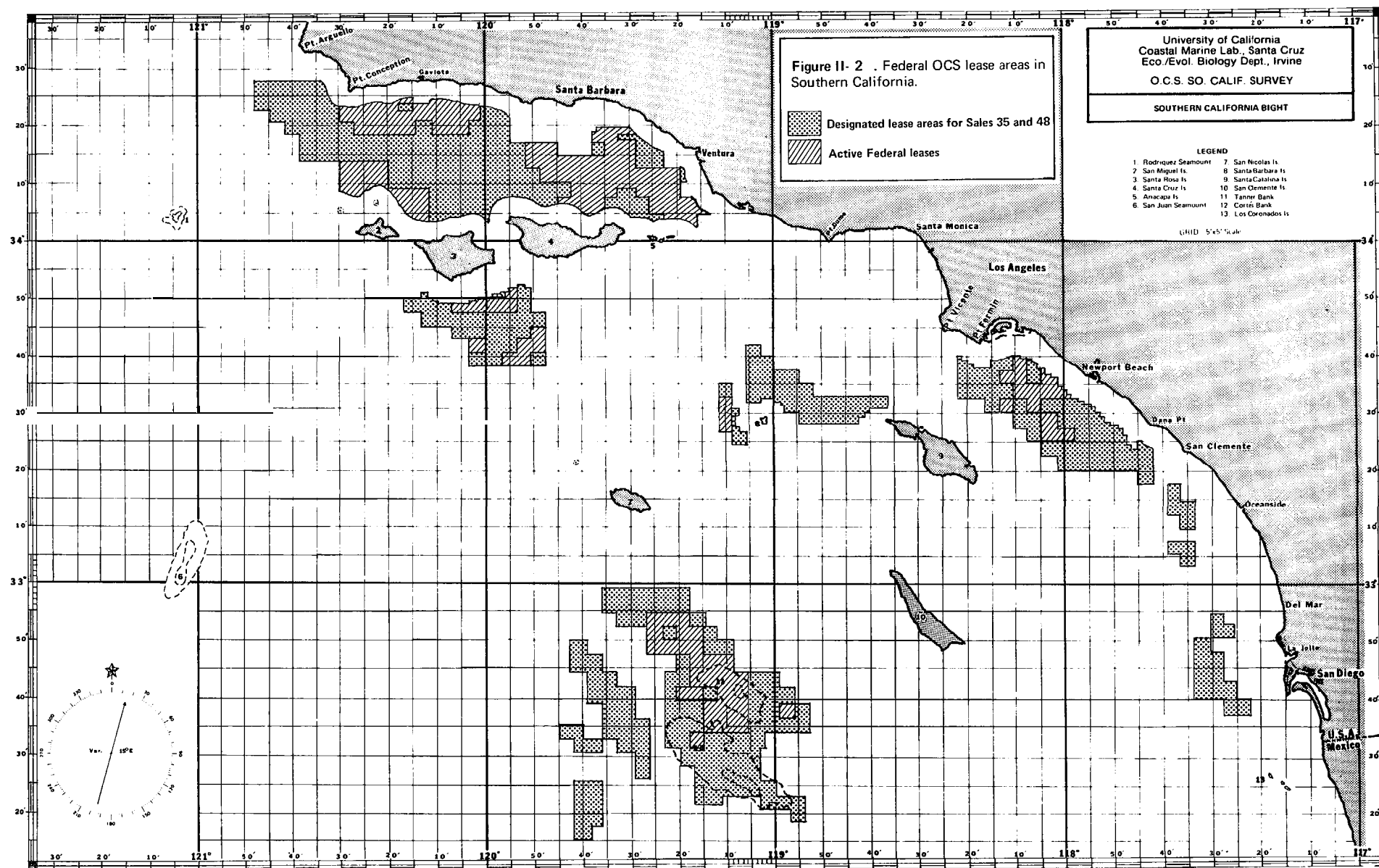
Designated and active federal oil lease tracts in the SCB, as of 1977, total over 6000 km² (Fig. II-2). All tracts are located beyond the State three-mile (4.8 km) line; an additional three-mile buffer zone was established in the vicinity of San Miguel Is. due to its special significance to seabirds and pinnipeds. The Western Oil and Gas Association estimates 14 billion barrels of oil and 28 trillion cubic feet (785 x 10⁶ cubic meters) of gas could be recovered from these submerged lands.

The State of California has leased more than 670 km² of nearshore tidal or fully-submerged land for oil and gas exploitation. Additionally, mineral rights to approximately 3,240 km² are held by private concerns.

Other Human Use of the Bight

The SCB is adjacent to one of the largest and fastest-growing population centers in the United States. Most of the coast is urban and is privately owned. Figure II-3 shows some of the more conspicuous use areas in the Bight. Considerable use is made of the waters of the Bight for recreational boating and sport fishing. This area also supports a \$100 million commercial fishery annually supplying 225,000 metric tons of





The Study Area
Other Human Use of the Bight (continued)

fish, crustaceans, and shellfish.

Most of the waters of the Bight are designated as National Defense Operating Areas. The most active militarily is the Pacific Missile Range, encompassing over 41,000 km². Three of the eight islands are owned by the Navy and are used as airbases or target areas. Anacapa and Santa Barbara islands comprise the Channel Islands National Monument, and the remaining three islands are privately owned.

Winds, Currents, and Drift

Because oil drifts with the wind and currents, the effects of a spill or chronic leakage must be considered both at the source (or within an area of assumed containment) and downstream.

Activities associated with OCS oil resource development are not confined specifically to the lease areas: oil and gas have to be transported from the wells to onshore storage or refining facilities, necessitating increased tanker traffic or laying of pipelines. Each added increment of transportation or handling increases the potential for leakage or an accidental spill.

The subject of winds, currents, and drift is projected twice in this volume to present both a comprehensive overview of physical components of the SCB, and the basis for later recommendations for minimizing the effects of accidental oil spills. The first description is general (in the three following sections) to establish the relationship of winds, currents, and drift to the SCB as a whole; the second appearance is a series of detailed descriptions, specific to a zone and season, preceding each of the Integrated Zonal Summaries, beginning on page II-68 .

The wind and current patterns of the SCB are seasonally and geographically complex but dominated by a few prominent and relatively constant features. Prevailing offshore winds are from the west and northwest. Water movement along the coast of California and Baja California is likewise, in a southerly or southeasterly direction (the California Current). Several counter-clockwise eddy systems, collectively known as the Southern California Gyre, develop within the Bight. Surface drift is mainly a function of wind direction, but is modified by local surface currents. This effect is especially noticeable in areas of strong tidal or longshore currents.

Winds

The Pacific Anticyclone, a high pressure area centered northwest of the Bight, between Hawaii and Alaska, is most strongly developed during the warm months when it shifts northward from about 30° to 35° north latitude. Winds measured offshore of southern California average 18-20 km/hr (about 10-15 knots) decreasing inshore in the lee of Pt. Conception. Gusts of 140+ km/hr (75+ knots) from these winds have

The Study Area

Winds (continued)

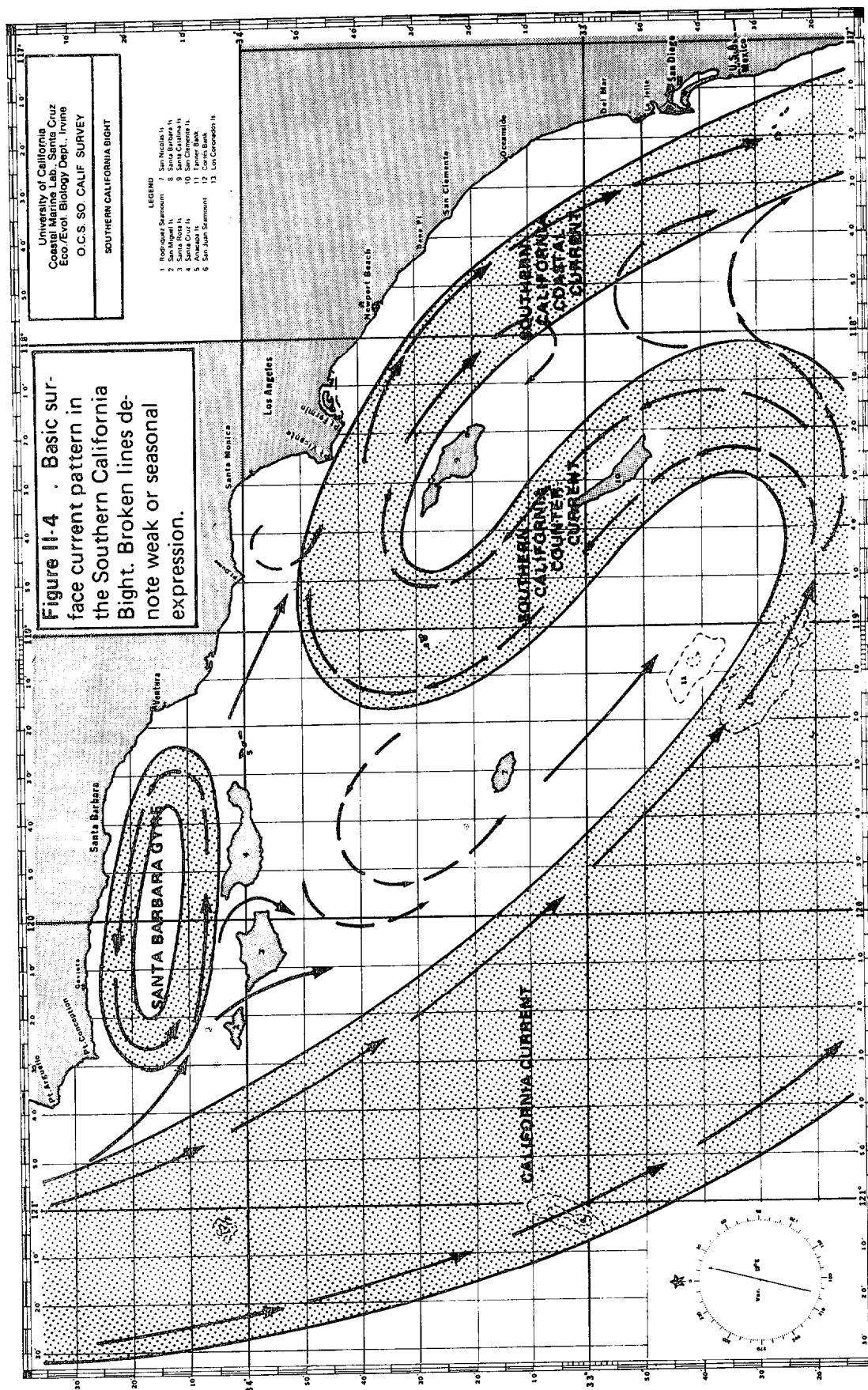
been recorded at San Miguel Is. during spring.

These prevailing northwesterlies are modified by several climatic features within and outside the Bight. In winter, cyclonic low pressure systems regularly pass through the southern California region, bringing moderate southerly winds. As these storms pass through the Bight, winds shift from the southeast to west and finally to the northwest. In the autumn, tropical disturbances may bring moderate to strong southerlies. Santa Ana (northeast) winds occurring in the autumn and winter can be severe, particularly in Santa Barbara and San Pedro channels, where velocities of 75-90 km/hr (40-50 knots) are not uncommon. Inshore, the dominant air flow is often the diurnal sea/land breeze. The sea breeze blows onshore during the day, the land breeze offshore at night. Generally, the sea breeze predominates during the warm months (summer and autumn), the land breeze during the winter. Finally, the Catalina Eddy, a regional cyclonic vorticity, can act at times to radically alter the daytime streamlines over the sea and near the coast. The prevailing northwest winds recurve in the lee of Pt. Conception. More northerly winds push the origin of the recurvature southward. The recurvature results in west to southwesterly winds near the mainland, contrasting with north to northwesterly winds farther offshore. This small low pressure area is generally centered near Santa Catalina Island.

Currents

The basic features of water movement in the SCB are relatively constant from year to year (with predictable seasonal variations), are directly affected by winds, and result in part from the shape of the Bight relative to the coast of California and Baja California. Principal features of the primary current systems are shown in Figure II-4.

The prevailing northwest offshore winds drive the California Current southeastward along the coast of California. North of Pt. Conception this broad river of relatively cool water is located 50 to 150 km offshore. South of Pt. Conception, where the coastline veers abruptly eastward (to form the Southern California Bight), the California Current continues its southeast course parallel to and seaward of the Patton Escarpment (the Outer Continental Shelf), separating from the mainland to a maximum of about 200 km. The coast resumes a roughly north-south alignment above San Diego (about 33° N), which converges with the Current's southeast flow line near the latitude of Ensenada, Mexico (about 32° N) and the Current again becomes located within 100 km of the coast. As the California Current passes the southern region of the Bight far offshore, a portion of its flow is diverted to loop back northward, becoming the Southern California Countercurrent with its associated eddy systems. Another loop, swinging around the north end of Santa Catalina Island, turns this flow southward again, parallel to and near the coast (the Southern California Coastal Current), eventually to rejoin the California Current along the coast of Mexico.



The Study Area

Currents (continued)

The basic pattern of water movement is commonly termed the Southern California Gyre. This gyre is centered over the Santa Rosa-Cortés Ridge; water to the west of San Miguel and San Nicolás islands moves south or southeast, entraining some surface water from further east. Deeper water (greater than 150 m) to the east of the ridge flows northwestward throughout the year as the California Undercurrent. The surface water entrained by this current flows northwestward as the Southern California Countercurrent. East of Santa Catalina and San Clemente islands, water transport is slow and complicated by local eddies.

The strength of the Southern California Countercurrent is seasonally variable due to changes in the pattern of prevailing winds. In late summer, autumn, and winter, these winds weaken and are frequently interrupted by southward-migrating centers of low pressure, the Southern California Countercurrent becomes well-developed, and the California Current diminishes in strength and moves offshore. In spring and early summer, the prevailing northwest winds are strong and relatively constant, driving the California Current inshore and diminishing the expression of the Countercurrent. Water east of Santa Catalina and San Clemente islands is somewhat blocked in its northward movement by a local eddy around the northern islands and is turned southward close inshore as the Southern Coastal Current.

Drift

Surface drift is generally a function of wind direction and force. Water within the upper ten cm moves in the direction of the wind at 1-3% of the wind speed.'" Although offshore surface currents may affect the speed and direction of such drift, especially during periods of calm, their effect is secondary to that of the wind. Inshore, strong tidal or longshore currents--interacting with local winds and regional currents in complex and variable patterns--may affect surface flow to a much greater extent than do the relatively sluggish offshore currents. Surface drift is often difficult to predict on a long-term basis since it is so much a function of immediate wind conditions. The northwesterlies that prevail offshore in spring and summer are the most predictable indicator of drift within the Bight: drift is less predictable closer to shore, especially in autumn and winter.

The seasonal statements and maps of winds, currents, and drift that introduce each Integrated Zonal Summary (beginning on page II-68) will guide the reader more specifically.

Upwelling, Temperature, and Productivity

Under the influence of steady northwest winds in the spring and early summer, surface waters are driven offshore, allowing the upwelling of colder, subsurface waters. Upwelled water tends to be relatively high in nitrate and phosphate nutrients and stimulates phytoplankton blooms.

The Study Area

Upwelling, Temperature, and Productivity (continued)

The increased primary productivity is accompanied by an increase in the abundance of primary consumers (zooplankton), and attracts higher trophic-level consumers (including birds, seals, and whales). The effect of upwelling is most noticeable in shallow water (less than 200 m) along the mainland coast, the south and southwest sides of islands, and over the banks, ridges, and escarpments.

In addition to nutrient enrichment, upwelling contributes to seasonal temperature variation in the SCB. However, this effect is relatively minor when compared to the influx of colder northern water in the winter and Spring, and the influx of warmer southern water in the summer and autumn when the Southern California Countercurrent is well expressed. Surface temperatures vary seasonally from about 12°C to more than 20°C. Water throughout the Bight is cool and rather homogeneous in the winter and spring. In the summer, water in the eastern sector heats quickly as warmer southern water pushes northward into the Bight. During the summer months a differential of 5° to 7°C exists between the western waters (cooled by the California Current) and the eastern waters (warmed by the Southern California Countercurrent).

This general seasonal pattern of temperature variation is a direct consequence of geostrophic surface water movement and prevailing winds. Within the limits of year-to-year variation in winds and currents, it is a predictable feature of the Bight. However, long-term temperature variations are the rule, rather than the exception. Trends of temperature-increase or -decrease occur over periods of several years and may affect the mean temperature by 2°C. These changes may be aperiodic or, more likely, are cycles of unknown period.

What does this mean in terms of animal distribution? The waters of the SCB support the foraging activities of the marine mammal and bird inhabitants. All of the species described in the subsequent sections are highly mobile--they go where food is plentiful. Upwelling, seasonal temperature variation, and long-term temperature variation affect the distribution of the food resources of the marine mammals and birds. The distributions of higher trophic-level consumers, therefore, cannot be fixed in space or time. Marine mammals and birds can be relied upon to adjust their foraging areas and pattern of activities to fit those of the prey species.

Though the pattern is far from simple, three generalizations can be made relating numbers, distribution, and even species composition, to upwelling, temperature, and productivity:

- 1) Marine mammals and birds are most likely to be found in areas of upwelling and high productivity. Further, there is a "downstream" effect and animal species can be expected to follow it. Foraging animals are not confined to areas of upwelling. However, upwelling is one of the reasons the animals are found in the SCB.

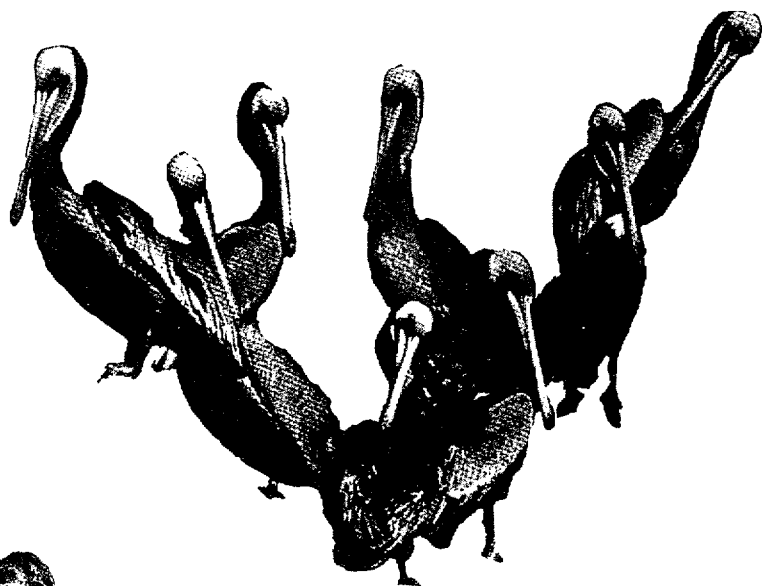
The Study Area

Upwelling, Temperature, and Productivity (continued)

- 2) Marine mammals and birds can be expected to show seasonal relocations in their distributions as seasonal changes in temperature and productivity affect the distribution of prey species. Some of these relocations may take some or all animals of a particular population or species beyond the limits of the SCB.
- 3) Long-term temperature variation can affect the distribution of prey species. The areal distribution of many marine organisms is defined by narrow limits of temperature tolerance. Many species reach the southern boundary of their range in the SCB; other species reach the northern boundary of their range here. Trends toward warmer (or cooler) water over a period of several years can affect the composition of the fauna as well as numbers, distribution, and reproductive success of high trophic-level consumers.



Overview:
**THE
ANIMALS**



OVERVIEW

The Animals

Pinnipeds

Six species of seals and sea lions are found in the Southern California Bight (SCB). Two of them, the California sea lion and the northern elephant seal, are so abundant that, at certain times of the year and in certain locations, the rocks and beaches are literally carpeted with adults and pups. Two others, the harbor seal and the northern fur seal, though breeding and pupping in the SCB, are numbered in the many hundreds rather than thousands. Another species, the Steller or northern sea lion, reaches the southern limit of its breeding range in the SCB; very few adults are seen on land and only a handful of pups are born here. The sixth species, the Guadalupe fur seal, is rare and occurs as a non-breeding visitor in the Bight.

Pinnipeds, like nesting seabirds, are closely tied to the land. Breeding activity and the birth of pups takes place on land or sometimes in the shallow water. Reproductive activities are confined to a specific time of the year (the breeding season) and to specific locations (rookeries). Pinnipeds, though gregarious, must disperse widely during most of the year in order to take advantage of spatially- and seasonally-fluctuating resources of fish and squid. Nevertheless, they must also congregate in dense herds or harems on rookeries during the breeding seasons. Because of limited food nearby, pinnipeds must either fast for the duration of the breeding season or alternate periods on land with foraging excursions to feeding grounds at some considerable distance from the rookeries. Northern elephant seals fast and remain on the rookery throughout the breeding season. Among the sea lions and the fur seals, on the other hand, only the territorial males fast and the females alternate several days of nursing with several days of feeding.

Rookery locations are traditional to pinnipeds in the same sense that towns or cities are to man. This traditional occupation of certain locations is reinforced by the use of these preferred areas as hauling or resting grounds in the non-breeding seasons. Most of these areas are remote and isolated from human activity, and probably represent only a fraction of those beaches occupied in the past. With the exception of a few harbor seals hauling-out on sand flats at night, seals shun the mainland shore. The largest single hauling-ground in the SCB is at the west end of San Miguel Is., the westernmost island in the surveyed area. At any time of the year, about 60% of all censused pinnipeds will be at this single location. Of the remainder, most will be found on San Nicolas Island--also far offshore and bathed in the cold California Current.

Most pinnipeds are present in the SCB in the summer during the breeding season of the sea lions and fur seals. The total number that

The Animals

Pinnipeds (continued)

can be counted on land at this time of the year is about fifty thousand animals; there are perhaps another twenty thousand animals at sea. California sea lions represent over 90% of the total. Even in the winter, when most animals of this species have left the area, they are still the most numerous pinniped. The annual cycles in total numbers of the seals of the SCB are shown in Figure II-5. Each species has a predictable pattern of seasonal abundance. Occurrence of peak numbers in the SCB is usually associated with the breeding season. However, the northern elephant seal, which has a winter breeding season, hauls out on land in equally great numbers during the spring molting season.

The limits of the surveyed area are not the limits of the range of each pinniped species. Therefore, increases or decreases in number shown by the annual cycle of abundance in the SCB are reflections of seasonal relocations as animals enter or leave the area. Some species, such as the northern fur seal and the Steller sea lion, range as far north as Alaska; others, such as the California sea lion and the northern elephant seal, range southward along the coast of Baja California, Mexico. The SCB is an area of range overlap for these species. No other area in northern temperate waters supports such a diversity of pinnipeds.

The number of pinnipeds in the SCB has increased substantially in the last fifty years, yet remains at some unknown fraction of the number present in the early 1800's. In general, the twentieth century has been a time of recovery for seal populations brought to near-extinction in the last century by Russian and American sealers seeking oil and furs. As animal populations increased in size and reoccupied former range, their numbers were monitored by annual surveys carried out by the California Department of Fish and Game and, later, by Bartholomew and his collaborators (e.g., Bonnot 1928; Carlisle 1973; and Odell 1971).

Cetaceans

The order Cetacea consists of all the known whales, dolphins, and porpoises. The order may be divided into two basic suborders: (a) the toothed group (animals having teeth) which includes the sperm, beaked, killer, and pilot whales, and all of the dolphins and porpoises, and (b) the baleen whales, comprised of the remainder of the large whales (so named for the sheets of horny material suspended from the roof of the mouth and utilized as a strainer mechanism during batch feeding upon small fish and invertebrates).

Of the 80 or more species of cetacea known worldwide, 27 are found in the Southern California Bight. For the reader's convenience, a glossary of these species' scientific and common names is attached (Table II-1). These animals, for the sake of discussion, may be grouped in a variety of ways:

Figure II-5 . Annual cycles of four species of pinnipeds on land in the Southern California Bight, 1975-76.

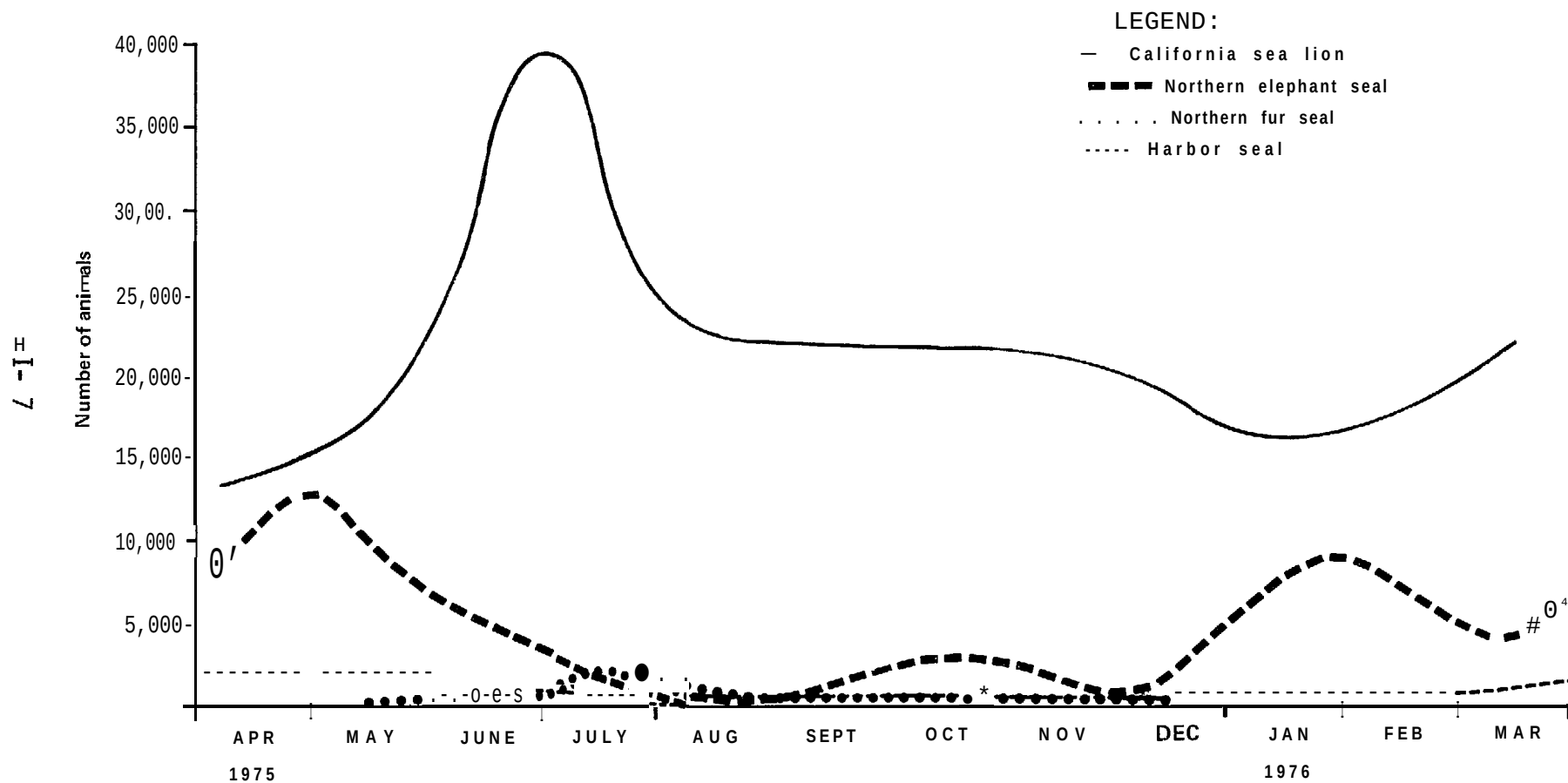


Table II-1. Glossary of Cetacea of the Southern California Bight.

<u>Scientific Name</u>	<u>Common Name</u>
BALEEN WHALES	
<u>Eschrichtius robustus</u>	California gray whale
<u>Balaenoptera musculus</u>	blue whale
<u>Balaenoptera physalus</u>	fin whale
<u>Balaenoptera borealis</u>	sei whale
<u>Balaenoptera edeni</u>	Bryde's whale
<u>Balaenoptera acutorostrata</u>	minke whale
<u>Megaptera novaeangliae</u>	humpback
TOOTHED WHALES (including porpoises)	
<u>Physeter catodon</u>	sperm whale
<u>Kogia breviceps</u>	pygmy sperm whale
<u>Kogia semis</u>	dwarf sperm whale
<u>Mesoplodon stejnegeri</u>	Stejneger's beaked whale
<u>Mesoplodon carlhubbsi</u>	Hubb's beaked whale
<u>Ziphius cavirostris</u>	Cuvier's beaked whale
<u>Berardius bairdii</u>	Baird's beaked whale
<u>Pseudorca crassidens</u>	false killer whale
<u>Orcinus orca</u>	killer whale
<u>Globicephala scammoni</u>	pilot whale, pothead, short-finned pilot whale
<u>Lagenorhynchus obliquidens</u>	Pacific bottlenose dolphin
<u>Delphinus delphis</u>	common dolphin
<u>Tursiops gilli</u>	Pacific bottlenose dolphin
<u>Grampus griseus</u>	Risso's dolphin, grampus
<u>Stenella attenuata</u>	spotted dolphin (porpoise)
<u>Stenella longirostris</u>	spinner porpoise
<u>Stenella coeruleoalba</u>	streaker porpoise, striped dolphin
<u>Lissodelphis borealis</u>	northern right whale dolphin
<u>Phocoena phocoena</u>	harbor porpoise
<u>Phocoenoides dalli</u>	Dan's porpoise

The Animals
Cetaceans (continued)

- a) Toothed versus baleen whales - This division is determined by feeding method. One may be sure that any animal observed that exceeds 35 feet (10.6 m) in length will be a baleen whale; the one toothed whale exception is the sperm whale, which approaches 60 feet (18.2 m) in maximum size.
- b) Whales versus porpoises and dolphins is a less precise categorization and a bit arbitrary, but, by convention, whales are considered the larger animals in the order Cetacea. However, two animals commonly noted in the Southern California Bight, the killer whale (30-32 feet) (9 m) and the pilot whale (18-20 feet) (6 m), are in reality very large porpoises, while examples of true whales, the pygmy sperm whale (12-13 feet) (4 m) and some beaked whales (15-17 feet) (5 m) are considerably smaller than some of the dolphins and porpoises. The terms "dolphin" and "porpoise", which are often used interchangeably, really are meant to differentiate between the long-beaked, small-toothed cetacea (dolphin) such as the common dolphin, and the blunt-headed varieties (porpoise) exemplified by the harbor porpoise in the SCB.
- c) Cool-water versus temperate-water species is an inaccurate convenience for the sake of broad separation into seasonal groupings. Although used elsewhere in this volume to describe seasonal fluctuations of species, these terms should be recognized as being primarily for the general use of biologists and in the main not useful to the reader.
- d) Species occurrence may be subdivided into a working arrangement that allows consideration of cetacea in general without taxonomic constraints. In this study we are more concerned with distribution, movement, and seasonality of cetacea as a whole than we are with the presence or absence of individuals. Of course, biologists concern themselves with species and subspecies of animals present, but, from the management viewpoint it is far more important to know when and where concentrations of cetacea may appear. All cetacea are air-breathing mammals that must interdict the air-water interface at frequent intervals (frequency, duration, and extent of body exposure can vary widely with the animal's activity, i.e., feeding, loafing, breaching, traveling). Therefore, any hazard or disturbance in their area or along their path affects all cetacean species nearly equally--the length of exposure or degree of impact may vary, but all cetacea are vulnerable.
 - 1) Year-round residents of the SCB are Dan's and Pacific white-sided porpoises; grampus; bottlenose, common, and northern right whale dolphins; and the pilot whale.

The Animals
Cetaceans (continued)

Although not seen every month, but noted at random throughout the year, are killer and fin whales, and the beaked whales.

- 2) Seasonal migrants through the Bight are sperm, blue, humpback, and California gray whales, and probably minke and sei whales.
- 3) Occasional visitors may be pygmy and dwarf sperm whales, the false killer whale, and the three species of Stenella porpoises usually found in Mexican waters or offshore.
- 4) Rare occurrences in the Bight could include any other species of cetacea not commonly associated with this geographic area. An example of such a rare occurrence would be the right whale, normally found in the Gulf of Alaska or no farther south than the coast of Oregon.

For a field guide to the more common cetacea in the SCB, Marine Mammals of California, published by the California Department of Fish and Game, is recommended. If a more complete discussion of the range, distribution, and biology of these animals is desired, see Volume III, Book I of this report series, or The Whales, Dolphins, and Porpoises of the Eastern North Pacific, published by Naval Undersea Center in San Diego, California.

Seabirds

No estimates exist at present as to the total number of seabirds utilizing the Southern California Bight (SCB) during the various seasons, though they certainly number well into the hundreds of thousands, if not millions, at times of peak abundance. Species diversity appears to be greatest in the periods of migration (April-May and August-October); avian numbers are highest in May and January, and probably lowest in late June. Approximately 80 species of primarily marine birds have been noted in the area in the past. These may be roughly grouped into six major faunal elements: nesting species; summer, winter, and year-round visitors; transients; strays.

A total of 17 species have been recorded nesting in the SCB (including Islas Los Coronados). Of these, the Common Murre, Tufted Puffin, and Royal Tern have nested at least sporadically in the past, but are not known to do so now. Three other species, the Least Tern, Caspian Tern, and Elegant Tern nest only on mainland beaches. Of the regularly nesting species, seven are year-round residents of the SCB, one other may also be resident, and three are summer visitors. The

The Animals
Seabirds (continued)

Channel Islands constitute the northern nesting range limit of the Xantus' Murrelet, Ashy and Black Storm-Petrels, and Brown Pelican, and the southern extremity of the ranges of the Pelagic Cormorant and Pigeon Guillemot. Despite the term "resident", there is considerable seasonal movement of the populations of most of these species. Most nesting populations are small remnants of those known to have existed here prior to the beginning of the twentieth century.

Seabirds generally nest on offshore rocks and islands and most species are colonial. It is believed that these nesting habits evolved in response to the paucity of terrestrial predators on islands, to the relative efficiency of preying upon mobile, unpredictable prey items that occur in patches (plankton, fish, and squid) from such centralized locations, and to the necessity of finding mates following several months of free-ranging, often-solitary existence. All of the seabird species that nest in the SCB do so in the months of March through August (though some early arrivals or late-nesting individuals may be found on the colonies up to a month on either end of the general reproductive season). In aggregate, the breeding seabirds of the SCB nest in almost all kinds of available habitat including seacliffs, island meadows and hillsides, under and on top of vegetation such as Choriopsis, in the rubble of rockslides, and on sandy and rocky beaches.

A second group of species are classed as year-round visitors; they do not breed in southern California but can be expected at any time of the year. Among these are two species of gull and one tern, which breed north of our area, and the Black-footed Albatross, which may be expected in open-ocean waters at any season. Six species may be listed as summer visitors, three of which nest to the south in Baja California, and two which nest in the southern hemisphere and spend "winter" in our area. Included in the latter category is the Sooty Shearwater--generally regarded as the most abundant and most energetically-important seabird of the entire California Current region.

Nearly half of all the regularly occurring seabirds in southern California are included in the category of winter visitors. This category represents the greatest avian biomass from October through April. Included in this group are several species of loons and grebes, sea ducks, and alcids, all of which are known to be vulnerable to oiling at sea. Nine species may be categorized as "pure" transients, passing through southern California waters while migrating between their wintering and breeding grounds. Lastly, several species are regarded as strays because they occur in such small numbers they are not considered an integral part of southern California's expected avifauna.

Seabirds exhibit a range of behavior patterns during the non-breeding seasons. Some species, such as the albatrosses, shearwaters, and alcids, never come ashore when not engaged in reproductive activities--eating, resting, and flying over open water for up to ten

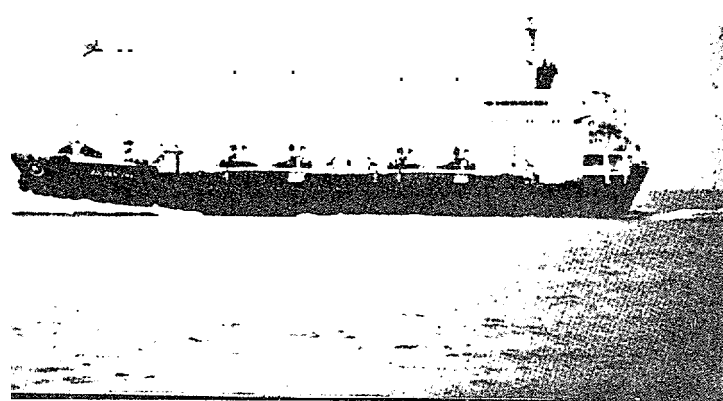
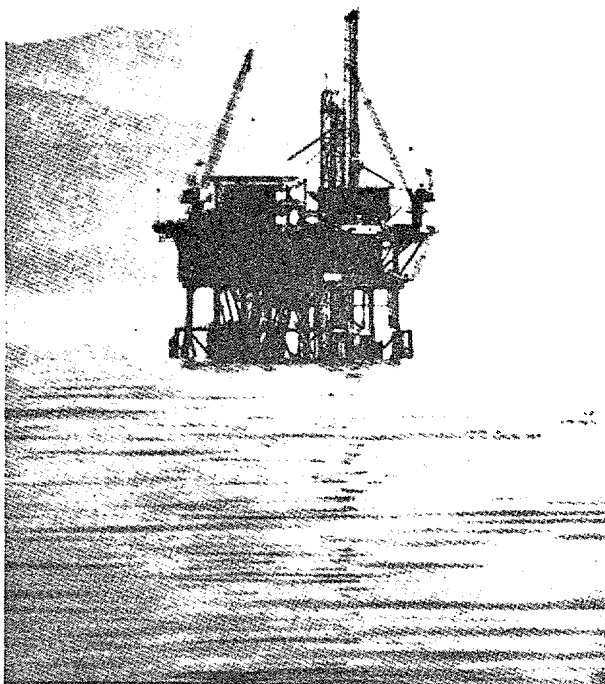
The Animals
Seabirds (continued)

months at a time. Other birds that more typically reside along coastlines--the cormorants, pelicans, and gulls, for example--come ashore on island or mainland beaches each evening and forage by day up to several tens of kilometers at sea. Roosting sites are occupied in a predictable seasonal pattern and are probably selected to optimize feeding opportunities and minimize disturbance by predators and people.

Taken together, the seabirds of the SCB feed at three or four trophic levels, including oceanic primary and secondary consumers (zooplankton, and schooling planktivorous fish and squid) as well as carrion, fish offal, and a variety of intertidal and terrestrial prey (crabs, shellfish, echinoderms, rabbits, insects, other birds, etc.). Although no models yet exist for the total trophic impact of all seabirds in the Bight in a given season, it has been estimated that shearwaters, alone, harvest 6,000 kg or more of anchovies per day in the SCB during May.

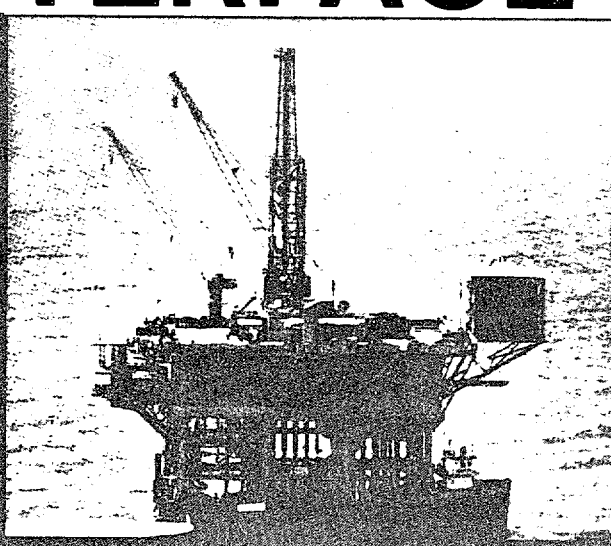
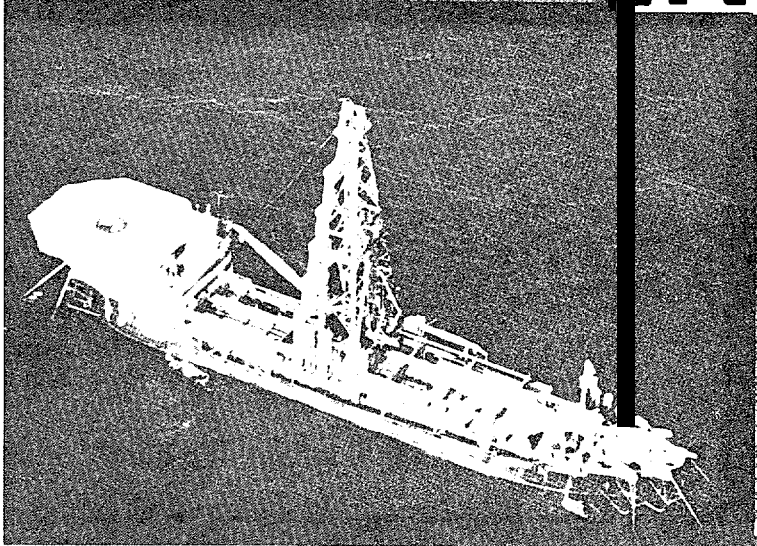
Surprisingly little quantitative information about the birds of the SCB is available in the literature. Though a few nesting species and areas have been recently studied thoroughly, there are no modern syntheses of the status of breeding birds of the Channel Islands, with the exception of the work of Jones (unpublished). Similarly, the patterns of seabird use of the open waters of the Bight have been relatively unstudied; prior to initiation of this program most available data were of very limited seasonal, geographic, or taxonomic scope.

In 1967-68, an attempt was made to quantify distributional patterns and seasonal status of marine birds in the oceanic area 150-500 km off the coast of southern California (King [cd.] 1974). The data gathered during this project by the Pacific Ocean Biological Survey Program remain largely unanalyzed and unpublished. Published data on the beaching of birds and the incidence of oiled birds on the beaches of southern California are lacking. The results of one study by D. G. Ainley of the Point Reyes Bird Observatory remain unpublished, although a short article on his studies of beached birds in California has appeared in the in-house Point Reyes Bird Observatory Annual Report (D. G. Ainley, pers. comm.).



Overview:

THE OIL/ANIMAL INTERFACE



OVERVIEW

The Interface Between OCS Resource Development and the Marine Mammal and Seabird Fauna

In this section, we identify potential hazards to marine mammals and seabirds associated with OCS resource development, explore the mechanisms at the interface of these hazards and the animal populations involved, and identify the species or populations that we believe to be the most vulnerable to these hazards. Obviously, we must seek to avoid the coincidence in time and space of potentially detrimental events and concentrations of vulnerable animals if we are to minimize the risk of serious impact.

Detrimental impact on animal populations has one or more of the following effects:

- a) depression of reproductive output,
- b) increased mortality,
- c) decreased availability of food or greater energetic costs of obtaining food,
- d) preemption of critical habitats,
- e) reduction in species diversity by removal of a member-species from the animal community.

Populations vary in their ability to withstand or recover from detrimental impact. This resilience is largely a function of two factors:

- a) size and insularity,
- b) reproductive status at the time of impact.

There are other factors affecting resilience to impact that are difficult to describe and perhaps impossible to define. These factors seem to be related to the behavior, ecology, distribution and movements of individual species. Basically, we do not know what levels of insult a population may withstand before irreparable damage is done, or, in other words, what population level constitutes a biologically viable critical mass. As an example, two species of whales, the northern right and the California gray, were afforded protection after being hunted to near-extinction. The California gray whale has recovered, and current numbers indicate a healthy growing population, while the

The Oil/Animal Interface (continued)

right whale, with the same protection, is seemingly diminishing in numbers and may be biologically extinct even though remnants of the species still exist. Several lessons may be learned from such an example:

- a) there may be far-reaching consequences of impact,
- b) the effects of impact may be cumulative,
- c) not only are there species differences in vulnerability, there are species differences in the ability to recover.

Because we can never predict in full the consequences of our activities, a cautious and conservative approach to OCS resource development is the only prudent course of action.

Potential Hazards and their Sources

Each phase of OCS resource development carries with it several sources of potential detrimental impact (hazards) to marine mammal and seabird populations (Table II-2). Since OCS resource development activities have both at-sea and onshore components and typically span from one to several decades, there exist, in addition to obvious and immediate episodic events (such as wellhead blowouts), chronic, low-intensity impacts. The cumulative effect of chronic, low-intensity impact (such as seepage, boat traffic, etc.) may be as significant over time as the impact of short-term, high-intensity events (such as oil spills). Further, there exist more subtle ecosystem effects that may profoundly alter the animals' supporting biological medium. At present, there are no unequivocal data demonstrating adverse effects of small amounts of oil in ecosystems. However, long-term studies have yet to be undertaken and until we finally know the critical tolerance level of populations, communities, or ecosystems to chronic, low-intensity oil pollution, we must be cautious indeed.

The Effects of Oil on Marine Mammals and Birds

Essentially, there are three types of hazards that can result from OCS oil resource development:

- a) Floating Oil: oil on water or beaches can lead to fouling of feathers and fur, ingestion through preening or grooming, ingestion through suckling by young, inhalation, and irritation of eyes and membranes;
- b) Increased Human Activity and Disturbance: increased boat, aircraft, or pedestrian traffic can lead to disruption of reproductive, feeding, and migratory activity at sea and disturbance to fragile social order in bird and pinniped reproductive colonies;

Table II-2 . Sources of potential hazards to marine mammals and seabirds, resulting from offshore oil resource development and production.

Activity or Facility	Chronic Hazards	Episodic/Catastrophic Events
<u>Exploration</u> Seismic profiling Drilling Boat traffic	Noise, "startle" effects Prop hits	Sub-surface noise - Concussion Siltation Downstream pluming Opacity increases
<u>Operation</u> Onshore facilities Staging areas Pumping stations Tank farms Separation plants Refineries Offshore facilities Production platforms Well-head Support Crew and supply boats Aircraft	Disturbance near reproductive areas of sensitive mammal and bird populations (depends on site) Introduction of terrestrial predators Leakage/seepage Sub-surface noise and propeller hits Noise in air	Disturbance in construction Blow-out
<u>Transport</u> Pipelines Pumping buoys Barges and tankers	Leakage Leakage Bilge Oil	Rupture Collision or grounding
<u>Clean-up</u> Oil on water Skimmers Burn-off Chemicals Grounded oil Booms Straw Chemicals		Boat activity Pollution--air Pollution--water Disturbance to sensitive bird and mammal populations on islands by human intrusion and aircraft activity

- c) Ecosystem Contamination: contamination of water by pollutants that may lead to the Preemption of critical feeding grounds, decrease the suitability of food resources, or decrease the abundance of prey species through ecosystem effects of unknown magnitude.

Our knowledge of the mechanisms whereby pollution of ecosystems, disturbance, and floating oil damage populations of marine mammals and birds varies from group to group and with the nature of the insult. Since seabirds are both conspicuous along populated coastlines and relatively vulnerable to oiling, much public attention and some scientific research has been focused on oil/seabird interactions. Cetaceans and pinnipeds are much less familiar to coastal inhabitants and wash ashore or strand only infrequently. As a result, knowledge of the effects of spilled oil on these mammals is quite limited. It should be stressed, however, that lack of information does not denote lack of effect; we simply don't know or are not yet able to assess the magnitude of impact on marine mammal populations.

The following three sections summarize currently available information on the interface between the hazards identified above and marine mammal and seabird populations.

a) Floating Oil

Contact with floating oil affects" marine birds and mammals in four obvious ways: by fouling of fur or feathers, by ingestion, by inhalation, and by irritation of eyes and membranes. When oil contaminates fur or feathers, two important physiological changes occur; buoyancy decreases and normal thermal resistance is impaired. Of the two, destruction of the insulation properties of the body covering is probably more damaging.

Fur seals depend on the integrity of their underfur for insulation and spend considerable time grooming their pelage with their nails and mouth. Kooyman (cited in Gentry, Johnson, and Holt, 1976) reported preliminary data on the effects of application of Prudhoe Bay crude oil to fur seal pelts and live captive animals. He found that 1.7 to 2.0 times as much heat was conducted through oiled pelts than normal, unsoiled ones and that the metabolic rate during immersion of oiled, experimental animals was 1.5 times that of controls. Obviously, oiling causes considerable heat loss in fur seals.

Most of the immediate mortality of birds that come into contact with spilled oil is due to contamination of the feathers. Oiling of the plumage leads to mechanical inability to fly or to forage under water, and lowering of body temperature (hypothermia) by impairment of the normal thermal resistance to cool environmental temperatures afforded by the plumage. Hartung (1967) found that oil on the plumage of waterbirds results in heat loss proportional to surface area oiled and that death in oiled birds usually comes after fat reserves are exhausted. Since oiled birds

usually refrain from eating, Hartung concluded that starvation, accelerated by rapid use of fat reserves for thermal maintenance, was often the cause of death.

Oil may be ingested by young cetaceans and pinnipeds during the course of suckling and by all higher marine vertebrates incidental to feeding. Additionally, pinnipeds and birds may take in oil during grooming or preening of contaminated hair or feathers. There have been few studies of the physiological effects of oil ingestion in these animals although blistering of the alimentary tract has been demonstrated. Further, laboratory experiments by Hartung (1965) and Grau et al (1977) have shown that oil ingestion causes cessation of laying and reduced hatchability in some birds. The very serious implications of this preliminary information signal the need for much additional study.

There has been no serious study of the physiological effects of inhalation of petroleum or its volatile constituents by cetaceans, pinnipeds, or seabirds. However, Geraci and Smith (1976) have reported severe eye irritation and avoidance behavior among pinnipeds exposed to floating oil.

The probability of contact with floating oil and of measurable population damage resulting from such contact varies from species to species. Most small cetaceans and many larger ones are highly social -- feeding and traveling in groups and relying on social groups for predator defense. As a result, it is likely that contact with an oil spill by a cetacean school may affect many animals at once. There is no evidence suggesting that cetaceans avoid oil spill areas (though this subject has not been adequately studied). Because cetaceans must surface to breathe, it is likely that animals would repeatedly surface through a spill.

The subject of oil ingestion and possible harmful effects on cetacea has not been adequately studied. The reviews of post-oil spill beaching of cetacea following the 1969 Santa Barbara blowout of platform A (Brownell 1971 and Orr 1969), merely state that no direct evidence of oil-induced death can be made. It must be understood that examination of animals several days or weeks after death cannot be conclusive as to cause of death. In fact, post-mortem tissue changes occur so rapidly in these animals that tissues obtained merely hours after death are usually useless for histological examination. Indeed, very small amounts of petroleum products introduced into the respiratory systems of mammals can induce pneumonia which is, in its terminal stages, indistinguishable from upper respiratory inflammation caused by other agents. Additionally, mortality from oil spill encounters may not occur at or near the site of the insult, particularly with migratory animals. And, finally, there is little or no guarantee that moribund animals will beach themselves, or if beached will be found in time for adequate post-mortem study.

The Oil/Animal Interface
The Effects of Oil on Marine Mammals and Birds (continued)

Nothing is known of the habits of seals and sea lions encountering floating oil at sea. Limited information is available regarding impact to populations hauled-out in areas where oil has washed ashore.

Shortly after the 1969 platform blowout in Santa Barbara Channel, biologists determined percentage mortality for northern elephant seal and California sea lion pups, percentage oil-fouled, and tagged oily and clean living pups (Le Boeuf 1971; Brownell and Le Boeuf 1971). It was determined that significantly more dead California sea lion pups were oil-fouled than living pups; however, no cause-and-effect relationship could be postulated from the scant data. Northern elephant seal pups, perhaps, fared somewhat better, in spite of the fact that the blowout occurred during the breeding season. Tag returns showed that oily pups survived as well as clean pups. Because the oil contamination occurred after the pups were weaned, they fortunately did not ingest oil as they suckled from their mothers. Had the blowout occurred two weeks earlier, the impact might have been severe. An oil spill that contaminated a gray seal rookery in Wales resulted in significantly lower peak weight of oiled pups and a very high overall mortality (both oily-and clean pups) (Davis and Anderson 1976). Though the high pup mortality was apparently related to oil clean-up activities with accompanying disturbance, stress, and disruption of the social structure, the ultimate survival of the smaller, oily pups remains in question.

A number of factors influence the vulnerability of different species of birds to contact with spilled oil. Factors which increase vulnerability include: 1) tendency to form large, dense flocks on the water, 2) existence of a species only as small populations, 3) considerable time spent swimming on the water, and 4) tendency to dive (and this become recontaminated upon surfacing) when alarmed. On the other hand, a species which has the following characteristics is likely to be less vulnerable to spilled oil: 1) foraging done by widely-dispersed individuals, 2) foraging accomplished by plunge-diving from the air or foraging done onshore, and 3) a tendency to fly rather than dive when alarmed.

To some extent, all colonial seabirds are vulnerable to contact with floating oil during the nesting season, since they are concentrated near their colonies during that period. However, species such as cormorants and alcids are particularly sensitive as they possess several characteristics which act to increase exposure to spilled oil. In southern California, Brown Pelican populations are vulnerable due to their restricted distribution and small population size, while Western Gulls can be expected to be affected by spilled oil to a lesser extent.

The Oil/Animal Interface
The Effects of Oil on Marine Mammals and Birds (continued)

b) Increased Human Activity and Disturbance

Acceleration of offshore petroleum resource development necessitates increases in ship and aircraft traffic near offshore facilities and between these facilities and the shoreline. The probability of intrusion upon land areas used by animals for reproduction is also increased.

We do not really know how ship or aircraft noise affects animals in or above the water. Some cetaceans are known to utilize acoustic information for navigation, maintenance of social bonds, and foraging. A dramatic increase in ambient noise levels or in the incidence of "startling", high-intensity, short-period sounds may well preclude successful hunting or make orientation or social cohesion much more difficult for these animals. The seabirds and pinnipeds found in the Southern California Bight (SCB) are not known to hunt acoustically, though this possibility should not be overlooked.

All floating or swimming animals are liable to being hit by boats. This is particularly true of small cetaceans, who depend on a reasonably normal acoustic environment for spatial and social orientation and would thus be more liable to being struck in the vicinity of a ship's noise.

Disturbance of bird and pinniped colony areas on land is a more tangible and well-known hazard. Disturbance is much more than an inconvenience to these animals--their reproductive activities may be completely disrupted by human intrusion or aircraft flyovers at critical times. Among pinnipeds, adult animals may stampede to the water at the sight of man, leaving pups behind. Mother-pup separation is a major source of pup mortality. Seabirds also react to man by deserting their nests. Human intrusion on nesting areas can lead to crushing of eggs, collapse of underground burrows, and mortality of eggs and chicks due to inter-specific predation.

Reproductive rookeries are used traditionally by pinnipeds and seabirds and repopulation following disturbance may in some cases require decades. Similarly, disturbance of gray whales by boating activity is thought to have led to abandonment of San Diego Bay as a calving ground several decades ago--they have never resumed breeding in this location.

The planning of resource development must take into account, and avoid at any cost, disturbance or intrusion upon pinniped rookeries and seabird nesting colonies in the breeding season. Likewise, any attempt to clean up these areas in the event of an oil spill would likely cause more harm to the animals than the presence of oil on land.

The Oil/Animal Interface
The Effects of Oil on Marine Mammals and Birds (continued)

c) Ecosystem Contamination

There is much evidence that the productivity of colonially-breeding animals is limited by the availability of food. The likelihood that food availability plays a major role in regulating populations of island-dwelling seabirds is particularly strong. The location of colonies of seabirds and pinnipeds is closely tied to location of foraging areas; even small changes in the abundance of prey, time required for foraging, or nutritional suitability of prey can cause major alterations in reproductive ecology.

The same can be said of important traditional migration routes. Over evolutionary time migrating whales, seals, and birds have been selected to use routes offering the optimal feeding areas, lowest mortality rates, and ease of passage. A loss of an important feeding area along such a route might well be very detrimental to a population as a whole.

No one really knows how spilled oil or its metabolizes, drill muds, or trace metal pollutants affect marine food chains or whether environmental alterations due to offshore oil production can preempt or spoil a major feeding area. This is not to say that such effects do not exist but rather that long-term food chain experiments have yet to be conducted.

Efforts at cleanup or monitoring of oil spills have been the sources of serious damage to bird populations. The use of emulsifiers in cleanup of spilled oil is among the most obvious impacts. This practice has led to loss of food supplies and direct toxic effect on oiled birds; emulsifiers may be concentrated in birds which come to eat fish and invertebrates poisoned by the treatment (Aldrich 1970).

Given our limited knowledge of these complex ecosystem effects, prudence demands that extra caution be used when considering any offshore resource development activity that lies in or close by an identifiable major feeding area.

THE RED FLAGS

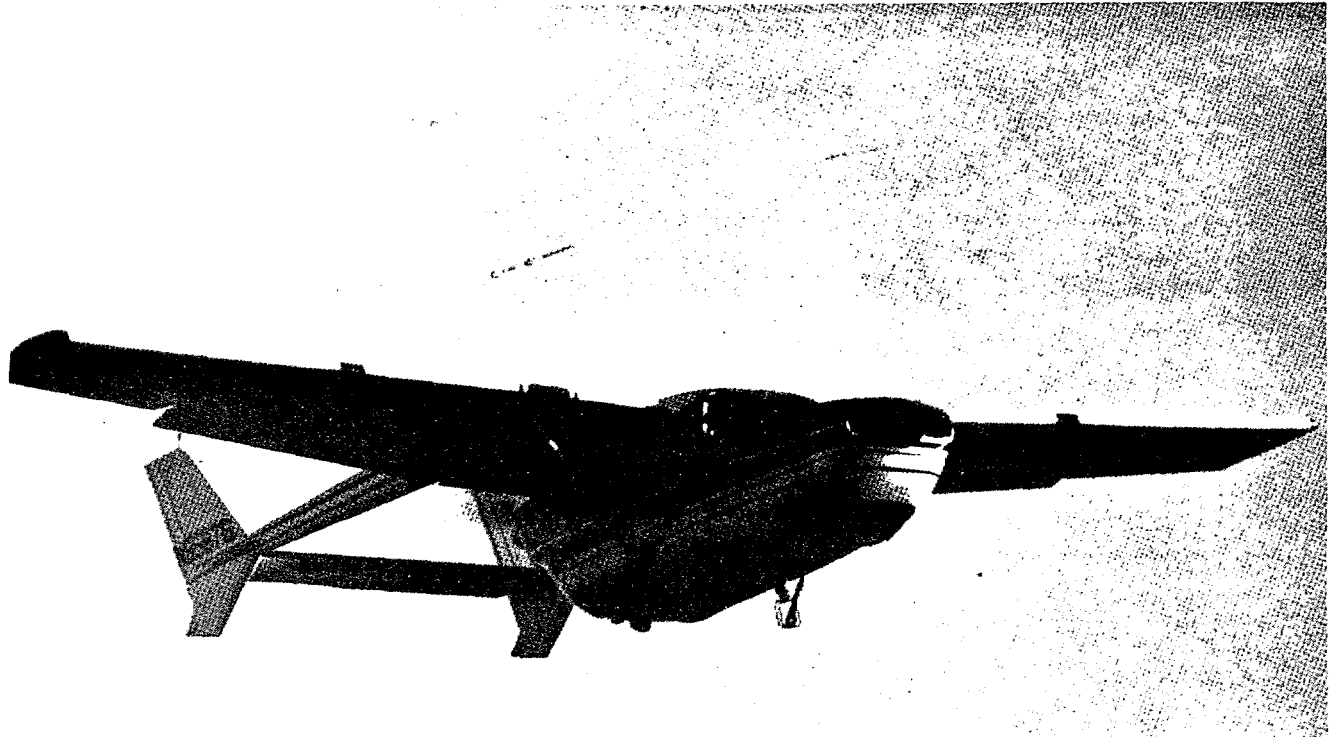
All of the populations of marine mammals and birds that frequent the waters off southern California are, to some extent, vulnerable to impacts associated with development of offshore oil and gas resources. However, by virtue of their small size, insularity, extreme susceptibility to contamination by floating oil, or narrow behavioral or ecological tolerances, some populations are so vulnerable to these impacts that catastrophic damage might result from even minimal changes in their environment. We call these the RED FLAG species: their concentrations in space and time signal the need for special caution in resource planning and development. A listing of these vulnerable species appears in Table II-3

TABLE II-3 . THE RED FLAGS: marine mammal and seabird species most vulnerable to impacts related to OCS oil resource exploitation. All populations are considered vulnerable to disruption of feeding grounds wherever they aggregate in large numbers. Marine mammals and birds are protected under the Marine Mammal Protection Act and the Migratory Bird Treaty Act.

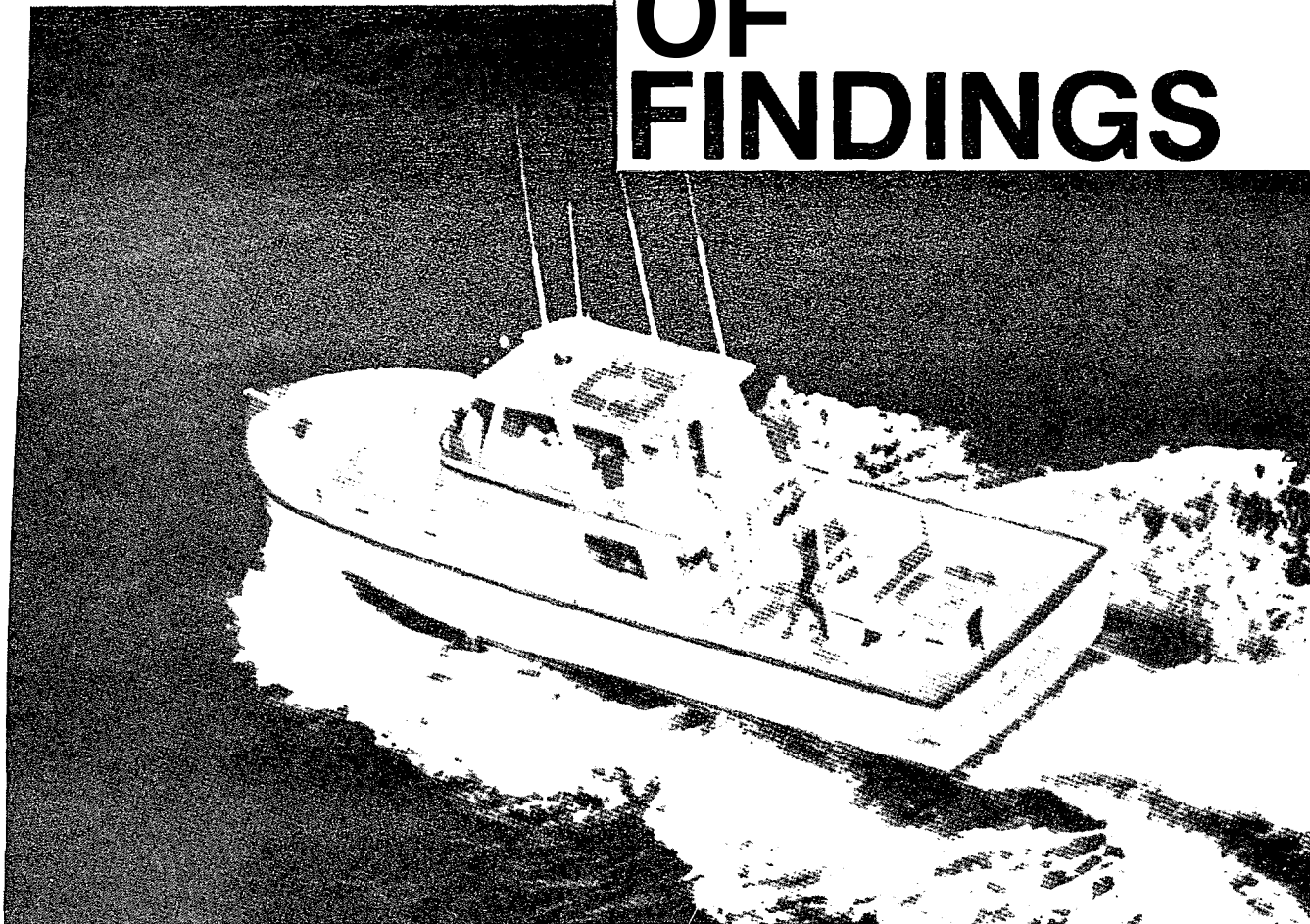
<u>Species</u>	<u>Comments</u>
Northern fur seal	Extremely vulnerable to exposure, stress, and loss of buoyancy resulting from oiling of fur; especially susceptible to oiling at the Castle Rock rookery on San Miguel Island.
All pinnipeds	Moderately to very susceptible to disturbance of rookery areas and hauling grounds; pups may ingest oil during suckling if mother is fouled.
California gray whale	Endangered species; migrates predominantly in band from 0 to 15 km off the mainland.
Blue, fin, humpback, sei, and sperm whales	Endangered species; population numbers small; migrate along western margin of study area.
Pilot whale	Susceptible during winter; seasonal feeding concentration in shallow waters surrounding southeastern portion of Santa Catalina Island.
Migratory waterfowl (loons, grebes, sea ducks)	Most are divers and are very susceptible to oiling of feathers; many species forage in large groups in restricted areas of shallow water nearshore.
Cormorants	Breeders in Channel Islands; very susceptible to disturbance of colonies; roost ashore in large groups and forage in flocks; susceptible to oiling of feathers.
Brown Pelican	Endangered species and Channel Islands breeder; very susceptible to disturbance of colonies.

TABLE II-3 . (continued)

<u>Species</u>	<u>Comments</u>
Phalaropes	Very numerous and wide-ranging but susceptible to oiling of feathers.
Western Gull	Channel Islands breeder; may contaminate eggs by bringing oil to nests on breast feathers.
Nesting Alcids (Cassin's Auklet, Pigeon Guillemot, Xantus' Murrelet)	Very susceptible to oiling of feathers; gather in large groups near colonies; vulnerable to disturbance of colonies and introduction of terrestrial predators.
Wintering Alcids	Very susceptible to oiling of feathers; may concentrate in restricted offshore areas for feeding.



SYNTHESIS OF FINDINGS



Section I.B
Synthesis of Findings

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INTRODUCTION TO SYNTHESIS OF FINDINGS

We have stated that this document should be considered as a management tool. It provides, to the present limits of our knowledge, the structure and dynamics of the higher marine vertebrate populations in the Southern California Bight--which species are there, how many, when, and where.

In order that the following discussion may be readily utilized, we have divided the study area into nine sub-areas, called "zones" (Figure II-6). These zones rather loosely partition the SCB into several bodies of water, each dominated by some central physiographic feature. The role of zonal descriptions in this document is not to define oceanographic or faunal regions, but rather to enable the reader to easily access information about a specific area. In other words, one needn't read a description of the entire Bight in order to find information specific to the Santa Barbara Channel. Since animals vary in numbers and distribution from season to season, the following discussions of geographic zones are prefaced by four overviews--each describing the animal populations as they existed throughout the Bight in one calendric quarter. Then, in succeeding sections, summaries and faunal accounts are provided for each zone in each season, highlighting both where the animals were and where they were not present.

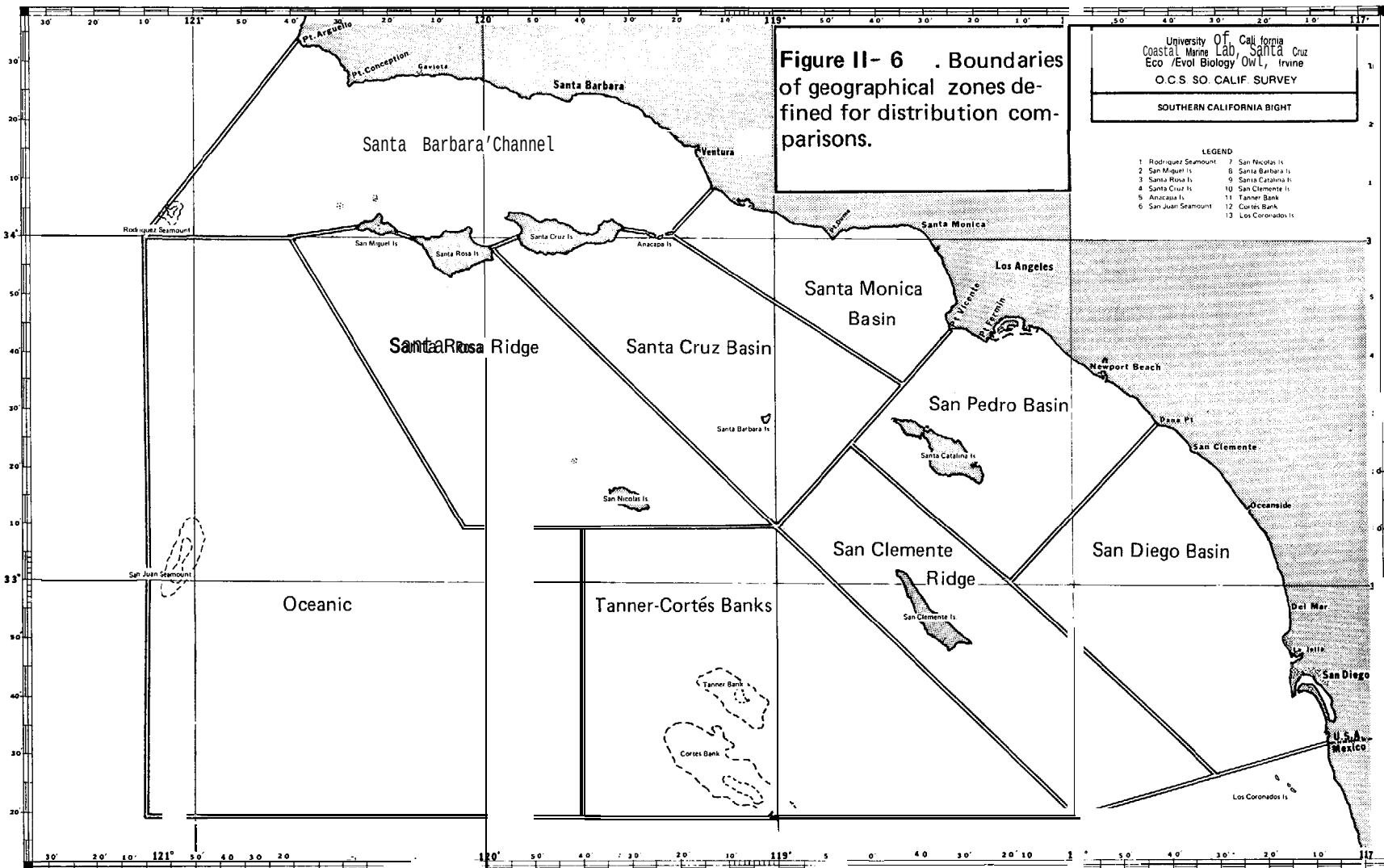
As used throughout this report, references to the yearly seasons correspond to the calendric quarters, thus:

spring = April, May, June

summer = July, August, September

autumn = October, November, December

winter = January, February, March



Synthesis of Findings:

INTEGRATED SEASONAL SUMMARIES



INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- April, May, June, 1975

Biological Context

For both pinnipeds and marine birds, the spring months encompassed most of the year's reproductive activity. From mid-May through June, male sea lions and fur seals established their territories while the females began to arrive, give birth, and nurse their pups. Harbor seal pupping reached its peak in April and May; herd size remained large through June. Nest building, egg laying, and hatching of chicks took place in nine seabird species; for most of these, fledging did not occur until summer. Additionally, northern elephant seals reached peak numbers on land in April when adult females and young animals hauled-out for their annual molt.

Throughout this period, populations of seabirds and pinnipeds swelled as animals migrated into the Southern California Bight (SCB). In contrast, the cetacean population was markedly reduced during these months. The greatest concentrations of pinnipeds and seabirds were recorded over island shelf waters and within 30 km of the mainland shore; few animals were seen east of Santa Catalina Island. Most cetacean sightings were randomly scattered throughout the Bight with few points of significant aggregation.

Faunal Composition

Species diversity and overall numbers among pinnipeds and seabirds were high this-season; cetacean diversity, however, was only moderate during this same period, with total numbers at a low for the year. The predominant pinniped at sea and on land was the California sea lion which accounted for 91% of the pinniped population in late June. Yearly population peaks also occurred at this time for northern elephant seals, northern fur seals, and harbor seals.

Approximately 2,500 cetaceans of ten different species were observed in the SCB during this period. Toothed whales, primarily Dan's porpoises and Pacific white-sided and northern right whales dolphins, comprised more than 65% of the total population. Common dolphins, predominant at other seasons, reached their lowest annual numbers in spring. Gray and minke whales were the only baleen whales sighted (Table II-4).

High diversity in the spring avifauna resulted from the passage of northbound transients, the annual departure of winter visitors, and the arrival of summer visitors from Mexican waters and the Southern Hemisphere. Throughout this period, Sooty Shearwaters were the most abundant, but substantial densities of migrating loons, phalaropes, and gulls were also recorded. The most prevalent species close to the islands and along mainland shores were loons, grebes, and gulls in addition to nesting species (Brandt's Cormorant, Brown Pelican, Western Gull, and Cassin's Auklet).

Table 11- 4. Cetacean Population Summary: Southern California Bight during April, May, June, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	<u>Hi Lo</u>
BALEEN WHALES							
Gray whale	2	4.65	3	0.12	1.5	2	1
Minke whale	2	4.65	2	0.08	1.0	1	1
SUBTOTAL	4	9.30	5	0.20	1.2	2	1
TOOTHED WHALES							
Bottlenose dolphin	1	2.33	10	0.40	10.0	10	10
Common dolphin	5	11.63	241	9.58	48.2	100	4
Dan's porpoise	13	30.23	44	1.75	3.4	10	1
Northern right whale dolphin	2	4.65	151	6.00	75.5	150	1
Pacific white-sided dolphin	7	16.28	2,048	81.43	292.6	2,000	1
SUBTOTAL	28	65.12	2,494	99.16	89.0	2,000	1
UNIDENTIFIED WHALES							
Large (>40')	2	4.65	2	0.08	1.0	1	1
Medium (20'-40')	2	4.65	2	0.08	1.0	1	1
small (<20')	7	16.28	12	0.48	1.7	5	1
SUBTOTAL	11	25.58	16	0.64	1.5	5	1
TOTAL	43	100.00	2,515	100.00	58.5	2,000	1

INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- April, May, June, 1975

Reproduction

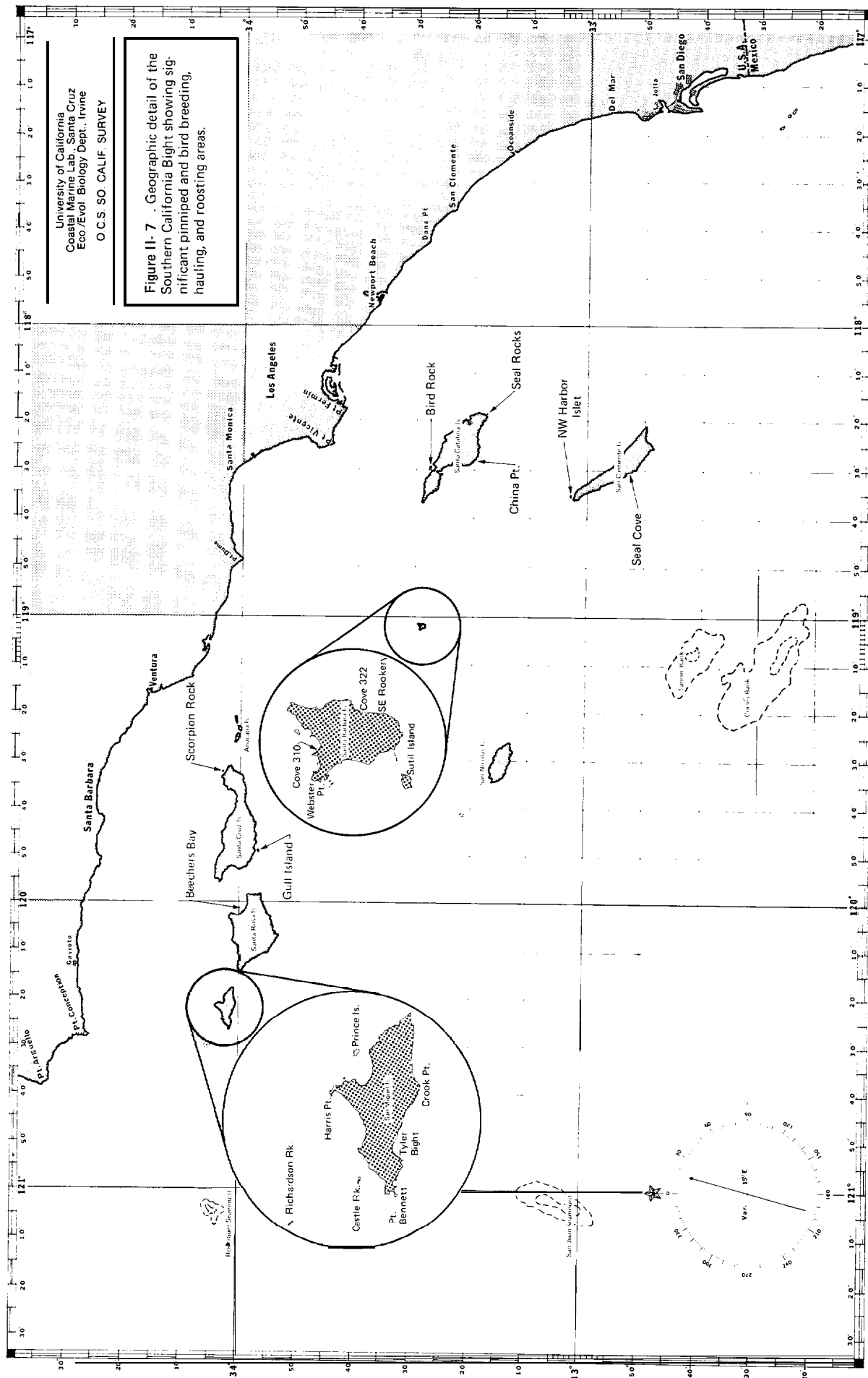
Nine marine bird species comprising 34,600 to 38,700 breeding adults, and 36,500 breeding pinnipeds of four different species used Channel Islands sites in 1975 (Fig. II-7). San Miguel Is. was the major locale of this reproductive activity: about 67% of the SCB's nesting birds and 54% of the pinnipeds resided here. Other important pinniped rookeries were found on San Nicolas (36% of breeding animals), Santa Barbara and San Clemente islands (5% each). Small herds of harbor seals, most with pups-of-the-year, were found on the remaining islands. In addition to the sites at San Miguel Is., large and diverse seabird colonies were also situated on Anacapa and Santa Barbara islands, and smaller ones were found on Santa Rosa, Santa Cruz, and San Nicolas islands (Fig. II-8). Few birds nested on either Santa Catalina or San Clemente islands. Historical population declines and nesting-range restrictions have been documented for Brandt's, Double-crested, and Pelagic Cormorants, and for Brown Pelicans and Cassin's Auklet; Tufted Puffins and Common Murres have suffered complete extirpation from the SCB. With the exception of abnormal female-female pairing in Western Gulls at several colonies, the reproductive output of Western Gull and Brown Pelican populations was within the normal range this year. Brandt's Cormorants on San Nicolas Is., however, appeared to have low success.

No young cetaceans were seen at sea in this quarter.

Movements and Migrations

Pre-reproductive season transitions led to extensive movement of both pinnipeds and seabirds during these months. The major migration of gray whales, however, had subsided by April. Large numbers of California sea lions moved into the Bight from the north and south prior to regrouping on the various Channel Island rookeries. Northern fur seals, present offshore in winter and early spring, departed the waters west of the Channel Islands enroute to the Bering Sea. The last vestige of the winter migration of gray whales was a sighting in May of three northbound adult animals in shallow coastal waters north of Dana Point.

Important migrations and relocations of marine birds took place during the spring season. Winter visitors to the SCB, including loons, grebes, sea ducks, several species of gulls, and alcids left the study area for inland or northern nesting sites. Several species of "pure transients", primarily gulls and terns, passed through offshore areas, and summer residents arrived to begin breeding. Summer visitors from the southern hemisphere also began their annual influx; shearwaters of two species outnumbered all other seabirds in the SCB by a factor of ten or more.



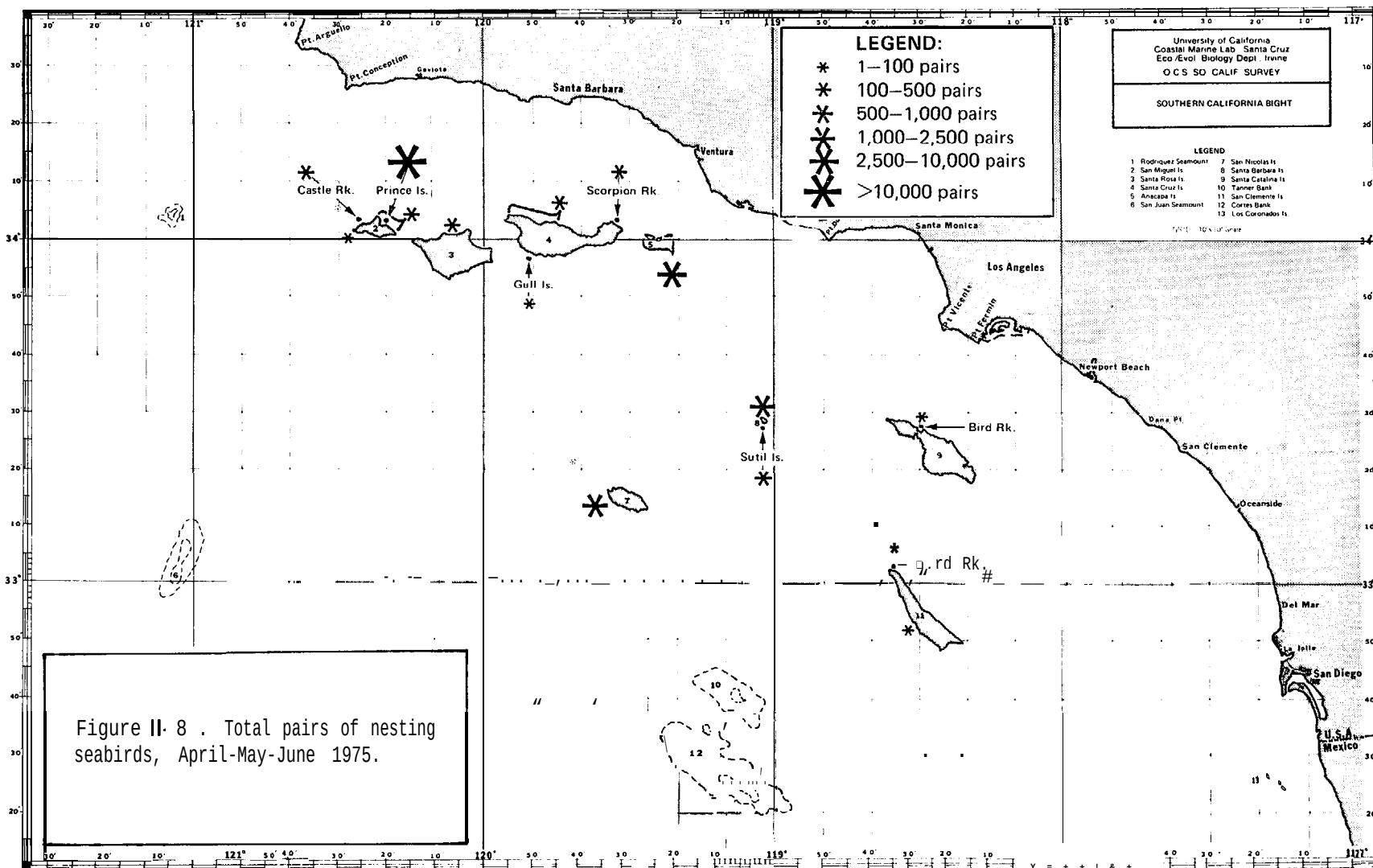


TABLE II-5. Quarterly occurrence of beached and oiled birds in Southern California, by region, May 1975-April 1976.

ZONE*	MAY-JUN 1975		JUL-SEP 1975		OCT-DEC 1975		JAN-MAR 1976		APRIL 1976		TOTAL	
	No./km/ month	% oiled	No./km/ month	% oiled	No./km/ month	% oiled	No./km/ month	% oiled	No./km/ month	% oiled	No./km/ month	% oiled
Santa Barbara Channel	2.04	23.4	1.77	42.6	1.89	63.0	2.93	59.4	2.52	37.9	2.21	48.6
Santa Cruz Basin	0.26	0.0	0.29	0.0	0.23	25.0	0.12	0.0	0.00		0.20	7.1
Santa Monica Basin	0.79	0.0	1.28	17.4	0.92	30.3	1.97	32.4	2.83	26.5	1.45	25.3
San Pedro Basin	2.12	0.0	0.40	0.0	0.51	0.0	2.73	29.6	3.64	33.3	1.57	19.4
San Diego Basin	0.60	0.0	0.81	18.2	0.29	5.0	2.65	13.9	1.28	20.7	1.15	13.5
<u>TOTAL</u>	<u>0.82</u>	<u>10.5</u>	<u>1.03</u>	<u>25.7</u>	<u>0.73</u>	<u>39.7</u>	<u>2.30</u>	<u>30.4</u>	<u>1.89</u>	<u>28.8</u>	<u>1.35</u>	<u>28.2</u>

*Beaches surveyed within each zone were as follows (numbers in parentheses indicate km surveyed each month):

<u>Santa Barbara Channel</u>	<u>San Pedro Basin</u>
Santa Cruz Island-West (4.2)**	Huntington State Beach (3.3)
Santa Cruz Island-North (4.3)**	<u>San Diego Basin</u>
McGrath State Beach (3.0)	San Onofre State Beach (5.0)
<u>Santa Cruz Basin</u>	South Carlsbad State Beach (9.3)
Santa Cruz Island-South (5.7)	Silver Strand State Beach (5.7)
<u>Santa Monica Basin</u>	Border Field State Beach (2.6)
Pacific Missile Test Center (3.1)**	
Point Mugu State Beach (3.3)	
<u>Dockweiler State Beach (5.6)</u>	
(= Playa Del Rey)	

** October surveys of Santa Cruz Island-North (0.7km) and Santa Cruz Island-West (1.8 km) were incomplete;
Surveys of Pacific Missile Test Center began in July, 1975.

SOUTHERN CALIFORNIA BIGHT -- April, May, June, 1975

Distribution on Land

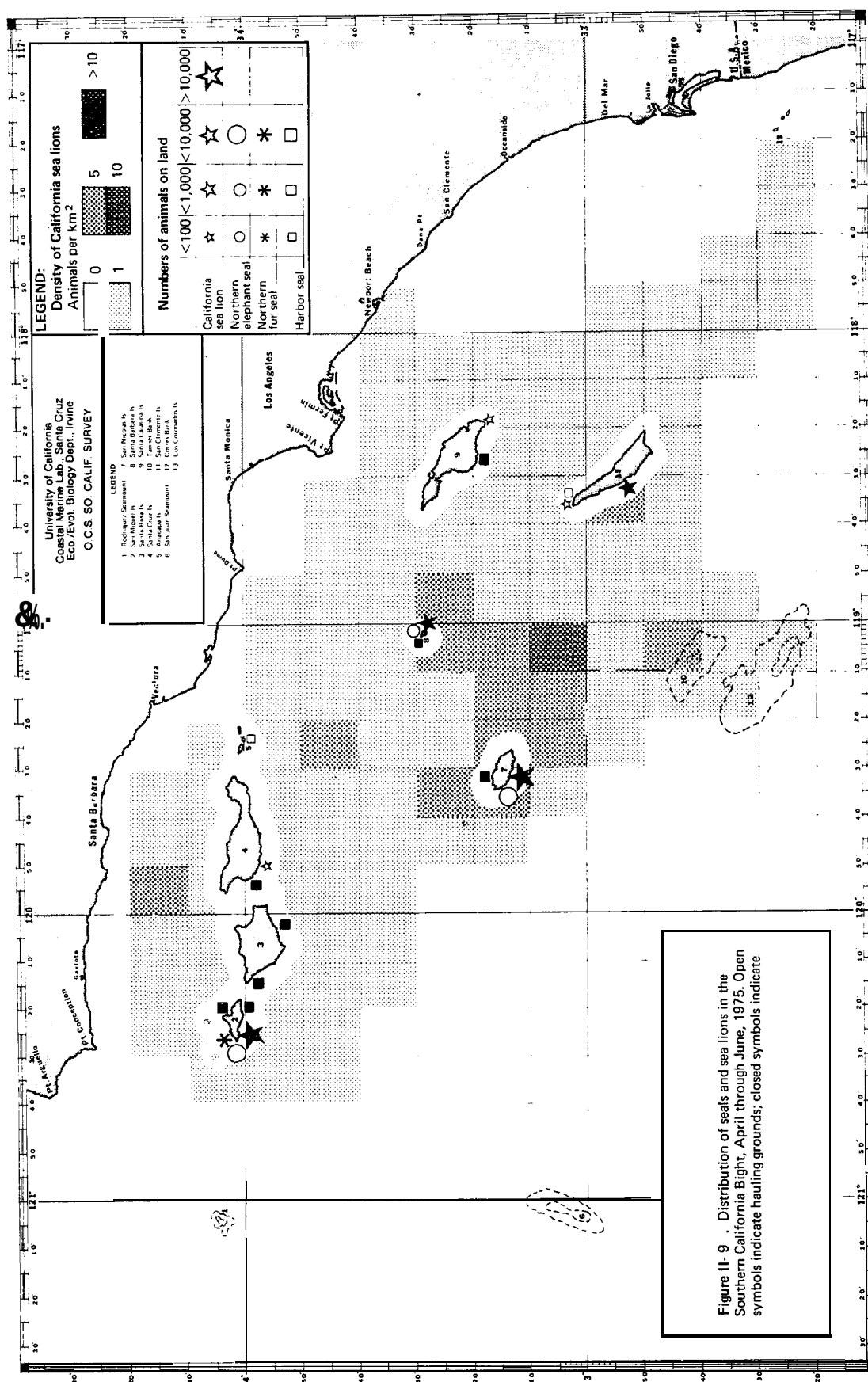
Slightly more than half (54%) of the pinnipeds and 67% of the seabirds on land in the SCB during the spring were counted on the beaches and nearshore rocks of the northern Channel Islands. Over 18,000 California sea lions, 1,000 fur seals, and more than 24,300 marine birds belonging to eight species bred on San Miguel Is. alone, and another 7,200 elephant seals hauled-out there to molt. Anacapa Is. also provided nesting grounds for an estimated 2,400 to 6,400 birds. In addition, the shores of the northern islands supported the largest numbers of harbor seals, Brown Pelicans, and several migratory species of gulls in the SCB.

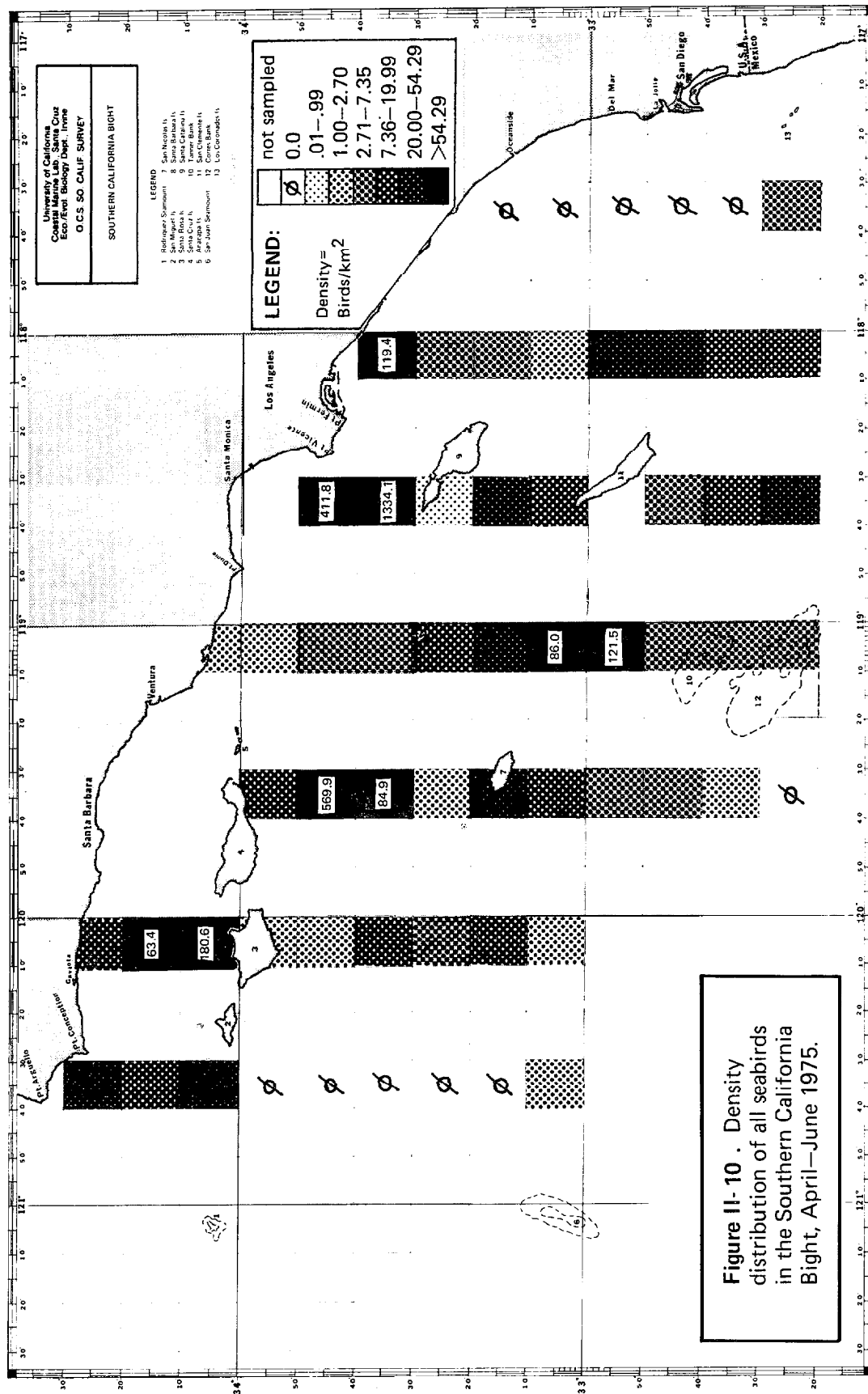
Seabird colonies of moderate size (total 2,400 individuals), plus 37% of the onshore pinniped population, were found on San Nicolas Island. The reproductive population of California sea lions made up 13,000 of the 15,000 pinnipeds counted here; the remainder consisted of molting elephant seals. Santa Barbara Is. harbored breeding populations of approximately 1,800 California sea lions and 4,750 birds. A similar number of California sea lions bred on San Clemente Is., though few marine birds were found there; the beaches of Santa Catalina Is. were little used by either group.

While the number of live birds found near mainland beaches was high (gulls and waterfowl), overall numbers of dead, beached birds (and the fraction of these that was oiled) was relatively low (Table II-5). Most of the dead birds were found along Santa Barbara Channel and San Pedro Basin beaches; the largest portion consisted of Sooty Shearwaters.

Distribution at Sea

The distribution of pinnipeds and seabirds followed similar patterns during the spring season, while cetaceans were scarce and relatively scattered. Important sites of pinniped and bird concentrations (Figs. II-9, -10) included western Santa Barbara Channel and areas near the northern island chain; substantial numbers of California sea lions foraged over shallow island shelves. Waters overlying the Santa Rosa Ridge and the deep, central portion of Santa Cruz Basin supported hundreds of thousands of migrating shearwaters, phalaropes, gulls, and small alcids; cetaceans, on the other hand, were concentrated southeast of the island chain around this basin's periphery. Very large numbers of seabirds and sea lions were also sighted over northern San Nicolas Basin and Tanner Bank. Densities of shearwaters exceeded 2,000 birds/km² in portions of San Pedro Channel; cetacean concentrations at the west end of Santa Catalina Is. also extended across this zone to the vicinity of Newport Beach. Another significant locale for cetaceans was Santa Barbara Island. Pacific white-sided dolphins, northern right whale dolphins, and Dan's porpoises were generally seen in the central portion of the Bight, while the range of the common dolphin was restricted to waters south of Santa Catalina





INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- April, May, June, 1975
Distribution at Sea (continued)

Island. With the exception of inshore waters close to the islands and the mainland, however, very few birds or pinnipeds were found in the Gulf of Santa Catalina.

The northward migration of loons, grebes, sea ducks, and phalaropes passed primarily within 20 km of the mainland coast. Though oceanic waters were incompletely sampled in the spring of 1975, it is suspected that small numbers of fur seals, wintering alcids, and migrating gulls and terns may still have been present in April. Those same oceanic waters were nearly devoid of cetacean activity.

INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- July, August, September, 1975

Biological Context

The reproductive season concluded in August for marine birds, fur seals, and sea lions, with the fledging of young pelicans, cormorants, and Western Gulls and the dispersal of most pinnipeds from their rookeries. In September, birds and pinnipeds were present in open-water areas that were not consistently used in the breeding season, and birds were abundant on sections of island and mainland coast not previously frequented on a daily basis. Cetacean numbers and diversity increased sharply from spring lows: sixteen taxa, including six species of baleen whales, were represented. Most of the baleen whales were large migratory animals commonly sighted in offshore waters; both warm- and cool-water toothed whales were abundant throughout most areas of the Bight.

In the warm-water months of August and September, phalaropes, jaegers, and terns nesting north of the Southern California Bight (SCB) passed through the area on their southward migration, generally over waters more than 25 km from the mainland shore. Shearwaters, the most abundant species in early summer, became fewer as they migrated out of the Bight to their southern hemispheric nesting grounds. Moving into northern California seas, male California sea lions also became increasingly rare.

Faunal Composition

Breeding populations of California sea lions, northern fur seals, cormorants, pelicans, Western Gulls, and small alcids were the predominant species on land and in nearshore waters in July and August. These species became more common offshore as summer progressed.

Minke whales were the most abundant of the baleen whales, especially over ridges and banks within the Channel Island chain. Blue, fin, sei, and humpback whales were less common than minkes, but did reach the year's peak number for these species in the SCB. Common and Pacific white-sided dolphins were the toothed whales most frequently sighted during these months (Table II-6).

Through mid-August, shearwaters, storm-petrels, and gulls were the most abundant animals in offshore waters. In late August and September, these birds were replaced by arctic- and sub-arctic-nesting species which migrated southward into the Bight. Of these, phalaropes, jaegers, and terns predominated offshore; phalaropes and jaegers also augmented inshore faunas.

Table II- 6. Cetacean Population Summary: Southern California Bight during July - September, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
						Hi	Lo
BALEEN WHALES							
Blue whale	7	3.91	7	0.04	1.0	1	1
Fin whale	2	1.12	2	0.01	1.0	1	1
Gray whale	1	0.56	4	0.02	4.0	4	4
Humpback whale	1	0.56	1	0.01	1.0	1	1
Minke whale	37	20.67	45	0.26	1.2	3	1
Sei whale	2	1.12	5	0.03	2.5	3	2
SUBTOTAL	50	27.94	64	0.37	1.3	4	1
TOOTHED WHALES							
Beaked whale	2	1.12	2	0.02	1.0	1	1
Bottlenose dolphin	5	2.79	149	0.87	29.8	80	6
Common dolphin	44	24.58	11,563	67.19	262.8	2,000	1
Dall's porpoise	16	8.94	70	0.41	4.4	12	1
Pacific white-sided dolphin	27	15.08	4,507	26.19	166.9	1,700	3
Pilot whale	10	5.59	336	1.95	33.6	90	8
Risso's dolphin	8	4.47	166	0.96	20.8	80	2
SUBTOTAL	112	62.57	16,793	97.58	149.9	2,000	1
UNIDENTIFIED WHALES							
Large (>40')	3	1.68	4	0.02	1.3	2	1
Medium (20'-40')	6	3.35	6	0.03	1.0	1	1
Small (<20')	8	4.47	342	1.99	42.6	215	1
SUBTOTAL	17	9.50	352	2.04	20.7	215	1
TOTAL	179	100.00	17,209	100.00	96.1	2,000	1

INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- July, August, September, 1975

Reproduction

By July, most of the reproductive activity of nesting bird species had been concluded. Breeding and pupping of sea lions and fur seals, on the other hand, continued into August. California sea lions produced about 11,000 pups at peak season in late June and early July. The total population at this time was about 36,000 animals, and declined in August to about 22,000, including 6,700 pups. The peak of northern fur seal pupping on San Miguel Is. was reached a month later than that of California sea lions; the August count was a little over 1,200 animals, including about 600 pups. Steller sea lions also pup in the SCB in the summer, but the population is only a small remnant of the historical population at the southernmost end of their breeding range; three pups of this species were counted in 1975.

In September, approximately 60 juvenile Pacific white-sided dolphins, accompanied by 150 adults, were observed in shelf waters off the south side of San Miguel Island. This single sighting accounted for nearly 43% of the young cetaceans seen during the year.

Movements and Migrations

Considerable movement of marine mammals took place during this season. Many California sea lion males traveled northward out of the SCB after the breeding season, and many transiting baleen whales were noted in offshore waters outside the Channel Islands. Blue, fin, sei, and humpback whales were the predominant species in this movement and utilized the migratory avenue extending northward from Cortés Bank to the vicinity of Rodriguez Seamount. Blue, fin, and humpback whales were all seen singly, while the sei whales were observed twice traveling in groups of two and three respectively. All of these except the sei whales were noted moving in a northerly direction. Additionally, an unusual post-season sighting of four adult gray whales was made inshore, northeast of San Nicolas Island.

Late summer is a time of turnover for the marine avifauna. Phalaropes, jaegers, and terns entered the Bight from their high-latitude nesting areas as shearwaters departed to the south.

Distribution on Land

The islands of the SCB harbored large and growing populations of cormorants, pelicans, and gulls throughout this period. The total pinniped population on land (24,500 animals in early August) was composed mostly of California sea lions (90%) and was decreasing from the early July peak. Nearly half of this total was hauled-out on the northern island chain, and 98% of these were counted on San Miguel Island. These islands also provided roosts for most of the cormorants,

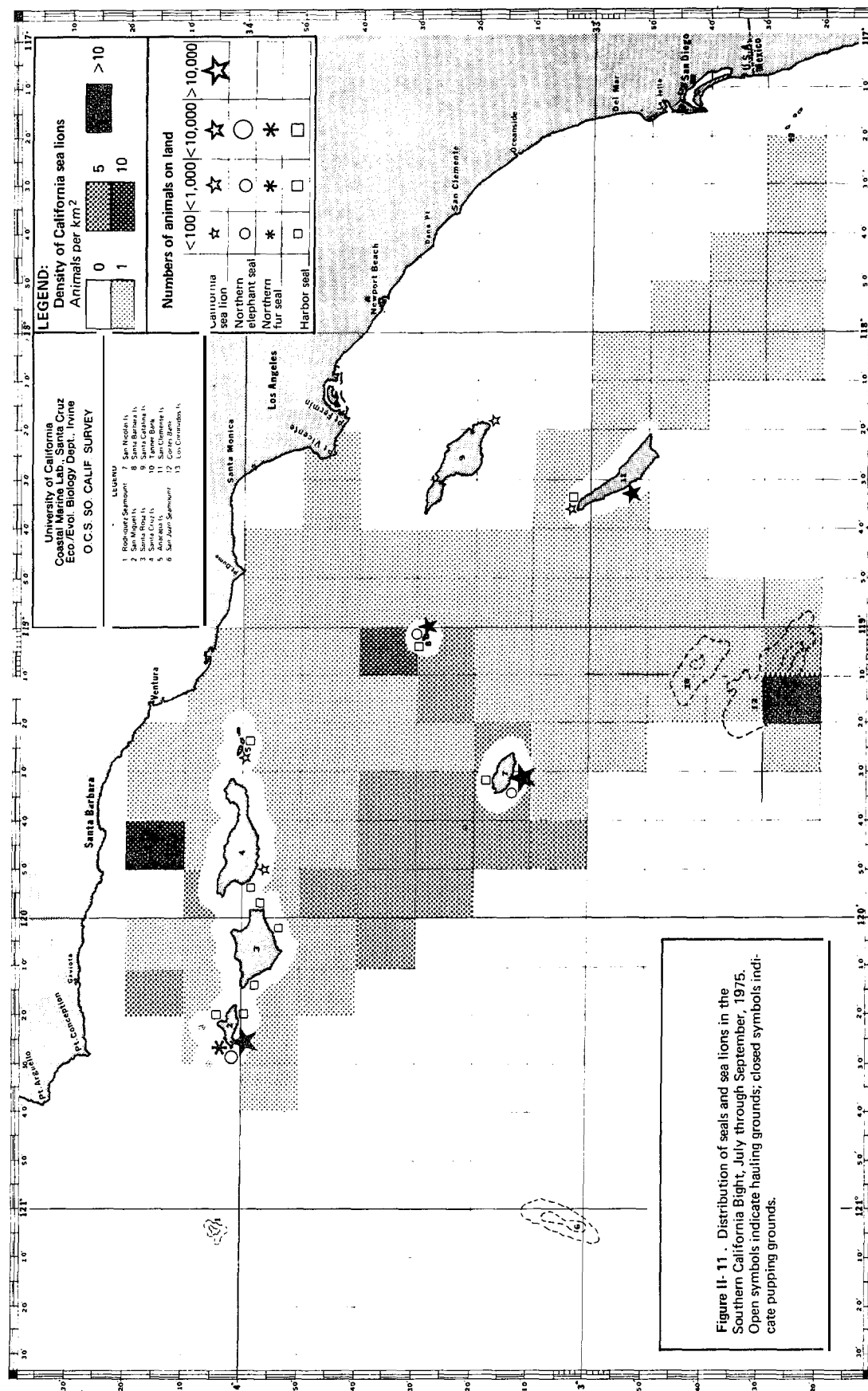
SOUTHERN CALIFORNIA BIGHT -- July, August, September, 1975
Distribution on Land (continued)

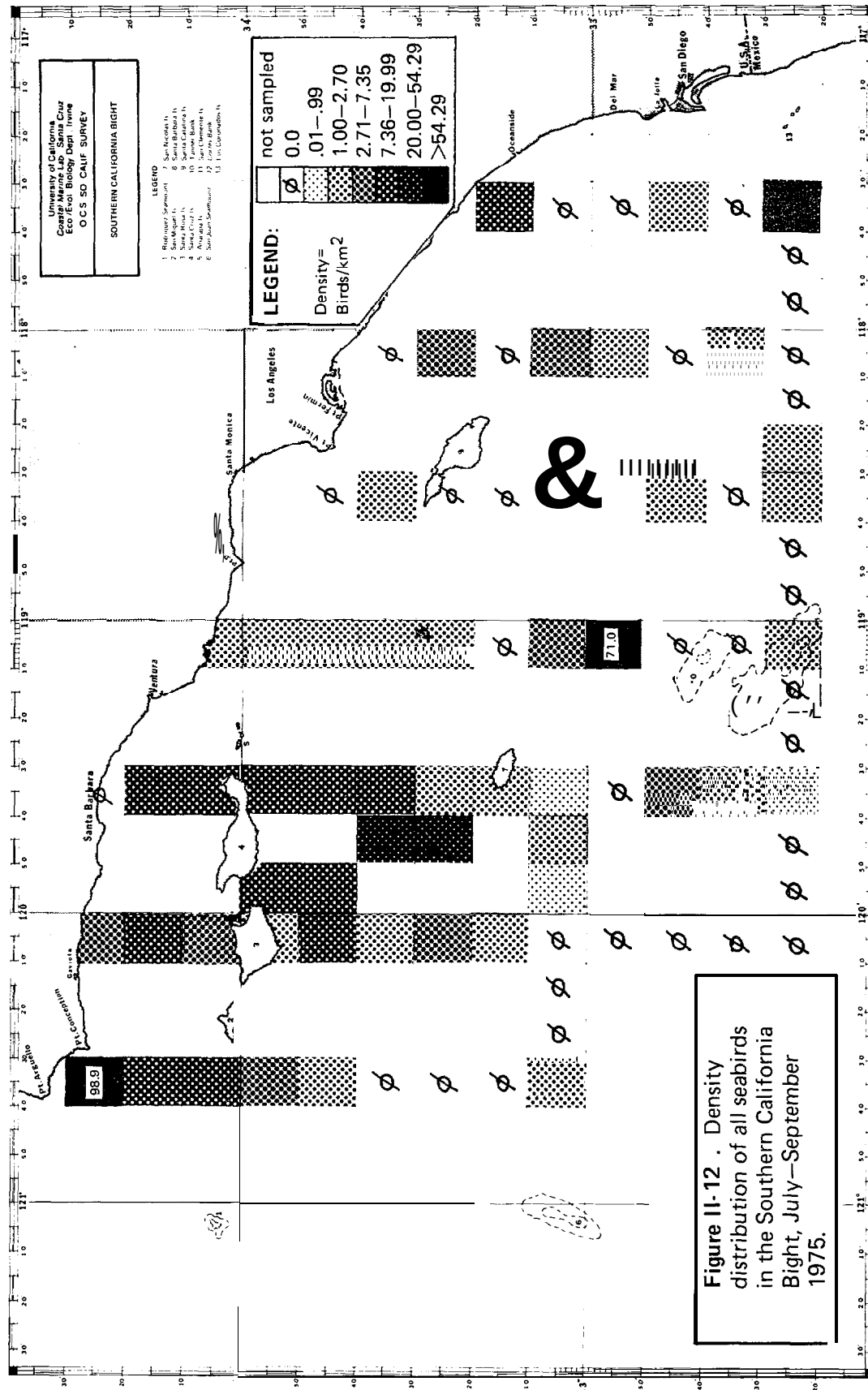
pelicans, and gulls. The mainland shore was occupied by the same species, plus terns (primarily from Mexican colonies). Most of the dead birds recorded were found on Santa Barbara Channel and Santa Monica Basin beaches. The rate of occurrence of dead, beached birds in summer was moderate (average of 1.03/km/mo.); about one-quarter of these were oiled (Table II-5).

Distribution at Sea

Marine mammals and seabirds were generally prevalent in the western SCB and offshore, and comparatively rare in the east; areas of moderate to high densities included Rodriguez Seamount, waters surrounding the northern Channel Island chain, and the Santa Rosa-Cortés Ridge. Rodriguez Seamount and Tanner-Cortés Banks were focal points in seabird migratory activity (Figs. II-11, -12).

At-sea densities of both pinnipeds and marine birds rose from July through September as the animals dispersed from their breeding grounds; nevertheless, most sightings occurred within 20 km of the islands. Pacific white-sided dolphins, Dan's porpoises, and minke whales were scattered offshore, along the Santa Rosa-Cortés Ridge (especially near San Nicolas Is.), and in shallow shelf areas around the northern islands. Pinnipeds and birds (shearwaters) were also common in these areas, as well as over Tanner-Cortés Banks. Santa Barbara Channel (particularly near Richardson Rk. in the west and the Ventura shelf in the east) received heavy use by California sea lions, pelicans, and gulls, as did the vicinity of Santa Barbara Is. and Santa Monica Basin; few cetaceans, on the other hand, were seen in these areas. San Pedro Channel waters and the Gulf of Santa Catalina were sparsely populated by pinnipeds or seabirds. The most abundant cetacean, the warm-water common dolphin, was widespread in the Bight, extending from Islas Los Coronados in the south to Rodriguez Seamount in the northwest corner of the study area.





INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- October, November, December, 1975

Biological Context

With the incursion of cool water masses in November and December, water temperatures in the Southern California Bight (SCB) began to decline. A general turnover in species composition and an increase in numbers was noted as several migratory species of birds entered the area, and cetaceans with cool-water preferences became more prevalent; warm-water species withdrew to the Bight's southern portions. Autumn sightings reflected the year's peak cetacean population in the SCB. In contrast, pinniped populations reached their yearly low during these months; only the California sea lion was commonly observed at sea. Numbers of this species on land had decreased 38% by October, as many animals migrated out of the Bight. The dispersal of spring- and summer-breeding pinnipeds and birds was evidenced by widespread distribution and the relatively heavy use of waters 50 to 150 km from rookery and colony sites. The waters near Cortés Bank and Rodriguez Seamount, which lie outside the normal foraging range of adults tied to rookeries and nesting areas in the spring, were used extensively in autumn by both birds and pinnipeds. In addition, juvenile birds were seen along mainland and island shores in areas not previously utilized by them.

Faunal Composition

California sea lions were the predominant pinniped both on land and at sea--this species comprised 90% of the pinniped community in the autumn. Northern elephant seals, harbor seals, and northern fur seals were present in low numbers on land but were rarely seen at sea.

Pilot whales, Dall's porpoise, and the common dolphin represented nearly 60% of the total observed cetacean population. Gray whales were the most common baleen whale and were increasing in numbers through this quarter (Table II-7).

Offshore bird numbers were dominated in October by gulls, jaegers, and pelicans, and in December by these groups plus kittiwakes, fulmars, and alcids. Some species that were abundant in April through September (Shearwaters and storm-petrels) disappeared from the study area during this season. Near the islands, in nearshore waters, and along mainland beaches the primary seabirds were cormorants, pelicans, gulls, and terns. Loons, grebes, and sea ducks began arriving in nearshore waters and increased in numbers through December.

Reproduction

No pinniped or seabird species breed in the autumn in the SCB. Young of the year are three- to six-months old and fairly self-sufficient.

Five sightings of juvenile cetaceans were made during the autumn period, nearly 20% of the total number of immature animals recorded for

Table II- 7. Cetacean Population Summary: Southern California Bight during October - December, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	<u>Hi Lo</u>
BALEEN WHALES							
Fin whale	5	2.13	8	0.03	1.16	3	1
Gray whale	11	4.68	24	0.10	2.2	5	1
Humpback whale	2	0.85	5	0.02	2.5	4	1
Minke whale	7	2.98	12	0.05	1.7	3	1
SUBTOTAL	25	10.64	49	0.20	1.9	5	1
TOOTHED WHALES							
Bottlenose dolphin	16	6.81	284	1.18	17.8	50	3
Common dolphin	42	17.87	18,034	75.00	429.4	7,500	1
Dan's porpoise	49	20.85	238	0.99	4.9	25	1
Northern right whale dolphin	10	4.26	616	2.56	61.6	500	1
Pacific white-sided dolphin	23	9.79	2,343	9.74	101.9	600	3
Pilot whale	48	20.43	2,031	8.44	42.3	400	1
Risso's dolphin	8	3.40	374	1.55	46.7	300	1
SUBTOTAL	196	83.41	23,920	99.46	122.0	7,500	1
UNIDENTIFIED WHALES							
Large (>40')	1	0.43	1	0.00	1.0	1	1
Medium (20'-40')	2	0.85	3	0.01	1.5	2	1
small (<20')	11	4.68	79	0.33	7.2	27	1
SUBTOTAL	14	5.96	83	0.34	5.9	27	1
TOTAL	235	100.00	24,052	100.00	102.3	7,500	1

INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- October, November, December, 1975
Reproduction (continued)

the year. Many young pilot whales, a few bottlenose dolphins, and a single Risso's dolphin were observed. A mother-young pair of gray whales was reported moving in a southerly direction on the south side of Santa Catalina Is. in late December. This sighting possibly indicates an early birth north of the SCB, an unusual occurrence since calving of gray whales usually takes place in the warm, shallow lagoons of Baja California, Mexico.

Movements and Migrations

Male California sea lions migrated northward out of the SCB following the summer breeding season; in October they comprised only about 1% of the total count, but by December, some northbound males from Mexican rookeries had entered the Bight. Females and most young of the year remained in the Bight through autumn or migrated southward into Mexican waters. Northward dispersal of young northern elephant seals, born the previous winter on Mexican rookeries, was detected by tag sightings on San Miguel and San Nicolás islands.

About one-half of the avifauna is comprised of winter residents. Many wintering populations are both substantial in size and susceptible to impact from spilled oil. Populations of these species migrated into the study area throughout this quarter and concentrated in a band extending offshore from the mainland for 25-30 km.

In mid-December, a few scattered sightings of gray whales were made in the SCB. These animals were the first of the main southbound migratory population to enter the study area; the peak did not occur until January.

In late December, the pilot whale population, usually dispersed in modest numbers throughout the SCB, was augmented by additional animals moving into the SCB and to the vicinity of Santa Catalina Island. This enlarged aggregation of pilot whales coincided with the breeding of squid in the shallows to the east and south of the island.

Distribution on Land

The northern island chain harbored the largest seabird and pinniped aggregations found on land during this season. About 60% of the entire pinniped population on land was hauled-out on the west end of San Miguel Island (15,000 animals). Cormorants and Brown Pelicans were the predominant birds along the shores of the northern islands with over 8,000 of the former being found on San Miguel, Santa Rosa, and Santa Cruz islands. San Nicolás Is. beaches harbored about one-third of the pinnipeds found on land (8,000 animals), while Santa Barbara and San Clemente islands hosted about 1,000 sea lions each.

SOUTHERN CALIFORNIA BIGHT -- October, November, December, 1975
Distribution on Land (continued)

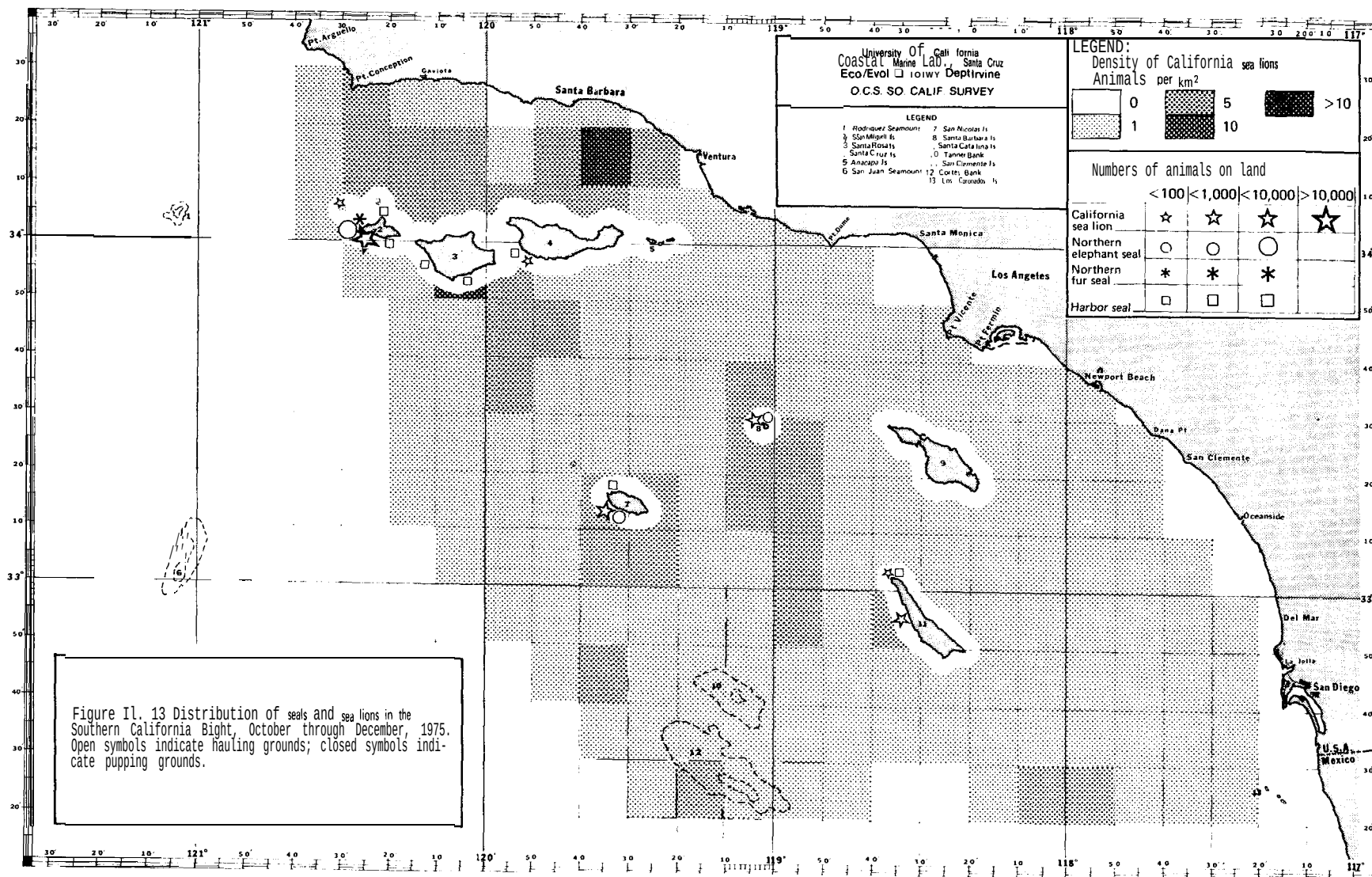
Mainland beaches were heavily used by birds, but rarely by pinnipeds. Seabirds concentrated at Ventura and Los Angeles Co. beaches; Brown Pelicans, gulls, and terns predominated in number. Wintering waterfowl (loons, grebes, sea ducks) became more numerous along mainland beaches from November onward,

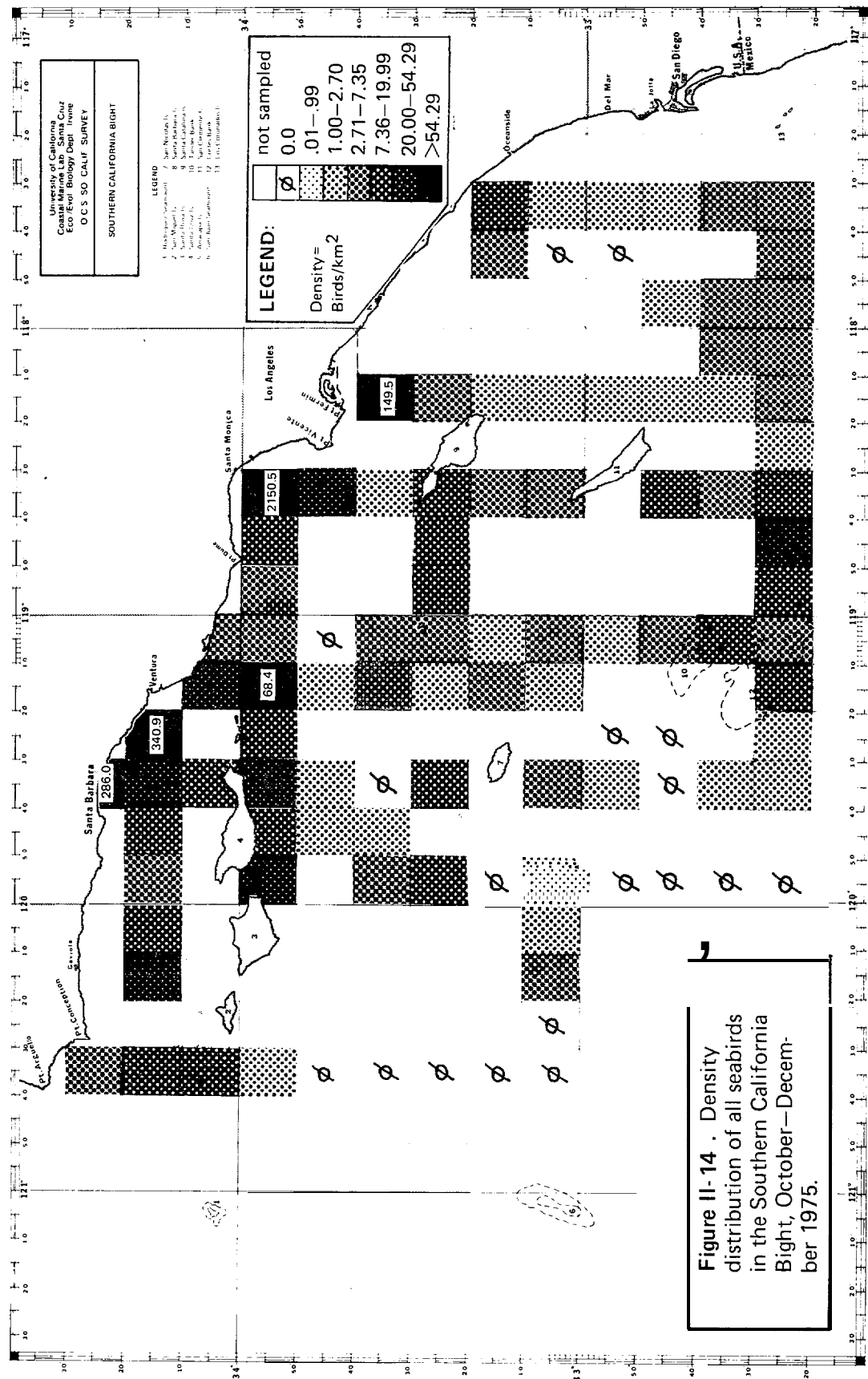
Relatively few dead birds were found along mainland and Santa Cruz Is. beaches; about 40% of these were oiled. Gulls, grebes, loons, and cormorants were the most numerous beached birds (Table II-5).

Distribution at Sea

Pinnipeds, cetaceans, and birds were widely distributed at sea in October. Pinnipeds were most abundant over the shelves near their island hauling-out grounds (Fig. II-13), while seabird density was greatest near the mainland and declined in offshore waters (Fig. 11-14). This gradient in bird numbers resulted in part from the large concentration of gulls, pelicans, cormorants, and fall migrants over shallow waters. Most animals were found west of Santa Barbara Island. Pinnipeds and birds were very abundant in the waters of eastern Santa Barbara Channel and for a few tens of kms southeast of Anacapa Is., in contrast to only four cetacean sightings in the area. Birds and pinnipeds were also present at moderate to high densities in central and western Santa Barbara Channel; no cetaceans were seen west of the city of Santa Barbara (119°40'W longitude). With the exception of a few seabirds, Santa Cruz Basin was empty. The neighboring waters over Santa Rosa-Cortés Ridge were used extensively by foraging animals of all taxa (especially just north of San Nicolas Is., where cetaceans were very numerous), with a significant void over the ridge south of this island. In addition, few animals were seen in the oceanic region west of the Santa Rosa-Cortés Ridge. Birds and pinnipeds were common near Santa Barbara Is., particularly to the east and southeast. The highest pinniped densities of the year were recorded midway between Santa Barbara Is. and Cortés Bank. A cool-water species, Dan's porpoise, was observed in a linear series of sightings occupying a narrow corridor from approximately Cortés Bank north to Santa Barbara Island.

In November, use of the waters over the Santa Rosa-Cortés Ridge remained high, but use of Santa Barbara Channel diminished somewhat for birds and pinnipeds. Populations of all animals substantially increased in the waters near to and east of Santa Catalina and San Clemente islands. In December a large influx of cetaceans occurred in the waters around Santa Catalina Island. Birds, sea lions, northern elephant seals, and Dan's porpoises were also seen at this time east of San Clemente Is. and over the San Clemente Escarpment. Additional areas of high concentration were nearshore waters off Pales Verdes Peninsula, the sill separating Santa Cruz and Santa Monica Basins, and that portion of the Santa Rosa Ridge just north of San Nicolas Island. Other sightings of Dan's porpoises were clustered approximately ten nm (18.5 km) east of San Clemente Island.





INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- January, February, March, 1976

Biological Context

The only species breeding in the Southern California Bight (SCB) during these months were the northern elephant seal and the harbor seal. The population of adult elephant seals numbered about 6,500 animals, from which 4,600 pups were produced. Harbor seals were born from February onward; the population in the SCB increased from 300 in January to 900 in March. Channel Island beaches and roosts were also occupied by substantial numbers of wintering gulls and waterfowl (loons, grebes, sea ducks), resident seabirds (pelicans, cormorants, gulls), and California sea lions. Most of these animals were concentrated around the northern island chain: an average of 17,000 seabirds was counted there, and the number of California sea lions on land rose from 6,800 in January to 10,300 in March.

The open-ocean waters of the study area were inhabited by at least eleven species of cetaceans and by wintering populations of some 30 seabird species, northern fur seals, and California sea lions. Among the cetaceans, cool-water species of toothed whales were present in their highest annual numbers, while warm-water forms continued their southerly retreat from intruding cold water. Migrating baleen whales also reached peak numbers during this period. The fur seals and sea lions were scattered at low densities in offshore (beyond the 1,500 m depth contour) and inshore regions, respectively. Seabird species composition varied with distance from shore; the shallow areas over mainland and island shelves and offshore banks harbored the largest concentrations.

Faunal Composition

The predominant species of marine vertebrates in the SCB during the winter months were California sea lions, gray whales, waterfowl, fulmars, pelicans and their relatives, gulls, and alcids. California sea lions were, as always, the most abundant pinnipeds at sea and on land; they comprised 65% of the total count in January and 82% in March. Northern elephant seals, which pupped during this quarter, were second in abundance, and low numbers of harbor seals and northern fur seals were also present. Fur seals were primarily animals from the Bering Sea breeding population wintering off the California coast.

Species diversity among cetaceans was moderately high during the winter months; pilot whales, common dolphins, and cool-water forms such as the Pacific white-sided and northern right whale dolphins were present, in addition to migrating gray whales. Although encountered in moderate numbers, common dolphins (generally considered warm-water animals) were restricted to the southern portion of the Bight (Table II-8).

Near island and mainland shores, the predominant seabirds included waterfowl (loons, grebes, sea ducks), pelicans, cormorants, and gulls. Gulls, alcids, and fulmars were predominant in areas more than ten km offshore. The winter of 1976 saw an "invasion" of Black-legged Kittiwakes

Table II- 8. Cetacean Population Summary: Southern California Bight during January - March, 1976.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	<u>Hi Lo</u>
BALEEN WHALES							
Fin whale	4	1.30	13	0.09	3.3	7	1
Gray whale	123	39.94	325	2.36	2.6	11	1
Minke whale	1	0.32	1	0.01	1.0	1	1
SUBTOTAL	128	41.56	339	2.46	2.6	11	1
TOOTHED WHALES							
Bottlenose dolphin	10	3.25	134	0.97	13.4	30	5
Common dolphin	25	8.12	7,836	56.92	313.4	2,500	2
Dall's porpoise	43	13.96	333	2.42	7.7	100	1
Killer whale	2	0.65	22	0.16	11.0	21	-1
Northern right whale dolphin	28	9.09	1,407	10.22	50.3	275	1
Pacific white-sided dolphin	22	7.14	1,536	11.16	69.8	250	2
Pilot whale	36	11.69	2,035	14.78	56.5	300	5
Risso's dolphin	5	1.62	106	0.77	21.2	50	4
SUBTOTAL	171	55.52	13,409	97.40	78.4	2,500	1
UNIDENTIFIED WHALES							
Large (>40')	2	0.65	3	0.02	1.5	2	1
Medium (20'-40')	6	1.95	9	0.07	1.5	2	1
small (<20')	1	0.32	6	0.04	6.0	6	6
SUBTOTAL	9	2.92	18	0.13	2.0	6	1
TOTAL	308	100.00	13,766	100.00	44.7	2,500	1

INTEGRATED SEASONAL SUMMARY

SOUTHERN CALIFORNIA BIGHT -- January, February, March, 1976
Faunal Composition (continued)

and Northern Fulmars; both are arctic/sub-arctic breeders that previously have appeared in large numbers only sporadically in the SCB.

Reproduction

Northern elephant seals and harbor seals both produced pups in the winter and early spring. The elephant seals pupped primarily in January and February and harbor seals from February through May or June. The largest elephant seal rookeries, producing 85% and 15%, respectively, of the 4,600 pups born in the SCB this year, were located on San Miguel and San Nicolas islands. In addition, small rookeries were situated on Santa Barbara Is. and Islas Los Coronados, Mexico, south of the surveyed area. Most harbor seal pupping occurred on the beaches of the northern island chain.

Young cetaceans of four species totaling 54 animals were sighted in the Bight on eight occasions; these sightings represent 39% of all immature animals noted this year. Of these, juvenile pilot whales were the most numerous, accounting for 27% of the year's sightings. With the exception of a solitary mother-young pair of gray whales seen near Santa Cruz Basin, all young animals were observed either near Santa Catalina Island or in nearshore waters south of Dana Point.

Marine birds did not breed during these months though partial reoccupation of colony areas by cormorants, gulls, and alcids in late winter marked the beginning of the 1976 nesting season.

Movements and Migrations

The numbers of wintering seabirds and northern fur seals increased to their annual peaks in January and February as animals entered the SCB from the north. Migrating gray whales on their yearly journey to and from breeding lagoons in Baja California passed through the Bight in large numbers during this period, accounting for nearly 40% of all cetacean sightings. Fin whales, also transient in the study area, were seen on five occasions around San Nicolas Basin. Populations of the SCB summer-breeding seabirds and sea lions were dispersed from their rookery areas both to the Bight's open waters and to other sections of coastline.

By March, California sea lions began to aggregate over the shallow island shelves and beaches near their rookery areas. Gray whales on the post-breeding leg of their migration began moving through the SCB from the south, and some northward movement and decline in numbers of over-wintering seabirds also took place.

SOUTHERN CALIFORNIA BIGHT -- January, February, March, 1976

Distribution on Land

Both pinnipeds and seabirds were most heavily concentrated on the beaches and rocks of the northern Channel Islands. In January, 57% of the 25,000 pinnipeds found on land were at San Miguel Is., and an average of 17,000 seabirds was counted among the northern islands from January through March.

About 31% of all pinnipeds censused on land in January were at San Nicolas Island; this figure rose to 35% in March. San Nicolas was not as heavily used by seabirds, which concentrated in large numbers around Santa Catalina and San Clemente islands.

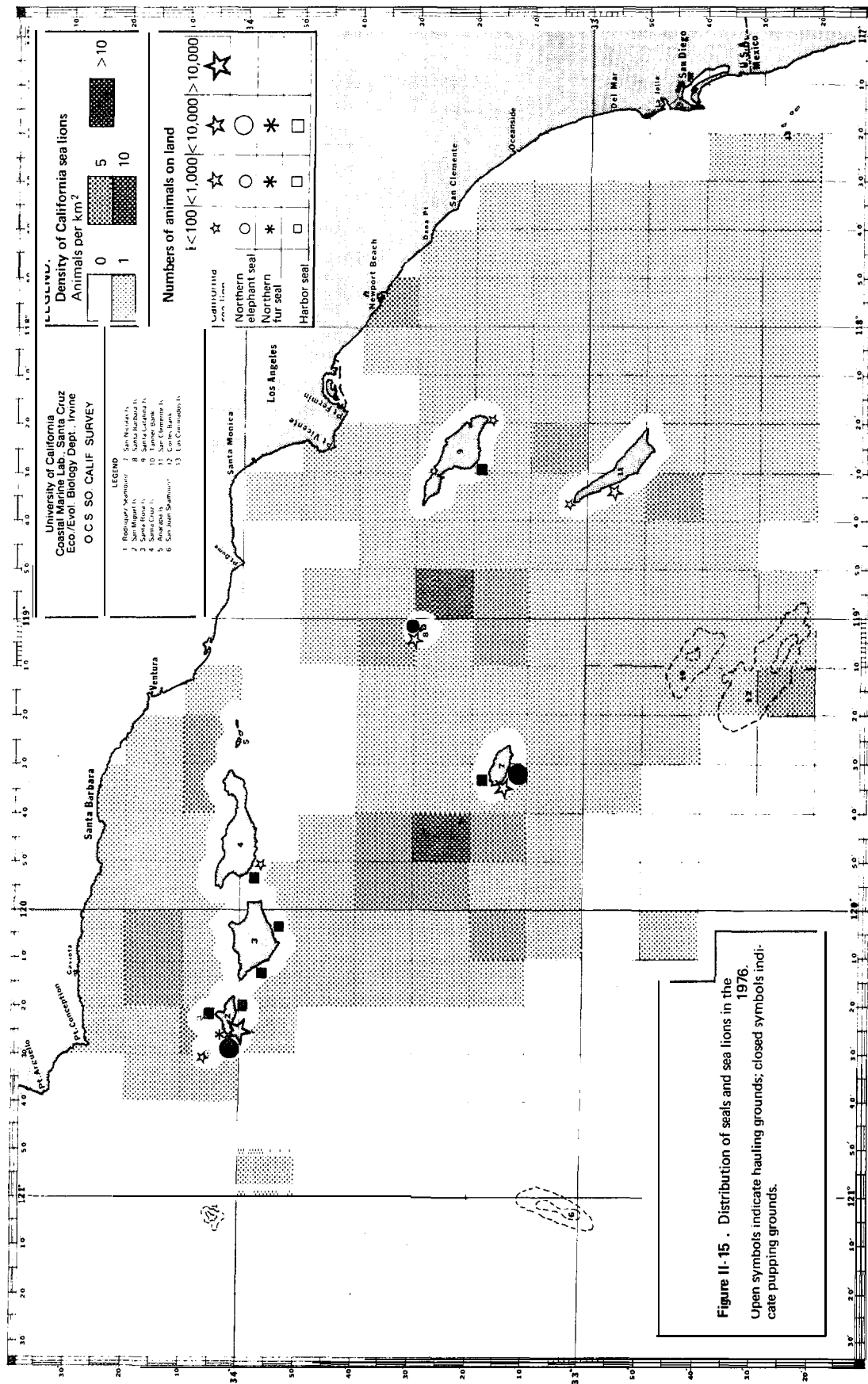
Mainland beaches, particularly those bordering Santa Barbara Channel, also sustained very large populations of wintering seabirds. A major February and March die-off of Northern Fulmars and Black-legged Kittiwakes dominated beached-bird records for these months and resulted in the highest counts of beached birds of any quarter (Table II-5). However, percentages of oiled birds were not unusually high (30.4%).

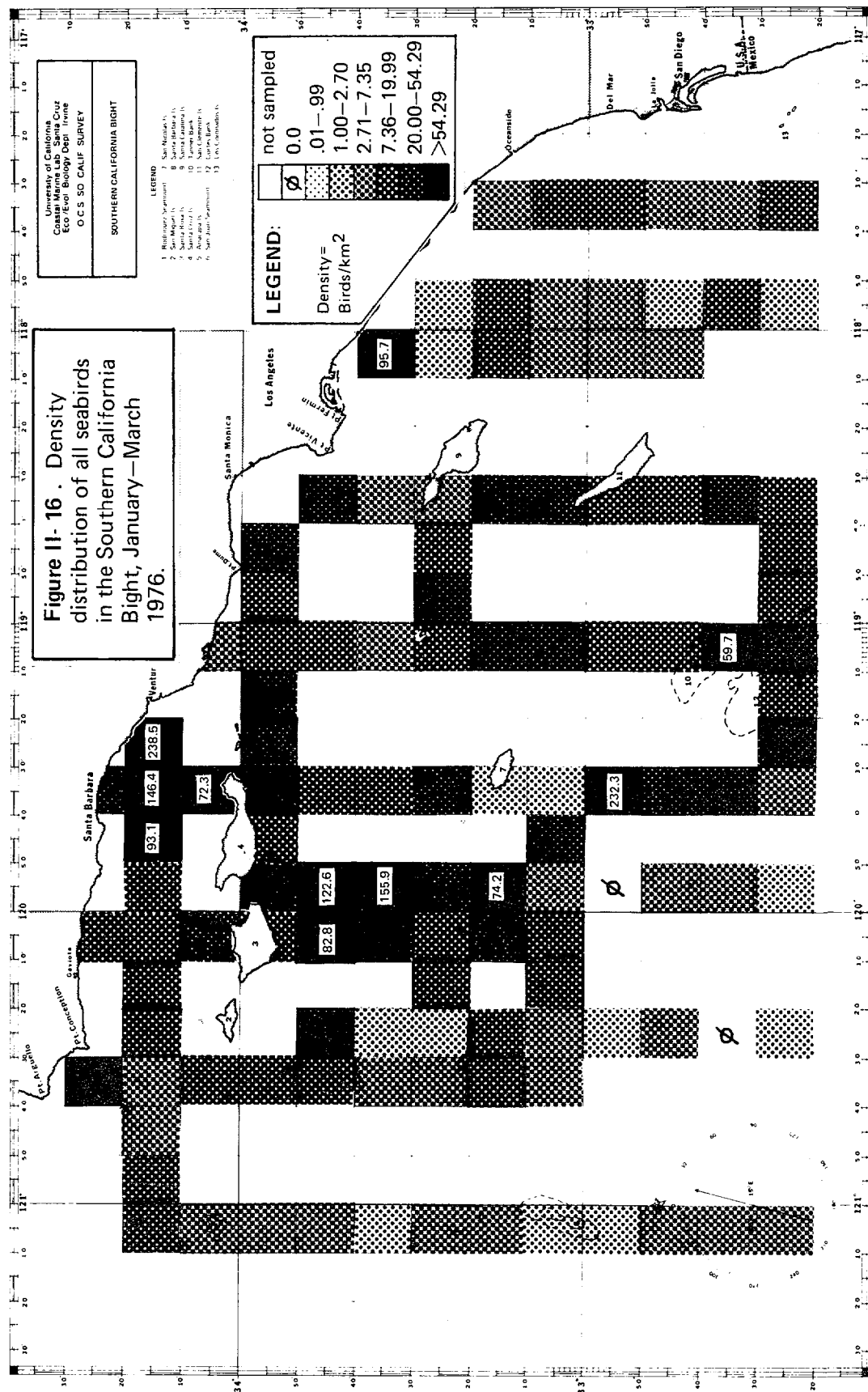
Distribution at Sea

Higher marine vertebrates were numerous throughout the SCB during the winter months. Several extremely large aggregations of seabirds contributed to an overall open-ocean density that reached a yearly high; cetaceans were also abundant in many areas. In contrast, pinnipeds tended to be widespread in low densities (Figs. II-15 ,16).

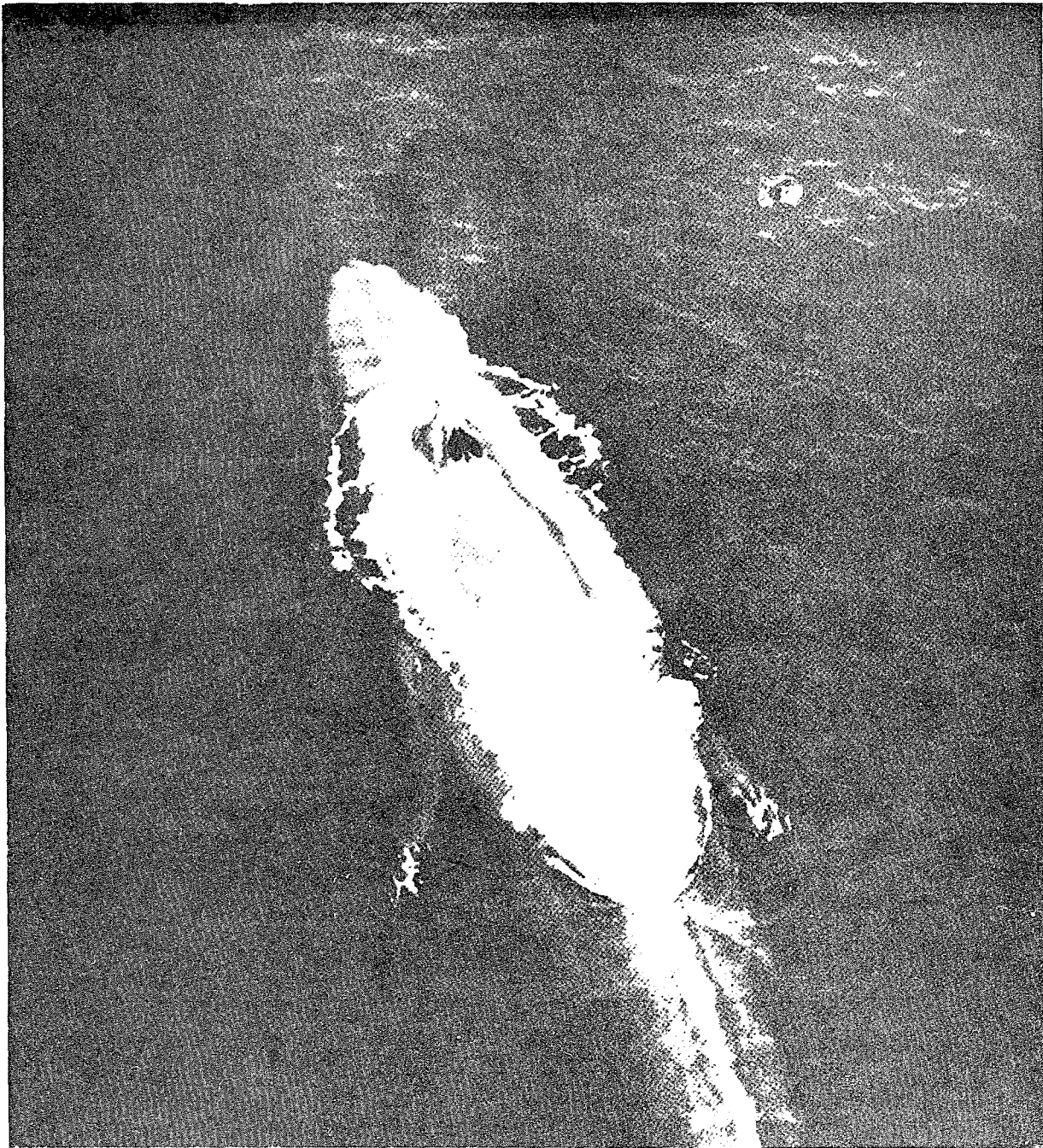
The nearshore waters of the northern island chain sustained large numbers of cetaceans and seabirds and moderate numbers of pinnipeds; similar numbers of pinnipeds and birds were found in western Santa Barbara Channel and over the Ventura Shelf. Populations declined in all three areas after February. The Santa Rosa-Cortes Ridge also supported extremely large concentrations of seabirds and moderate numbers of pinnipeds. Low but uniform numbers of fur seals, fulmars, pelagic alcids, and wintering gulls were found in the oceanic waters west of the Ridge; numerous cetaceans were recorded in San Nicolas Basin.

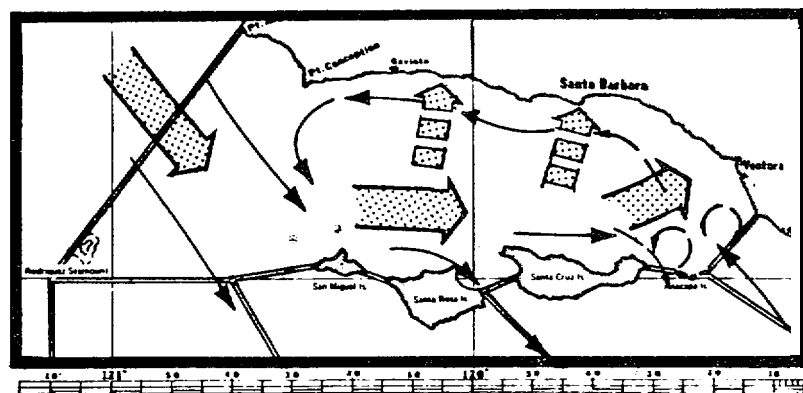
For all three faunal groups, winter was a period of extensive activity in waters east of Santa Barbara Island. Pilot whales and bottlenose dolphins were concentrated around Santa Catalina and San Clemente islands, and enormous numbers of birds were counted in Santa Monica Bay and San Pedro Channel --much as they were during spring and autumn migrations. Cetaceans were concentrated over the Santa Barbara Island shelf, and low to moderate densities of sea lions and marine birds, respectively, were found in the Gulf of Santa Catalina and San Diego Basin. Elephant seals and a single fur seal were seen over the San Clemente Escarpment. Coastal waters from Pt. Arguello to the Mexican border, especially south of the Pales Verdes Peninsula, were heavily used by migrating gray whales, whose presence bolstered the ranks of other marine mammals near Santa Catalina Island.





Synthesis of Findings: **INTEGRATED ZONAL SUMMARIES**





Prevailing winds
 Persistent surface currents
 Intermittent surface currents

accordance with currents or the local onshore breeze.

The well developed California Current bathes the westernmost islands in cold, upwelled water. A slow counterclockwise gyre

is formed as this water flows eastward near the islands and meets warmer water of the Southern California Countercurrent on the shallow Ventura shelf. Local eddies of unpredictable effect are formed in this zone of dynamic intermixing. Net water transport is to the west near the mainland shore and to the east near the island chain.

Hinds, currents, and drift:

From Pt. Conception to Santa Cruz Is. prevailing winds are strong and steady from the northwest. Near the island chain, surface water moves east and south-east. In the eastern sector, southwest winds drive water onshore. Winds of lower velocity occur along the Santa Barbara County shore and surface water moves in

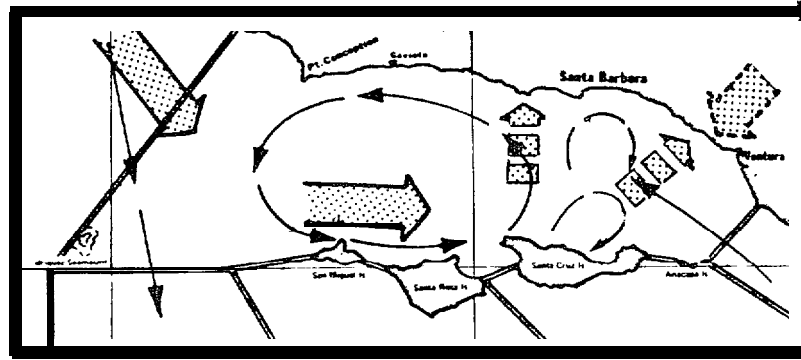
Spring was pupping season for the harbor seal, molting season for the northern elephant seal, and the time when summer-breeding otariids (the sea lions and fur seals) began to haul out for pupping. The peak pinniped population on the northern Channel Islands was about 22,000 during these months, of which 97% were found on San Miguel Island. Northern elephant seals outnumbered all other pinnipeds in April and May--we found nearly 7,000 of them hauled-out on the west-end sand flats of San Miguel Island. Then in June, over 18,000 California sea lions were on land for their breeding season. In 1975, approximately 6,000 California sea lion pups were born on the west end of San Miguel Is. and nearby Castle Rock. Harbor seals breed on all of the northern Channel Islands; we counted over 900 in late June, mostly on San Miguel and Santa Rosa islands. Also on land for pupping and breeding were northern fur seals and Steller sea lions. The San Miguel colony of northern fur seals numbered about 1,000 animals in late June, including about 450 pups; they were hauled-out exclusively on the west-end sand flats and on Castle Rock. Steller sea lions were rare in the Southern California Bight (SCB), hauling out in small numbers on the rocks off the west end of San Miguel Island; their pups were born on Richardson Rock. The Guadalupe fur seal was present occasionally on the west end of San Miguel Island.

These three months also encompass most of the nest-building, egg-laying, incubation, and nesting stages of the reproductive season of seabirds. In 1975, the four northern Channel Islands supported between 13,400 and 15,400 pairs of nesting birds of nine species, of which Cassin's Auklets and Western Gulls were the most numerous. Most of the present nesting populations are remnants of much larger ones. The largest nesting seabird colonies in southern California are located on San Miguel and Anacapa islands. With the exception of female-female pairing in gulls at San Miguel Island, clutch size and reproductive success of Western Gulls and Brown Pelicans nesting here in 1975 were

found to be within normal ranges. Moderate numbers of dead birds washed ashore during this period, though totals at beaches in this zone were higher than anywhere else in the Bight. Relatively few dead, beached birds were oiled.

The entire Santa Barbara Channel was a foraging area of major importance to the pinnipeds and birds associated with the northern islands. The foraging ranges of nesting birds extended at least 25 km in all directions from the island chain, while that of breeding pinnipeds extended perhaps twice as far. We found major concentrations of foraging animals north and west of San Miguel Is. (nesting alcids and some fur seals), in San Miguel passage (nesting birds), in Beecher's Bay (California sea lions), and in the vicinity of Anacapa Is. (Western Gulls, Brown Pelicans, and California sea lions).

In March, the migration of gray whales came to an end and the northward migration of wintering seabirds began. An influx of wintering migrants and non-breeding summer residents was recorded in the open waters of Santa Barbara Channel. Bird densities at sea were highest around the margins of the Channel and lowest near the center; the mean density at sea for all species was 72 individuals/km². California sea lions and harbor seals were widespread in low densities throughout this zone; concentrations at sea were centered northwest of San Miguel Is., along the northern shores of the island chain, and in Beecher's Bay. This zone was sparsely inhabited by cetaceans; a single Dall's porpoise was seen in the vicinity of Wilson Rk. near San Miguel Island.



Prevailing winds
 Persistent surface currents
 Intermittent surface currents

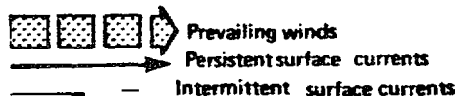
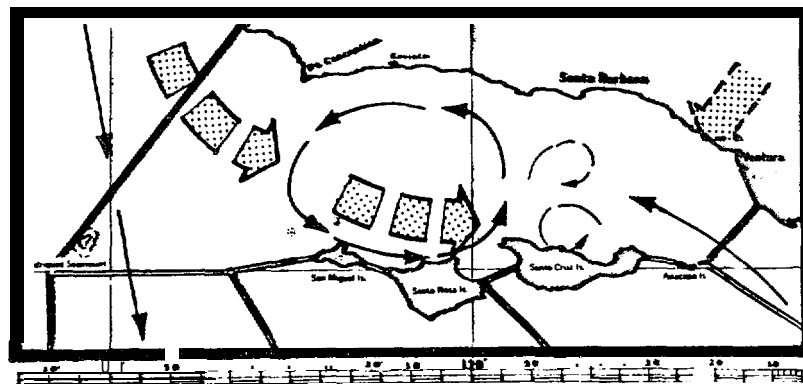
In late summer, strong northeast (Santa Ana) winds can occur in eastern Santa Barbara Channel. Surface water drift in accordance with wind patterns. Where winds weaken, surface water moves in accordance with patterns of current flow.

of the channel by the intrusion of water from the east. Prevailing winds are northwest, becoming westerly along the island chain. Near the mainland shore a sea breeze is common.

Winds, currents, and drift:
 Diminishing northwest winds at 1 on the California Current to slow and move farther offshore, with a decrease in upwelling. In contrast, the Southern California Counter-current is somewhat more developed, bringing water into the Santa Barbara Channel from the southeast. A counterclockwise gyre is confined to the western half

The summer-breeding pinnipeds (the California sea lion, northern fur seal, and Steller sea lion) reached peak numbers on land in July and began to disperse by August and September. Northern elephant seals and harbor seals were few. Of the nearly 12,000 pinnipeds on land, 98% were on the west end of San Miguel Island. Early and mid-season saw the fledging of juvenile pelicans, cormorants, gulls, and alcids; the young were seen with adults and older immatures in areas away from their breeding colonies for the first time in late August. Few dead birds were found on mainland and Santa Cruz Is. beaches; 42.6% of these were oiled.

At sea, the predominant marine mammals were California sea lions and common dolphins, and shearwaters outnumbered other seabirds. The post-breeding dispersal of California sea lions was accompanied by a substantial increase in their use of Santa Barbara Channel; mean density was over one animal/km². Harbor seals, resident in the zone, were occasionally seen at sea. Summer was the only period during the year when common dolphins were encountered in the Channel, where the species approached its northern range limit; the presence here of this warm-water form is seasonal. The 2,550 common dolphins seen accounted for 96% of all cetacean sightings for these months and 80% of the annual total of all species in this zone. Other toothed whales and three species of baleen whales were also seen. The mean summer density of birds at sea was 21 individuals/km², with the waters near Pt. Conception, near the island chain, and north of Santa Cruz Is. the most heavily populated. Though shearwaters predominated over open ocean, gulls and alcids were common near island and mainland shores.

**Winds, currents, and drift:**

Prevailing winds are from the northwest. However, low pressure cells migrating southward are common and tropical storms occasionally occur, bringing southerly winds. In addition, strong northeast (Santa Ana) winds are frequent. Their effect is most pronounced between Ventura and Anacapa Is.

Winds conditions in Santa

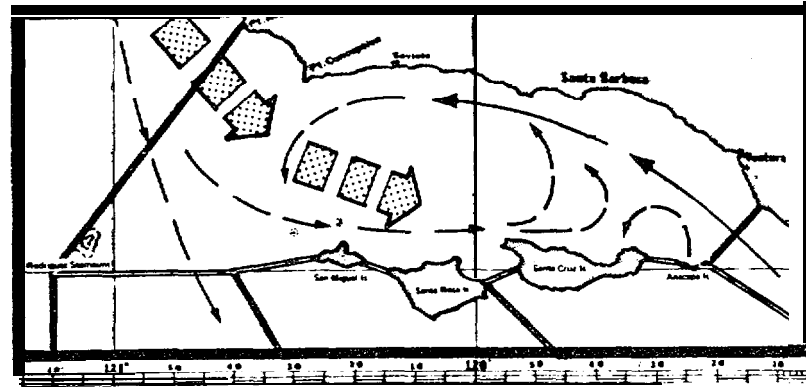
Barbara Channel in the fall are complicated, variable, and unpredictable on a long-term basis.

The Southern California Intercurrent is strongly expressed.

bringing water into the channel from the southeast. Water from the California Current enters from the west; net water transport is easterly near the Islands and westerly along the mainland shore. A counter-clockwise gyre occupies the western half of the channel; Intermixing and local eddies are found between Santa Barbara city and Santa Cruz Island.

Ninety-five percent of the 15,000 pinnipeds counted on land in October, including 12,000 California sea lions, 2,000 northern elephant seals, 300 fur seals, and 200 harbor seals, were hauled-out on San Miguel Island. Over 8,800 cormorants and pelicans (the year's high count) were found along the shores of the island chain (Anacapa Is. was not sampled). At McGrath State Beach in the eastern part of the zone, loons, grebes, pelicans, and gulls were also abundant.

Marine mammals and seabirds were concentrated in the eastern portion of the Channel. The largest aggregation of birds and foraging sea lions was centered over the shallow shelf area west of Ventura, and all cetaceans sighted (pilot whales and two cool-water porpoise species) were restricted to eastern waters. After accounting for 96% of the summer cetacean sightings, common dolphins were conspicuously absent as water temperatures lowered. No baleen whales were recorded, though the southerly migrating gray whales that appeared near Santa Catalina Is. had probably passed through the Santa Barbara Channel. Moderately-high densities of California sea lions were recorded zone-wide; mean seabird density was a high 71 individuals/km² to which loons, grebes, and gulls contributed most heavily.

**Winds, currents, and drift:**

Winds alternate between northwest and south with the passage of winter storms. Northeast (Santa Ana) winds are uncommon. Drift patterns are complicated, variable, and difficult to predict on a long-term basis.

The Southern California Countercurrent is well-developed, bringing water

into the Santa Barbara Channel from the southeast and moving surface water west along the mainland shore. The California Current is weakly expressed along the western margin of the

Santa Barbara Channel and some surface water moves east along the north shores of the Channel Islands.

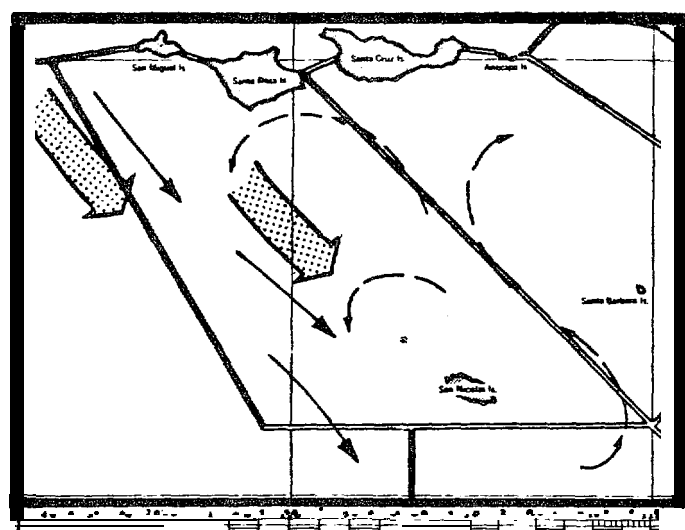
Northwest winds, and concomitant upwelling, usually increase in strength with the approach of spring.

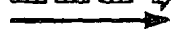
Winter is the pupping and breeding season of the northern elephant seal; the largest rookery in the Southern California Bight (SCB) is located on San Miguel Island. The highest count recorded in 1976 was nearly 7,000 animals, including about 3,800 new pups. California sea lion populations were at their SCB low in January; the San Miguel Is. count of 5,000 doubled by mid-March. Harbor seal pups were born as early as mid-February; in mid-March the census was 638 animals. Throughout the spring, herd size continued to increase and pups began to appear in most aggregations. The 1976 seabird reproductive season began on the islands during this period with reoccupation of nesting colonies by cormorants, gulls, and small alcids. Grebes, cormorants, pelicans, ducks, and gulls were abundant along the shores of the island chain and near mainland beaches. The results of major fulmar and kittiwake die-offs were recorded on mainland and Santa Cruz Is. beaches. The rate of occurrence of beached dead birds reached the yearly high of nearly three birds/km/month, of which almost 60% were oiled.

The distribution of California sea lions at sea was patchy and densities were low; concentrations were located near Anacapa Is., the city of Santa Barbara, and Pt. Conception. Gray whales moving along their inshore migration route were the only baleen whales seen. Also in nearshore waters were Dan's porpoises and Pacific white-sided dolphins; killer whales (a single sighting of 21 animals), northern right whale dolphins and Risso's dolphins were recorded well offshore near Rodriguez Seamount. Mean bird density in Santa Barbara Channel was high (42 individuals/km²). The shallow shelf west of Ventura harbored the greatest number of birds, especially loons, grebes, fulmars, gulls, and murre.

SANTA ROSA RIDGE April-June

INTEGRATED ZONAL SUMMARY

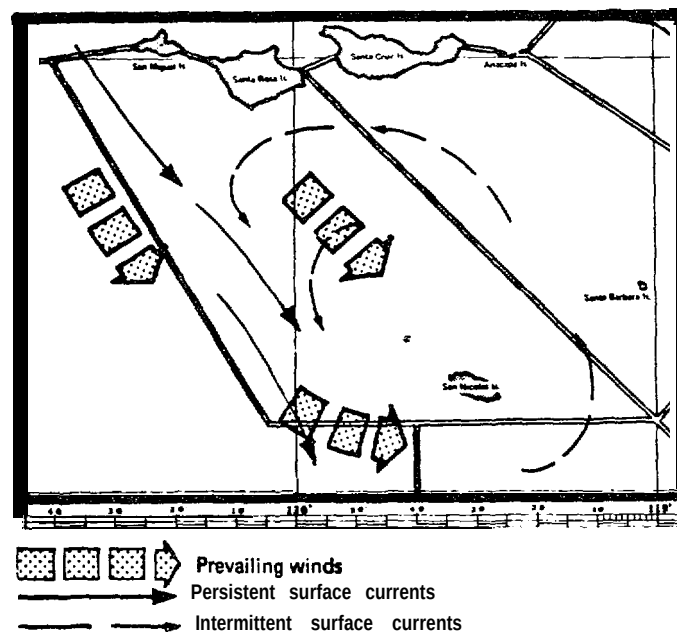


 Prevailing winds
 Persistent surface currents
 Intermittent surface currents

Winds, currents, and drift: Winds are strong and steady from the northwest in the spring. Northwest of San Nicolas Is. the California Current flows close to the Santa Rosa Ridge. Surface water is moved southeast by the wind. Water from the Santa Rosa Ridge between San Nicolas and Santa Rosa islands is entrained westward into the flow of the California Current allowing deeper water east of the ridge to upwell. Some water is brought north and northeast between San Nicolas Is. and Tanner Bank to join the Southern California Countercurrent. Drift in this zone is generally south and southeast with the northwest winds, except in the lee of Santa Rosa Is. where surface water moves to the west and southwest.

The peak pinniped population on land in this quarter was about 15,000 animals. In April and May, approximately 1,500 northern elephant seals were seen on San Nicolas Is., along with 5,000 California sea lions and small numbers of harbor seals. By the end of June, most northern elephant seals had departed and the California sea lion population increased to a peak of over 13,000 animals. At least 3,800 California sea lion pups were produced here in 1975. All California sea lions and northern elephant seals were found along one six km section of shoreline on the west side of San Nicolas Island. Harbor seals usually hauled-out in coves on the island's north end and were also common along the south side of Santa Rosa Island. In 1975, San Nicolas Is. supported a total of 1,085 nesting pairs of Brandt's Cormorant and Western Gulls; we found a reproductive success of zero for the cormorants at one surveyed colony.

Water temperatures in this quarter were the coolest found in the zone this year. Overall density of birds at sea was moderate (approximately 30 individual s/km²); shearwaters made up 41% of our sightings. Density of California sea lions was very-low. Most bird and pinniped activity at sea occurred over the shallow island shelves. Only two cool-water cetacean species were observed in the zone: the Pacific white-sided dolphin and the northern right whale dolphin.

**Winds, currents, and drift:**

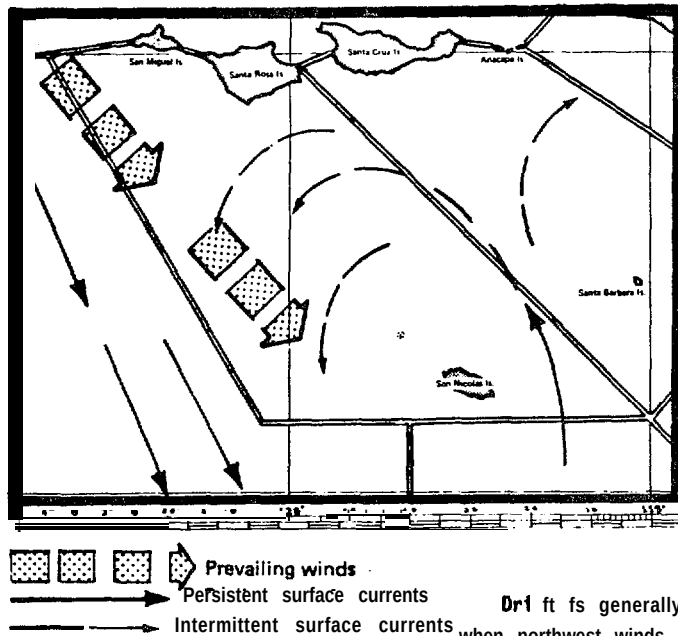
Prevailing winds are from the northwest and west. The California Current flows strongly close to the Santa Rosa Ridge. Some water east of San Nicolas Is. moves north and northeast contributing to the Southern California Countercurrent. Water from over the Santa Rosa Ridge between Santa Rosa and San Nicolas islands is entrained into the flow of the California Current. Drift is with the northwest winds to the south or southeast except in the lee of Santa Rosa Is., where surface water moves west and southwest.

The breeding season of Brandt's Cormorants, Western Gulls, and California sea lions on San Nicolas Is. was drawing to a close during this quarter, and animals began to disperse from their colonies. In August, over 10,000 sea lions remained on the island, and almost 900 Brown Pelicans, cormorants, and gulls were counted on the beaches. Very few northern elephant seals or harbor seals were present.

Most at-sea activity of birds and pinnipeds occurred on the eastern side of the Santa Rosa Ridge north of San Nicolas Island. Moderate densities were recorded for California sea lions (2 individuals/km²) and birds (10.5 individuals/km²); most seabirds were migrating shearwaters. Summer brought a twelve-fold increase in numbers of cetaceans, peak species diversity, and the highest annual incidence of baleen whales. The uncommon beaked whale (*Mesoplodon* sp.) was seen for the first time.

SANTA ROSA RIDGE.- October-December

INTEGRATED ZONAL SUMMARY



Hinds, currents, and drift:

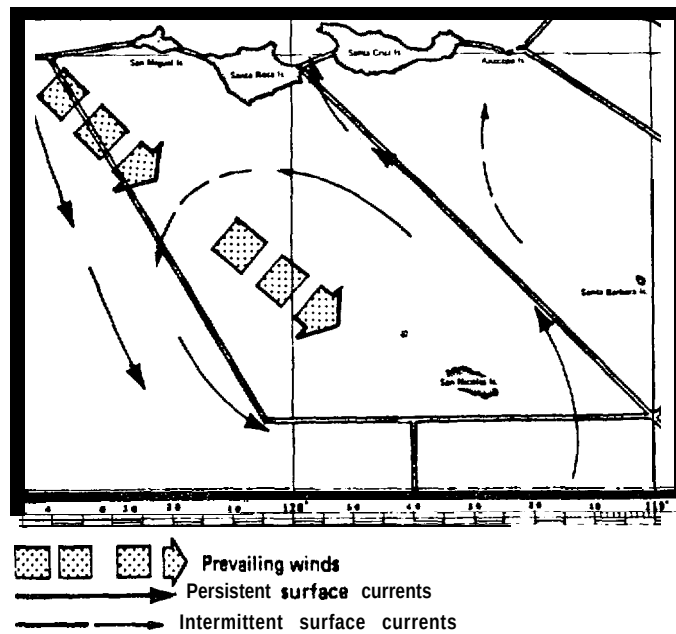
Northwest winds are frequently interrupted by passing low pressure cells with south and southeast winds. The California Current flows south and southeast along the western margin of this zone. The southern California Countercurrent becomes increasingly well-expressed in the autumn and transports water north and northwest between San Nicolas and Santa Barbara islands. Much of this water is entrained to flow across the Santa Rosa Ridge to join the California Current. San Nicolas Island and the Santa Rosa Ridge become the center of the Southern California gyre.

Drift is generally south and southeast throughout the zone when northwest winds prevail. In the absence of winds or with winds from the south and southeast, drift is to the north and northwest along the eastern margin of the Santa Rosa Ridge, and northwest or west in the lee of Santa Rosa Island.

Over 2,600 pelicans, cormorants, and gulls and 8,000 California sea lions were found on San Nicolas Is. during autumn surveys; a few northern elephant seals and harbor seals were present as well.

At sea, initially low densities of California sea lions had increased to moderately-high levels by December; seabird and cetacean numbers were moderate to high throughout the season. Marine mammal activity was greatest in the southern and southeastern portions of this zone, while birds were most concentrated within ten km of the islands. Gulls and alcids were the most numerous seabirds, though some loons, grebes, and scoters also migrated through. Numbers of common dolphins in this zone reached their yearly peak; although the numbers of sightings dropped, school size was markedly increased. The incidence of baleen whales was reduced, but a humpback whale provided a new species addition to the zone.

SANTA ROSA RIDGE-- January-March

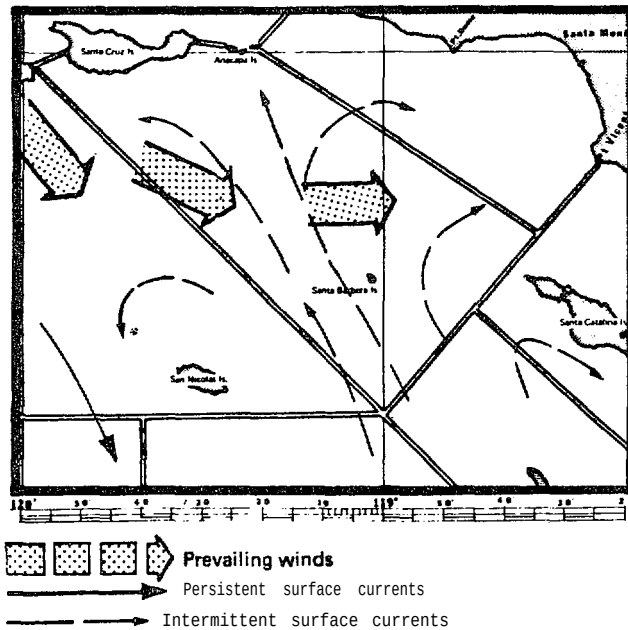


INTEGRATED ZONAL SUMMARY

Winds, currents, and drift: winds are from the northwest but commonly shift to the southeast as winter storms pass through the Southern California Bight. The California Current is broad, slow, and far offshore. The Southern California Countercurrent is well-developed and carries water north and northwest along the eastern margin of the ridge. Drift is generally in accordance with the water transport of the southern California Gyre, but can be accelerated, slowed or reversed by winds.

At peak breeding season, over 1,900 northern elephant seals, including 700 new pups, were counted at the San Nicolas Is. rookery. In addition, 5,000 California sea lions were present on the island in January and increased to 9,000 by mid-March. Several thousand loons, grebes, cormorants, and gulls were found along the beaches and in nearshore waters of San Nicolas and the northern islands.

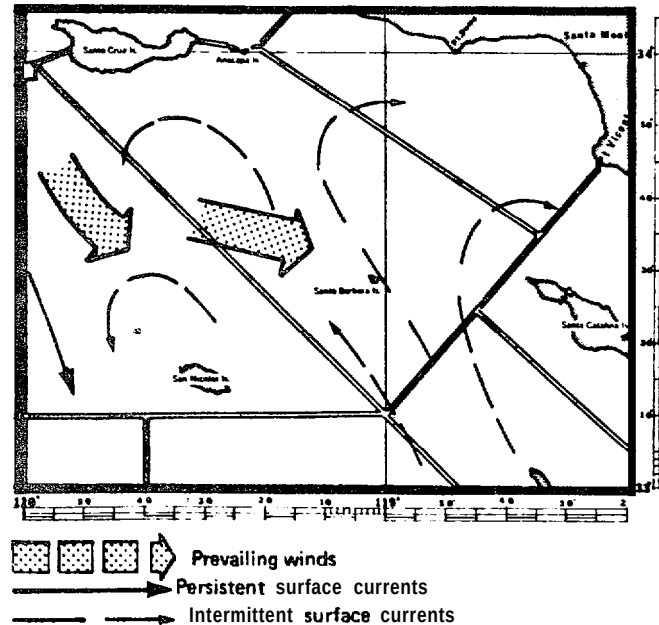
Density of birds at sea was high (44 individuals/km²), but numbers of California sea lions fluctuated from low to moderate and back to low. Both the predominant seabirds (fulmars, gulls, phalaropes, and small alcids) and pinnipeds (California sea lions and a few fur seals) were concentrated in the shallow waters over the crown of the Santa Rosa Ridge. The cetacean fauna was reduced and characterized by the presence of cool-water species such as Pacific white-sided and northern right whale dolphins. The common dolphin was completely missing and not to be found anywhere north of a line connecting San Nicolas and Santa Catalina islands.



Hinds, currents, and drift: Prevailing winds are from the west and northwest. Net surface water movement is to the north and northwest with the weak, y-developed Southern California Countercurrent. Some water is entrained by the California Current to flow west over the Santa Rosa Ridge. Drift is with the wind in an easterly or southeasterly direction, except in the lee of the islands.

The total pinniped population on Santa Barbara Is. was 2,200 animals, 88% of which were California sea lions. The population of California sea lions totaled 1,800 in late June, including 700 pups (most born in coves on the west and north sides of the island). Small numbers of California sea lions were also found on Gull Is. on the south side of Santa Cruz Island. Six bird species totaling 2,373 pairs nested on Santa Barbara Is. in 1975, with Western Gulls and *Xantus' Murrelets* accounting for the greatest numbers. Except for female-female pairing, reproductive success for the Western Gulls nesting here was within the species' normal range.

At sea, water temperatures had stabilized their annual lows, and the higher vertebrate fauna was comprised mainly of migrating Shearwaters, gulls, small alcids, California sea lions, and smaller toothed cetaceans. The cetacean population was represented by three cool-water species and dominated by the Pacific white-sided dolphin. Dan's porpoises and northern right whale dolphins were also observed but were less prevalent. Cetacean distributional patterns were primarily over ridges and shallows, with very few deep basin sightings. Most migratory gray whales had passed through the basin during the previous quarter. The seabird density averaged 98 individuals/km². Foraging activity of breeding pinnipeds and birds was concentrated on the shallow shelves within 20 km of Santa Barbara, Santa Cruz, and Anacapa islands. Birds nesting on Santa Barbara Is. foraged primarily northwest, north, or northeast of the island, and moderately-high densities of California sea lions were found in these same waters.



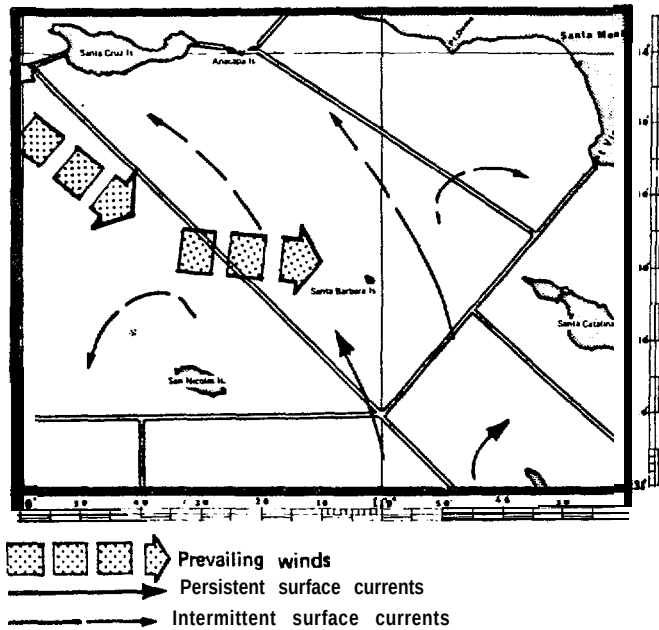
Winds, currents, and drift: Prevailing winds are from the west and northwest. Occasional northeast (Santa AM) winds occur and are felt as far south as Santa Barbara Island. Net surface water transport is to the north and northwest with the Southern California Countercurrent. Drift is predominantly to the east and southeast when west winds are strong. In the absence of wind, drift is north and northwest with the Southern California Countercurrent.

With the exception of six northern elephant seals, some 1,000 California sea lions were the only pinnipeds on Santa Barbara Island. Gulls, cormorants, and alcids nesting on Santa Barbara Is. fledged their young during July and August. Total bird populations on Santa Barbara Is. were moderate compared to other seasons.

Oceanic sightings were of shearwaters, gulls, California sea lions, Pacific white-sided dolphins, common dolphins, pilot whales, bottlenose dolphins, and minke whales. Bird density at sea was relatively low (mean density was 8 individuals/km²) with gulls and shearwaters predominating over the deep central basin. As California sea lions dispersed from the rookery, the mean density of animals at sea increased from 1 to over 2 individuals/km². Although overall density was moderately-high, most California sea lions were seen within 25 km of Santa Barbara and San Nicolas islands. Intermixing of oceanic and inshore cetacean species resulted in the greatest cetacean diversity of the year. Increased individual school sizes were noted causing this season to be the second most populous of the year. The pattern of sighting distributions shifted from the northernmost sectors of the zone in July to the southern boundary in September.

SANTA CRUZ BASIN.- October-December

INTEGRATED ZONAL SUMMARY



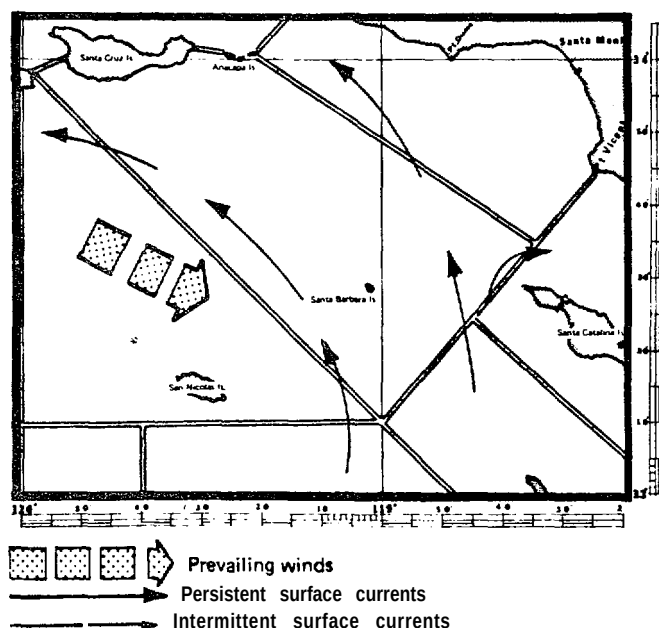
Winds, currents, and drift: Winds from the west and northwest are often interrupted by northeast (Santa Ane) winds, and by low pressure cells with south and southeast winds. The Southern California Counter-current becomes increasingly well-expressed, moving surface water to the north and northwest. When wind is strong and steady, drift is downwind. When winds shift or abate, drift is north and northwest with the current.

The pinniped population of Santa Barbara Is. consisted of approximately 1,000 California sea lions throughout this period. A substantial increase in the number of pups present on land suggested a southward movement of these animals from the larger rookeries on San Nicolas and San Miguel islands. The numbers of pelicans, cormorants, gulls, and jaegers were high onshore and within a few km of Santa Barbara Is. and the northern island chain.

At-sea sightings of pinnipeds, cetaceans, and birds were concentrated along the shallow northern and eastern rims of Santa Cruz Basin; the deeper waters of the central basin were practically devoid of animals. Mean bird density at sea was 12 individuals/km². Shearwaters and storm-petrels decreased rapidly in abundance through the autumn and were replaced in the nearshore zone by populations of loons, grebes, and scoters arriving to winter in the area. In October, California sea lion densities were moderately-high except near Santa Barbara Is. where density was low. This pattern was reversed in November and December, with density near Santa Barbara Is. increasing to moderately-high levels and that in the northern sector decreasing to low and very-low levels. These were transitional months for cetacea, with cooling water temperatures stimulating first appearances of animals with cool-water preferences, while warm-water species had already commenced their movement out of the cool water mass. The basin supported its lowest yearly numbers of cetacea, as well as a markedly reduced diversity of species.

SANTA CRUZ BASIN . January-March

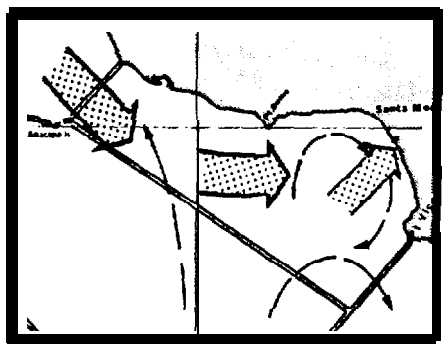
INTEGRATED ZONAL SUMMARY



Winds, currents, and drift: West and northwest winds alternate with south, southeast, and east winds as winter storms pass the Southern California Bight. The Southern California Countercurrent is well developed, bringing water north and northwest throughout this zone. Drift is north and northwest in January and February when winds are southeasterly. With west and northwest winds in these months and especially in March, drift is south and southeast.

From the small breeding population of northern elephant seals on Santa Barbara Is. (less than 150 animals) about 70 pups were weaned in 1976; the California sea lion population was stable at some 1,000 animals. Reoccupancy of Santa Barbara Is. nesting colonies by gulls, cormorants, and perhaps small alcids marked the beginning of seabird reproductive activity later in this period,

Water temperatures in the basin approached annual minimums due to the incursion of cooler offshore waters, and migratory and wintering species were the rule. Loons, grebes, ducks, cormorants, and gulls were numerous in nearshore waters south of the northern island chain and in the vicinity of Santa Barbara Island. Fulmars, gulls, and small alcids dominated the offshore bird fauna; winter densities averaged 21 individuals/km². While California sea lion densities were low offshore, they, too, were common within 20 km of Santa Barbara Island. Migrating cetaceans included southbound gray whales which reached the year's maximum numbers for this zone, and increasing numbers of pilot whales moving into the SCB. A significant rise occurred in counts of cool-water inhabitants, particularly Pacific white-sided dolphins and Dan's porpoises; initial sightings of northern right whale dolphins were also recorded at this time.





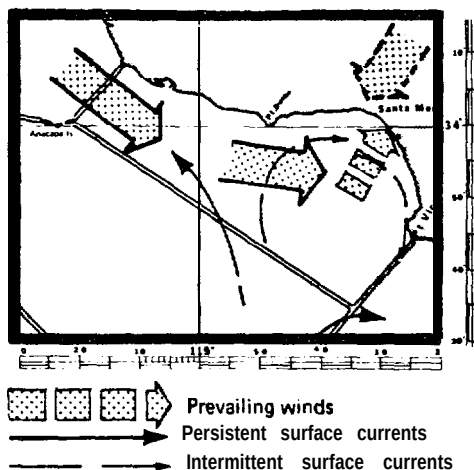
 Prevailing winds
 Persistent surface currents

 Intermittent surface currents

Winds, currents, and drift: Prevailing winds are from the west and southwest within the bay and west or northwest in the vicinity of Pt. Mugu. Maximum velocities are usually from the north. The sea/land breezes are poorly developed. Surface water movement is a clockwise gyre within the bay, trending southward inshore. Outside the bay, flow is generally southeast. The southern California Countercurrent is poorly developed. Drift is southeasterly and onshore.

California Least Terns nest in a small colony near Pt. Mugu. No pinniped reproductive colonies are found in this zone. Mainland beaches supported occasional harbor seals and low numbers of birds, though many loons, grebes, and sea ducks probably passed through the zone close to the coast prior to the start of the study. Relatively few dead birds were found ashore.

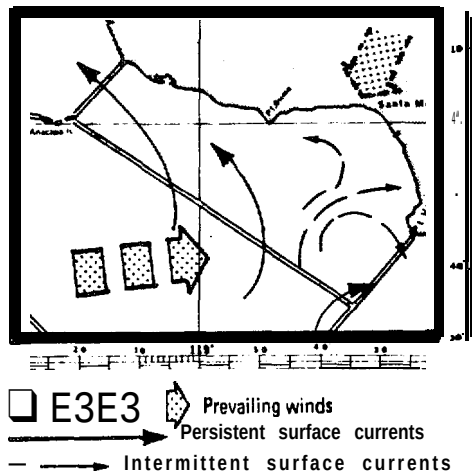
No seals or sea lions were seen along open water transects. Overall bird density, however, was very high (mean of 138 individuals/km²); most sightings were of shearwaters passing northwestward toward Santa Barbara Channel. This was the period of lowest annual cetacean activity in the zone with only two sightings. One was a solitary minke whale nearshore, east of Anacapa Island, and the other was a pair of unidentified animals in the southern portion of the area.



Minds, currents, and drift Prevailing winds are west and southwest within the bay, and west or northwest near Pt. Mugu. Winds are somewhat diminished from those of the spring. During this season, the sea breeze becomes the dominant Inshore wind. Surface waters move easterly within the bay, turning south nearshore. The clockwise eddy is not apparent in this season. With the gradual development of the Southern California Countercurrent, surface flow becomes northwesterly outside the bay from Pales Verdes to Pt. Mugu. Drift is southeasterly and onshore.

Mainland beaches in Santa Monica Basin harbored sizeable roosting populations of Brown Pelicans and gulls during the summer, in addition to low to moderate numbers of dead, beached birds. Nearshore migration of waterfowl, phalaropes, and jaegers occurred in September.

Overall bird density at sea was low (two birds/km²); included were small numbers of cormorants, pelicans, gulls, phalaropes, and jaegers. California sea lions were widely and thinly distributed in the basin in July and August, but density increased slightly in September as animals dispersed from the rookeries in neighboring zones. Modest cetacean activity occurred at this season, yielding 20% of the annual zonal count. With the exception of one pilot whale sighting, all activity occurred outside the confines of Santa Monica Bay. Minke whales were again present along the western boundary of this zone adjacent to the basin's deeper waters.

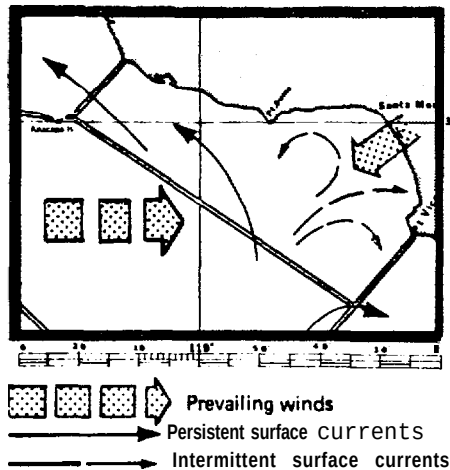


Winds, currents, and drift: Prevailing winds are from the west with low force. Santa Ana winds from the northeast may alternate with southerlies brought in by early winter north Pacific storms or autumn tropical disturbances. In central Santa Monica Bay, the Santa Ana winds may eddy and blow from the southwest. The sea breeze diminishes during this season and the land breeze increases.

Surface water flow within the bay is complicated by the well-established Southern California Countercurrent. The diminished clockwise eddy may be replaced by a more local counterclockwise gyre in the north half of the bay. Surface currents in the south end of the bay approach from the west and southwest, forming a clockwise gyre and moving water onshore. The Southern California Countercurrent moves water northwest along the outer coast of Pt. Mugu. Drift is dependent on the complex and variable wind patterns within this region.

Substantial populations of migrant and wintering loons, grebes, pelicans, scoters, and gulls were found near the mainland beaches of this zone. Relatively few dead birds washed ashore here in autumn; 30% of these were oiled.

Loons, grebes, and scoters migrated through the basin from November onward. Very large concentrations of gulls, apparently attracted by spawning squid, led to an average bird density at sea of over 440 individuals/km², with the greatest numbers found close to the shoreline. California sea lions were the only pinnipeds seen in Santa Monica Basin and densities were low. Again, cetacean activity was modest, yielding another 20% of the annual zonal count. The first migrating California gray whales on their southward passage through the area were seen in mid-December. An unexpected clustering of Dan's porpoises was noted on four occasions in the Pt. Dume area.

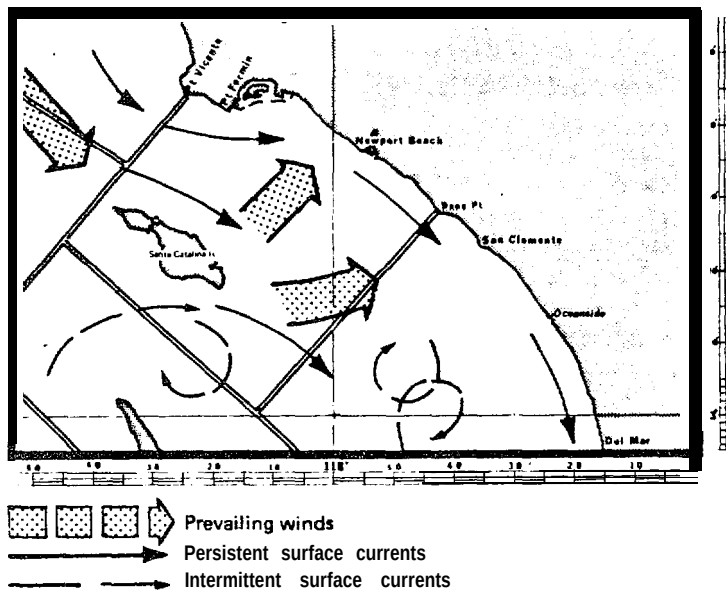


Winds, currents, and drift: Prevailing winds of increasing velocity are from the west, broken by regular north Pacific cyclonic storms bringing strong southerlies, and by Santa Ana winds from the north and northeast. The Santa Ana winds eddy east Pales Verdes Peninsula to blow from the southwest across central Santa Monica Bay. The onshore sea breeze is poorly developed during these months, but the land breeze may blow briskly offshore at night.

Surface flow within the bay is complicated. A counter-clockwise gyre dominates north Santa Monica Bay circulation. In the south bay surface water enters from the west and southwest, bending clockwise to move water onshore to the east and southeast. Surface currents outside the bay flow generally to the southeast as the northwest contribution of the Southern California Countercurrent diminishes sharply during this season. Drift is dependent on the complex and variable wind patterns within this region during these months.

Mainland beaches and nearshore waters supported large wintering populations of loons and grebes, sea ducks, and gulls. The results of major fulmar and kittiwake die-offs were apparent here; relatively high numbers of dead birds were found on Santa Monica Basin beaches, about one-third of them oiled.

In the open-ocean waters of the basin, seabird density averaged 14 individuals/km²; the great majority of sightings was of gulls. Overall densities of California sea lions were low to very-low. Some use of these waters by northern elephant seals was evident. More than 60% of this zone's annual cetacean activity occurred during these winter months. Migrating gray whales were the only baleen whales seen and represented more than half of the sightings reported for the period. Two species uncommon in this zone, Risso's and Pacific white-sided dolphins, were also seen.

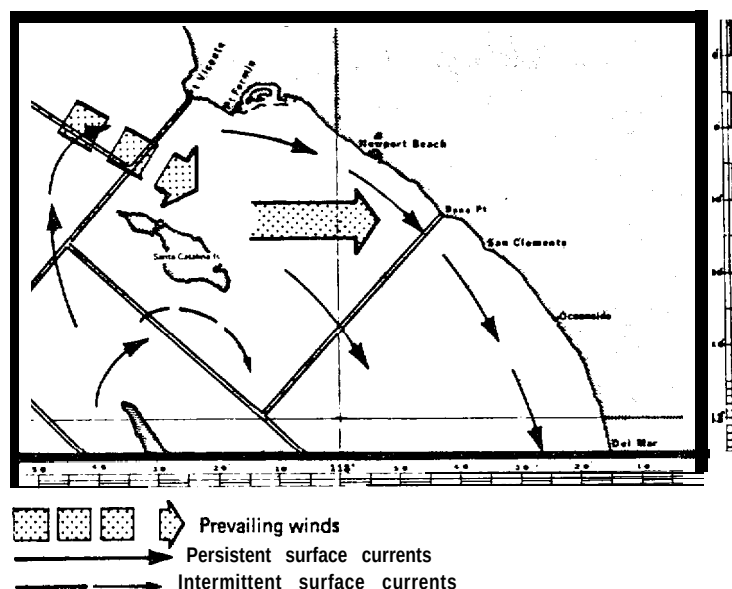


Minds, currents, and drift: The strong prevailing winds from the west and southwest are interrupted by passing spring storms bringing transient moderate southerlies. The nightly offshore land breeze predominates during these months although the daily onshore sea breeze is also moderately developed.

Surface currents flow general 1 y southeast, as the Southern California countercurrent is poorly expressed during this season. In late spring the Southern California Countercurrent begins to alter surface flow to the northwest, although the effect is minor. Inshore currents are particularly complex. Drift is in accordance with unpredictable local winds.

Santa Catalina Is. provided nest areas for 25 to 30 pairs of Western Gulls, and over 150 harbor seals were hauled-out on the island during the spring pupping season. Small numbers of California sea lions were also present, but no pupping or breeding occurred here. Mainland and island shores harbored moderate numbers of birds, primarily grebes and gulls, and though relatively large numbers of dead birds were found on the zone's mainland beaches, none were oiled.

The passage of migrating shearwaters, plus moderately high numbers of loons, grebes, and gulls, gave rise to very high densities of birds at sea (mean 250 individuals/km²), and small numbers of California sea lions were present near the Catalina Escarpment east of that island. Cetacean species composition underwent a transition phase with reduction of cool-water and winter migrant groups. Two species each of baleen and toothed whales were sighted (total 24 animals); distribution in the area was scattered with no pronounced loci of concentration.

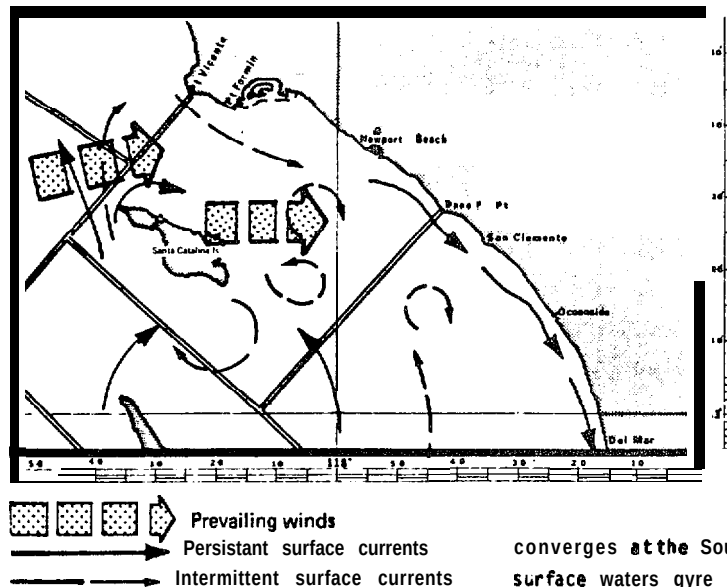
Winds, currents, and drift:

Prevailing winds from the west and southwest are diminished somewhat from spring. Inshore, the daily onshore sea breeze is well developed.

Surface currents remain southeasterly throughout the offshore portions of this region, although occasional pulses of the Southern California Countercurrent may alter flow to the northwest. Drift is generally to the east and northeast in accordance with the prevailing winds.

Censuses of mainland shores revealed substantial summering populations of gulls, but relatively few gulls or cormorants and only 17 California sea lions were seen on Santa Catalina Island. Harbor seals were no longer present on land, but two northern elephant seals were seen within five km of the island during these months. The flyway for loons, grebes, and phalaropes migrating in September apparently passed through the inshore portions of San Pedro Channel.

Numbers of all animal groups at sea were low; the dominant species were gulls, shearwaters, and phalaropes, California sea lions, and small toothed whales. Cetacean sightings (pilot whales, common, Pacific white-sided, and bottlenose dolphins) were restricted to three general areas: around the Pales Verdes Peninsula, off the west end of Santa Catalina Is., and along the Catalina Escarpment.

Winds, currents, and drift:

Prevailing winds from the west are weakest during this season, often interrupted by calms, by northeast (Santa Ana) winds, and by moderate southerlies generated by early fall tropical "disturbances" or late fall north Pacific cyclones. Inshore, the sea breeze is moderately well developed although the land breeze may predominate late in the season.

During the fall, the Southern California Countercurrent becomes increasingly well expressed, bringing surface waters to the northwest. An eddy complex

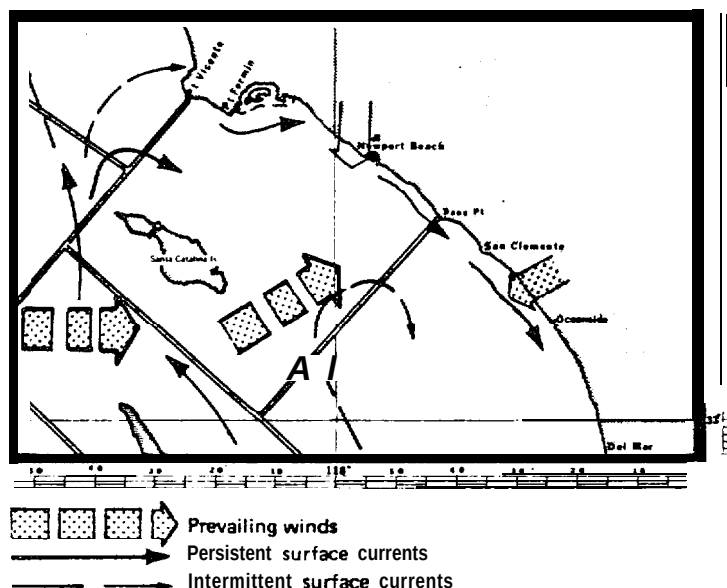
converges at the southern tip of Santa Catalina Is. where surface waters gyre counterclockwise to the north and east, and clockwise immediately south of the island. The inshore

southerly current near San Pedro broadens and develops during this season. Drift patterns are complex and unpredictable during the fall, depending on local wind propagation.

In contrast to the pattern observed in zones to the north and west, many gulls, but few cormorants and pelicans, were present on Santa Catalina Is. or mainland beaches of the San Pedro Basin; beached dead birds were also uncommon. No pinnipeds were found hauled-out on island shores.

Water temperatures began to drop from summertime highs, and with migration and turnover of cetaceans and marine birds, at-sea species diversity and numbers increased. California sea lion densities, initially low in October and November, had increased to moderately-high levels by December. Moderate densities of seabirds (23 individuals/km²), predominantly gulls, were recorded. Migration of grebes, loons, and scoters occurred in October and November along the mainland, but significantly, no cetaceans were observed in nearshore waters southeast of the Pales Verdes Peninsula. Heavy concentrations of these animals were found around Santa Catalina Is., with scattered sightings off the peninsula itself. Approximately 99% of all cetaceans encountered were toothed whales, though it was at this time that the first migratory gray whales were seen.

SAN PEDRO BASIN -- January-March



INTEGRATED ZONAL SUMMARY

Winds, currents, and drift:

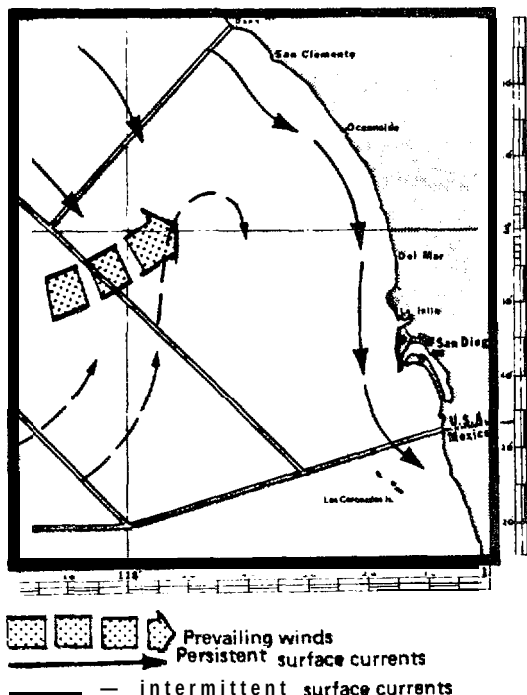
Prevailing winds **from** the west and southwest increase in strength during the winter, interrupted by north Pacific cyclonic southerlies, and northeast Santa Ana winds. The land breeze dominates the daily inshore wind pattern, with the sea breeze poorly expressed.

The Southern California Counter-current weakens during the winter, and thus surface currents tend to flow to the southeast. The longshore southerly current near San Pedro flows strongly. Drift patterns are complex and unpredictable during the winter, depending on highly variable local wind propagation.

Cormorants, pelicans, and gulls were found to be abundant along the Santa Catalina Is. shoreline, along with a few California sea lions and about 150 harbor seals, while grebes, loons, and gulls were numerous along mainland beaches.

Water-column temperatures reached their lowest annual level during this period, and among seabirds and cetaceans, moderate to large numbers and moderate species diversity were noted. Loons, grebes, and gulls were common, and while baleen whales were represented only by the migratory gray whale, both warm- and cool-water forms of toothed whales were abundant. In contrast, overall at-sea density of California sea lions was low.

The most significant areas of cetacean aggregation were the south side of Santa Catalina Is., over the San Pedro Escarpment (gray whales, pilot whales and bottlenose dolphins), and along the coastal shallows from Huntington Beach to Dana Point (common dolphins).

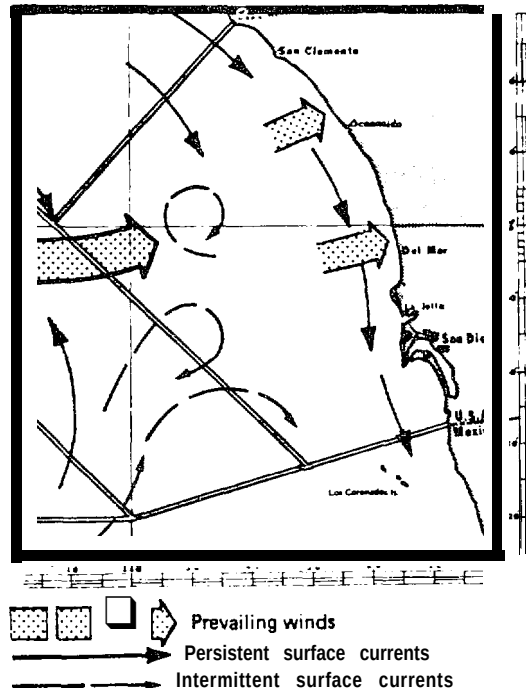


Winds, currents, and drift: Prevailing winds are moderate from the west and southwest, as the Catalina eddy bends the prevailing northwesterly lies in this region. Cyclonic storms regularly augment the southerly winds. The sealand breezes are poorly developed in spring though land breeze predominates.

Surface currents flow generally southeast during the spring, as the Southern California Countercurrent is poorly developed. A weak expression of the countercurrent moves offshore water to the northeast in this region, forming a weak clockwise eddy as the flow returns southward nearshore (the Southern California Coastal Current). Drifts generally to the northeast during these months.

The basin's mainland beaches harbored moderate numbers of loons, grebes, and gulls, and relatively few dead, beached birds. No seabird or pinniped reproductive colonies are located here, but about 300 seals and sea lions and many thousands of seabirds breed on Islas Los Coronados, Mexico, south of the surveyed area. The foraging range of these animals probably extends into San Diego Basin.

Water-column temperatures were rising during this period of environmental and species transition. Densities of higher marine vertebrates at sea were low. Not surprisingly, most pinniped sightings occurred near Los Coronados; cetaceans (all toothed), however, were found offshore and scattered along the outer perimeter of the San Diego Trough.

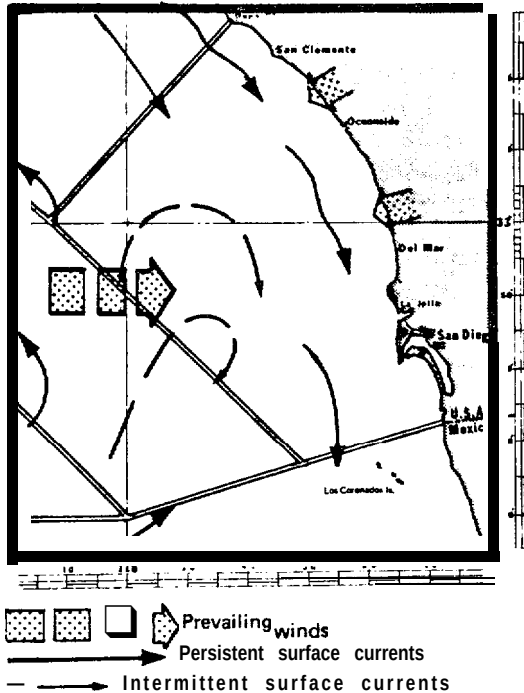


Winds, currents, and drift: Prevailing winds are from the west as the expression of the Catalina eddy is diminished. The sea breeze is dominant inshore.

As the Southern California Countercurrent develops, a clockwise gyre is formed between San Clemente Is. and the mainland. The gyre is increasingly expressed as this season progresses. Drift is to the east during this period.

Substantial summering and post-breeding migrant groups of gulls and Brown Pelicans were found on mainland beaches. Though the number of beached dead birds was low, 20% were oiled--a high figure for this zone.

This was a period of warm water in the area, and species diversity was moderate. The most prominent forms were storm-petrels, gulls, and smaller toothed whales. Very few pinnipeds were seen; the greatest concentration of California sea lions was encountered over the Coronado Escarpment. At-sea densities of seabirds were moderate (7 individuals/km²); more than 6,300 cetacea were sighted, primarily south of 33° N latitude and along the periphery of the San Diego Trough and over the Coronado Escarpment. The common dolphin was the most abundant cetacean species present in the zone (approximately 53%) followed by slightly less numbers of Pacific white-sided dolphins (approximately 40%). Baleen whales were reduced to a sighting of a solitary minke whale.

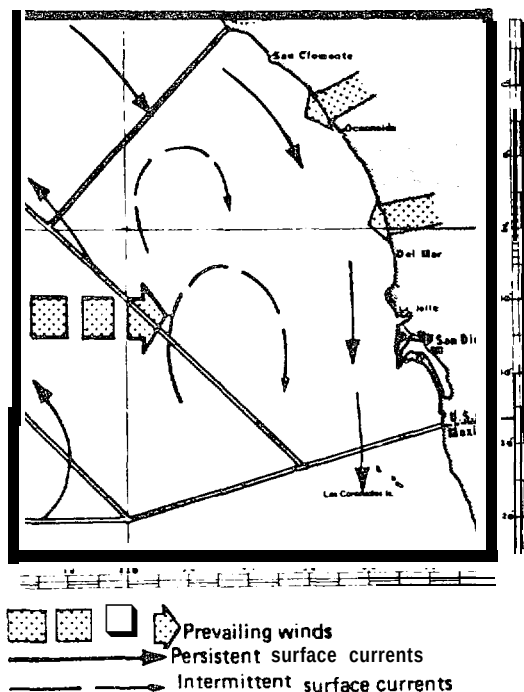


Winds, currents, and drift: Prevailing westerly winds are broken by occasional tropical disturbances in early autumn, by intermittent north Pacific storms bringing southerlies, and by Santa Ana (north) winds. Calm water is not uncommon offshore in these months. The sea breeze is not strong during this time, and the land breeze becomes dominant inshore.

A clockwise current gyre becomes an increasingly predominant feature between San Clemente Is. and the mainland, as the Southern California Countercurrent is most pronounced during this season. Flow is northerly offshore and southerly inshore. Drift is in accordance with the variable wind patterns, except during periods of calm weather when the clockwise surface water flow determines drift.

Pelicans, loons, grebes, and terns were abundant on mainland beaches. Beached dead-birds were few in number and of these, only 5% were oiled.

Water temperatures began to decrease, after peaking here in mid-season. Moderate densities of birds were observed at sea ($4 \text{ individuals/km}^2$); the majority of sightings consisted of gulls and jaegers. Pelicans, storm-petrels, and alcids were also found offshore in small numbers ($0.1 - 0.4/\text{km}^2$). Overall density of California sea lions at sea was low; however, some areas showed increased use in late autumn. The highest densities were recorded near Lasuen Knoll in the zone's northern sector. Four northern elephant seals were seen in the waters east of the San Clemente Escarpment. This was a period of significant change for cetaceans, including increasing species diversity. Only one baleen whale was seen, but the common dolphins were abundant, totaling approximately 13,500 animals. Migrating gray whales were not noted in this basin, though they were present in adjacent zones. Cetacean sightings were generally widely scattered throughout the area, showing no distinct patterns of distribution over ridges or seamounts.

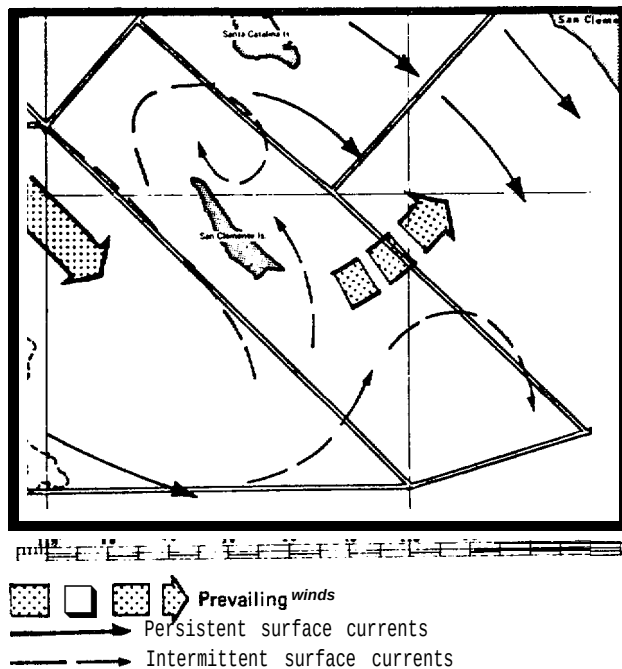


Winds, currents, and drift: Prevailing winds are from the west and northwest, broken intermittently by southerlies brought by north Pacific storms and by northerly Santa Ana winds. Inshore, the land breeze predominates.

Offshore, clockwise gyre is strongly expressed but diminishes later in this season. Surface flow is northwest offshore and southeast inshore. Drift is in accordance with the variable and complex wind patterns present during these months.

Mainland beaches and nearshore waters harbored large numbers of grebes, scoters, and gulls during this season. High rates of beached bird occurrence particularly reflected the major winter die-off of fulmars and kittiwakes that occurred throughout the Bight. Islas Los Coronados supported a small breeding population of northern elephant seals numbering about 100 animals and producing about 40 pups; some of these animals undoubtedly migrated into the study area.

During this period water column temperatures approached their lowest annual levels. Bird density at sea averaged 6 individuals/km² through the winter, of which gulls constituted the largest portion, and low to very-low densities of California sea lions were encountered. More than 3,500 cetaceans were sighted; cool-water species were beginning to appear in increased numbers. Two species of baleen whales were recorded, but smaller toothed whales predominated (six species). The baleen whales occupied the nearshore areas while the common dolphins (3,000) were dispersed over the Coronado Escarpment and along the inshore edge of the San Diego Trough.



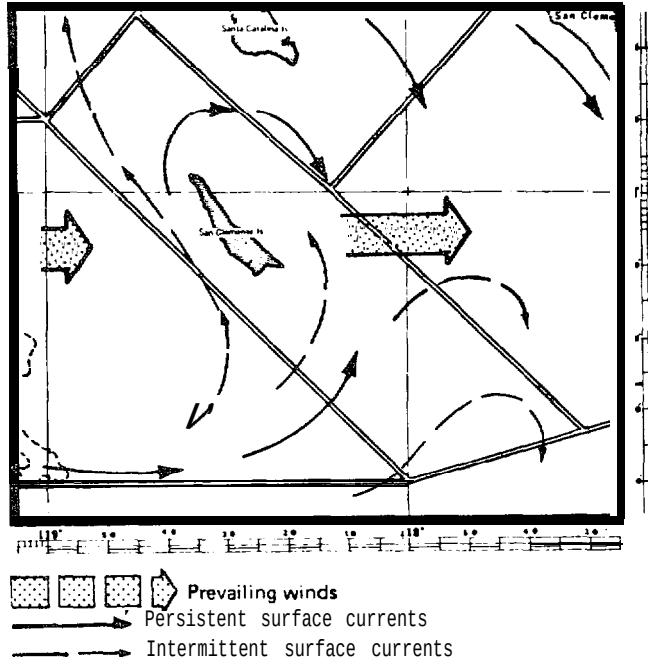
Hinds, currents, and drift: Prevailing winds are from the west and northwest, interrupted by southerlies brought by north Pacific cyclonic storms. Net surface water movement is general 1 y southeast during this period of low Southern California Countercurrent development. When the countercurrent develops, surface flow shifts to the northeast south of San Clemente Is., and flows northwest in the immediate vicinity of the island, paralleling the bottom contours there. Drift is to the east in accordance with the prevailing westerlies, except during passing storms, when the transient southerlies blow surface waters to the north. In the lee of San Clemente Island drift may be in accordance with the prevailing currents.

All pinniped reproductive activities occurred at Seal Cove on the west side of San Clemente Island. The peak count of California sea lions in June was over 1,800 animals, including 600 pups. A few harbor seals and non-breeding California sea lions were hauled-out at Northwest Harbor Island. Two species of seabirds nested on the island in 1975-- Brandt's Cormorant and the Western Gull--but the populations totaled only 44 pairs. In addition, we found an average of 460 gulls, pelicans, and cormorants on the beaches.

At sea, most sea lions were seen within 20 km of the rookery; northern elephant seals were seen north of San Clemente Is. and on the San Clemente Escarpment. Total bird density averaged 13 individuals/km², largely shearwaters and small alcids. Cetacean numbers and species diversity were at their lowest for the year: only three small groups of toothed whales were observed.

SAN CLEMENTE RIDGE -- July-September

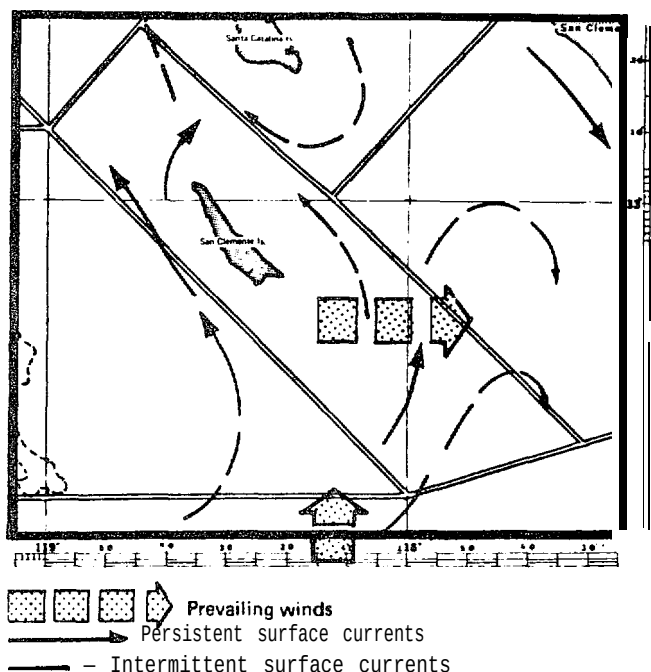
INTEGRATED ZONAL SUMMARY



Winds, currents, and drift: Prevailing winds are from the west and northwest although somewhat diminished in force from spring. Net surface water movement is to the northeast south of San Clemente Is. and northwest past the island itself, following the bottom contours there. Drift is generally east and southeast according to the prevailing winds, although drift may move northwest with the currents in the lee of San Clemente Island.

Roosting gulls, pelicans, and cormorants numbered over 750 individuals on San Clemente Island; most of these were found along the northern shoreline. Slightly more than 1,500 California sea lions were still present in early August.

At sea, water temperatures reached peak high levels in late September. Densities of marine birds and California sea lions were consistently low except for an increase in sea lions within 25 km of the island. In contrast, the year's high count of cetaceans for this zone was recorded during these months; more than half of the animals were common dolphins, sightings occurred from north and west of San Clemente Island southward to the border of San Clemente Basin.



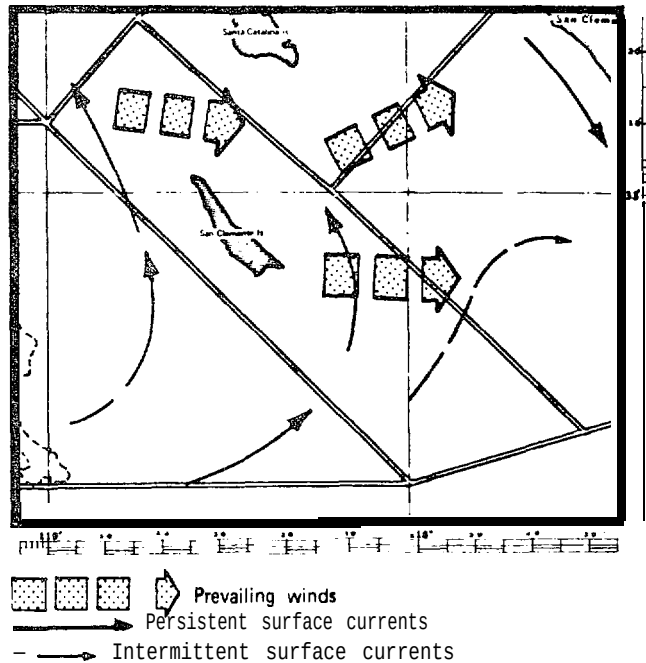
Winds, currents, and drift: Prevailing west and northwest winds weaken during this period, giving way to occasional southerlies brought in early fall by tropical storms, and later by passing north Pacific cyclones. Santa Ana winds blow occasionally from the north and northeast although their effect is quite diminished this far offshore. This is the season of most frequent fairs. Surface currents flow northeast south of San Clemente Island, and northwest parallel to the island itself as the Southern California Counter-current is most developed during this time. Drift is unpredictable on a long-term basis due to the variability of the winds at this season. During fair periods and in the lee of San Clemente Is., however, drift is generally in accordance with the prevailing northeast-northwest currents.

The population of California sea lions on San Clemente Is. was nearly 1,000 animals in October and had increased 30% by December. Pelicans, cormorants, and gulls formed large roosts at several places on the northern end of the island: an average of 800 birds was recorded in Northwest Harbor during October and December surveys.

Low to very-low densities of California sea lions were recorded in October, with the greatest concentrations found near the Seal Cove rookery on the west side of San Clemente Island. In contrast, by December, the animals' use of these waters had increased to moderate and moderately-high levels, with high densities found over the San Clemente Escarpment southeast of the island. Cetacean species composition shifted toward cool-water forms as water column temperatures declined during the period. Pacific white-sided dolphins were the most prevalent species representing approximately 92% of all animals sighted. The appearance of California gray whales in December marked the onset of the species' annual migration through the Southern California Bight. In contrast, overall bird densities at sea were moderately low throughout this period (5 individual s/km²); gulls and jaegers predominated at sea, though many other taxa migrated through or took up winter residence here as well.

SAN CLEMENTE RIDGE -- January-March

INTEGRATED ZONAL SUMMARY



Hinds, currents, and drift: Prevailing winds from the west and northwest strengthen during this season, interrupted frequently by passing north Pacific storms bringing moderate southerlies, and by north winds following these storms.

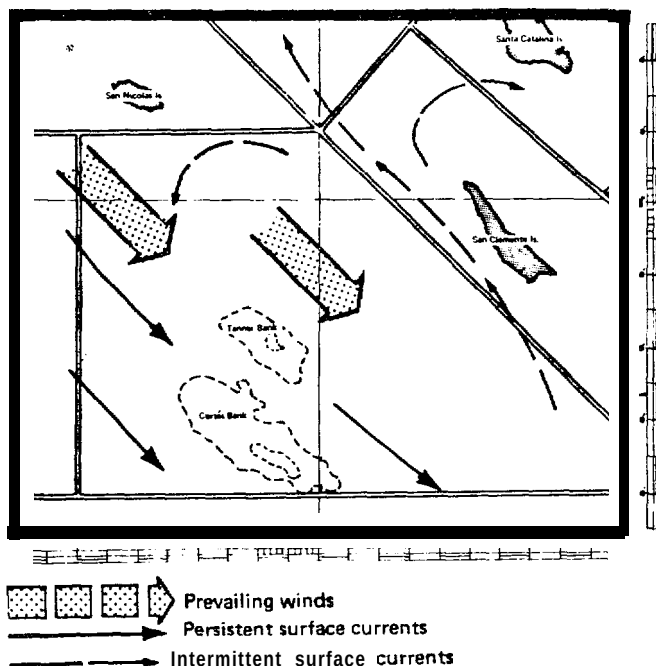
Surface current flow generally shifts to the southeast as the Southern California Countercurrent diminishes in strength. During this period flow is often northwest immediately inside San Clemente Is. and southeast outside. Drift is generally in accordance with the winds; during periods of calm and in the lee of San Clemente Is. the currents determine surface drift.

Slightly more than 1,500 California sea lions were present on San Clemente Is. in January; by March the total count had increased to more than 1,800 animals. No other pinniped species were seen on land. Cormorants, pelicans, and gulls roosted in large numbers (an average of over 1,450 birds) on the north shore of the island.

As cool water entered the Southern California Bight from the northwest, sea temperatures dropped, and warm-water cetaceans moved southward. While the number of animals decreased, species diversity increased markedly. For both pinnipeds (California sea lions, northern elephant seals, and a northern fur seal) and cetaceans, Fortymile Bank on the San Clemente Escarpment proved a locus of concentration. Cetaceans were generally spread over areas of irregular bottom topography with slightly higher densities found over ridges and escarpments. California sea lion density, low in January and moderate by March, was concentrated within 20 km of San Clemente Is. as well. Marine bird density averaged 9 individuals/km², to which pelicans, gulls, and small alcid contributed most heavily.

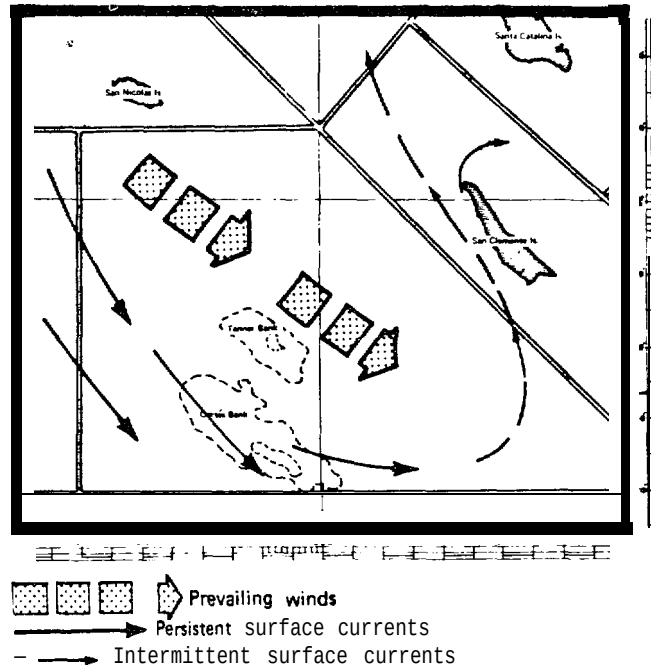
TANNER-CORTÉS BANKS -- April-June

INTEGRATED ZONAL SUMMARY



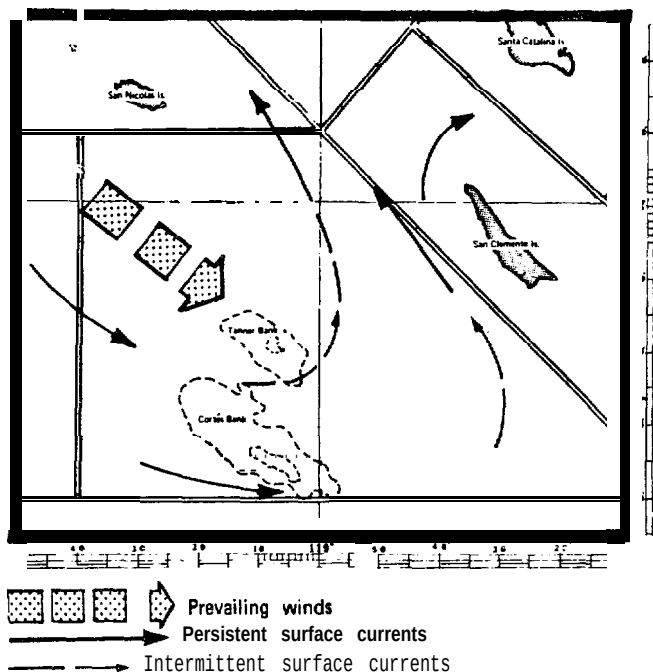
Winds, currents, and drift: Northwest winds prevail. Most surface water moves southeast through this zone with the well developed California Current. Some water is drawn eastward into the weakly developed Southern California Countercurrent. Drift is to the southeast, with the wind.

No pinniped or seabird reproductive colonies exist in this zone, but California sea lions use the area as a feeding ground and were concentrated in moderately-high density south of San Nicolas Is., over Tanner Bank, and over the north rim of San Nicolas Basin. Total seabird numbers were also moderately-high (mean density was 22 individuals/km²), and we found the birds concentrated north and east of the banks. Presumably, offshore migration of gulls, terns, and perhaps alcids occurred here prior to our first surveys. In contrast, no cetaceans were recorded during this period, though sightings in adjacent zones suggest that these highly mobile animals have passed through the area.



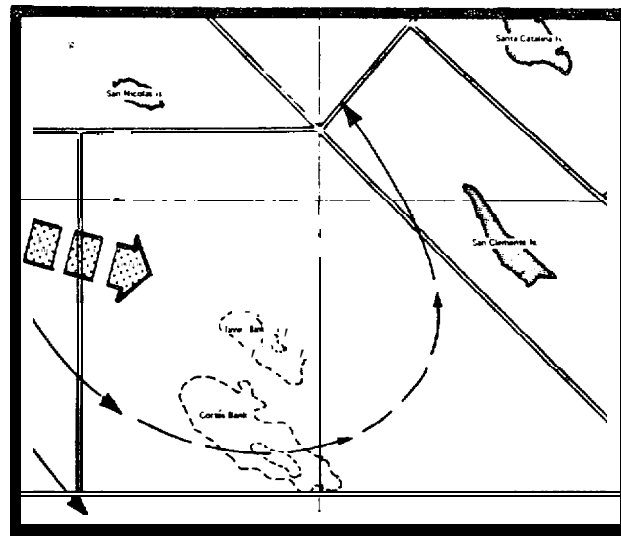
Hinds, currents, and drift: As northwest winds diminish, the California Current gradually moves offshore. The southward component of this current is well developed. Surface water moves southeast throughout most of this zone with the prevailing winds and northwest swell. However, a strong northward movement of water is detected over the rim of the San Nicolás Basin between San Nicolás and San Clemente islands. This water contributes to the Southern California Countercurrent. In periods of steady wind, drift is to the southeast. When winds abate, drift is southeast over Tanner and Cortés Banks and north and northeast closer to San Clemente Island.

Marine vertebrate activity was generally high during this period. Though few California sea lions were seen in other waters of this zone, moderately- to very-high densities were recorded over the banks themselves. The only sightings of sei whales in the Southern California Bight during 1975 were along the western edge of Cortés Bank. Sightings of four other species were scattered along the Santa Rosa-Cortés Ridge, with common dolphin numbers reaching their highest levels for the year in the area. Moderate seabird densities (5 individuals/km²) resulted from a predominance of shearwaters in July and August, declining in September, and the subsequent influx of migrating terns, jaegers, alcids, and individuals of infrequently-seen species.



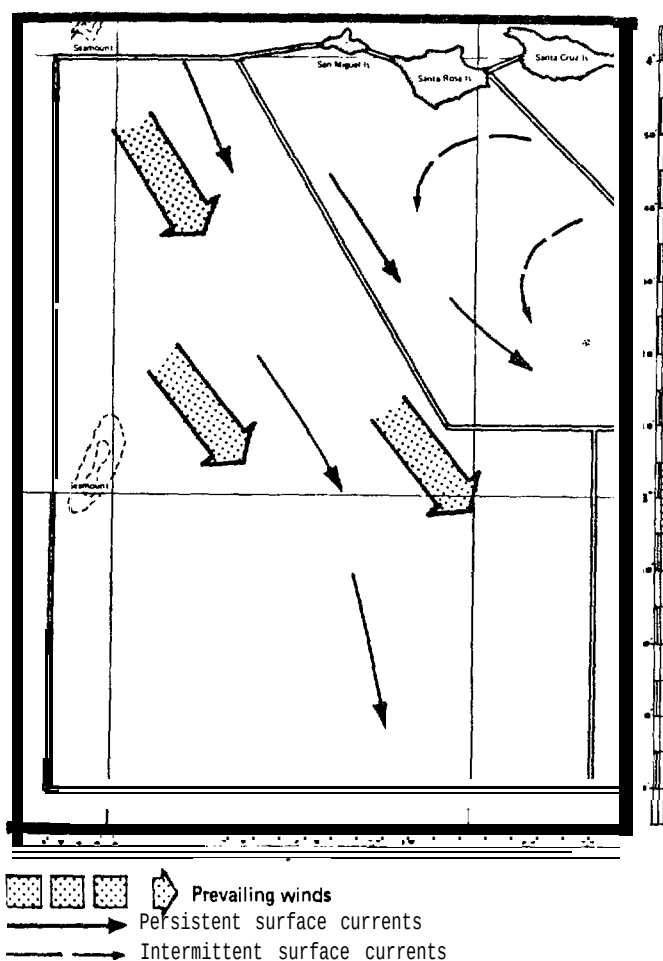
Winds, currents, and drift: Northwest winds alternate with southerlies resulting from passage of low pressure cells of either north Pacific or tropical origin. Water from the California Current flows eastward over Tanner and Cortés Banks. As the Southern California Countercurrent strengthens, water near the eastern margin of this zone is diverted northward and northwestward by the San Clemente Ridge. In general, drift follows the current pattern except during periods of strong northwest or southeast winds.

Water temperatures recorded in October were the highest for the year, with a cooling trend starting in November. Use of the area by the different animal groups varied. California sea lions were present in moderately- to very-high densities over the banks and at the north rim of San Nicolas Basin, and cetacean diversity reached its peak with eight species recorded. Northern right whale dolphins, Risso's dolphins, and Dan's porpoises attained their greatest numbers for the year. Moderate densities of seabirds persisted, with gulls, jaegers, and small alcids predominating while shearwaters and storm-petrels became increasingly scarce. Small numbers of loons and pelicans were also seen.



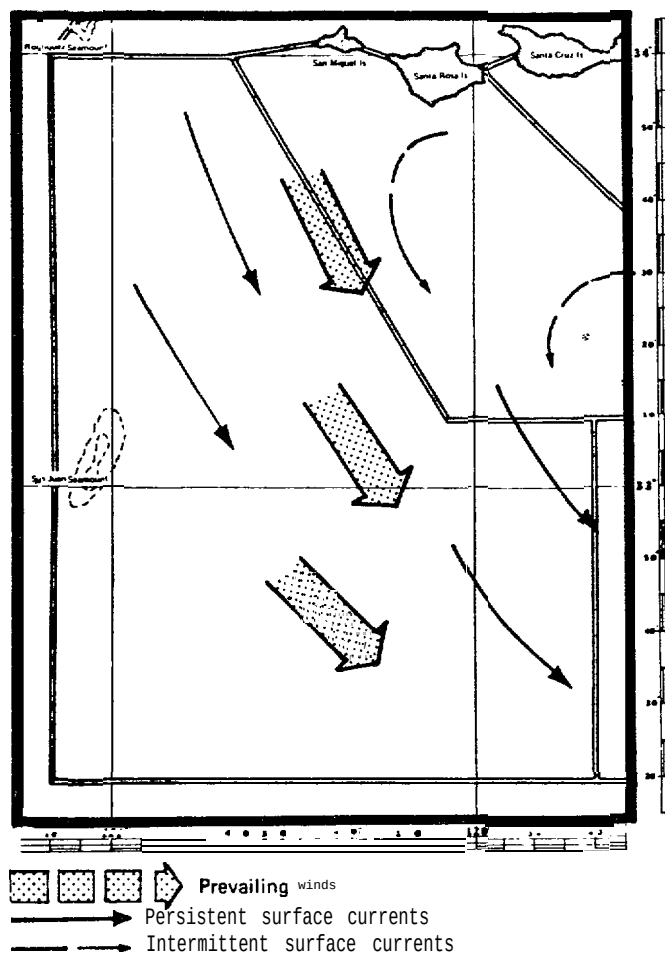
Hinds, currents, and drift: Winds vary from the northwest, west, south, and southeast in the winter with passing storms. The California Current is far offshore and the Southern California Countercurrent is fully developed. Most water moves east across Tanner and Cortés Banks, turning northeast over the rim of San Nicolas Basin between San Nicolas and San Clemente islands. Drift in the winter is in accordance with current patterns, but is modified by local winds.

Water temperatures had dropped to annual low levels, and overall animal activity was high. Tanner and Cortés Banks were heavily used by California sea lions while adjacent waters showed only low densities. Northern fur seals and northern elephant seals were seen on most surveys. Records for these months showed the highest numbers of cetaceans (Pacific white-sided dolphins and northern right whale dolphins) for this zone. Although coastal and intermediate regions saw their greatest numbers of gray whales, none were seen here. Fulmars, gulls, and auklets contributed to the high (35 birds/km²) average density recorded for this period.



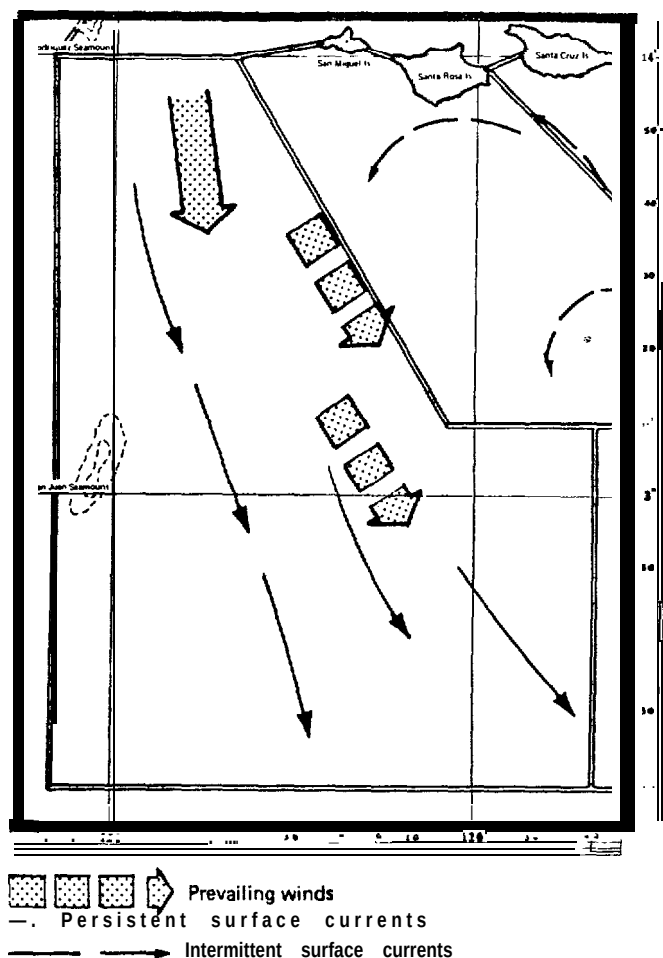
Winds, currents, and drift: Winds are strong and steady from the northwest. The California Current is well developed west of the Santa Rosa-Cortés Ridge. Net water transport is to the south and southeast. Some water is entrained into this flow from the east. Drift is southeasterly with the wind.

Water temperatures were at their lowest and gale-force winds were common here during the spring. No cetaceans were recorded, and seabird and pinniped densities were low. Presumably, migration of terns, shearwaters, and alcids through this zone had already occurred. California sea lion density was directly related to distance from San Miguel Island. Some northern fur seals were present offshore--migrants from the Bering Sea population or animals associated with the small San Miguel Is. colony.



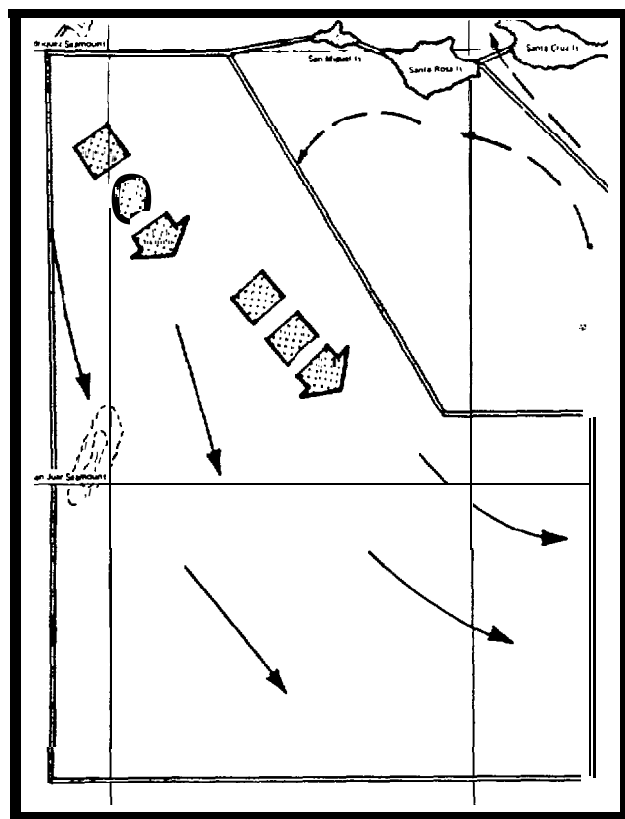
Winds, currents, and drift: Prevailing winds are from the northwest. The California Current is well developed and surface water transport is to the south and southeast. Upwelled water is entrained from over the Santa Rosa-Cortés Ridge.

Warming of the water column and diminishing winds characterized the summer season in the oceanic zone. Densities of higher marine vertebrates were low to moderate. Nearly all of the cetaceans sighted were **common** dolphins (seasonal visitors to the oceanic zone); eight **Risso's** dolphins were also seen southeast of Rodriguez Seamount (about 50 km west of San Miguel Island). A variety of resident and migrant seabird species also occurred in the vicinity of San Miguel Is. and Rodriguez Seamount. Although few pinnipeds were encountered in July and August, young California sea lions were found foraging extensively near Rodriguez Seamount in September.



Winds, currents, and drift: Winds are from the northwest, occasionally interrupted by southward-migrating low pressure cells with southerly winds. The California Current begins to flow further offshore of the Santa Rosa-Cortés Ridge.

The water column, initially warm, underwent cooling during this season. Although no pinnipeds were seen and seabird densities were very low, both numbers and species diversity of cetaceans were relatively high (87% of the year's total in this zone). Sightings of fin whales, common dolphins, Pacific white-sided dolphins, and northern right whale dolphins were noted in the vicinity of Patton Escarpment. In addition, the largest school of Risso's dolphins seen during the study year was encountered in the same general area.





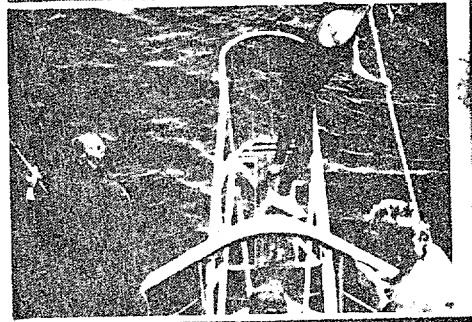
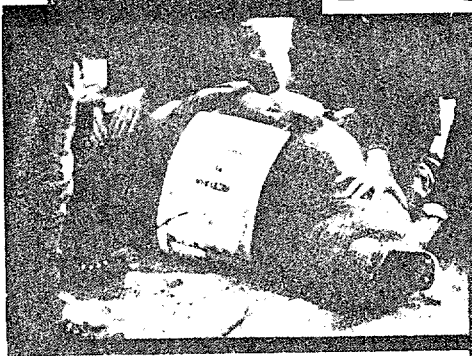
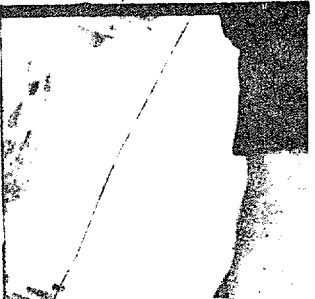

 Prevailing winds
 Persistent surface currents
 Intermittent surface currents

Winds, currents, and drift: Diminishing northwest winds allow California Current to flow further offshore. Water transport is to the south in the northern latitudes and to the southeast in southern latitudes. Prevailing northwest winds are frequently interrupted by winter storms, bringing southerly winds. Drift is generally to the south and east except during these periodic storms.

Cooling of the water column continued through this period. Cetacean and pinniped densities were low: northern right whale dolphins were the only cetaceans seen; low but uniform densities of northern fur seals were recorded along with a few California sea lions. The avifauna was dominated by fulmars, kittiwakes, and alcids in moderate densities.



Synthesis of Findings:
**FAUNAL
ACCOUNTS**



Faunal Accounts:
PINNIPEDS



Faunal Accounts
Sequence of Data

a) Pinnipeds

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SANTA BARBARA CHANNEL -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

In early spring the most numerous pinniped seen hauled-out is the northern elephant seal (Table 11- 9). Adult females and younger animals of both sexes spend four to six weeks on land for their annual molt of skin and hair. The animals are fasting and there is little coming-and-going from the beaches used as hauling grounds. In May of 1975, we counted nearly 7,000 northern elephant seals in this zone--all were found on the beaches and broad sand flats at the west end of San Miguel Island. The number of northern elephant seals on land declined precipitously in late spring and was composed almost entirely of males. These animals were rarely seen at sea and almost nothing is known of their whereabouts during the pelagic periods in their annual cycle.

Table 11- 9 . Summary of the seal and sea lion population of the Santa Barbara Channel zone in April, May, and June, 1975.

Species	San Miguel Is.	Santa Rosa Is.	Santa Cruz Is.	Anacapa Is.	Total population on land	Abundance at sea
California sea lions						widespread
16-17 May	4,851	394	0	0	5,245(41%)	at low density
27-30 June	18,559	0	25	0	18,584(85%)	(0.429 animals/km ² ± 1.068 SD)
northern elephant seals						absent
16-17 May	6,948	0	0	0	6,948(54%)	
27-30 June	1,287	0	0	0	1,287(06%)	
northern fur seals						absent
13 May	6	0	0	0	6	
27-30 June	1,013	0	0	0	1,013(05%)	
harbor seals						common
16-17 May	464	136	1	1	602(05%)	
27-30 June	400	336	195	0	931(04%)	
Steller sea lions						rare
16-17 May	1	0	0	0	1	
27-30 June	6	0	0	0	6	
Guadalupe fur seals						rare
16-17 May	0	0	0	0	0	
27-30 June	1	0	0	0	1	
Total pinnipeds						
16-17 May	12,270(96%)	530(4%)	1	1	12,802(100%)	
27-30 June	21,266(97%)	336(3%)	220	0	21,822(100%)	

As the number of northern elephant seals on land declines, the number of California sea lions increases enormously. Simultaneously with the influx of California sea lions comes the arrival of the northern fur seals and the Steller sea lions. These three species, along with the rare and endangered Guadalupe fur seal, are summer breeders. At the end of June, peak numbers are on land. Once again, most animals in this zone were hauled-out on the west end of San Miguel Is. and nearby Castle and Richardson Rocks. The breeding population of California sea lions on San Miguel Is. increased from about 5,000 animals, in late May of 1975 when the first pups were born, to over 18,000 animals in late June at the peak of the pupping period. Of this total, about 6,000 were pups (33%). California sea lions were the most numerous pinnipeds at sea in Santa Barbara Channel. This body of water, along with the inter-island passages, is a primary feeding ground for this species. They are found

as far offshore as Rodriguez Seamount (55 km west of San Miguel Island), and as far east as Ventura and Pt. Mugu. Most of the animals seen at sea are females on two- or three-day feeding forays. Most males are on the rookeries with nursing females and pups. Females at sea commonly commute to feeding grounds in large aggregations and are seen in open water resting in large rafts. We found low to moderate densities of California sea lions along aerial transects in late June (mean density = 0.429 animals/km²) with great heterogeneity from segment to segment (standard deviation of 1.068). Many groups of sea lions accompanied by seabirds were observed feeding in waters near the north sides of Santa Rosa and Santa Cruz islands. Large rafts totaling nearly 400 animals were seen near Beecher's Bay on the north side of Santa Rosa island. California sea lions on feeding forays also haul out to rest on the northwest side of Santa Cruz Is., on Gull Is. on the southwest side of Santa Cruz Is., and near Ford Pt. on the southeast side of Santa Rosa Island.

Northern fur seals are rare in the Bight, but are seen occasionally on Castle Rk. in the early spring. In June, many animals were hauled-out on Castle Rk. and on the sand flats of Adams Cove on the west end of San Miguel Island. These two rookeries are nearly equal in size and comprise the entire breeding colony of northern fur seals in the Southern California Bight (SCB). The San Miguel colony numbered slightly over 1,000 animals on land in late June. About 450 of these were pups (45%). Northern fur seal females leave their pups for five to ten days at a time for feeding forays. We did not see them east of Pt. Conception in Santa Barbara Channel--presumably they spend their time further offshore.

Steller sea lions are rare and perhaps declining in number in the SCB. They haul out in small numbers on Richardson Rk. ten km north of San Miguel Is., on Castle Rk., and on the rocks on the north side of Pt. Bennett on the west end of San Miguel. There were no Steller sea lions seen at sea in April, May, or June of 1975.

The Guadalupe fur seal is a rare and casual visitor to the SCB. A single adult male was seen on Pt. Bennett on the west end of San Miguel Island in late June.

The harbor seals are commonly found on all the northern California Channel Islands. Spring is the pupping season for this species and more of these wary and secretive seals are seen on land in this season than at any other time of year. They are highly mobile and move from island to island. The numbers counted on land increased from about 600 in mid-May to over 900 in late June on San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands. An equal number was likely present at sea and uncounted. Harbor seals are common in Santa Barbara Channel and in harbors or estuaries on the mainland shore. Herds are small and found on many beaches and flat rocks around the perimeter of San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands. Pups account for about 20% of the population and are seen among most herds at this time of the year.

SANTA BARBARA CHANNEL -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

The summer breeders--the California sea lion, the northern fur seal, and the Steller sea lion--are at peak numbers on land in July, but begin to disperse in August and September. Our single census in this three-month period occurred in the first week of August. We counted 9,712 California sea lions hauled-out on San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands (Table 11-10). This count was only about one-half of the late June population in the same area. Ninety-nine percent of these were on the Pt. Bennett rookery at the west end of San Miguel Island. Pups-of-the-year represented 30% of the San Miguel Is. population.

Table 11-10. Summary of the seal and sea lion population of the Santa Barbara Channel zone in July, August, and September, 1975.

Species	San Miguel Is.	Santa Rosa Is.	Santa Cruz Is.	Anacapa Is.	Total population on land	Abundance at sea
California sea lions 4-7 Aug	9,653	3	56	0	9,712(81%)	common at moderately - high mean density (1.061 animals/km ² ± 2,917 SD)
northern elephant seals 4-7 Aug	782	0	0	0	782(07%)	rare
northern fur seals 4-7 Aug	1,210	0	0	0	1,210(10%)	rare
harbor seals 4-7 Aug	52	82	50	18	202(02%)	common
Steller sea lions 4-7 Aug	19	0	0	0	19	rare
Guadalupe fur seals	0	0	0	0	0	absent
<u>Total pinnipeds</u> 4-7 Aug	11,716(98%)	85(01%)	106(01%)	18	11,925(100%)	

Northern fur seals reach the peak of their breeding season one month later than California sea lions. The numbers counted on the Castle Rock and Adam's Cove rookeries of the San Miguel colony had increased 19% from 1,013 (on 27 June) to 1,210 (on 7 August). Pups represented about 50% of the total number on land. Nursing females represented only 10% of the total number on land--we calculated an additional 480 females were absent from the rookery on feeding forays. The total size of this breeding population is about 1,700 animals.

Steller sea lions numbered only 19 in early August. Most of these were seen on Richardson Rock, about ten km north of San Miguel Island. Few pups were born in 1975 at San Miguel Is.--the southernmost location where this species is known to breed. We counted three pups on Richardson Rock along with eight females and three males. An additional four females and one male were seen on Pt. Bennett.

Harbor seals were seen in small herds on each of the four northern islands. We counted a total of 202 in early August--a decrease of 78% from 931 counted five weeks earlier. As expected, they were the dominant pinniped species hauled-out on Santa Rosa, Santa Cruz, and Anacapa islands (a group of California sea lion males were seen on Gull Is. and will be discussed in the next section).

At sea, we encountered widespread use of Santa Barbara Channel by California sea lions. Several concentrations were present, producing moderate densities near Richardson Rk. in the west, and north of Anacapa Island in the east, and very-high density ten km offshore of the city of Santa Barbara. Overall density for Santa Barbara Channel in early August was moderately high at 1.061 animals/km² with a standard deviation of 2.917. Use of these waters had substantially increased since the late June survey--a time when most California sea lions were closely tied to the rookery on San Miguel Island. Apparently, the post-season dispersal does not extend far offshore. We saw no California sea lions on a transect between San Miguel Is. and Rodriguez Seamount--55 km to the west. Our offshore survey was not intensive but we were surprised not to see any northern fur seals on this transect either. The absence of fur seals in waters east of San Miguel (surveyed by both aircraft and ship) suggests that these animals feed primarily in the colder deep water far offshore of the continental shelf.

Harbor seals forage extensively in Santa Barbara Channel. On this survey we saw three near Santa Rosa Island.

(a) Pinnipeds

California sea lions are the most abundant pinnipeds in this zone in late autumn. Numbers increased 26% from 9,712 in August to 12,263 in late October (Table 11-11). Nearly all of the California sea lions present were hauled-out on San Miguel Is. and of these 94% were on Pt. Bennett and the sand flats at the west end of the island; the remainder were hauled-out on nearby Castle and Richardson Rocks. Most of the animals counted were females, juveniles and yearlings. However, mother/pup pairs accounted for 15% of the total. Males were rare (less than 1%), most having migrated out of the Southern California Bight (SCB) into northern waters.

Table 11-11. Summary of the seal and sea lion population of the Santa Barbara Channel zone in October, November, and December, 1975. Dash indicates area not surveyed.

Species	San Miguel Is.	Santa Rosa Is.	Santa Cruz Is.	Anacapa Is.	Total population on land	Abundance at sea
California sea lions 23-26 Oct	12,208	0	55		12,263(82%)	common at moderately-high mean density (3.411 animals/km ² $\pm$ 8.381 SD)
northern elephant seals 23-26 Oct	2,141	0	0	-	2,141 (14%)	rare
northern fur seals 23-26 Oct	263	0	0		263(02%)	rare
harbor seals 23-26 Oct	176	0	30	.	206(02%)	common
Steller sea lions 23-26 Oct	1	0	0		1	rare
Guadalupe fur seals	0	0	0		0	absent ,
<u>Total pinnipeds</u> 23-26 Oct	14,789(99%)	0	85(01%)	-	14,874 (100%)	

Following the early summer breeding season, most sea lions dispersed (only 25% of the breeding population remained in this zone). Therefore, the population increase in October represents a substantial influx of sea lions back into this zone--perhaps related to a seasonal increase in some food resource in Santa Barbara Channel. Use of these waters continued at a high level throughout the autumn reaching an overall density in October of 3.411 animals/km² with a standard deviation of 8.381. Moderately-high densities were found on all aerial transects in late October, with very-high densities near the mainland shore in the east (a feeding aggregation of over 50 females and young plus a raft of 35 more within the search area contributed to these densities). In December, only one short transect sample of these waters was carried out. We found densities between Pt. Conception and San Miguel Is. to have remained moderately high.

The number of northern elephant seals in this zone increased from a population low of 782 in August to 2,141 in October. These animals are on land to molt--a process that takes four to six weeks, during which time they remain on land and fast. All of the elephant seals

present were on San Miguel Island. Sixty-three percent were on the broad sand flats of the west end and the remainder were hauled-out on the beaches of Tyler Bight. Of the total, 87% consisted of juvenile or subadult males and a few adult females (the sex ratio was nine males to one female). The remainder were yearling and two-year animals of both sexes.

In October, there were still about 300 northern fur seals on the Adam's Cove and Castle Rk. rookeries of San Miguel island. Of the total on land, 230 were at Adam's Cove. Forty-three percent of these could be distinguished as pups-of-the-year. No northern fur seals were seen at sea on the standard aerial transects (the westernmost transect is on 120°30' W longitude).

Numbers of harbor seals counted on land on San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands in October remained virtually unchanged from August levels; we counted a total of 206. Eighty-five percent were on San Miguel Island; the remainder were near Sandstone Pt. on the south side of Santa Cruz Island. One harbor seal was seen on transect near Pt. Conception.

Northern sea lions (Steller sea lions) are seen occasionally throughout the year in the SCB. We found one adult female hauled-out on Richardson Rk. near San Miguel Is. on both October and December visits.

Winter is the pupping and breeding season of the northern elephant seal, and the largest rookery in the Southern California Bight (SCB) is on San Miguel Island. Nearly as many northern elephant seals are found in this colony as in the mother population on Isla de Guadalupe, Mexico.

The reproductive activities of northern elephant seals on San Miguel Is. take place on the broad sand flats near Pt. Bennett and on the sandy beaches along the south side of the island. Males begin arriving on the rookery in December and the number remains fairly constant until the end of February. Females begin arriving in mid-December; their numbers reach a peak in late January and then decline until all are gone in mid-March; their average stay on land is 34 days. During this period they nurse their pup, come into estrus, mate with a dominant bull, and depart to sea leaving the weaned pup behind.

The highest count in 1976 was nearly 7,000 animals (Table II-12).

TABLE 11-12. Censuses of northern elephant seals on San Miguel Island in the 1976 breeding season.

<u>Date of census</u>	<u>Males</u>	<u>F e m a l e s</u>		<u>P u p s</u>	<u>Yrl./juv.</u>
6 Jan (air)	899	1,380	693	26	2,998
11-14 Jan (land)	875	2,067	762	50	3,754
24Jan (air)	740	3,842	2,408	0	6,990
14 Mar (air)	280	24	3,063	36	3,403

The total size of the breeding population must be computed statistically since some females have departed from the rookery as others are still arriving. Additionally, as the dense confluent harems break up and pups become more easily counted, some of those weaned early have already gone to sea. Based on known parameters of female arrival and departure, and the number on land at peak season, we calculate that 4,725 females were present on land. The number of pups produced by these females, assuming 95% parity and 15% mortality, was 3,815. Including the maximum count of males, the size of the San Miguel breeding population in 1976 was 9,439. Approximately 80% of the pups were born on the sand flats at the west end of the island. The remainder were born on the beaches of Tyler Bight.

In the winter, the population of California sea lions on land is low; most males have moved northward out of the SCB and many females and young have migrated into Mexican waters. On San Miguel Is. 5,238 animals were hauled-out on the west end and nearby rocks on 6 January (Table II- 13). By 14 March, the population on land had nearly doubled to 10,327. Most of these animals were females, juveniles, and yearlings. Interestingly, the proportion of males in the San Miguel population was 29% in early January, as compared with less than 1% in October. By March,

SANTA BARBARA CHANNEL -- January, February, March
(a) Pinnipeds (continued)

FAUNAL ACCOUNT

the males had declined 60% and represented only 7% of the total animals on land. Thus, a distinct winter peak of males was evident as a "wave" of animals entered the Bight.

Table II- 13. Summary of the seal and sea lion population in the Santa Barbara Channel zone in January, February, and March, 1976. Dash indicates area not surveyed.

Species	San Miguel Is.	Santa Rosa Is.	Santa Cruz Is.	Anacapa Is.	Total population on land	Abundance at sea
California sea lions						common at low mean density (0.253 animals/km ² : 0.535 SD)
22-25 Jan	6,769	0	33		6,802(48%)	
13-15 Mar	10,327	0	7		10,334(72%)	
northern elephant seals						rare
22-25 Jan	6,990	0	0		6,990(50%)	
13-15 Mar	3,403	0	0	-	3,403(24%)	
northern fur seals						rare
22-25 Jan	0	0	0		0	
13-15 Mar	15	0	0		15	
harbor seals						common
22-25 Jan	89	124	66	-	279(02%)	
13-15 Mar	265	353	20	-	638(04%)	
Steller sea lions						rare
22-25 Jan	8	0	0		8	
13-15 Mar	5	0	0	-	5	
Guadalupe fur seals						absent
22-25 Jan	0	0	0	-	0	
Total pinnipeds						
22-25 Jan	13,856(98%)	124(01%)	99(01%)		14,079(100%)	
13-15 Mar	14,015(97%)	353(02%)	27(01%)		14,395(100%)	

Most of the sea lions on San Miguel Is. were on the sand flats of the west end where room existed for both California sea lions and northern elephant seals. Elsewhere on the northern Channel Islands, we counted 22 females and eleven yearlings near Ford Pt. on the south side of Santa Rosa Is., three females on Gull Is. on the south side of Santa Cruz Is., and four females with four yearlings at Coche Pt. on the north side of Santa Cruz Island.

At sea, the distribution of California sea lions in early January was patchy and density was low (0.276 animals/km² with a standard deviation of 0.662). Sea lions were concentrated at moderately-high density near Anacapa Is., within ten km of the city of Santa Barbara, and south of Pt. Conception. However, no animals were seen between San Miguel Is. and Rodriguez Seamount (55 km to the west). By late January, the western half of Santa Barbara Channel showed increasing use. The eastern half showed low to very-low density except for a concentration near Anacapa Island. The overall density in this zone was low with 0.828 animals/km² ± 1.513 standard deviation. In mid-March, density had decreased slightly to 0.230 animals/km² with a standard deviation of 0.408. Most of the western waters were empty, and low to moderate densities were recorded in the eastern half.

In January, the advance guard of northern fur seal migrants from the Bering Sea populations arrived offshore of the SCB. As far as is

known, the animals are entirely pelagic during this part of the annual cycle. Though several thousand animals are present offshore in the winter and early spring, few are seen in the surveyed area (the SCB). Generally, they remain in the colder water of the California Current. They are seen in Santa Barbara Channel only in the westernmost portion of this zone. In late January, we recorded sightings near Rodriguez Seamount (55 km west of San Miguel Island). The rookeries on San Miguel Island and Castle Rk. were vacant in January. By March, nine males and six females or juvenile males were hauled-out on Castle Rock. Intermixing of the small San Miguel Is. population and the Bering Sea population likely takes place in spring. By May, most Bering Sea migrants have left the area and San Miguel colony animals are seen in greater numbers on land.

Harbor seal pups are born as early as mid-February. In January, herds are still small and scattered. By February and March, animals begin to congregate at several specific locations on each island, herd size increased, and many pups are seen. Pups are precocious and go to sea with their mothers almost from birth. Our census of the shoreline of San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands in late January found 279 animals on land. By mid-March, the population on these islands had increased 128% to 638. Pups account for about 20% of the population and are found among most herds in the spring. Generally, harbor seals avoid beaches occupied by other pinnipeds. On San Miguel Island, they haul-out along the north side, the east end, and the beaches east of Crook Pt. on the south side. On Santa Rosa and Santa Cruz islands they use beaches around the entire perimeter.

Harbor seals feed in the Santa Barbara Channel but are rarely seen on open-water transects because of their relatively small total population size and preference for nearshore water. In January, we saw one harbor seal in Santa Barbara Channel.

A few Steller sea lions, were seen on Richardson Rk. offshore of San Miguel Is. at the time of our January and March censuses. In all cases, they were adult females. Our counts were: three on 6 January, eight on 24 January, and three on 14 March. On our last census, we also found two females hauled-out on Castle Rock. In late January, a female Steller sea lion was seen on aerial open-water transect about 25 km north of San Miguel Island.

SANTA ROSA RIDGE -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

This area of rich upwelling is used as a feeding ground by animals associated with San Nicolas Is. to the south and San Miguel and Santa Rosa islands to the north. Most at-sea activity of California sea lions was observed on the island shelves near the hauling grounds. Other species were not seen at sea in this zone in April, May, or June. However, harbor seals commonly haul out on beaches on the south sides of San Miguel, Santa Rosa, Santa Cruz, and Anacapa islands and forage to some unknown extent in the water over the Santa Rosa Ridge.

San Nicolas Is. is the second largest California sea lion rookery in the Southern California Bight (SCB). The population occupies a six km section of shoreline on the windward southwestern side of the island. In mid-May we counted about 5,000 animals as the breeding season got underway; by the end of June over 13,000 animals were present, including approximately 3,800 pups (Table 11-14).

Table 11-14 . Summary of the seal and sea lion population of the Santa Rosa Ridge zone in April, May, and June, 1975.

<u>Species</u>	<u>Numbers present on San Nicolas Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			not seen on transect; density very low
17 May	4,945	76%	
28 June	13,449	98%	
northern elephant seals			rare
17 May	1,562	24%	
28 June	149	1%	
northern fur seals	absent		rare
harbor seals			rare
17 May	0		
28 June	225	1%	
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
17 May	6,507		
28 June	13,823		

A small colony of northern elephant seals is also present on the west side of San Nicolas Island. Approximately 1,500 were hauled-out in mid-May for the spring molt; by late June only 149 were present.

Harbor seals are sometimes found among the sea lions and elephant seals on the west side of San Nicolas Is. but more commonly are seen in a single cove on the northeast side of the island. The population is substantial and numbered 255 in late June.

SANTA ROSA RIDGE -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

In late August and September, the breeding season of the California sea lion draws to a close. Numbers hauled-out on San Nicolas Is. declined 24% from 13,449 on 28 June to 10,194 on 5 August (Table II-15). On the latter date, pups-of-the-year numbered 2,969 and represented 29% of the total population. Adults and pups continued to occupy a six km section of shoreline on the island's west side.

Table II- 15. Summary of the seal and sea lion population of the Santa Rosa Ridge zone in July, August and September, 1975.

<u>Species</u>	<u>Numbers present on San Nicolas Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions 5 Aug	10,194	99%	common at low mean density in early Aug. (0.743 animals/km ² $\pm$ 1.142 SO) increasing moderately - high in late Sept. (1.958 animals/km ² $\pm$ 3.423 SO)
northern elephant seals 5 Aug	39	<1%	rare
northern fur seals	absent		absent
harbor seals 5 Aug	36	<1%	uncommon
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
%+1 & -	10,269		

Interspersed among the sea lions were occasional aggregations of northern elephant seals. August is the population low for this species in the Southern California Bight (SCB)--we counted 39 on San Nicolas Island.

At Phoca Cove on the north side of San Nicolas Is. were 36 harbor seals.

The overall mean density of California sea lions at sea in the Santa Rosa Ridge zone was low (0.743 animals/km² with a standard deviation of 1.142 in July and August). However, moderate to high densities were recorded by both ship and air along most of the eastern side of the Santa Rosa Ridge north of San Nicolas Island. By September, the overall mean density was moderately-high (1.958 animals/km² $\pm$ 3.423) with high density recorded in most quadrates sampled by ship transect. A single northern elephant seal was seen on transect in this same area as well. Five harbor seals were seen near Santa Rosa Island.

On Gull Is., offshore of the south side of Santa Cruz Is., we saw 56 California sea lions (48 were adult males). Their presence here is presumably associated with the post-breeding season dispersal of animals from the San Miguel Is. rookery. California sea lions that are still tied to the San Miguel Is. rookery forage to an undetermined extent in the waters over the Santa Rosa Ridge.

The California sea lion rookery on San Nicolas Is. makes this species the dominant pinniped in the Santa Rosa Ridge zone. We found nearly 8,000 hauled-out on San Nicolas Is. in October (Table 11-16). The population had declined 22% from over 10,000 on land in August. The decrease in numbers on this island is comparable to the increase in numbers on San Miguel Is. for the same period and suggests a seasonal relocation of these animals northward. Pups accounted for 29% of the total population on San Nicolas Island. Most animals were females, juveniles, and yearlings. Males accounted for only 0.7% of the population. The hauling grounds on San Nicolas Is. are nearly continuous along a six km section of shoreline on the west side of the island. We also counted 55 females, juveniles, and yearlings on Gull Is., an offshore rock on the south side of Santa Cruz Island.

Table 11-16. Summary of the seal and sea lion population of the Santa Rosa Ridge zone in October, November, and December, 1975.

<u>Species</u>	<u>Numbers present on San Nicolas Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions 26 Oct	7,918	96%	common at low mean density in Oct. (0.878 animals/km ² ± 1.297 SD), increasing to moderate density in Dec. (1.948 ± 3.869 SD).
northern elephant seals 26 Oct	290	> 3%	uncommon
northern fur seals	absent		rare
harbor seals 26 Oct	20	<1%	uncommon
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u> 26 Oct	8,228		

The density at sea of California sea lions was low overall in October as measured by our aerial transect survey (0.878 animals/km² with a standard deviation of 1.297). Waters north of San Nicolas Is. were empty; low densities were recorded to the west, and moderately-high densities to the east. Over the Santa Rosa Ridge, densities ranged from low to moderate. By December, moderate to high densities were recorded over the Santa Rosa Ridge by standard ship transect survey (mean density was 1.948 animals/km² ± 3.869 SD).

The population of northern elephant seals on San Nicolas Is. had increased slightly to 290 by October. Nearly all were molting juvenile males. At sea we saw one near Sandstone Pt. on Santa Cruz Is. and another south of Santa Rosa Island.

In October, about 50 harbor seals were counted in this zone. Thirty were hauled-out at Sandstone Pt. on Santa Cruz Is. and 20 were seen in Phoca Cove on San Nicolas Island. None were seen on Santa Rosa

SANTA ROSA RIDGE -- October, November, December
(a) Pinnipeds (continued)

FAUNAL ACCOUNT

Island. However, a census of Santa Rosa Is. in December showed 94
hauled-out at the east end.

Two harbor seals were seen at sea in October--both were near the
south side of San Nicolas Island.

A substantial northern elephant seal rookery exists on San Nicolas Island. As in the case of the California sea lion, their activities are confined to a six km section of shoreline on the west side of the island. At peak season we counted 1,261 animals. The age and sex composition of the breeding population are presented in Table II-17 .

TABLE II-17. Censuses of northern elephant seals on San Nicolas Island in the 1976 breeding season.

<u>Date of census</u>	<u>Males</u>	<u>Females</u>	<u>Pups</u>	<u>Yrl./juv.</u>	<u>Total</u>
6 Jan (air)	100	158	101	27	386
23Jan (air)	107	679	475		1,261
12 Feb (air)	48	393	577		1,018
14 Mar (air)	29	3	254	93	379

Not all of the females and pups are on land at the same time. Therefore the total number of participating females must be calculated statistically. Approximately 837 females were present on San Nicolas Is. in 1976 and, assuming 95% parity and 15% mortality, 676 pups were produced. Including the maximum count of males, the total breeding population size in 1976 was 1,620. At sea, three subadult males were seen in the water over the Santa Rosa Ridge.

California sea lions on San Nicolas Is. numbered only 4,883 on 6 January; this was the low count for the year (Table 11-18). However, an influx of animals later in this season produced a winter peak in total numbers.

The census of 23 January was up 30% to 6,372. By mid-March, the population had increased by 41% to 9,014. Most of these animals were females, juveniles, and yearlings. The proportion of males in this population had increased considerably from the very low percentage found in the autumn. Males increased from 9% in early January to 13% in mid-March. As in other seasons, all California sea lions were hauled-out along the six km section of shoreline on the west side of the island.

SANTA ROSA RIDGE -- January, February, March
(a) Pinnipeds (continued)

FAUNAL ACCOUNT

Table II- 18. Summary of the seal and sea lion Modulation of the Santa Rosa Ridge zone in January, February, and March, 1976.

<u>Species</u>	<u>Numbers present on San Nicolas Is.,</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California-sea lions			common at low mean density (0.322 animals/km ² + 0.551 SD in Jan. and 0.931 + 2.792 SD in Mar.)
6 Jan	4,883	92%	
23 Jan	6,372	83%	
14 Mar	9,014	95%	
northern elephant seals			uncommon
6 Jan	386	7%	
23 Jan	1,261	16%	
12 Feb	1,018		
14 Mar	379	4%	
northern fur seals	absent		common at low density
harbor seals			uncommon
6 Jan	27	1%	
23 Jan	28	1%	
14 Mar	128	1%	
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
6 Jan	5,296		
23 Jan	7,661		
14 Feb	9,521		

Density of California sea lions in the open waters of the Santa Rosa Ridge zone was low overall in January, increased in February to moderate levels and decreased slightly in March. In mid-January, animals were concentrated on the southern half of the Santa Rosa Ridge zone and the northern portion was nearly empty. Moderately-high density was found in the waters northwest of San Nicolas Is., decreasing to low density north and northeast of San Nicolas Island. The late January survey found essentially the same pattern with slightly increased use of the waters near Santa Rosa Island. By February, high to very-high density was recorded for nearly all of the Santa Rosa Ridge zone; densities decreased toward the east. In March, most of the zone was empty; however, the waters within 25 km of the north side of San Nicolas Is. showed moderately-high density of California sea lions.

Northern fur seals were present at low density in this zone in winter and early spring. We sighted four on aerial transect in January and one in March. These animals are migrants from the Bering Sea population and are found in considerable numbers offshore of the 1500 m contour. Their appearance within the Southern California Bight was a welcome surprise. Their distribution is apparently related to the flow of the cold California Current along the west side of the Santa Rosa-Cortés Ridge.

In January, we sighted a rare Guadalupe fur seal over the Santa Rosa Ridge; the animal appeared to be a subadult male. Almost nothing is known of the pelagic distribution of this species.

SANTA ROSA RIDGE -- January, February, March
(a) Pinnipeds (continued)

FAUNAL ACCOUNT

Harbor seals were present in small numbers on San Nicolas Is. in January; we counted 27 on 6 January and 28 on 23 January in Phoca Cove on the north side of the island. By 14 March, 128 were present on San Nicolas Island. Five pups were counted in two herds--one at Phoca Cove and the other at Dutch Harbor on the south side of the island.

SANTA CRUZ BASIN -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

This zone includes the small island of Santa Barbara. Three species of pinnipeds are found hauled-out there--the California sea lion, the northern elephant seal, and the harbor seal. Most of the animals seen on Santa Barbara Is. are California sea lions (89% in mid-May, increasing to 98% in late June); their population was about 1,200 animals in mid-May and increased by 50% to nearly 1,800 animals at the peak of the breeding season in late June (Table II-19). Of the total, 684 (38%) were pups-of-the-year. Santa Barbara Is. serves as a way-station for transient animals (mostly females) presumably enroute to other rookeries. Thus the annual cycle of numbers on land shows a peak in late May. In 1975 this population maximum was 2,150 animals. Most of these migrants were hauled-out on the southeast side of the island. Most pups, however, are born in the cobbly coves at the base of sheer cliffs on the windward west and northwest sides of the island. The mean density of California sea lions recorded on aerial transects in late June in the Santa Cruz Basin zone was moderately-high ($1.127 \text{ animals/km}^2$) with considerable variance (standard deviation of 1.100). Densities were highest in the waters over the island shelf to the north of Santa Barbara Island. Most segments sampled in the deeper water of Santa Cruz Basin were empty. However, some sightings were recorded 15 km south of Anacapa Passage. Small numbers of California sea lions are known to haul out at Gull Is. on the south side of Santa Cruz Island. We counted 25 here in late June.

Table 11-19. Summary of the seal and sea lion population of Santa Cruz Basin in April, May and June, 1975.

<u>Species</u>	<u>Numbers present on Santa Barbara Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			moderate density ($1.127 \text{ animals/km}^2 \pm 1.100 \text{ SD}$); most animals near Santa Barbara Is.
17 May 75	1,208	89%	
27 May 75	2,150		
20 June 75	1,321		
29 June 75	1,788	98%	
northern elephant seals			rare
17 May 75	145	11%	
29 June 75	26	2%	
northern fur seals	absent		absent
harbor seals			very rare
17 May 75	6		
29 June 75	6		
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
17 May 75	1,359		
29 June 75	1,820		

Northern elephant seals represent a relatively small component of the total pinniped population of Santa Barbara Island. We counted 145 in mid-May (11% of total pinnipeds), declining to 26 (2%) by the end of June. The animals on land in May were adult females and juvenile males hauled-out for molt, giving way to subadult and adult males in June.

Harbor seals are very rarely seen on Santa Barbara Island. We counted only six on offshore rocks in both May and June surveys. They are common, however, on the beaches and rocks of Santa Cruz and Anacapa islands in the northern sector of this zone and presumably forage in the waters of Santa Cruz Basin. We counted 166 harbor seals along the south side of Santa Cruz Is. in late June. Only one harbor seal was observed at sea in this zone in this quarter, and that was 25 km north of Santa Barbara Island.

SANTA CRUZ BASIN -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

California sea lions decline in number on the rookeries of Santa Barbara Is. as the breeding season comes to an end. From a peak of 1,788 in late June, the population decreased at a rate of about 20% per month to a low of 875 in late September (Table 11-20). On 6 August the pup count of 418 represented 39% of the total population of 1065. With the exception of six northern elephant seals, the California sea lions were the only pinnipeds on Santa Barbara Island.

Table 11-20. Summary of the seal and sea lion population of Santa Cruz Basin in July, August, and September, 1975.

<u>Species</u>	<u>Numbers present on Santa Barbara Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			common at moderately-high mean density
16 July	1,438		(1.289 animals/km ² ± 0.912),
22 July	1,163		increasing slightly as animals
6 Aug	1,065	99%	disperse from rookeries.
22 Sept	875		
northern elephant seals			rare
6 Aug	6		
northern fur seals	absent		absent
harbor seals	absent		rare
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
6 Aug	1,071		

As the post-breeding season dispersal occurred, the mean density of California sea lions at sea in this zone increased from 1.289 animals/km² to 2.178 animals/km² with great variance. The density was moderately high overall during the breeding season as well. Most California sea lions seen at sea were in the vicinity of Santa Barbara Is. (within 25 km) or between Santa Barbara and San Nicolas islands. In the waters of Santa Cruz Basin south of Santa Cruz and Anacapa islands, density was low to very-low. However, some sea lions were consistently present.

SANTA CRUZ BASIN -- October, November, December
(a) Pinnipeds

FAUNAL ACCOUNT

In late October, nearly 1,000 California sea lions were on Santa Barbara Island (Table 11-21). Most of these were hauled-out on Southeast Rookery (62%)--an eroded hillside on the east side of the island. Pups accounted for only 5% of the total--most had presumably dispersed to other islands. The male count was high (4% of the total) relative to San Nicolas and San Miguel islands (less than 1% of the total). There may be a southward component of the dispersal of males as well as the better known northward migration.

Table II- 21. Summary of the seal and sea lion population of Santa Cruz Basin in October, November, and December, 1975.

<u>Species</u>	<u>Numbers present on Santa Barbara Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			
24 Oct	994	96%	common at low density in Oct. (0.242 animals/km ² + 0.333 SD), increasing to moderate density in Dec. (1.149 + 2.525 SD).
19 Nov	1,360		
15 Dec	1,110		
northern elephant seals			uncommon
24 Oct	54	4%	
northern fur seals	absent		absent
harbor seals	absent		rare
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
24 Oct	1,048		
19 Nov	1,360		
15 Dec	1,110		

In November, high winds and heavy seas forced many sea lions onto land--more than 1,300 were counted at Southeast Rookery on the lee side of the island.

By December, the count had increased slightly from the October count but consisted of many more pups-of-the-year than had been present since the summer breeding season. Pups accounted for 20% of the total and presumably represented a wave of southward-moving animals from the larger rookeries on San Nicolas and San Miguel islands.

The overall densities of California sea lions at sea increased slightly from October to December.

<u>Date of survey</u>	<u>Mean density (animals/km²)</u>		<u>Standard deviation</u>
23-26 Oct (aerial)	0.242	+	0.333
16-21 Nov (ship)	0.876	+	2.223
15-20 Dec (ship)	1.149	+	2.525
16-18 Dec (aerial)	0.966	±	1.534

In October, the animals at sea were concentrated within 25 km of Santa Cruz and Anacapa islands. Densities recorded were moderately high. Over the Santa Barbara Is. shelf, however, density was low. By November, density near Santa Barbara Is. increased to moderately-high levels and

decreased to low and very-low levels near Santa Cruz and Anacapa islands in the northern sector. In December, densities remained low to very-low in the northern sector and moderately-high near Santa Barbara Is. (within 25 km) and over Osborn Bank (ten km south of Santa Barbara Island).

Northern elephant seals were scarce on Santa Barbara Is. in the autumn--we counted 46 in October. The population there consisted mostly of juvenile males (82%), as on the other rookeries. Northern elephant seals were hauled-out for molt in Coves 310 and 322 on the north and east sides of the island. At sea, we observed one 20 km south of Anacapa Is. and another 10 km southeast of Santa Barbara Island.

SANTA CRUZ BASIN -- January, February, March
(a) Pinnipeds

FAUNAL ACCOUNT

A small breeding population of northern elephant seals is found on Santa Barbara Island. Pups are born in two small coves--one on the north side of the island (cove 310), the other on the east side (cove 322). Two censuses of this population were made during the 1976 winter breeding season. The highest count was 126 animals.

<u>Date of census</u>	<u>Males</u>	<u>Females</u>	<u>Pups</u>	<u>Yrl./juv.</u>	<u>Total</u>
22 Jan	15	68	43	0	126
13 Mar	1	0	24	16	41

Based on the peak count and the kinetics of arrival and departure, we calculate that 84 females were present during the season. Assuming 95% parity and 15% pup mortality, 68 pups were weaned. Including the maximum count of males, the breeding population numbered 167 animals.

The California sea lion population on Santa Barbara Is. continued to be stable at about 1000 animals. On 22 January we counted 1,054 on land; nearly all were females, juveniles, and yearlings (Table II-22). On 13 March, 1,006 were counted. Many beaches around the perimeter of the island were occupied; however, most animals were at the Southeast Rookery. The two coves occupied by elephant seals were not shared with California sea lions. "

Table II-22 . Summary of the seal and sea lion population of Santa Cruz Basin in January, February, and March, 1976.

<u>Species</u>	<u>Numbers present on Santa Barbara Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California- sea lions			common at low mean density
22 Jan	1,054	89%	(0.791 animal s/km ² + 1.680 SD); all
13 Mar	1,006	96%	animals seen near Santa Barbara Is.
northern elephant seals			uncommon
22 Jan	126	11%	
13 Mar	41	4%	
northern fur seals	absent		absent
harbor seals	absent		rare
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
Total pinnipeds			
22 Jan	1,180		
13 Mar	1,047		

Overall density of animals at sea was low throughout the winter of 1976.

SANTA CRUZ BASIN -- January, February, March
(a) Pinnipeds (continued)

FAUNAL ACCOUNT

<u>Date of survey</u>	Mean density (animal s/km ²)		<u>Standard deviation</u>
22-25 Jan (aerial)	0.859	<u>±</u>	2.104
9-14 Feb (ship)	0.999	<u>±</u>	2.231
12-14 Mar (aerial)	0.515	<u>±</u>	0.706

The waters south of Santa Cruz and Anacapa islands and over the Santa Cruz Basin were empty on all surveys. In contrast, moderately-high densities within 20 km of Santa Barbara Is. were recorded on all surveys.

SANTA MONICA BASIN -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

This zone contains no known hauling grounds of pinnipeds. However, harbor seals can be seen occasionally on or near the mainland shore.

No sightings of seals or sea lions were recorded for Santa Monica Basin in this quarter, but undoubtedly animals hauled-out on neighboring Anacapa Is. do forage in the northwest sector of the Basin.

SANTA MONICA BASIN -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

Only California sea lions were seen in this zone in July, August, and September. All were seen on shipboard standard transect cruises. The mean density was low, but animals were widespread and consistently present in all segments sampled.

<u>Date of survey</u>	<u>Mean density (animals/km²)</u>		<u>Standard deviation</u>
21-26 July	0.102	<u>+</u>	0.194
24-30 Aug	0.338	<u>+</u>	0.234
22-27 Sept	0.454	<u>+</u>	0.371

Density ranged from very-low to low in July and August. Some quadrats sampled showed moderate densities in September. The slight but steady increase in density of California sea lions is apparently a result of the post-breeding season dispersal from the rookeries in neighboring zones.

This zone of nearshore waters was used lightly by California sea lions for foraging. No animals at all were seen here on the October aerial survey. In November, low to moderate densities were detected off Pt. Vicente by the standard ship transect survey, and low densities were recorded east of Anacapa Island. The December transect cruise found low density off Pt. Vicente and moderate density offshore of Pt. Dume. This zone is sparsely occupied by sea lions in the autumn. No other pinnipeds were seen.

<u>Date of survey</u>	<u>Mean density (animal s/km²)</u>		<u>Standard deviation</u>
23-26 Ott (aerial)	0.000	+	0.000
16-21 Nov (ship)	0.219	<u>+</u>	0.494
15-20 Dec (ship)	0.346	<u>+</u>	0.541

Low to very-low overall densities of California sea lions were recorded on two aerial and two shipboard transect surveys of this zone. In January, the density was 0.028 animals/km² and sightings were widely separated (one concentration was noted in Santa Monica Bay). By February and March, few sightings were recorded in this zone, while increased activity was noted in neighboring waters.

In February, a subadult male northern elephant seal was seen 20 km south of Santa Monica, and in March, another subadult male was seen 25 km east of Anacapa Island.

SAN PEDRO BASIN -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

This zone includes Santa Catalina Is., the Catalina Escarpment, and Lasuen Knoll. Santa Catalina Is. is used only moderately as a hauling ground for pinnipeds. In the late spring, the most numerous species seen is the harbor seal, which uses several beaches between China Pt. and Ben Weston Pt. on the south side of the island as hauling grounds. Pupping occurs on these beaches--we estimate pup production to have been approximately 30 animals in 1975 (20% of the largest total count). In mid-May we counted slightly over 150 animals along this section of coastline (Table II-23). By the end of June all of these animals had dispersed. A single harbor seal sighting at sea was recorded near the Newport Harbor breakwater on the mainland.

Table II- 23. Summary of the seal and sea lion population of San Pedro Basin in April, May and June, 1975,

<u>Species</u>	<u>Numbers present on Santa Catalina Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			low to very-low mean density (0 to 0.129 animals/km ² ± 0.289 SD)
16 May 75	6	4%	
29 June 75	0		
northern elephant seals	absent		uncommon
northern fur seals	absent		absent
harbor seals			common
16 May 75	152	96%	
29 June 75	0		
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
16 May 75	158		
29 June 75	0		

California sea lions do not breed on Santa Catalina Island; consequently, they are rare here in the spring, preferring the island rookeries to the west and south. We counted only six in mid-May, hauled-out near Seal Rocks at the east end of the island; none were present in late June at the peak of the breeding season. However, some sea lions from other islands (e.g. San Clemente and Santa Barbara) might be expected to visit the waters of this zone on feeding forays. We recorded animals near Lasuen Knoll and on the Catalina Escarpment on aerial transect surveys in the late spring and summer. The mean density was low (0.129 animals/km²).

Northern elephant seals have not been observed to haul out on Santa Catalina Island; however, one juvenile male was observed at sea near the west end of the island.

SAN PEDRO BASIN -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

Only 17 California sea lions were present on Santa Catalina Is. on 4 August (Table II-24). All were adult males and most were hauled-out at China Pt. on the south side or Seal Rocks at the east end of the island. No other pinnipeds were seen on land.

Table II- 24. Summary of the seal and sea lion population of San Pedro Basin in July, August, and September, 1975,

<u>Species</u>	<u>Numbers present on Santa Catalina Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions 4 Aug	17	100%	uncommon at very-low density (0.092 animals/km ² $\pm$ 0.206 SD)
northern elephant seals	absent		uncommon
northern fur seals	absent		absent
harbor seals	absent		rare
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u> 4 Aug	17		

Very-low overall mean densities of California sea lions were recorded by standard ship transect samples of this zone.

<u>Date of survey</u>	<u>Mean density (animals/km²)</u>		<u>Standard deviation</u>
21-26 July	0.088	$\pm$	0.197
24-30 Aug	0.098	$\pm$	0.218
22-27 Sept	0.091	$\pm$	0.203

In most instances, the animals seen at sea were near Pt. Vicente on the mainland or near the west end of Santa Catalina Island.

Two northern elephant seals were seen in water within five km of Santa Catalina Island.

SAN PEDRO BASIN -- October, November, December
(a) Pinnipeds

FAUNAL ACCOUNT

No pinnipeds were hauled-out on Santa Catalina at the time of the October aerial census. Density at sea of California sea lions was low around the island and to the west, and empty in the east. The standard ship transect survey in November found low density in the eastern half of this zone. By December, density in this area had increased to moderately-high levels.

<u>Date of survey</u>	<u>Mean density (animal s/km²)</u>		<u>Standard deviation</u>
16-21 Nov (ship)	0.114	$\pm$	0.254
15-20 Dec (ship)	1.013	$\pm$	1.082

Overall density increased through the autumn. Apparently, this zone is seasonally important as a feeding ground for California sea lions.

No other species were seen here on our surveys.

SAN PEDRO BASIN -- January, February, March
(a) Pinnipeds

FAUNAL ACCOUNT

Harbor seals haul out in sizeable numbers on Santa Catalina Island. As noted on other islands, these animals are most inclined to haul out during the spring pupping and breeding season. None were on land at the time of our January census. By March, approximately 150 were hauled-out on several cobble beaches near China Pt. on the south side of the island (Table II-25).

Table 11-25. Summary of the seal and sea lion population in San Pedro Basin in January, February, and March, 1976.

<u>Species</u>	<u>Numbers present on Santa Catalina Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			common at low mean density
23 Jan	26	100%	(0.379 animal s/km ² ± 0.353 SD)
13 Mar	16	10%	
northern elephant seals	absent		uncommon
northern fur seals	absent		absent
harbor seals			uncommon
23 Jan	0		
13 Mar	150	90%	
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
=#W-			
13 Mar	26		
	166		

California sea lions were hauled-out at two locations on 23 January; 16 were counted on Seal Rocks at the east end, and another ten were seen on a rock offshore of Salta Verde on the south side of the island. In March, we counted nine animals on these same rocks and an additional seven in the water.

Overall density of California sea lions in the open waters of this zone was low in the winter and early spring of 1976.

<u>Date of survey</u>	<u>Mean density (animal s/km²)</u>		<u>Standard deviation</u>
5-10 Jan (ship)	0.295	±	0.308
22-25 Jan (air)	0.430	±	0.665
9-14 Feb (ship)	0.533	±	0.557
13-15 Mar (air)	0.258	±	0.353

In January, we recorded scattered sightings near the mainland by ship, and moderately-high density near Santa Catalina Is. by air. In February and March, we found low to moderate densities to the north and south of the island.

There are no pinniped hauling grounds in this zone. However, harbor seals are known to frequent the waters (and tide flats) of Mission Bay and San Diego Bay, and small groups of California sea lions are seen occasionally on San Mateo Rocks near Dana Point.

Islas Los Coronados, a group of three small islands in Mexican waters near the southern boundary of our study area, provide a hauling ground for about 200 California sea lions, less than 50 northern elephant seals, and less than 50 harbor seals. These animals forage to an undetermined extent in the waters of San Diego Basin (including the Coronados Escarpment).

Although this zone is sparsely inhabited by California sea lions, we did observe some animals at sea over the Catalina Escarpment, near the San Clemente Escarpment, and near Islas Los Coronados, but the mean density was low (0.143 animals/km², standard deviation of 0.284). No other species were seen at sea in this quarter.

SAN DIEGO BASIN -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

This zone was virtually empty from July through September. A few widely separated solitary California sea lions were seen from survey to survey and a single northern elephant seal was also sighted. The greatest concentration of animals was seen on the Coronados Escarpment near Islas Los Coronados. The highest overall mean density recorded was only 0.065 animals/km² in late September.

Overall density of California sea lions was low in this zone ($0.141 \text{ animals/km}^2 + 0.253$ standard deviation), but there was an increase in sea lion usage of some areas in late autumn. In October, no California sea lions were seen on our aerial survey. The November ship transect survey recorded only scattered sightings at low density in this zone. By December, the consistent presence of sea lions at low density was recorded offshore of San Diego, while moderate levels were observed near San Clemente Escarpment. High density was found in the northern part of San Diego Basin near Lasuen Knoll.

We recorded four sightings of northern elephant seals in this zone in the autumn. This species is usually uncommon at sea in the Southern California Bight and its appearance may represent movement by this species into the San Diego Basin associated with the winter spawning of squid.

Very few California sea lions were encountered on transect surveys of this zone in the winter of 1976. No sightings whatsoever were recorded on aircraft surveys, and ship surveys recorded only scattered sightings of single animals.

<u>Date of survey</u>	<u>Mean density</u> <u>(animal s/km²)</u>		<u>Standard</u> <u>deviation</u>
5-10 Jan (ship)	0.053	±	0.134
22-25 Jan (air)	no sightings on transect		
9-14 Feb (ship)	0.238	±	0.331
12-14 Mar (air)	no sightings on transect		

Islas Los Coronados, in Mexican waters near the southern boundary of our study area, harbor a small breeding population of northern elephant seals. The total size of this population is about 100 animals and about 40 pups were produced here in 1976. It is likely that some of these animals forage in the waters of the San Diego Basin, but none were seen on our winter surveys.

SAN CLEMENTE RIDGE -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

California sea lions pup and breed on San Clemente Island. At the beginning of the breeding season in mid-May 1,144 animals were hauled-out on the rookery located at Seal Cove, from Mail Pt. to Eel Pt. on the west side of the island (Table II-26). By the peak of the season in late June, 1,847 animals were on land, including 608 pups (34%). Non-breeding animals haul out on the large flat rock in Northwest Harbor.

Table II-26 . Summary of the seal and sea lion population of the San Clemente Ridge zone in April, May, and June, 1975.

<u>Species</u>	<u>Numbers present on San Clemente Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			low to very-low mean density (0 to 0.129 animal s/km ² + 0.289 SD)
16 May	1,144	97%	
29 June	1,847	100%	
northern elephant seals	absent		uncommon
northern fur seals	absent		absent
harbor seals			uncommon
16 May	38	3%	
29 June	0		
Steller sea lions	absent		absent
Guadalupe fur seals	absent		rare
<u>Total pinnipeds</u>			
16 May	1,182		
29 June	1,847		

Harbor seals are found on San Clemente Is. in small numbers. The preferred hauling ground is Northwest Harbor Rock, but they also haul out near Pyramid Cove at the south end of the island. We counted 38 on San Clemente Is. in mid-May, but saw no pups; none were present at the time of our late June aerial census.

From aerial transects, the mean density of California sea lions at sea was low in late June (0.129 animals/km² with a standard deviation of 0.889); however, within 20 km of the rookery (where all sightings occurred) the density was moderately-high.

Northern elephant seal males were seen at sea north of San Clemente Is. and over the San Clemente Ridge.

SAN CLEMENTE RIDGE -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

The number of California sea lions hauled-out at the rookery on the west side of San Clemente Is. had declined 17% from 1,847 at the peak of the breeding season to 1,541 on 4 August (Table II-27). A total of 419 pups were counted, representing 27% of the population. On Northwest Harbor Rk., 64 harbor seals were hauled-out. A rare Guadalupe fur seal was seen among the sea lions hauled-out south of Mail Point.

Table II- 27, Summary of the seal and sea lion population of the San Clemente Ridge zone in July, August, and September, 1975.

<u>Species</u>	<u>Numbers present on San Clemente Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions 4 Aug	1,541	96%	common at low density (0.184 animals/km ² ± 0.314 SD)
northern elephant seals	absent		uncommon
northern fur seals	absent		absent
harbor seals 4 Aug	64	4%	rare
Steller sea lions	absent		absent
Guadalupe fur seals 4 Aug	1		rare
<u>Total pinnipeds</u> 4 Aug	1,606		

The mean density of California sea lions in this zone was consistently low from July through September. However, moderate densities were recorded on all surveys for the waters within 25 km of San Clemente Island. Moderate density was found in September for the waters near Fortymile Bank on the San Clemente Escarpment. Two northern elephant seals were also seen on the San Clemente Escarpment.

SAN CLEMENTE RIDGE -- October, November, December
(a) Pinnipeds

FAUNAL ACCOUNT

The population of California sea lions on San Clemente Is. numbered 990 in October and increased 35% to 1,333 in December (Table II-28). Most of the animals on land were adult females and younger animals roving southward toward Mexican waters. Two areas are used as hauling grounds by sea lions on San Clemente: Seal Cove between Mail Pt. and Eel Pt., and Northwest Harbor Rock. Northwest Harbor Rk. was shared with 26 harbor seals in December. None were present on San Clemente Is. earlier in the autumn.

Table II-28 . Summary of the seal and sea lion Modulation of the San Clemente Ridge zone in October, November, and December, 1975.

<u>Species</u>	<u>Numbers present on San Clemente Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			common at low density in Oct. and Nov. (0.410 animals/km ² + 1.225 SO), increasing to moderate densities in Dec. (1.583 + 2.026 SO)
23 Oct	990	100%	
16 Dec	1,333	98%	
northern elephant seals	absent		uncommon
northern fur seals	absent		absent
harbor seals			rare
23 Oct	0		
16 Dec	26	2%	
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
23 Oct	990		
16 Dec	1,359		

In October and November, most of the San Clemente Ridge zone was empty or showed very-low density of California sea lions. Scattered sightings were recorded over the San Clemente Escarpment and moderately-high densities were found near the Seal Cove Rookery on the west side of the island. By December, the usage of these waters for foraging had substantially increased. Overall density was 1.583 animals/km² + 2.026 standard deviation with moderate to high densities over the San Clemente Escarpment southeast of the island. One northern elephant seal was also seen in this area.

SAN CLEMENTE RIDGE -- January, February, March . FAUNAL ACCOUNT
(a) Pinnipeds

Only California sea lions were present on San Clemente Is. in January and March; a total of 1,546 were hauled-out on 22 January, of which 95% were at Seal Cove on the west side of the island and the remainder on the NW Harbor Islet (Table II-29). Surprisingly, we counted 189 adult and subadult males--over 12% of the population. These males may have moved north from the Mexican rookeries to overwinter in the Bight. B.Y March, the total count had increased to 1,859, but the proportion of-males had dropped to 3%.

Table II- 29. Summary of the seal and sea lion population in the San Clemente Ridge zone in January, February, and March, 1976.

<u>Species</u>	<u>Numbers present on San Clemente Is.</u>	<u>Percent of total pinnipeds in zone</u>	<u>Abundance at sea</u>
California sea lions			common at low mean density in Jan.
22 Jan	1,546	100%	(0.184 animals/km ² ± 0.487 SD),
13 Mar	1,859	100%	increasing to moderate density in Mar. (1.012 ± 1.168 SD)
northern elephant seals	absent		uncommon
northern fur seals	absent		rare
harbor seals	absent		rare
Steller sea lions	absent		absent
Guadalupe fur seals	absent		absent
<u>Total pinnipeds</u>			
22 Jan	1,546		
13 Mar	1,859		

Density of California sea lions at sea in this zone was low in January but increased to moderate levels by March of 1976.

<u>Date of survey</u>	<u>Mean density (animals/km²)</u>	<u>Standard deviation</u>
5-10 Jan (ship)	no sightings on transect	
22-25 Jan (air)	0.184	± 0.487
9-14 Feb (ship)	0.291	± 0.485
13-15 Mar (air)	1.012	± 1.168

In early January, animals were seen within 20 km of San Clemente Island. By February, density was moderately high within 50 km of the island. In March, moderately-high densities were found near San Clemente Is., and concentrations were found 50 km south and over Fortymile Bank on the San Clemente Escarpment.

In February, we saw two subadult male northern elephant seals and one northern fur seal at Fortymile Bank.

TANNER-CORTÉS BANKS -- April, May, June
(a) Pinnipeds

FAUNAL ACCOUNT

No islands or mainland shores occur in this offshore zone. The shallow banks, however, provide a foraging ground for seals and sea lions associated with San Clemente, Santa Barbara, and San Nicolas islands.

The mean density of California sea lions in this zone in late June was fairly low overall (0.531 animals/km²) with considerable patchiness (standard deviation of 1.371). However, moderately-high density was observed midway between San Nicolas and San Clemente islands over the north rim of San Nicolas Basin.

TANNER-CORTÉS BANKS -- July, August, September
(a) Pinnipeds

FAUNAL ACCOUNT

In the northern waters of this offshore zone, low to very-low densities of California sea lions were encountered on both aerial and shipboard transect. Density increased with proximity to San Clemente Island.

The waters over Tanner and Cortés Banks were visited twice in this quarter; once by ship and once by air. On both surveys, moderately-high to very-high densities were recorded. The California sea lions present were aggregated into feeding or rafting groups. The area of concentration extended about 20 km northeasterly from the banks.

Overall density in this zone was nevertheless low.

<u>Date of survey</u>	<u>Mean density</u> <u>(animals/km²)</u>		<u>Standard</u> <u>deviation</u>
21-26 July (ship).	0.442	±	0.361
4-7 Aug (air)	0.709	±	2.602
24-30 Aug (ship)	0.488	±	0.399
22-27 Sept (ship)	0.121	±	0.269

TANNER-CORTÉS BANKS -- October, November, December
(a) Pinnipeds

FAUNAL ACCOUNT

These waters show heavy usage by California sea lions in the autumn. Most animals are probably associated with the hauling grounds on San Nicolas, Santa Barbara, and San Clemente islands. However, the seasonal increase in usage may also be related to the migration of females and younger animals southward after the breeding season.

In October, we found low to moderate densities between San Nicolas Is. and Tanner and Cortés Banks. The November ship transect survey did not visit the Banks due to weather but found very-high densities over the 'north rim of the San Nicolas Basin and northward toward Santa Barbara Island. The densities recorded were the highest found in the 1975-1976 survey year. The December ship transect survey found moderately-high densities over Cortés Bank, decreasing somewhat near Tanner Bank, and increasing again to high levels over the north rim of the San Nicolas Basin. The December aerial survey found essentially the same pattern.

<u>Date of survey</u>	<u>Mean density</u> <u>(animal s/km²)</u>		<u>Standard</u> <u>deviation</u>
16-21 Nov (ship)	6.820	$\pm$	6.611
15-20 Dec (ship)	3.827	$\pm$	6.410

An adult female northern elephant seal was observed over Cortés Bank in October.

This zone is a seasonally important feeding ground for California sea lions in the autumn.

TANNER-CORTÉS BANKS -- January, February, March
(a) Pinnipeds

FAUNAL ACCOUNT

In this zone, sightings are usually concentrated in the vicinity of the Banks or over the north rim of the San Nicolas Basin. Overall density in this zone was low from January through March of 1976 despite substantial use of these two areas. California sea lion density was low to moderate over Cortés and Tanner Banks in early January, and low over the north rim of the San Nicolas Basin. In late January, density was moderately-high over both Banks but very-low over the north rim. By March, water over the Banks was empty, and density over the north rim of the San Nicolas Basin was low.

<u>Date of survey</u>	<u>Mean density (animal s/km²)</u>		<u>Standard deviation</u>
5-10 Jan (ship)	0.221	±	0.413
22-25 Jan (air)	0.387	±	0.722
9-14 Feb (ship)	0.622	±	0.733
13-15 Mar (air)	0.161	± "	0.400

In January, four northern fur seals were seen over the north rim of the San Nicolas Basin. In February, one northern fur seal was seen over the north rim, and one northern elephant seal subadult male was seen over Cortés Bank. In March, another northern elephant seal subadult male was seen over the north rim of the San Nicolas Basin.

The waters west of the 1500 m contour were not sampled until the late June aerial survey. The density was low near San Miguel Is. and waters were empty elsewhere (mean density of California sea lions was 0.081 animals/km² with a standard deviation of 0.228). California sea lions associated with the rookeries on San Miguel and San Nicolas islands certainly forage to a limited extent in these deep waters to the west of the rookeries. However, this could not be documented due to the relatively brief coverage of this area by one survey.

Earlier in the spring, northern fur seal migrants from the Bering Sea rookeries are common offshore (see January-March). We do not know if they are still present in these waters by May--most have probably begun their northward migration. Those remaining may be associated with the colony on San Miguel Island. The absence of northern fur seal sightings at sea in the waters of the inshore zones in late June suggests that nursing females forage offshore in the pattern of the Bering Sea migrants.

No pinnipeds were seen in the oceanic zone on the single aerial survey carried out in early August. However, low to very-low density was recorded in waters closer to San Miguel Island. Some foraging by adult female sea lions probably occurs in this zone but to such a limited extent that it is difficult to detect by widely-spaced aerial transect lines.

The September offshore cruise found young California sea lions foraging extensively near Rodriguez Seamount (about 55 km west of San Miguel Island). Great numbers of young animals were seen south of San Miguel Is. as well. During the breeding season, foraging commonly occurs within about 25 km of the San Miguel rookery. This area probably extends further offshore as some food resources become depleted.

OCEAN IC -- October, November, December
(a) Pinnipeds

FAUNAL ACCOUNT

This zone was surveyed only once in autumn (October aerial survey).
No pinnipeds were seen.

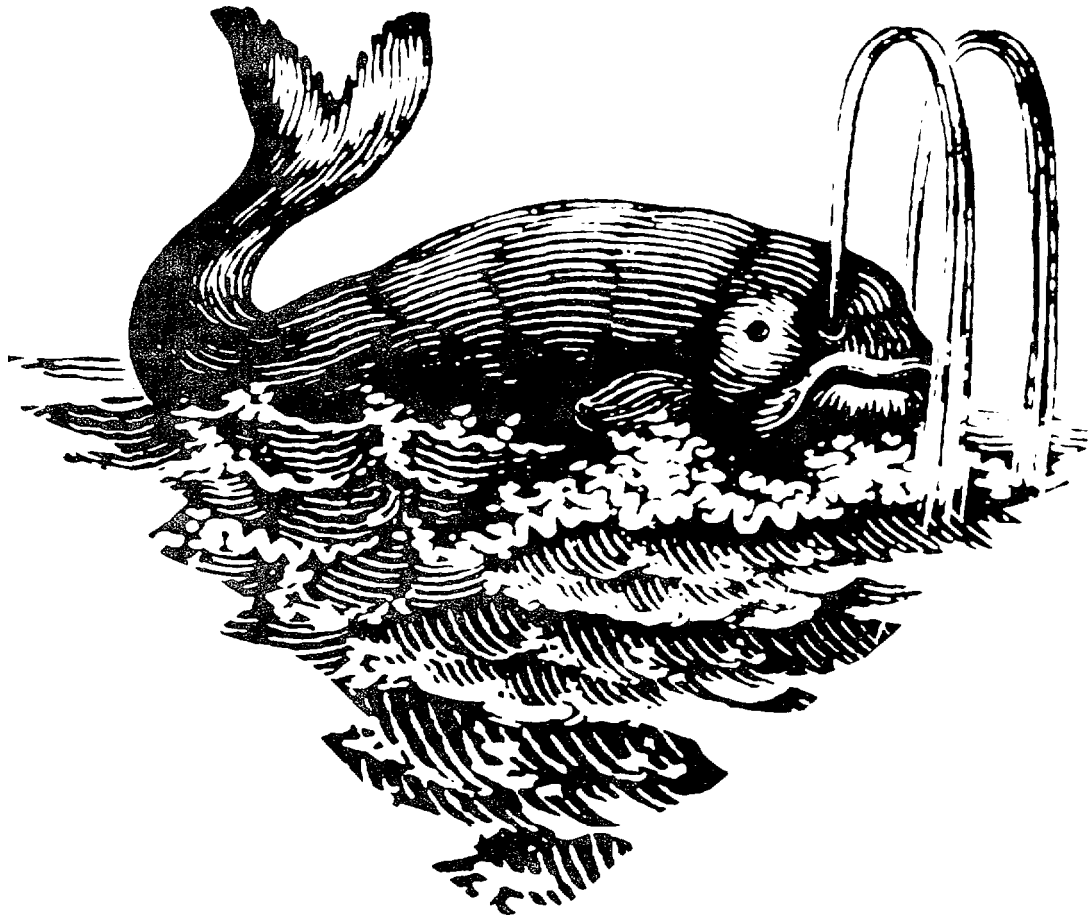
This zone was surveyed twice in the winter and early spring. Our first survey was in late January and extensively sampled the entire area. In March, our survey was confined to the area adjacent to the Santa Rosa Ridge; the area was virtually empty on both surveys. The waters well beyond the continental shelf, however, showed low but uniform density of northern fur seals. These animals are migrants from the Bering Sea and overwinter in the water offshore of the Southern California Bight. In January, we counted twelve northern fur seals on transect and within search corridor bounds. All were beyond the 1500 m contour and most were on 121°00'W longitude, passing over San Juan and Rodriguez Seamounts.

In these offshore waters, we encountered a few California sea lions--always considered to prefer the shallow inshore waters. Sightings, at low density, were recorded southwest of San Nicolas Is. at distances of 70 and 140 km!

Overall density of California sea lions in this zone was low (0.072 animals/km² $\pm$ 0.206 standard deviation).

Faunal Accounts:

CETACEANS



Faunal Accounts
Sequence of Data

b) Cetaceans

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2) Santa Rosa Ridge zone,	Apr.-June 1975	~~II-166~~
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SANTA BARBARA CHANNEL -- April, May, June
(b) Cetaceans

FAUNAL ACCOUNT

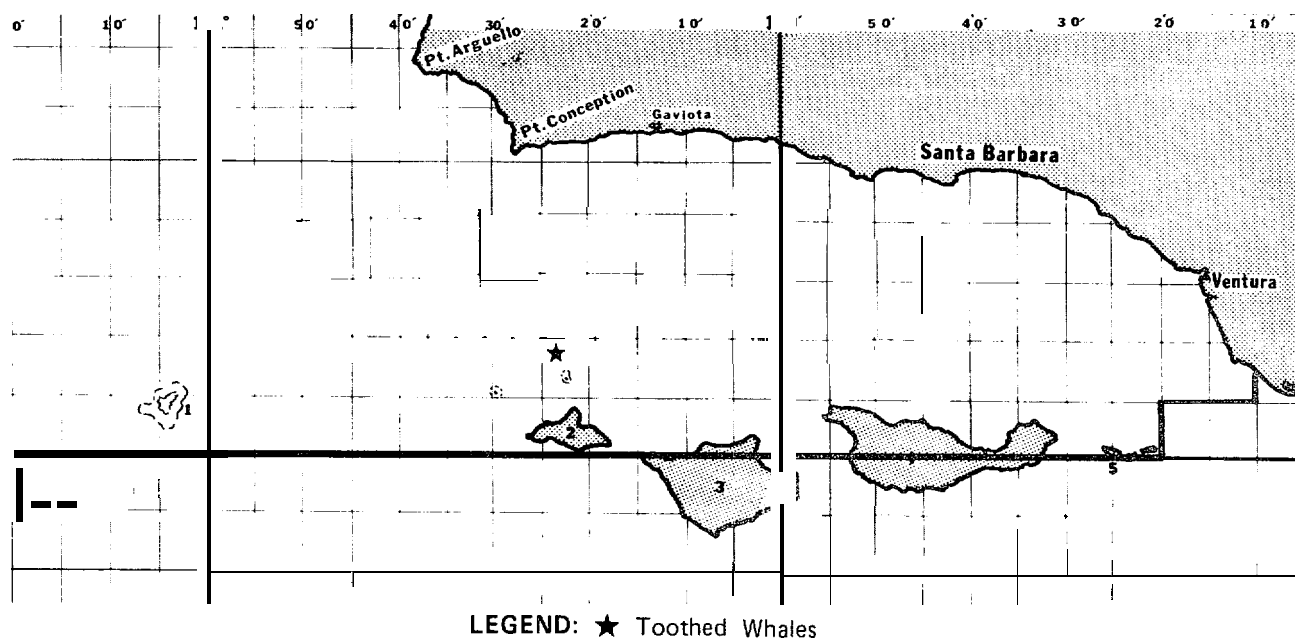
The spring months in this zone were characterized by the lowest annual water temperatures and erratic wind and sea conditions, environmental factors that apparently limited the presence of cetaceans. (It is this quarter particularly that has earned the Pt. Conception-Pt. Arguello area the reputation of "Cape Horn of the Pacific".)

During this period only one sighting was noted: a single Dan's porpoise seen in the vicinity of Wilson Rock near San Miguel Island (Fig. II-17 and Table 11-30).

TABLE II- 30. Cetacean Population Summary: Santa Barbara Channel during April - June, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL-SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
No sightings recorded						
TOOTHED WHALES						
Dan's porpoise	1	100.00	1	100.00	1.0	1 1
SUBTOTAL	1	100.00	1	100.00	1.0	1 1
UNIDENTIFIED WHALES						
No sightings recorded						
TOTAL	1	100.00	1	100.00	1.0	1 1

Figure 11-17 . Cetacean population distribution:
 Santa Barbara Channel zone,
 April-June, 1975



SANTA BARBARA CHANNEL -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

Warming water temperatures, lessening winds, and relatively large concentrations of cetaceans of various species characterized this period. In 18 separate sightings (Table 11-31), a total of 2,642 cetaceans were observed, involving seven species plus unidentified species. Sightings were limited to the southern half of the zone, below 34°15' latitude.

TABLE 11-31 . Cetacean Population Summary: Santa Barbara Channel during July - September, 1975.

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Blue whale	1	5.56	1	0.04	1.0	1 1
Humpback whale	1	5.56	1	0.04	1.0	1 1
Minke whale	2	11.11	2	0.08	1.0	1 1
SUBTOTAL	4	22.23	4	0.16	1.0	1 1
TOOTHED WHALES						
Common dolphin	3	16.66	2,550	96.52	850.0	2,000 50
Dall's porpoise	1	5.56	1	0.04	1.0	1 1
Pacific white-sided dolphin	1	5.56	10	0.38	10.0	10 10
Risso's dolphin	4	22.22	71	2.69	17.8	60 3
SUBTOTAL	9	50.01	2,632	99.63	292.4	2,000 1
UNIDENTIFIED WHALES						
Large (>40')	3	16.66	4	0.15	1.3	2 1
Medium (20' -40')	1	5.56	1	0.04	1.0	1 1
small (<20')	1	5.56	1	0.04	1.0	1 1
SUBTOTAL	5	27.79	6	0.23	1.2	2 1
TOTAL	18	100.00	2,642	100.00	146.8	2,000 1

Four baleen whale sightings were recorded: a solitary blue whale near Rodriguez Dome, two minke whales near Santa Rosa Island, and a humpback whale near the east end of Santa Cruz Island (Fig. II-18).

Toothed whales accounted for nine sightings involving 2,632 animals of four species. Pacific white-sided dolphins were seen near San Miguel Island; Risso's dolphins were sighted near Richardson Rk. and Rodriguez Dome, and a lone Dall's porpoise was seen between Rodriguez and San Miguel Island.

The most striking statistic of the quarter was that over 96% of all animals seen were common dolphins; they accounted for over 80% of the annual total of all cetaceans seen in this zone. A warm-water species, this animal's presence here is apparently seasonal; this was the only period in which common dolphins were encountered this year. The species probably approaches its northern range limits in this zone.

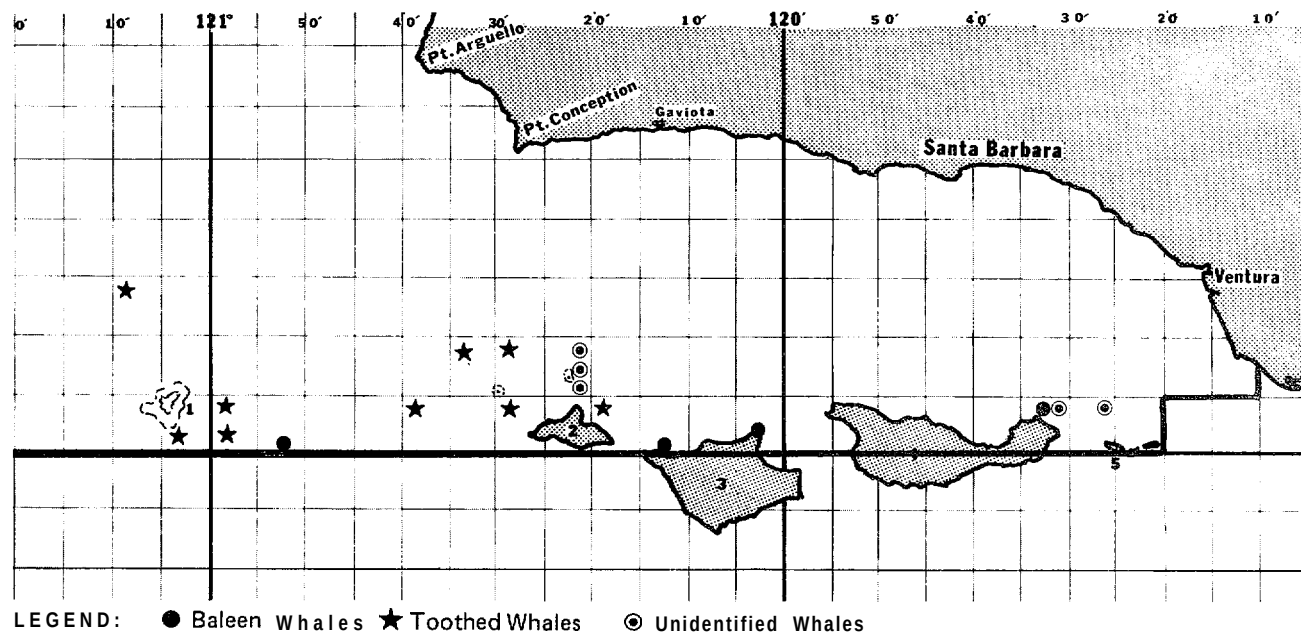
SANTA BARBARA CHANNEL -- July, August, September
(b) Cetaceans (continued)

FAUNAL ACCOUNT

Two groups of this species were seen near Rodriguez Dome; the remaining sighting was near Richardson Rk., west of San Miguel Island.

Six unidentified cetaceans were also sighted: four large animals near Wilson Rock, San Miguel Is., and two animals (one medium, one small) near Anacapa Passage.

Figure 11-18 . Cetacean population distribution:
Santa Barbara Channel zone,
July-September, 1975



SANTA BARBARA CHANNEL -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

The autumn months were marked by cooling water temperatures and corresponding shifts in species occurrence and distribution.

Ten sightings (44 animals) were recorded; six were of Dan's porpoises, two of Pacific white-sided dolphins, and one each of pilot whales and small unidentified animals (Table II-32).

TABLE 11-32. Cetacean Population Summary: Santa Barbara Channel during October - December, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
No sightings recorded						
TOOTHED WHALES						
Dall's porpoise	6	60.00	17	38.64	2.8	4 1
Pacific white-sided dolphin	2	20.00	13	29.55	6.5	10 3
Pilot whale	1	10.00	11	25.00	11.0	11 11
SUBTOTAL	9	90.00	41	93.19	4.6	11 1
UN IDENTIFIED WHALES						
small (<20')	1	10.00	3	6.82	3.0	3 3
SUBTOTAL	1	10.00	3	6.82	3.0	3 3
TOTAL	10	100.00	44	100.00	4.4	11 1

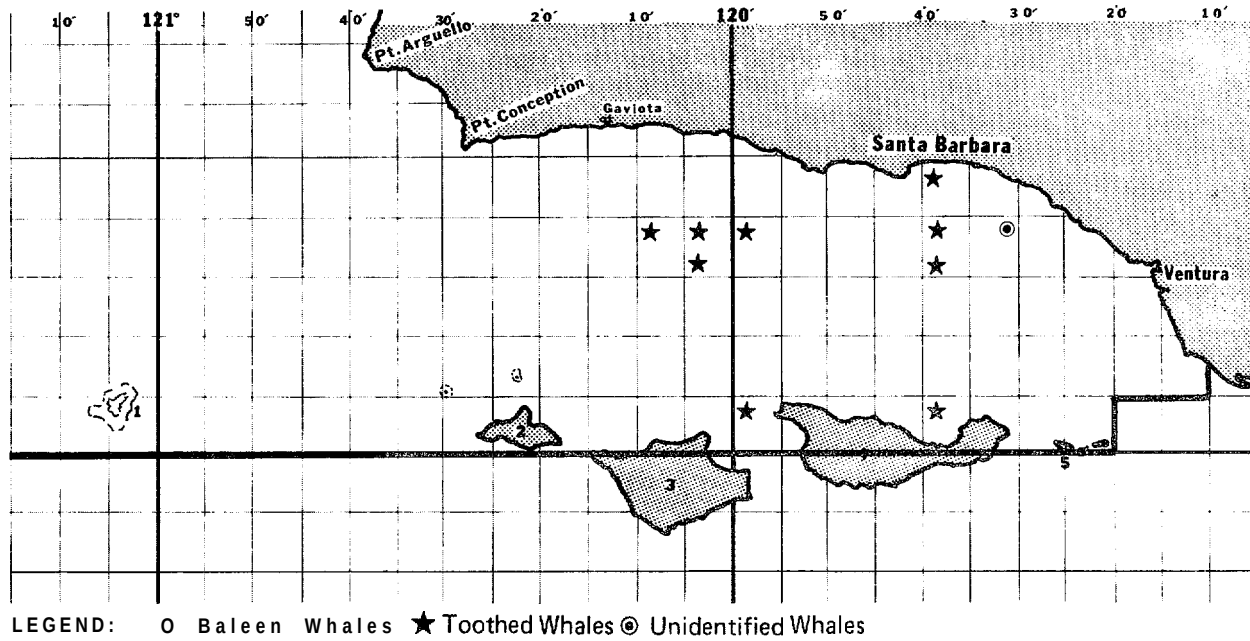
No baleen whales were seen in Santa Barbara Channel during the autumn months, although a few southerly-migrating gray whales probably passed through the area since they were sighted near Santa Catalina Is. in December.

All cetacean sightings were in the eastern half of Santa Barbara Channel (Fig. II-19), which is usually warmer than the western portion, off Pt. Conception.

A significant shift in species composition was exemplified by the absence of common dolphin sightings; during the previous quarter they had comprised over 96% of all cetaceans seen in this zone.

The distribution of species sighted included one group of eleven pilot whales, a temperate-water animal, off the city of Santa Barbara, and two cool-water species: Dan's porpoises, seen in mid-channel west of Goleta and off Santa Barbara, and Pacific white-sided dolphins in the Santa Cruz Channel and near Santa Barbara.

Figure 11-19 . Cetacean population distribution:
 Santa Barbara Channel zone,
 October-December, 1975



SANTA BARBARA CHANNEL -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

Gales and severe storms at sea, typical conditions for this area during the winter months, were accompanied by further lowering of already-cool sea temperatures. Apparently in response to these environmental variables, shifts occurred in distribution and species composition of the cetacean population.

Sightings totaled 450 animals of six species, representing 14% of the annual total.

TABLE II- 33. Cetacean Population Summary: Santa Barbara Channel during January - March, 1976.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Gray whale	13	56.52	41	9.11	3.2	11 1
SUBTOTAL	13	56.52	41	9.11	3.2	11 1
TOOTHED WHALES						
Oal 1's pm-poise	5	21.74	116	25.78	23.2	100 1
Killer whale	1	4.35	21	4.67	21.0	21 21
Northern right whale dolphin	1	4.35	4	0.89	4.0	4 4
Pacific white-sided dolphin	2	8.70	255	56.67	127.5	250 5
Risso's dolphin	1	4.35	13	2.89	13.0	13 13
SUBTOTAL	10	43.49	409	90.90	40.9	250 1
UNIDENTIFIED WHALES						
No sightings recorded						
TOTAL	23	100.00	450	100.00	19.6	250 1

Of 23 sightings, 13 were of gray whales, five were of Dall's porpoises, two of Pacific white-sided dolphins, and one each of killer whales, northern right whale dolphins, and Risso's dolphins.

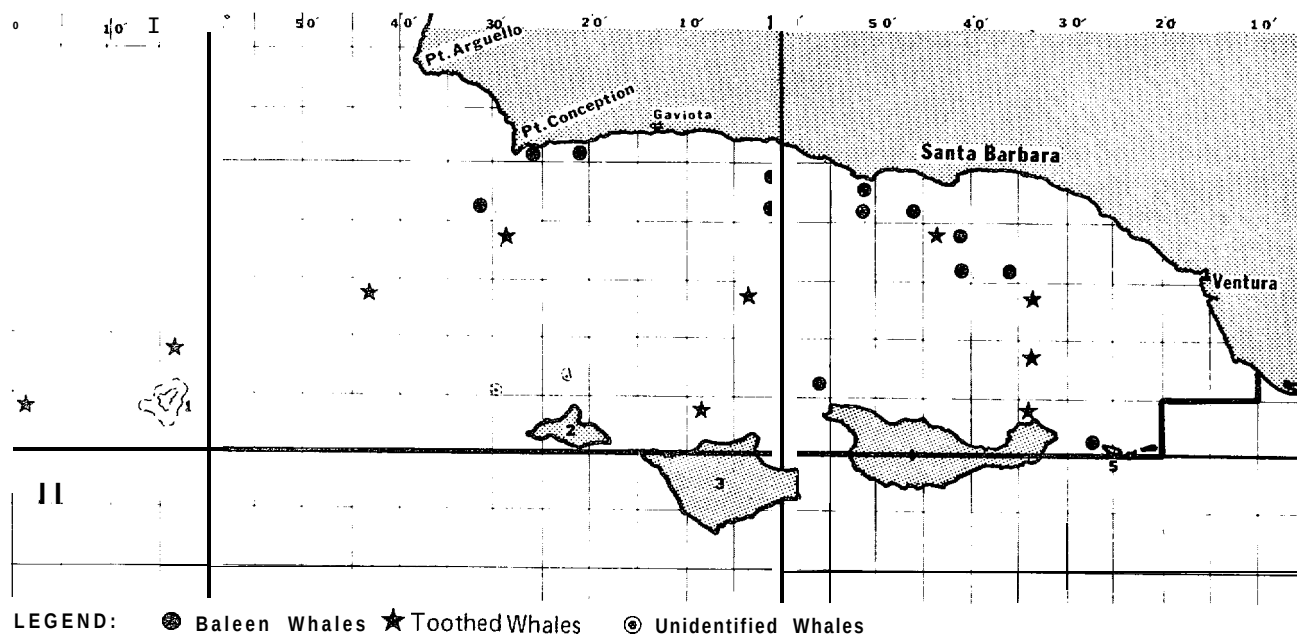
Baleen whale sightings were restricted to gray whales, which were seen close to land (mainland or islands), conforming to their usual migration patterns.

Toothed whales were represented by five species. A single sighting of a school of 21 killer whales west of Rodriguez Dome (Fig. II- 20) accounted for approximately 95% of this species sighted during the year. Other toothed whales sighted were species normally considered inhabitants of cool water, although Risso's dolphin, an offshore species, often occupies a wide range of thermal conditions. Significantly, this was the second consecutive three-month period during which common dolphins were not seen in this zone, a particularly interesting fact because this species represents more than 80% of the

annual total number of cetaceans seen in Santa Barbara Channel. The largest school seen, of any species, was a group of 250 Pacific white-sided dolphins encountered near Talcott Shoal, north of Santa Rosa Island. Substantial numbers of Dan's porpoises were also noted.

The general distribution of sightings was as follows: killer whales, northern right whale dolphins, and Risso's dolphins were well offshore near Rodriguez Dome; inshore in Santa Barbara Channel were California gray whales, Dan's porpoises, and Pacific white-sided dolphins.

Figure II-20 . Cetacean population distribution:
 Santa Barbara Channel zone,
 January-March, 1976



SANTA ROSA RIDGE -- April, May, June
(b) Cetaceans

FAUNAL ACCOUNT

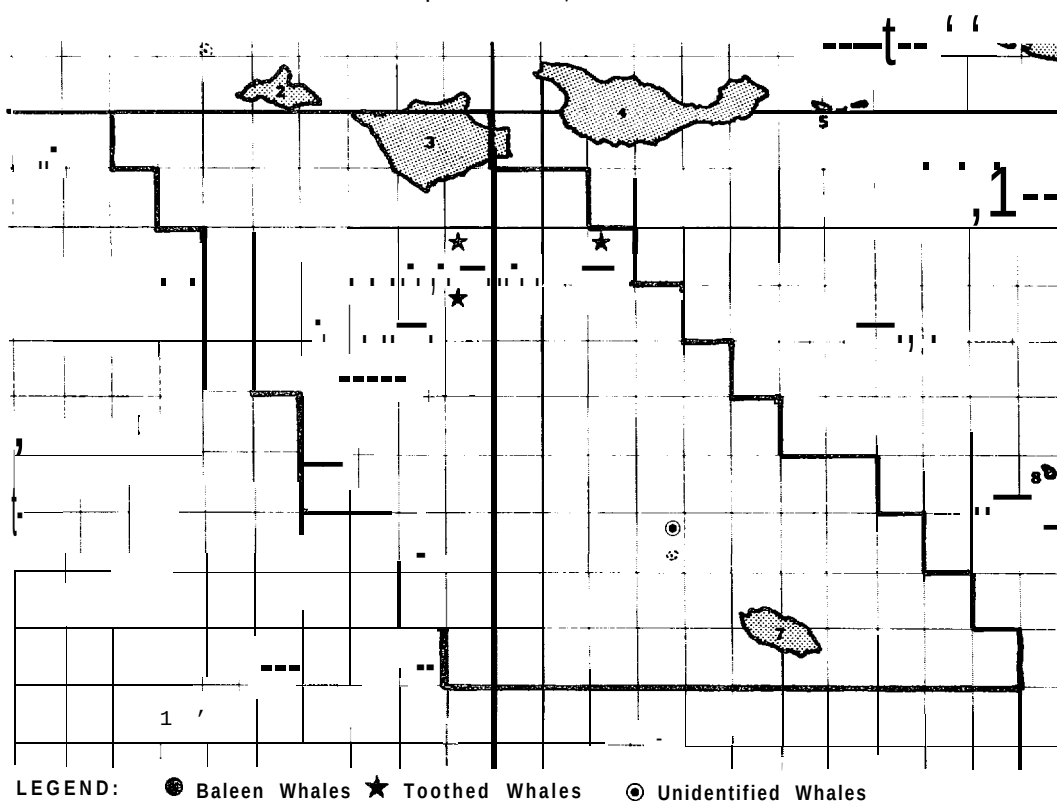
Minimum water temperatures in this zone reduced the population to the annual low of 2.5% of the yearly total.

The few (nine) Pacific white-sided dolphins sighted was a surprisingly low figure. The Santa Rosa-Cortés Ridge (the dominant underwater feature of this zone) plus the cool adjacent waters seemingly should have held considerably more of these animals. Northern right whale dolphins (150), cool-water residents, were also seen (Table II-34).

TABLE II-34. Cetacean Population **Summary:** Santa Rosa Ridge during April - June, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
No sightings recorded						
TOOTHED WHALES						
Northern right whale dolphin	1	25.00	150	93.75	150.0	150 150
Pacific white-sided dolphin	2	50.00	9	5.63	4.5	8 1
SUBTOTAL	3	75.00	159	99.38	53.0	150-151
UNIDENTIFIED WHALES						
Large (>40')	1	25.00	1	0.63	1.0	1 1
SUBTOTAL	1	25.00	1	0.63	1.0	1 1
TOTAL	4	100.00	160	100.00	40.0	150 1

Figure 11-21 . Cetacean population distribution:
 Santa Rosa Ridge zone,
 April-June, 1975



SANTA ROSA RIDGE -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

During this quarter a massive increase in animal numbers and species was noted. The cetacean population consisted of a varied mix of inshore and offshore animals, as well as warm- and cool-water inhabitants.

The greatest numbers and diversity of baleen species, for this zone, was found during this period. All sightings of these animals lay directly over the Santa Rosa-Cortés Ridge (Fig. II-22).

Almost equal numbers (919 vs. 923) of Pacific white-sided dolphins and common dolphins were found (Table II- 35). In addition, both species were found congregated along the shallows to the south and west of San Miguel Is. during the month of September; an unusual situation, considering their respective preferences for cool and warm water. The most reasonable explanation for this aggregation of these species together during one month would have to be an abundance of prey items overriding the animals' usual temperature selection. Less than 16% of the combined numbers of these species was found south of the San Miguel Is. shallows (mid-July sightings), and none were found in the southern one-third of the zone.

TABLE II- 35. Cetacean Population Summary: Santa Rosa Ridge during July - September, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
						<u>Hi</u>	<u>Lo</u>
BALEEN WHALES							
Blue whale	3	4.35	3	0.15	1.0	1	1
Fin whale	2	2.90	2	0.10	1.0	1	1
Gray whale	1	1.45	4	0.21	4.0	4	4
Minke whale	18	26.09	21	1.08	1.2	2	1
SUBTOTAL	24	34.79	30	1.54	1.3	4	1
TOOTHED WHALES							
Beaked whale	2	2.90	2	0.10	1.0	1	1
Common dolphin	13	18.84	923	47.33	71.0	350	1
Dan's porpoise	13	18.84	64	3.28	4.9	12	1
Pacific white-sided dolphin	14	20.29	919	47.13	65.6	540	3
SUBTOTAL	42	60.87	1,908	97.84	45.4	540	1
UNIDENTIFIED WHALES							
Medium (20'-40')	1	1.45	1	0.05	1.0	1	1
small (<20')	2	2.90	11	0.56	5.5	10	1
SUBTOTAL	3	4.35	12	0.61	4.0	10	1
TOTAL	69	100.00	1,950	100.00	28.3	540	1

During July, the Dali's porpoise was found clustering in the central portion of the zone over Santa Rosa-Cortés Ridge, while in September a lesser number were found directly south of Santa Rosa Is., 2-7 nm (3.5-13 km) offshore.

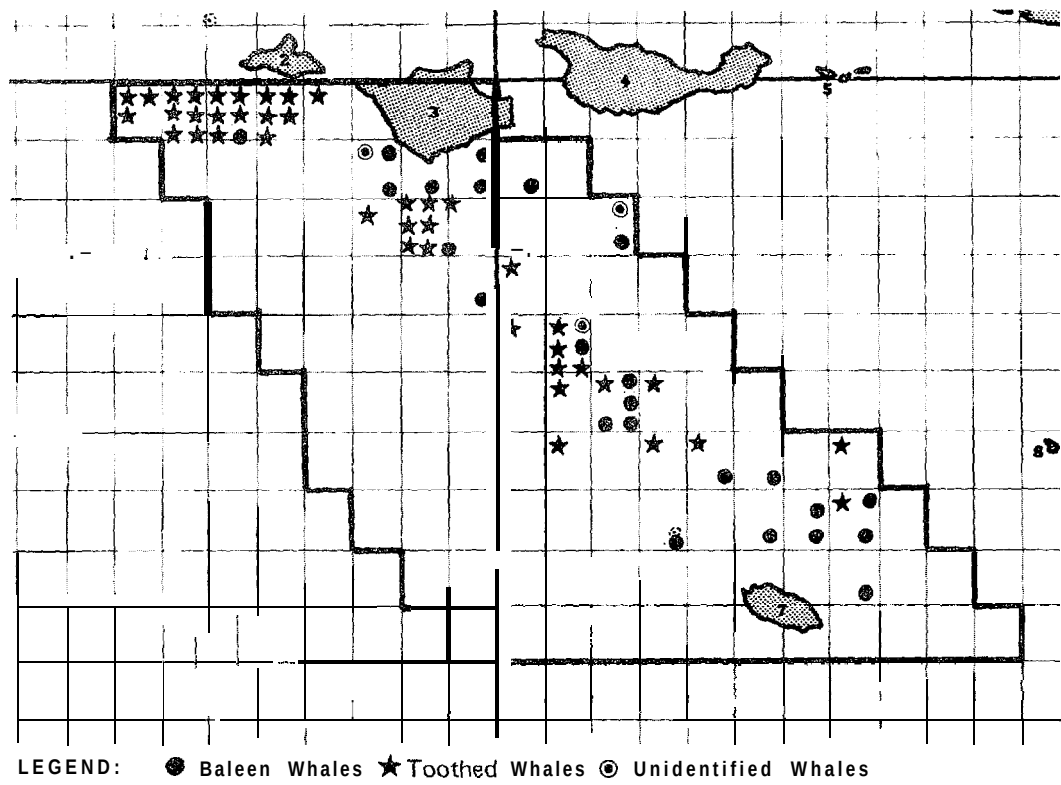
The sighting of four adult gray whales in early July, 7 nm (13 km) east of San Nicolás Is., was of considerable interest: not only is this area markedly seaward from their usual northward migration route, but the sighting occurred rather late in the season.

Two sightings each of fin whales and beaked whales occurred in late July over the Santa Rosa-Cortés Ridge, approximately 20 nm (37 km) northwest of San Nicolás Island.

Three sightings of blue whales were also spread along the Santa Rosa-Cortés Ridge in the northern half of this zone.

Minke whales were seen during the entire three-month period of this quarter, with sightings equally scattered from San Nicolás Is. to the southern boundary of Santa Rosa Island. However, the distribution of these animals was very clearly defined along the eastern-most border of the Ridge, adjacent to the deeper waters of Santa Cruz Basin.

Figure 11-22 . Cetacean population distribution:
 Santa Rosa Ridge zone,
 July-September, 1975



SANTA ROSA RIDGE -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

This quarter accounted for 60% of the annual numbers of cetacea found in this zone. The majority of the animals seen were in the southern portion, in contrast to their previous clustering adjacent to San Miguel and Santa Rosa islands.

Baleen whales were seen in lesser numbers, with blue whales and gray whales completely absent. A not unusual seasonal visitor, the humpback whale, was present this quarter.

Common dolphins increased greatly in numbers (3,202 the annual high), and their average school size increased substantially from 71 animals in the previous quarter to 446 this quarter (Table II-36). Sightings were predominantly in the southern one-third of the zone, scattered northwest of San Nicolas Island (Fig. II-23).

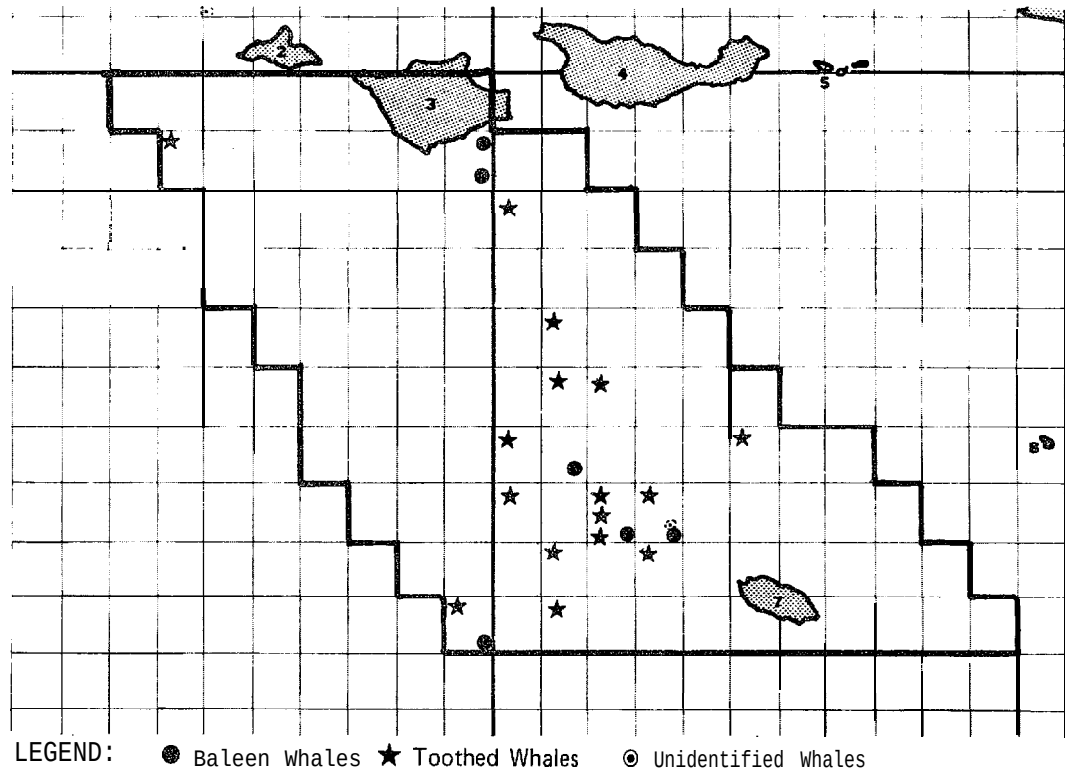
TABLE II- 36. Cetacean Population Summary: Santa Rosa Ridge during October - December, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi</u>	<u>Lo</u>
BALEEN WHALES							
Fin whale	2	9.09	3	0.08	1.5	2	1
Humpback whale	1	4.55	4	0.10	4.0	4	4
Minke whale	3	13.64	5	0.13	1.7	2	1
SUBTOTAL	6	27.28	12	0.31	2.0	4	1
TOOTHED WHALES							
Common dolphin	6	27.27	3,202	83.45	446.6	1,000	2
Dan's porpoise	1	4.55	2	0.05	2.5	2	2
Northern right whale dolphin	1	4.55	20	0.52	20.0	20	20
Pacific white-sided dolphin	8	36.36	601	15.66	75.1	300	3
SUBTOTAL	16	72.73	3,825	99.68	207.8	1,000	2
UNIDENTIFIED WHALES							
No sightings recorded							
TOTAL	22	100.00	3,837	100.00	174.4	1,000	1

Pacific white-sided dolphins were found in reduced numbers and generally distributed toward the western border of the zone; however, one sighting in October was in the most northwesterly portion.

One sighting was made of 20 northern right whale dolphins (usually considered cool-water inhabitants) in association with a school of common dolphins located over the Santa Rosa-Cortés Ridge, approximately 15 nm (28 km) northwest of San Nicolas Island.

Figure II-23 . Cetacean population distribution:
 Santa Rosa Ridge zone,
 October-December, 1975



SANTA ROSA RIDGE -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

The cool-water months of this period saw the zone's cetacean population reduced to 6% of the annual total. Distribution was scattered fairly evenly throughout the zone without the geographical clustering seen in other periods of the year.

Pacific white-sided dolphins were the major contributors to the population, with multiple small schools averaging approximately 30 animals (Table II-37). The schools were found scattered from Santa Rosa Is. south throughout 75% of the zone, absent only from the southernmost portions around San Nicolas Island (Fig. II-24).

TABLE II-37 . Cetacean Population Summary: Santa Rosa Ridge during January - March, 1976

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Fin whale	1	6.25	3	0.76	3.0	3 3
Gray whale	1	6.25	1	0.25	1.0	1 1
SUBTOTAL	2	12.50	4	1.01	2.0	3 1
TOOTHED WHALES						
Dan's porpoise	4	25.00	13	3.29	3.3	6 2
Northern right whale dolphin	2	12.50	150	37.97	75.0	100 50
Pacific white-sided dolphin	7	43.75	222	56.20	31.7	150 2
SUBTOTAL	13	81.25	385	97.46	29.6	150 2
UNIDENTIFIED WHALES						
Small (<20')	1	6.25	6	1.52	6.0	6 6
SUBTOTAL	1	6.25	6	1.52	6.0	6 -6-
TOTAL	16	100.00	395	100.00	24.7	150 1

Dall's porpoise also was found in small groups scattered throughout the northern three-quarters of the zone.

Two moderate-size schools (50 and 100) of northern right whale dolphins were sighted in 600-fathom (1100 m) water along the easternmost border of the zone on the edge of Santa Cruz Basin.

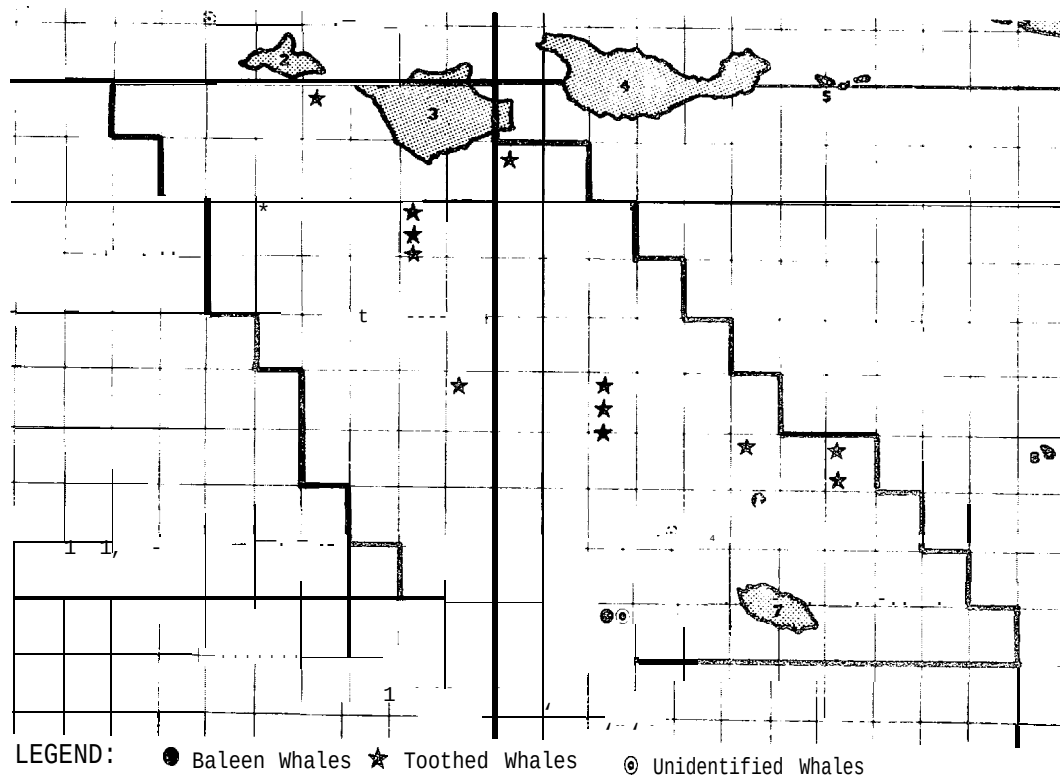
The only baleen sighting during this quarter was a solitary California gray whale noted in mid-December migrating southward, 10 nm (18.5 km) north of San Nicolas Island. This sighting was within a few miles of a northerly-migrating pod of gray whales seen in July and suggests that these animals were migrating considerably further offshore than was commonly believed.

SANTA ROSA RIDGE -- January, February, March
(b) Cetaceans (continued)

FAUNAL ACCOUNT

One group of three fin whales was sighted west of San Nicolas Is., accompanied by several unidentified smaller animals. Noted at the time was the probable identification of these unknown animals as Northern right whale dolphins. Although positive identification was not made, this association of species has been seen in the past.

Figure II-24 . Cetacean population distribution:
 Santa Rosa Ridge zone,
 January-March, 1976



SANTA CRUZ BASIN -- April, May, June
(b) Cetaceans

FAUNAL ACCOUNT

During this cool-water period, the Pacific white-sided dolphin reached maximum annual numbers in this zone and represented 98% of all cetacea sighted.

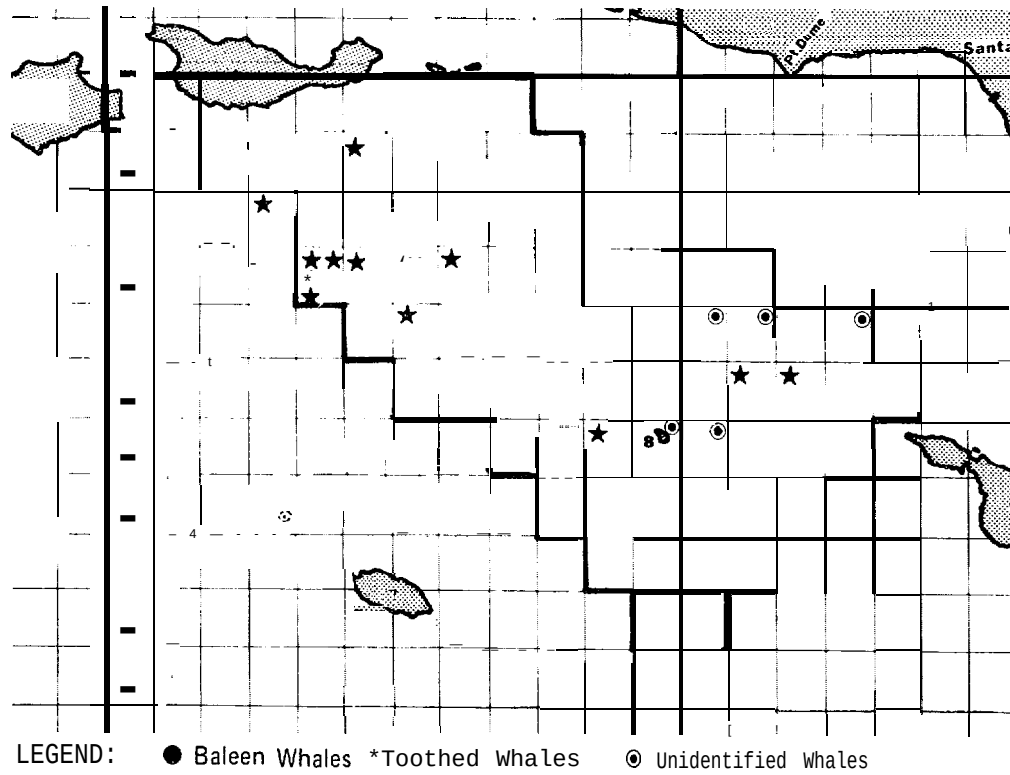
Distribution once again assumed a pattern over the ridges and shallows, with few deep-basin sightings. Classically, toothed whales and porpoises apparently select for these areas (Fig. II- 25).

Five sightings of small unidentified animals were felt to be Dall's Porpoises in at least four occurrences, although positive identification was not made (Table 11-38).

TABLE II- 38. Cetacean Population Summary: Santa Cruz Basin during April - June, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u> <u>Hi Lo</u>
BALEEN WHALES						
No sightings recorded						
TOOTHED WHALES						
Oall's porpoise	8	47.06	27	1.32	3.4	10 1
Northern right whale dolphin	1	5.88	1	0.05	1.0	1 1
Pacific white-sided dolphin	3	17.65	2,010	98.19	670.0	2,000 2
SUBTOTAL	12	70.59	2,038	99.56	169.8	2,000 1
UNIDENTIFIED WHALES						
Small (<20')	5	29.41	9	0.44	1.8	5 1
SUBTOTAL	5	29.41	9	0.44	1.8	5 1
TOTAL	17	100.00	2,047	100.00	120.4	2,000 1

Figure II-25 . Cetacean population distribution:
 Santa Cruz Basin zone,
 April-June, 1975



SANTA CRUZ BASIN -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

This quarter saw the peaks of the annual water temperatures and the species diversity in this zone. Distribution tended to be bimodal, with concentrations in the northern sector in the first half of the quarter equalling sightings in the southern portion in late August and September. This observation held true for the toothed whales and porpoises only (Fig. II-26).

The minke whale, a late summer visitor to the Southern California Bight (SCB), was found throughout the zone; all sightings occurred in late August and September. Two unidentified medium-size whale sightings were thought to be this species as well.

Common dolphins reached their maximum annual numbers during these months. Greater numbers than those seen should be expected in these waters (Table II-39).

TABLE II-39. Cetacean Population Summary: Santa Cruz Basin during July - September, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Minke whale	9	37.50	12	1.51	1.3	3 1
SUBTOTAL	9	37.50	12	1.51	1.3	3 1
TOOTHEO WHALES						
Bottlenose dolphin	2	8.33	14	1.76	7.0	8 6
Common dolphin	1	4.17	150	18.89	150.0	150 150
Dal I's porpoise	2	8.33	5	0.63	2.5	3 2
Pacific white-sided dolphin	3	12.50	508	63.98	169.3	500 4
Pilot whale	2	8.33	88	11.08	44.0	80 8
Risso's dolphin	1	4.17	2	0.25	20	2 2
SUBTOTAL	11	45.83	767	96.59	69.7	500 2
UNIDENTIFIED WHALES						
Medium (20' -40')	2	8.33	2	0.25	1.0	1 1
small (<20')	2	8.33	13	1.64	6.5	12 1
SUBTOTAL	4	16.66	15	1.89	3.8	12 1
TOTAL	24	100.00	794	100.00	33.1	500 1

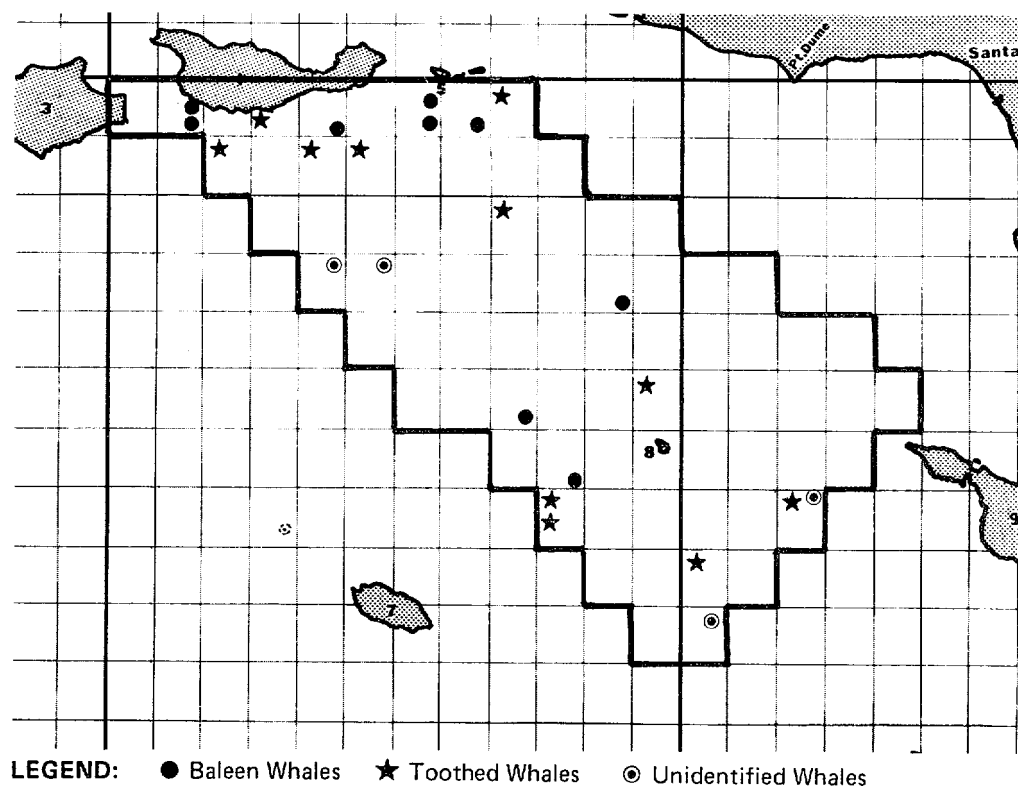
Pacific white-sided dolphins were sighted three times. The largest school was north of Santa Barbara Is. over the sill that separates Santa Cruz and Santa Monica Basins, and two smaller sightings occurred in the Santa Rosa-Cortés Ridge area.

Pilot whales were seen twice, with the largest school (80 animals)

occurring just south of Santa Cruz Is. on the eastern edge of the Santa Rosa-Cortés Ridge. The second sighting was over the narrow sill separating San Nicolás Basin from Santa Catalina Basin. Both locations are less than 250 fathoms (460 m) deep and reasonable sites for these animals which seem to prefer shallow areas, at least when noted in the SCB.

The paucity of DalI's porpoise sightings was to be expected during this period of higher water temperatures.

Figure II-26 . Cetacean population distribution:
 Santa Cruz Basin zone,
 July-September, 1975



SANTA CRUZ BASIN -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

Autumn in this zone, as in the entire Bight, is a period of transition for the cetacean populations. Animals with cold water preference were beginning to appear, while warm-water animals had already begun their movement out of this cooling water mass. Migratory whales had begun to move through the area (Fig. II-27).

While Santa Cruz Basin is not noted for large concentrations of cetacea at any time of year, autumn represents the low ebb of their numbers. Only 3% of the zone's annual population was found during this quarter. A total of 113 animals were seen in 21 sightings, representing five species (Table II-40).

TABLE II- 40. Cetacean Population Summary: Santa Cruz Basin during October - December, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
						<u>Hi</u>	<u>Lo</u>
BALEEN WHALES							
Gray whale	1	4.76	1	0.88	1.0	1	1
SUBTOTAL	1	4.76	1	0.88	1.0	1	1
TOOTHED WHALES							
Common dolphin	2	9.52	34	30.09	17.0	25	9
Dal 1 's porpoise	11	52.38	39	34.51	3.5	10	1
Pacific white-sided dolphin	1	4.76	15	13.27	15.0	15	15
Pilot whale	5	23.81	22	19.47	4.4	10	1
SUBTOTAL	19	90.47	110	97.34	5.8	25	1
UNIDENTIFIED WHALES							
Medium (20' -40')	1	4.76	2	1.77	2.0	2	2
SUBTOTAL	1	4.76	2	1.77	2.0	2	2
TOTAL	21	100.00	1'3	100.00	5.4	25	1

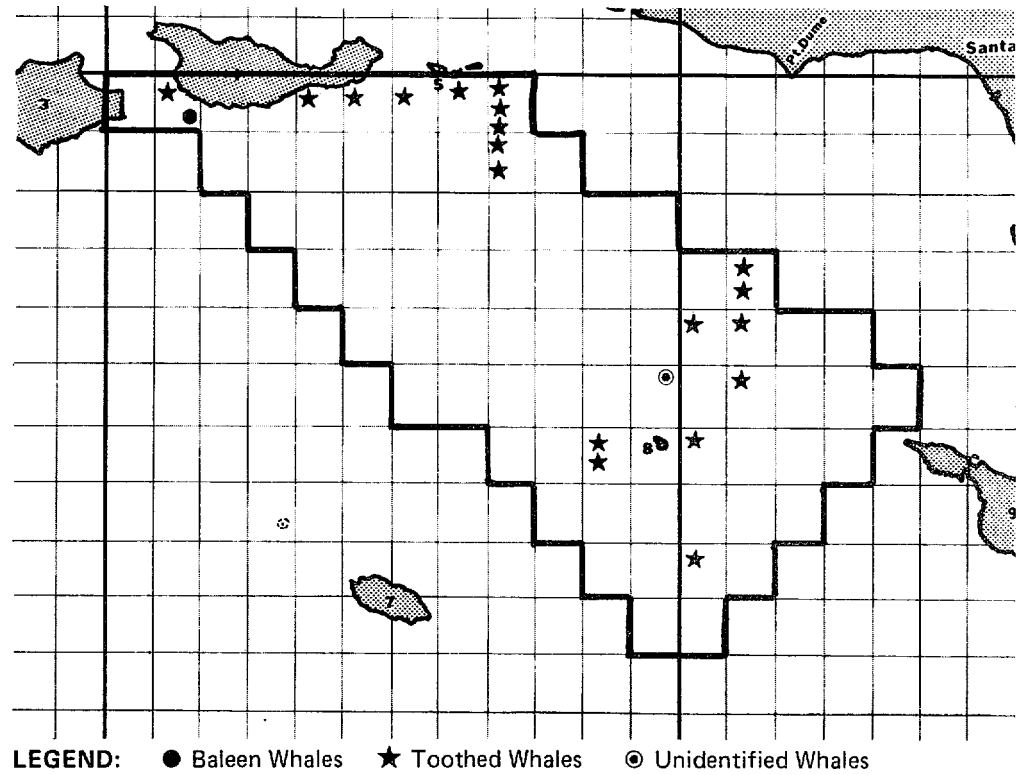
Dan's porpoise was seen the most often, with 11 sightings totaling 39 animals. As cooler oceanic waters moved inshore the animals followed from previous concentrations in the Santa Rosa Ridge area.

Common dolphins were reduced in number, foretelling their complete absence until the next summer.

Pilot whales were seen in scattered groups of four or five, moving through the area enroute to squid grounds to the south.

The first southern migrating gray whales were noted. Two unidentified whales sighted north of Santa Barbara Is. were also felt to be gray whales, although positive identification was not made.

Figure II-27 . Cetacean population distribution:
 Santa Cruz Basin zone,
 October-December, 1975



SANTA CRUZ BASIN -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

This quarter brought stabilization of water temperatures at almost the lowest annual level. With cetacean populations reflecting this cool-water period, the common dolphin (a warm-water animal) was completely absent. The remaining animals were either those migrating through the area or the first major appearances of cool-water species.

Intrusion of the migratory animals increased the percentage of annual sightings for this quarter to 14%. Distribution of animals throughout the zone was also altered by the movement of the migratory species, with these animals sighted over the deepest portions of the Basin (Fig. II-28).

The Pacific white-sided dolphin, a true cool-water animal, increased in number 16 times and represented better than 50% of the total cetacean sightings (Table II-41). The Dan's porpoise population also increased to become the second most numerous cetacean seen.

TABLE 11-41 . Cetacean Population Summary: Santa Cruz Basin during January - March, 1976.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>
BALEEN WHALES						
Gray whale	10	30.30	27	5.72	2.7	5 1
SUBTOTAL	10	30.30	27	5.72	2.7	5 1
TOOTHED WHALES						
Dan's porpoise	13	39.39	104	22.03	8.0	20 1
Northern right whale dolphin	3	9.09	45	9.53	15.0	25 4
Pacific white-sided dolphin	3	9.09	239	50.64	79.7	225 2
Pilot whale	1	3.03	50	10.59	50.0	50 50
Risso's dolphin	1	3.03	4	0.85	4.0	4 4
SUBTOTAL	21	63.63	442	93.64	21.0	225 1
UNIDENTIFIED WHALES						
Medium (20' -40')	2	6.06	3	0.64	1.5	2 1
SUBTOTAL	2	6.06	3	0.64	1.5	2 1
TOTAL	33	100.00	472	100.00	14.3	225 1

Southern migrating gray whales (27 seen) represented a major component of movement through this zone, with more of them seen here than in zones either to the east or the west, marking this as a major migratory pathway for this animal.

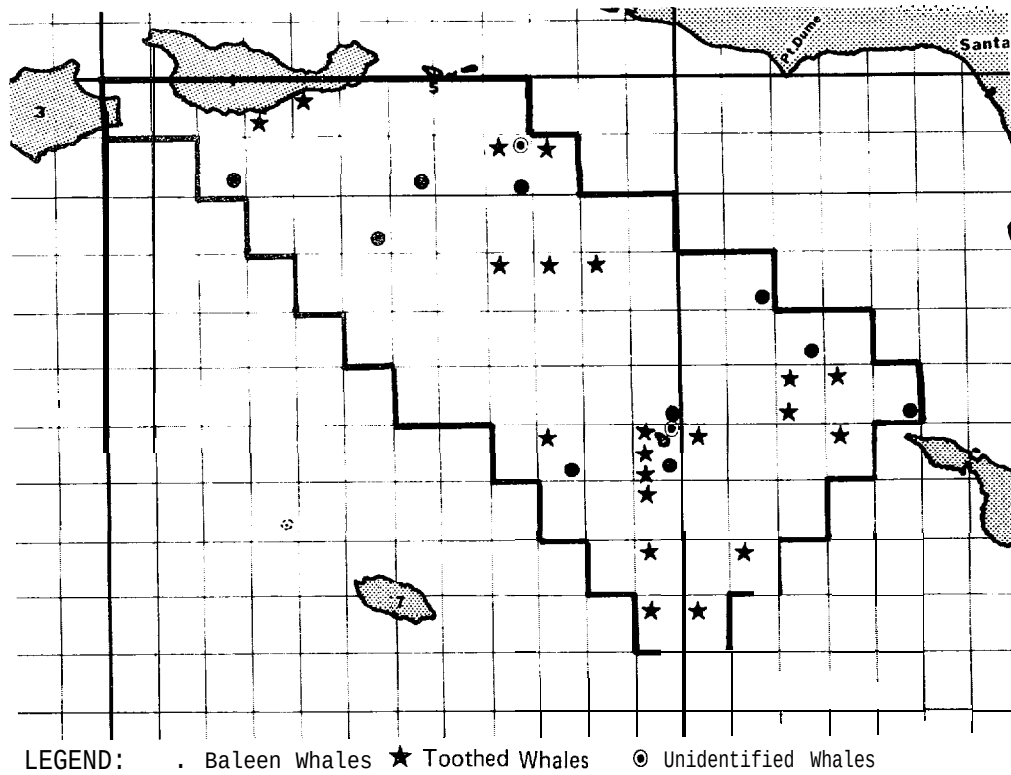
Pilot whales were noted in increased numbers, reaching their maximum annual numbers. Clustering of sightings in the southern portion

of the zone around Santa Barbara Is. represented their movement toward the squid spawning grounds at Santa Catalina Island (Fig. 11-28).

Sightings of northern right whale dolphins, not usually found in these waters, during the last half of the quarter represented a casual visitation from larger concentrations to the west.

The year's lowest water temperatures permitted movement of these inhabitants of deep, cool water into the Basin.

Figure II-28 . Cetacean population distribution:
 Santa Cruz Basin zone,
 January-March, 1976



SANTA MONICA BASIN -- April, May, June
(b) Cetaceans

FAUNAL ACCOUNT

This is the smallest of our geographic zones and one of the least productive for cetacean sightings. Four factors could contribute to the paucity of cetacean activity: (1) The extremely-high density of low-flying aircraft from three local airports, including Los Angeles International, generates constant noise pollution. (2) Numerous small boat marinas give rise to great numbers of fishing and pleasure craft. (3) Fifteen sewer outfalls contaminate the waters and seemingly reduce the prey species. (4) Freshwater run-off contributes to the problems of salinity and turbidity in the shallower water of Santa Monica Bay.

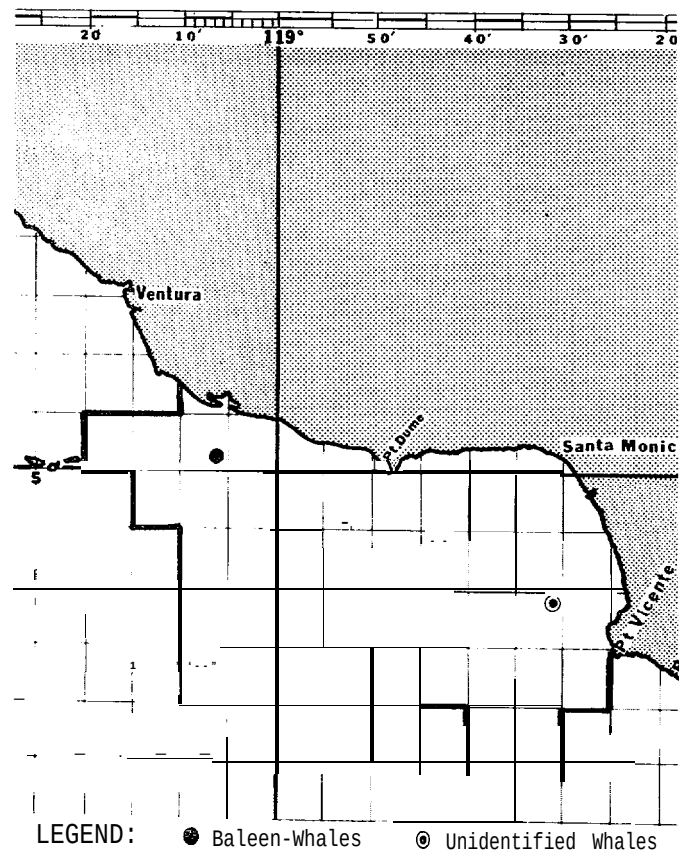
A solitary minke whale was sighted outside the Bay proper, in the northernmost portion of this zone (Table II-42 , Fig. II-29).

TABLE II-42. Cetacean Population Summary: Santa Monica Basin during April - June, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Minke whale	1	50.00	1	33.33	1.0	1 1
SUBTOTAL	1	50.00	1	33.33	1.0	1 1
TOOTHEO WHALES						
No sightings recorded						
UNIDENTIFIED WHALES						
Small (<20')	1	50.00	2	66.67	2.0	2 2
SUBTOTAL	1	50.00	2	66.67	2.0	2 2
TOTAL	2	100.00	3	100.00	1.5	2 1

Two unidentified small animals sighted off of Pales Verdes Peninsula were probably bottlenose dolphins, which are commonly found in this area.

Figure II-29 . Cetacean population distribution:
 Santa Monica Basin zone,
 April-June, 1975



SANTA MONICA BASIN -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

During this period 96 cetaceans, or 20% of the annual total, were sighted. Santa Monica Bay, proper, yielded only one sighting of animals (25 pilot whales), five miles northwest of Pales Verdes Point (Fig. 11-30).

Minke whales were found during all three months around the periphery of Santa Monica Basin, which is the deepest water found in this zone and occupies the westernmost border.

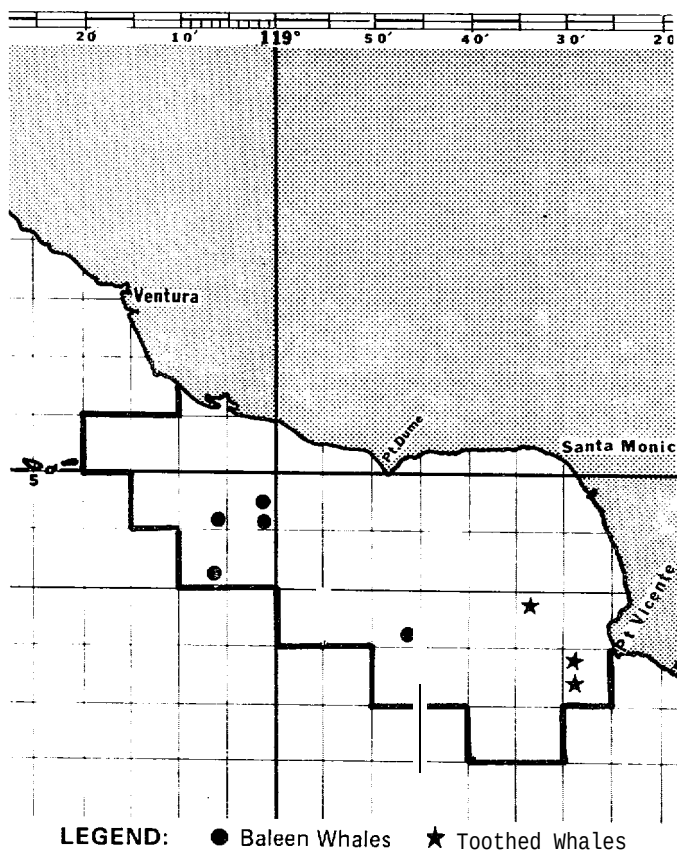
There were two sightings of pilot whales, both in the southern portion of the zone (Table II-43). Some small populations of these animals were frequently present in the Pales Verdes Pt. and Pt. Vicente area.

TABLE 11-43. **Cetacean Population Summary:** Santa Monica Basin during July - September, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Minke whale	5	62.50	6	6.25	1.2	2 1
SUBTOTAL	5	62.50	6	6.25	1.2	2 1
TOOTHED WHALES						
Bottlenose dolphin	1	12.50	25	26.04	25.0	25 25
Pilot whale	2	25.00	65	67.71	32.5	40 25
SUBTOTAL	3	37.50	90	93.75	30.0	40 25
UNIDENTIFIED WHALES						
No sightings recorded						
TOTAL	8	100.00	96	100.00	12.0	40 1

Bottlenose dolphins were sighted once. at the southern boundary of the zone. As with the pilot whales, this species is also commonly seen in this area and is considered an indigenous population moving back and forth across San Pedro Basin between Santa Catalina Is. and the mainland.

Figure II-30 . Cetacean population distributed on:
Santa Monica Basin zone,
July-September, 1975



Autumn was a period of modest cetacean activity in this zone. As with the summer period, approximately one-fifth of the annual cetacean population was counted during this quarter.

Pilot whales were seen in relatively small pods, averaging seven animals, spread throughout the southern portion of the zone adjacent to the Pales Verdes Peninsula (Table II-44). These animals are considered to be year-round residents and probably are not a portion of the annual influx seen during these months in the waters around Santa Catalina Island.

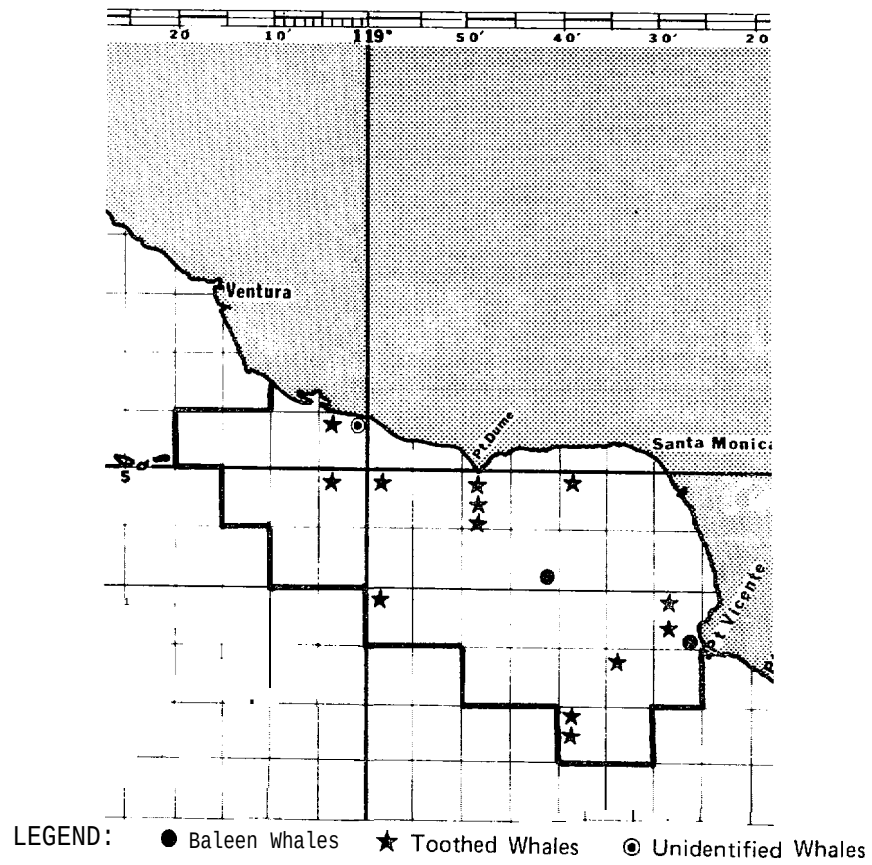
TABLE II- 44. Cetacean Population Summary: Santa Monica Basin during October - December, 1975.

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Gray whale	2	12.50	3	3.09	1.5	2 1
SUBTOTAL	2	12.50	3	3.09	1.5	2 1
TOOTHED WHALES						
Bottlenose dolphin	1	6.25	4	4.12	4.0	4 4
Common dolphin	1	6.25	1	1.03	1.0	1 1
Dan's porpoise	4	25.00	37	38.14	9.3	20 2
Pilot whale	7	43.75	50	51.55	7.1	10 4
SUBTOTAL	13	81.25	92	94.84	7.1	20 1
UNIDENTIFIED WHALES						
small (<20')	1	6.25	2	2.06	2.0	2 2
SUBTOTAL	1	6.25	2	2.06	2.0	2 2
TOTAL	16	100.00	97	100.00	6.1	20 1

Three California gray whales were seen on their southern migration. One was sighted midway across Santa Monica Bay on a line from Pt. Dume to Pt. Vicente, the usual pathway taken by these animals during migration. The other two were seen directly off the beach at Pt. Vicente (Fig. 11-31).

Four bottlenose dolphins were sighted close to shore in the Pales Verdes Pt. area.

Figure 11-31 . Cetacean population distribution:
 Santa Monica Basin zone,
 October-December, 1975



SANTA MONICA BASIN -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

In an area not noted for a high incidence of cetacean activity, these months provided the greatest annual number of animals at 318 individuals (Table II-45).

TABLE 11-45. Cetacean Population Summary: Santa Monica Basin during January - March, 1976.

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Gray whale	7	53.85	25	7.86	3.6	10 1
SUBTOTAL	7	53.85	25	7.86	3.6	10 1
TOOTHED WHALES						
Dall's porpoise	2	15.39	4	1.26	2.0	3 1
Pacific white-sided dolphin	1	7.69	250	78.62	250.0	250 250
Pilot whale	2	15.39	12	3.77	6.0	7 5
Risso's dolphin	1	7.69	27	8.49	27.0	27 27
SUBTOTAL	6	46.16	293	92.14	48.8	250 1
UNIDENTIFIED WHALES						
No sightings recorded						
TOTAL	13	100.00	318	100.00	24.5	250 1

Two small pods of pilot whales were seen in their usual location off the Pales Verdes Peninsula (Fig. II-32).

Risso's dolphins, uncommon visitors to these waters, were noted in one sighting of 27 animals at the western edge of the Basin.

Another unexpected sighting was one school of 250 Pacific white-sided dolphins, seen less than 2 nm (3.5 km) off Pt. Dume in extremely shallow water. Numerous schools of bait fish were noted in the area and it was assumed the cetacea were feeding upon this bait, although positive feeding behavior was not observed.

The California gray whale was the only baleen whale seen; their distribution extended along a line from Pt. Dume, across the mouth of Santa Monica Bay to Pt. Vicente. One notable sighting consisted of ten gray whales milling in shallow water directly under Pt. Dume. This species often congregates in numbers at headlands, prior to crossing areas of open water, and this was believed to be the behavior at this sighting location. Gray whales in the Southern California Bight (SCB) are usually seen in small pods of one to three animals and dispersed from the shoreline out to 100 nm (185 km) offshore. In contrast, migrating gray whales seen north and south of the SCB area are usually within 5 nm (9 km) of the shore and aggregated into larger groups.

Map of the Santa Monica Bay area showing whale sightings. The map includes a grid with longitude (119° to 120°) and latitude (33° to 34°) markings. Key locations labeled are Ventura, Santa Monica, and Pt. Vicente. A legend at the bottom indicates that black dots represent Baleen Whales and black stars represent Toothed Whales. The sightings are plotted along the coast and in the bay area.

SAN PEDRO BASIN -- April, May, June
(b) Cetaceans

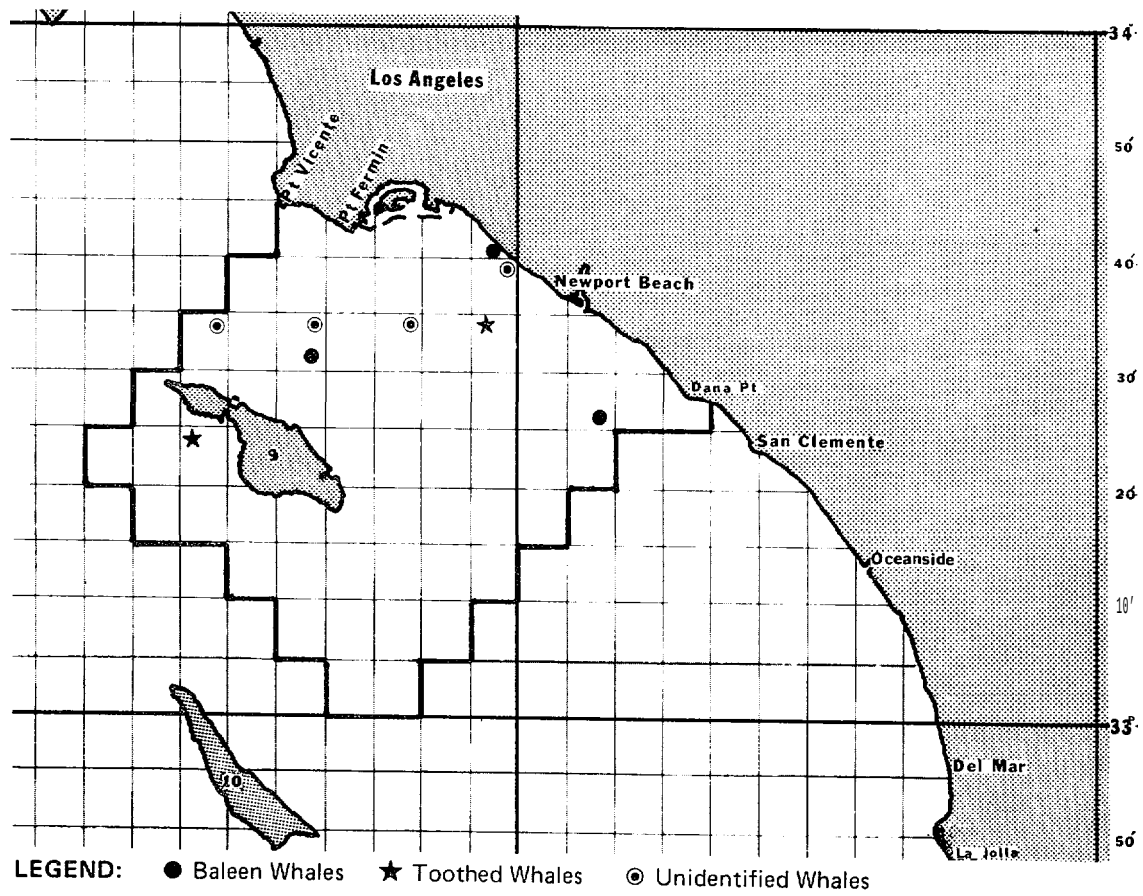
FAUNAL ACCOUNT

The baleen whale population consisted of three migratory gray whales sighted moving in a northerly direction in shallow coastal waters and a single minke whale in San Pedro Channel near the west end of Santa Catalina Island (Fig. II-33). A single school of six Dan's porpoises was noted within 5 nm (9 km) of the coast off Newport Beach, and a school of ten bottlenose dolphins was sighted near the edge of Catalina Canyon (Table II-46). Four additional unidentified cetacean sightings were made in San Pedro Channel.

TABLE II- 46. Cetacean Population Summary: San Pedro Basin during April - June, 1975.

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi	Lo
BALEEN WHALES							
Gray whale	2	22.22	3	12.50	1.5	2	1
Minke whale	1	11.11	1	4.17	1.0	1	1
SUBTOTAL	3	33.33	4	16.67	1.3	2	1
TOOTHED WHALES							
Bottl enose dolphin	1	11.11	10	41.67	10.0	10	10
Oal 1's porpoise	1	11.11	6	25.00	6.0	6	6
SUBTOTAL	2	22.22	16	66.67	8.0	10	6
UNIDENTIFIED WHALES							
Large (>40')	1	11.11	1	4.17	1.0	1	1
Medium (20'-40')	2	22.22	2	8.33	1.0	1	1
Small (<20')	1	11.11	1	4.17	1.0	1	1
SUBTOTAL	4	44.44	4	16.67	1.0	1	1
TOTAL	9	100.00	24	100.00	2.7	10	1

Figure II-33 . Cetacean population distribution:
San Pedro Basin zone,
April-June, 1975



SAN PEDRO BASIN -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

The greatest number of minke whale sightings in the Southern California Bight (SCB) occurred from July through September. Most were concentrated near the northern Channel Islands with the exception of a solitary animal sighted over the Catalina Escarpment (Fig. II-34).

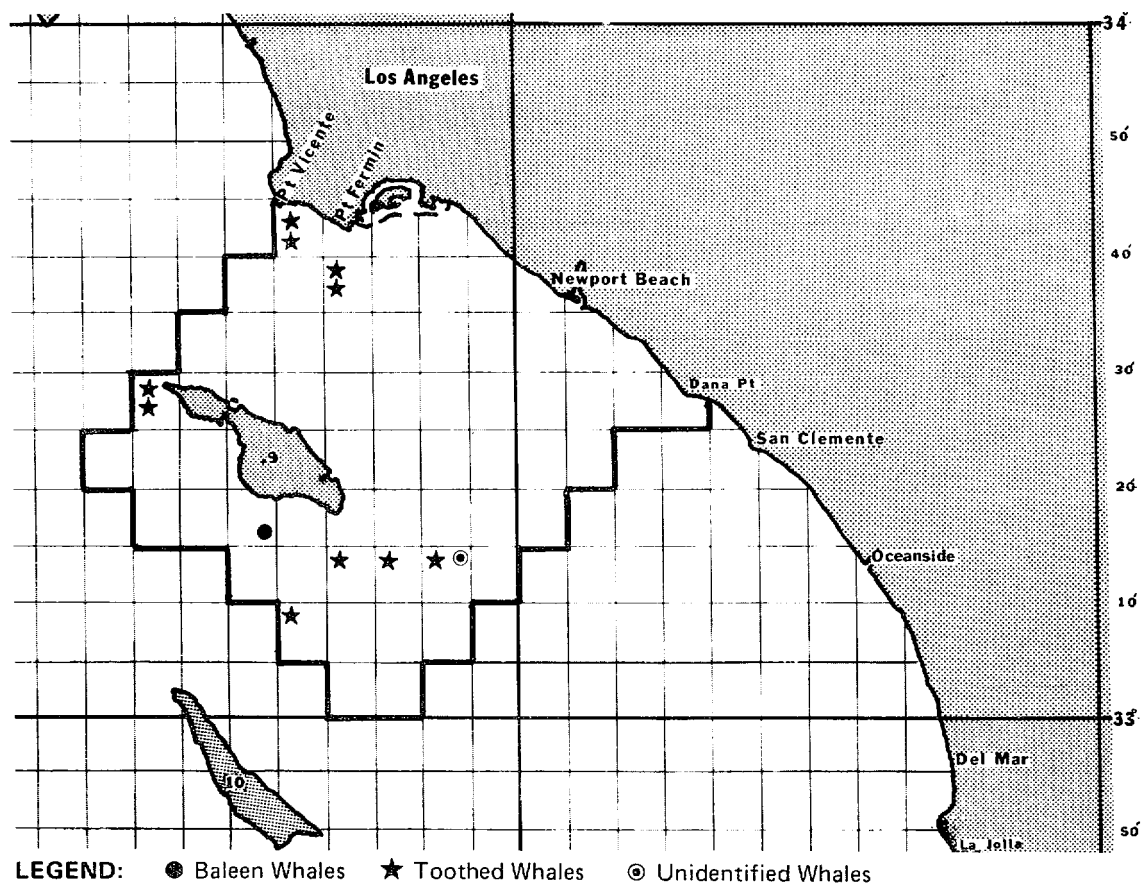
Common dolphins were observed in large numbers, representing over 90% of all cetaceans sighted (Table II-47). These animals tended to range southeast of Santa Catalina Is. in the vicinity of the Catalina Escarpment.

TABLE 11-47. Cetacean Population Summary: San Pedro Basin during July - September, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
BALEEN WHALES							
Minke whale	1	8.33	1	0.05	1.0	1	1
SUBTOTAL	1	8.33	1	0.05	1.0	1	1
TOOTHED WHALES							
Bottl enose dolphin	2	16.67	110	5.44	55.0	80	30
Common dolphin	4	33.33	1,825	90.26	456.3	1,000	25
Pacific white-sided dolphin	1	8.33	30	1.48	30.0	30	30
Pilot whale	3	25.00	55	2.72	18.3	30	10
SUBTOTAL	10	83.33	2,020	99.90	202.0	1,000	10
UNIDENTIFIED WHALES							
Medium (20'-40')	1	8.33	1	0.05	1.0	1	1
SUBTOTAL	1	8.33	1	0.05	1.0	1	1
TOTAL	12	100.00	2,072	100.00	168.5	1,000	1

Three schools of pilot whales (55 animals) were sighted in waters off the Pales Verdes Peninsula moving over the San Pedro Escarpment. Bottlenose dolphins were observed near the west end of Santa Catalina Is. and in the vicinity of the San Pedro Escarpment. A solitary herd of 30 Pacific white-sided dolphins was observed off the west end of Santa Catalina Island. Most Pacific white-sided dolphin sightings were spread throughout the SCB with the heaviest concentration along the Santa Rosa-Cortés Ridge.

Figure II-34 . Cetacean population distribution:
San Pedro Basin zone,
July-September, 1975



SAN PEDRO BASIN -- October, November, December
(b) Cetaceans

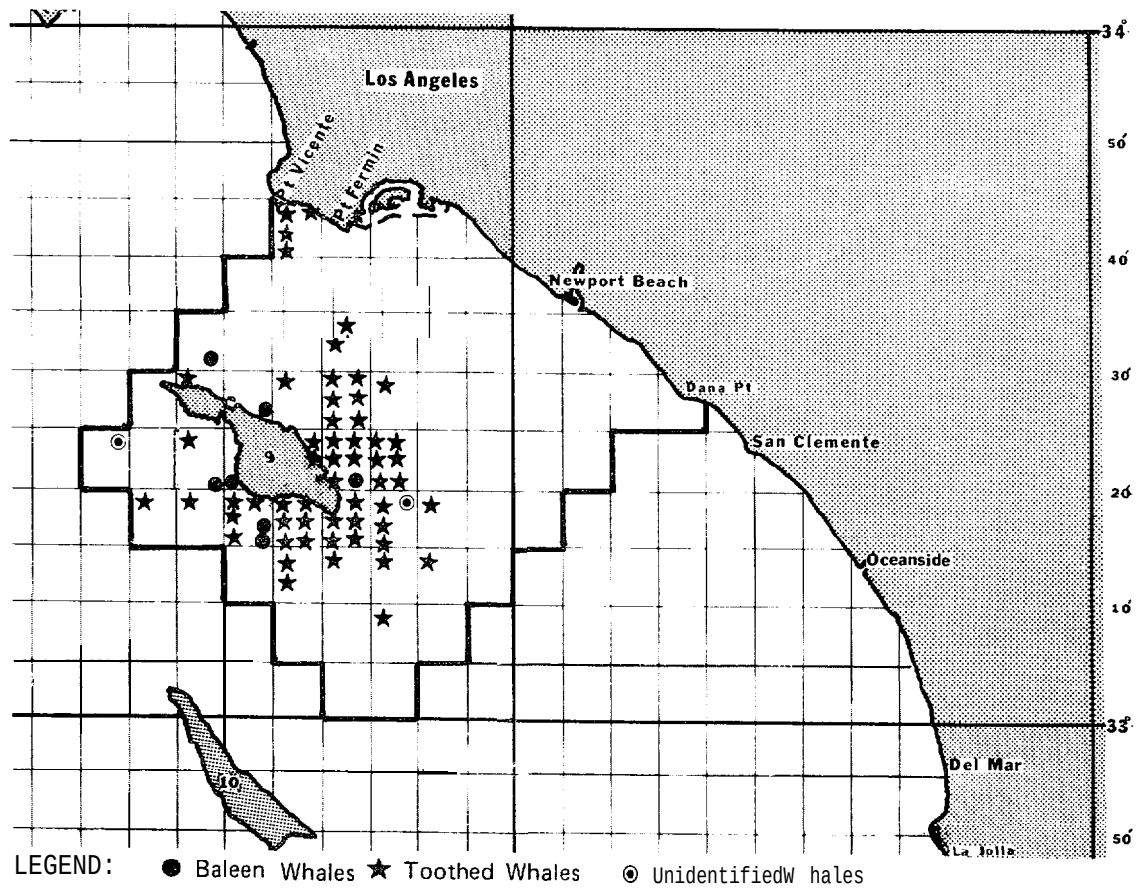
FAUNAL ACCOUNT

The migratory gray whale appeared in the area in December, signaling the start of **their** annual southward movement (Fig. II-35). All animals were sighted offshore around Santa Catalina Island. High concentrations of pilot whales and associated bottlenose dolphins began to aggregate around Santa Catalina Is. in November, reaching their peak in December. This annual aggregation coincides with the spawning of squid in the same area, which are known to be a primary food source for these animals. Most sightings were made in the area bounded by Long Pt. and Church Rock. Additional scattered sightings of pilot whales and bottlenose dolphins were also reported over the San Pedro Escarpment. Two cool-water species, Dan's porpoise and the northern right whale dolphin, were observed off the east end of Santa Catalina Island. Pacific white-sided dolphins were seen on two occasions totaling 103 animals (Table II-48). The sightings were widely separated in the zone: one school of 100 was observed on the periphery of the Catalina Basin and the second group (three animals) was sighted in mid-San Pedro Channel.

TABLE II- 48. Cetacean Population Summary: San Pedro Basin during October - December, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Gray whale	7	10.77	16	0.64	2.3	5 1
SUBTOTAL	7	10.77	16	0.64	2.3	5 1
TOOTHED WHALES						
Bottlenose dolphin	14	21.54	277	11.16	19.8	50 4
Common dolphin	3	4.62	145	5.84	48.3	100 20
Dan's porpoise	3	4.62	15	0.60	5.0	8 1
Northern right whale dolphin	1	1.54	1	0.04	1.0	1 1
Pacific white-sided dolphin	2	3.08	103	4.15	51.5	100 3
Pilot whale	33	50.77	1,916	77.23	58.1	400 12
SUBTOTAL	56	86.17	2,457	99.02	43.8	400 1
UNIDENTIFIED WHALES						
small (<20')	2	3.08	8	0.32	4.0	6 2
SUBTOTAL	2	3.08	8	0.32	4.0	6 2
TOTAL	65	100.00	2,481	100.00	38.2	400 1

Figure II-35 . Cetacean population distribution:
San Pedro Basin zone,
October-December, 1975



SAN PEDRO BASIN -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

One hundred thirty-three gray whales were reported in 49 sightings in the San Pedro Basin (Table II-49).

TABLE II-49. Cetacean Population Summary: San Pedro Basin during January - March, 1976.

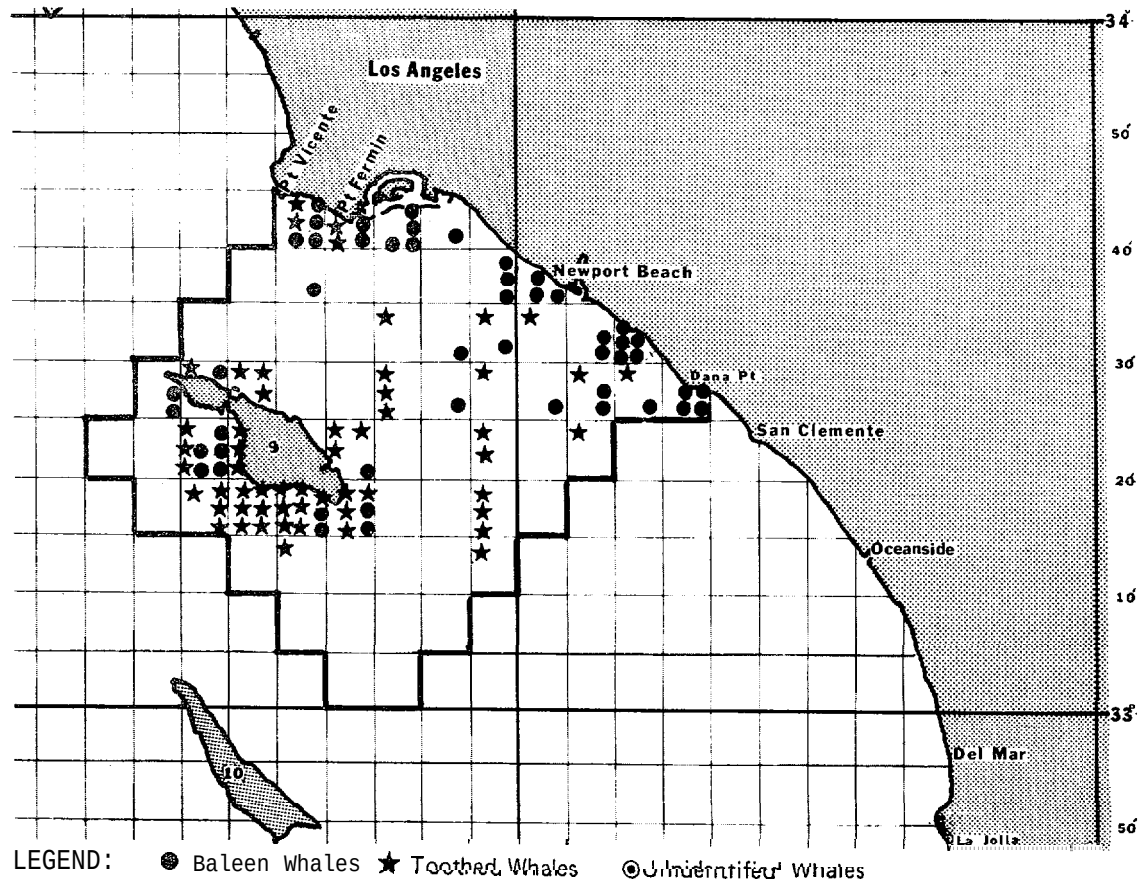
Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Gray whale	49	46.67	133	2.03	2.7	7 1
SUBTOTAL	49	46.67	133	2.03	2.7	7 1
TOOTHED WHALES						
Bottlenose dolphin	7	6.67	89	1.36	12.7	30 5
Common dolphin	6	5.71	3,968	60.70	661.3	2,500 2
Dan's porpoise	6	5.71	36	0.55	6.0	12 2
Northern right whale dolphin	5	4.76	262	4.01	52.4	200 1
Pacific white-sided dolphin	2	1.90	252	3.85	126.0	250 2
Pilot whale	29	27.62	1,796	27.47	61.9	300 5
SUBTOTAL	55	52.37	6,403	97.94	116.3	2,500 1
UNIDENTIFIED WHALES						
Medium (20' -40')	1	0.95	1	0.02	1.0	1 1
SUBTOTAL	1	0.95	1	0.02	1.0	1 1
TOTAL	105	100.00	6,537	100.00	62.3	2,500 1

Seventy-five percent of the sightings were within 5 nm (9 km) of the coast; the remainder farther offshore in the San Pedro Channel and around Santa Catalina Island (Fig. II-36). Pilot whales were present in large numbers around the south and east side of Santa Catalina Is. throughout January and early February. The population declined rapidly in late February. Newborn pilot whales were observed on numerous occasions in the vicinity of Silver Canyon/Ben Weston Point, often in mother/young pairs. Bottlenose dolphin schools were closely associated with many of the pilot whale sightings at Santa Catalina Is. and near the Pales Verdes Peninsula.

Dan's porpoise and northern right whale dolphin populations increased as the water column temperatures cooled. These animals are essentially cool-water types.

Common dolphins were by far the most numerous of the toothed whales sighted. During this period of cool water, their geographical range was reduced to the warmer waters of the southern portions of the Southern California Bight and to nearshore waters; their northernmost extension was off Huntington Beach within 5 nm (9 km) of the shore.

Figure II-36 . Cetacean population distribution:
San Pedro Basin zone,
January-March, 1976



SAN DIEGO BASIN -- April, May, June
(b) Cetaceans

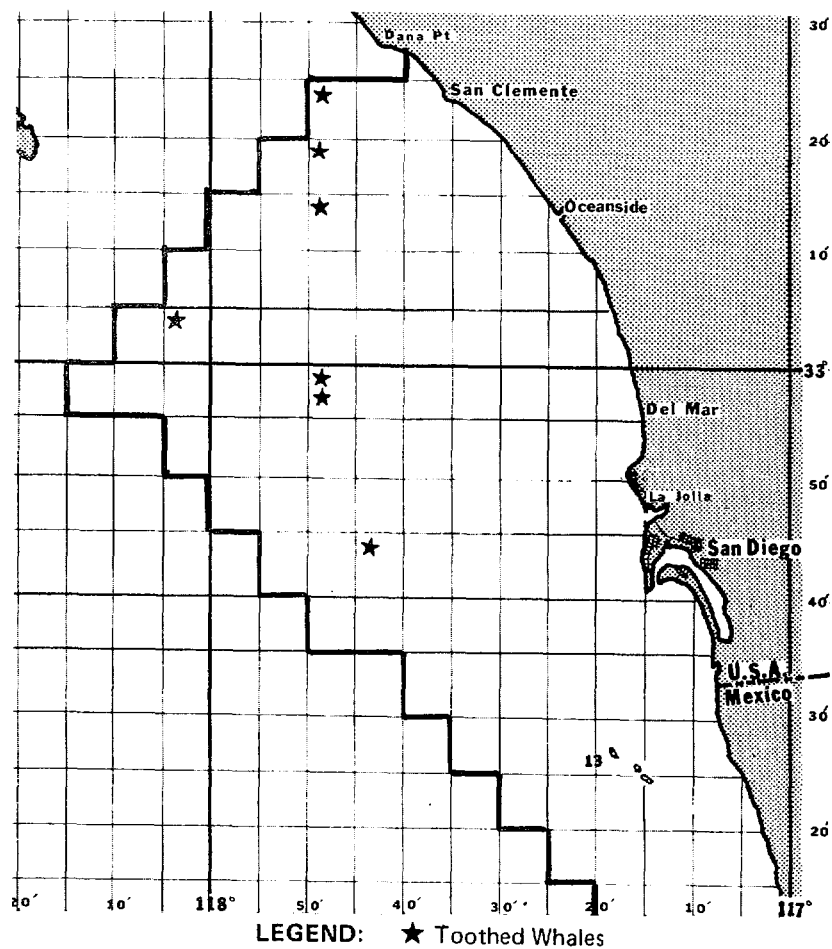
FAUNAL ACCOUNT

No baleen whales were sighted. Common dolphins comprised almost 88% of the toothed whale sightings (Table 11-50). Two Dan's porpoise schools of six and three animals respectively were sighted over the northern portion of the San Diego Trough (Fig. II-37). A single school of 24, Pacific white-sided dolphins was noted in the same vicinity.

TABLE 11-50. Cetacean Population **Summary:** San Diego Basin during April - June, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
BALEEN WHALES							
No sightings reported							
TOOTHED WHALES							
Common dolphin	4	57.14	229	87.40	57.3	100	4
Dan's porpoise	2	28.57	9	3.44	4.5	6	3
Pacific white-sided dolphin	1	14.29	24	9.16	24.0	24	24
SUBTOTAL	7	100.00	262	100.00	37.4	100	3
UNIDENTIFIED WHALES							
No sightings reported							
TOTAL	7	100.00	262	100.00	37.4	100	3

Figure II-37 . Cetacean population distribution:
San Diego Basin zone,
April 1 - June, 1975



SAN DIEGO BASIN -- July, August, September
(b) Cetaceans

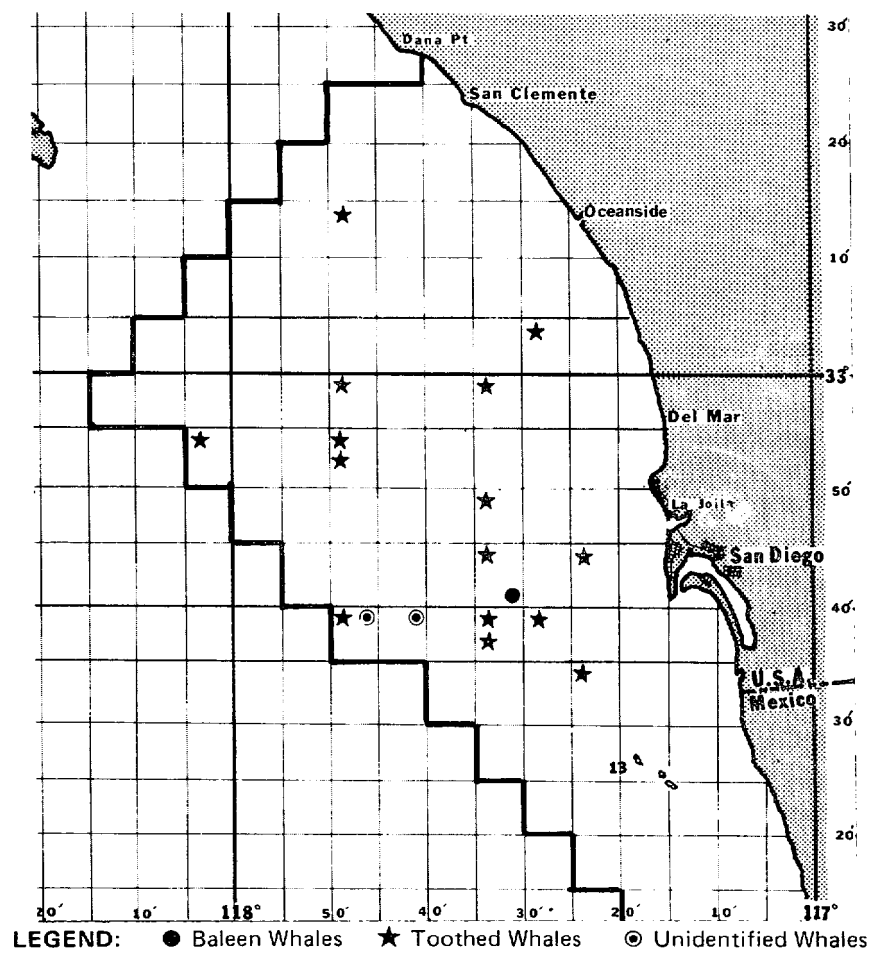
FAUNAL ACCOUNT

Common dolphins were widely distributed throughout the Southern California Bight during the summer months, mostly ranging offshore outside the Channel Islands and over banks and ridges. Nearshore, San Diego Basin supported the greatest population of these animals (Fig. II-38). This species was the most abundant of the toothed whales, with more than 3,300 observed in the Basin, representing 53% of the cetaceans sighted (Table 11-51). Pacific white-sided dolphins were also abundant and widespread throughout the Bight, but only two sightings totaling 2,500 animals were recorded in San Diego Basin.

TABLE 11-51. Cetacean Population Summary: San Diego Basin during July - September, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
BALEEN WHALES							
Minke whale	1	5.56	1	0.02	1.0	1	1
SUBTOTAL	1	5.56	1	0.02	1.0	1	1
TOOTHED WHALES							
Common dolphin	10	55.56	3,361	53.31	336.1	1,450	5
Pacific white-sided dolphin	2	11.11	2,500	39.65	1,250.0	1,700	800
Pilot whale	3	16.67	128	2.03	42.7	90	8
SUBTOTAL	15	83.34	5,989	94.99	399.2	1,700	5
UNIDENTIFIED WHALES							
Small (<20')	2	11.11	315	5.00	157.5	215	100
SUBTOTAL	2	11.11	315	5.00	157.5	215	100
TOTAL	18	100.00	6,305	100.00	350.3	1,700	1

Figure II-38 . Cetacean population distribution:
San Diego Basin zone,
July-September, 1975



SAN DIEGO BASIN -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

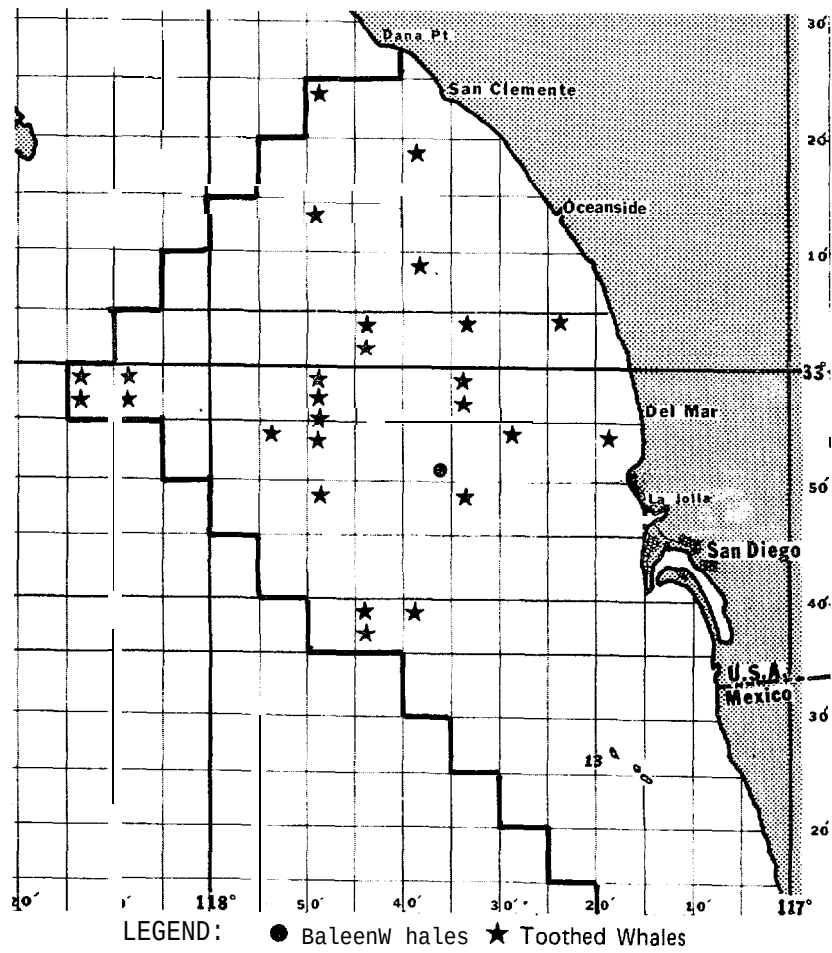
Common dolphins were the most conspicuous of the toothed whales, representing more than 99% of all cetaceans sighted (Table II-52).

TABLE 11-52. Cetacean Population **Summary:** San Diego Basin during October - December, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Minke whale	1	3.70	1	0.01	1.0	1 1
SUBTOTAL	1	3.70	1	0.01	1.0	1 1
TOOTHED WHALES						
Bottlenose dolphin	1	3.70	3	0.02	3.0	3 3
Common dolphin	16	59.26	13,504	99.35	844.0	7,500 1
Dall's porpoise	6	22.22	22	0.16	3.7	7 2
Pacific white-sided dolphin	1	3.70	30	0.22	30.0	30 30
Pilot whale	2	7.40	32	0.24	16.0	20 12
SUBTOTAL	26	96.28	13,591	99.99	522.7	7,500 1
UNIDENTIFIED WHALES						
No sightings reported						
TOTAL	27	100.00	13,592	100.00	503.4	7,500 1

Their distribution was widespread in the San Diego Basin zone, with some minor aggregating in the central and northern portions of the San Diego Trough (Fig. II-39). Pilot whales were sighted twice in the inshore northern portion of the zone between the coastal cities of San Clemente and Oceanside. Dall's porpoises, a cool-water species, were seen six times (totaling 22 animals) in sightings ranging from Emory Knoll near San Clemente Is. to the city of Del Mar on the coast.

Figure II-39 . Cetacean population distribution:
San Diego Basin zone,
October-December, 1975



SAN DIEGO BASIN -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

Eighty-four gray whales were reported in 38 sightings in San Diego Basin (Table II-53). With few exceptions, these migratory baleen whales were sighted within 5 nm (9 km) of the coastline.

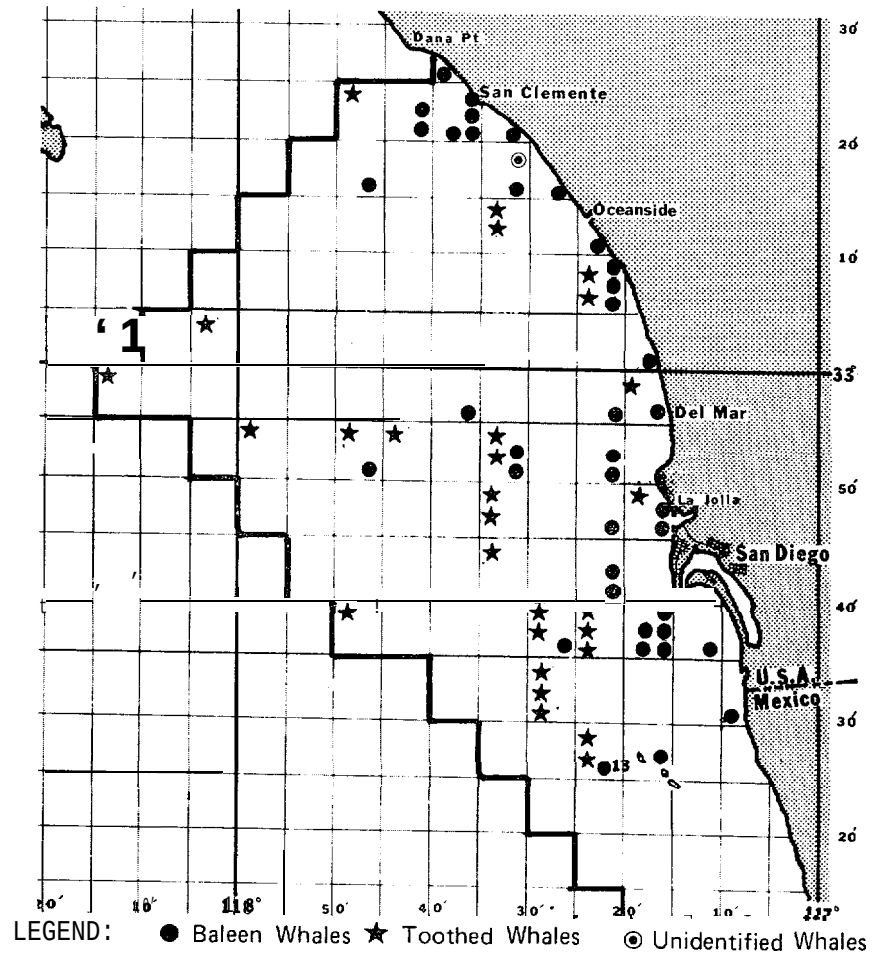
TABLE II- 53. Cetacean Population Summary: San Diego Basin during January - March, 1976.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
BALEEN WHALES							
Gray whale	38	55.88	84	2.38	2.2	4	1
Minke whale	1	1.47	1	0.03	1.0	1	1
SUBTOTAL	39	57.35	85	2.41	2.2	4	1
TOOTHED WHALES							
Bottlenose dolphin	2	2.94	25	0.71	12.5	15	10
Common dolphin	15	22.06	3,030	85.79	202.0	2,500	3
Dan's porpoise	3	4.41	19	0.54	6.3	12	1
Northern right whale dolphin	3	4.41	218	6.17	72.7	200	3
Pacific white-sided dolphin	2	2.94	22	0.62	11.0	18	4
Pilot whale	3	4.41	132	3.74	44.0	100	12
SUBTOTAL	28	41.17	3,446	97.57	123.0	2,500	1
UNIDENTIFIED WHALES							
Medium (20' -40')	1	1.47	1	0.03	1.0	1	1
SUBTOTAL	1	1.47	1	0.03	1.0	1	1
TOTAL	68	100.00	3,532	100.00	51.9	2,500	1

Toothed whales were represented by six species. Most numerous were common dolphins which comprised more than 85% of all species observed. While present year-round, this warm-water species had withdrawn from its previously wide geographical distribution to the reduced range along the Coronado Escarpment and the San Diego Trough (Fig. 11-40).

Cool-water species like Dall's porpoises and northern right whale dolphins were observed in San Diego Basin in moderate numbers and remained well offshore along the outer periphery of the San Diego Trough. This intrusion may indicate the animals were following patterns of cooling water into this southern extreme of the Southern California Bight. Two sightings of Pacific white-sided dolphins were recorded in nearshore areas. With these minimal data, no well-defined distributional pattern was apparent. During this period of cooling water temperatures, pilot whale and bottlenose dolphin schools were sighted along the Coronado Escarpment and in nearshore waters north of Pt. La Jolla.

Figure 11-40 , Cetacean population distribution:
San Diego Basin zone,
January-March, 1976



SAN CLEMENTE RIDGE -- April, May, June
(b) Cetaceans

FAUNAL ACCOUNT

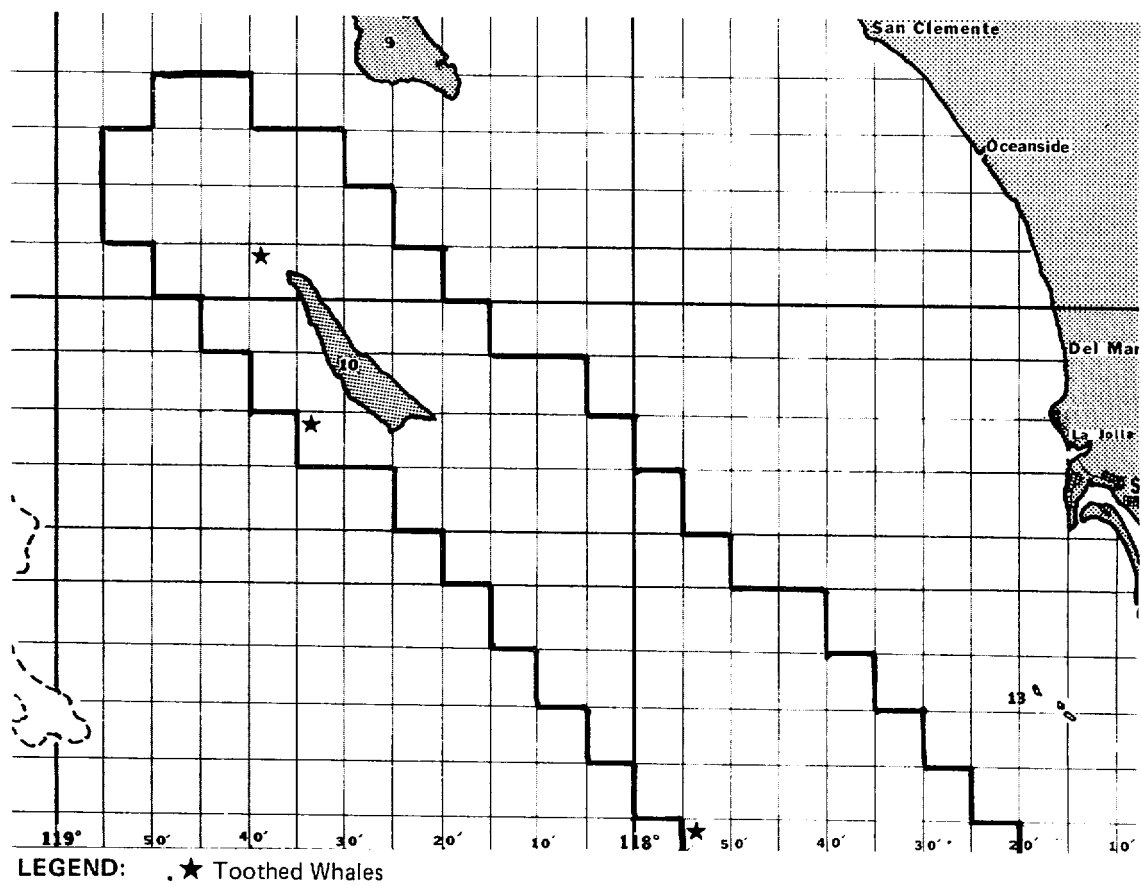
Cetacean numbers were at their lowest for the year, with only 0.57% of the year's total population in this zone recorded. Water temperatures were at their lowest annual levels during April, followed by a warming trend in May and June.

Species diversity was also at a minimum. Only three sightings of small groups of three species were noted (18 total), located along the eastern edge of the San Nicolas Basin and along the southern border of the San Clemente Basin (Table II-54 , Fig. 11-41).

TABLE II- 54. Cetacean Popul ation Summary: San Cl emente Ridge during Apri 1 - June, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
No sightings reported						
TOOTHED WHALES						
Common dolphin	1	33.33	12	66.67	12.0	12 12
Dan's porpoise	1	33.33	1	5.56	1.0	1 1
Pacific white-sided dolphin	1	33.33	5	27.78	5.0	5 5
SUBTOTAL	3	99.99	18	100.00	6.0	12 1
UNIDENTIFIED WHALES						
No sightings reported						
TOTAL	3	100.00	18	100.00	6.0	12 1

Figure 11-41 . Cetacean population distribution:
San Clemente Ridge zone,
April-June, 1975



SAN CLEMENTE RIDGE -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

During these months the highest cetacean numbers for the year were recorded. Nearly 69% (1,220 animals) of the total was represented by the common dolphin (Table II-55). With the exception of Santa Monica Basin, this species was widely distributed throughout the Southern California Bight. This activity was coincident with increased water temperatures that reached peak high levels by the end of September.

TABLE II-55. Cetacean Population Summary: San Clemente Ridge during July - September, 1975.

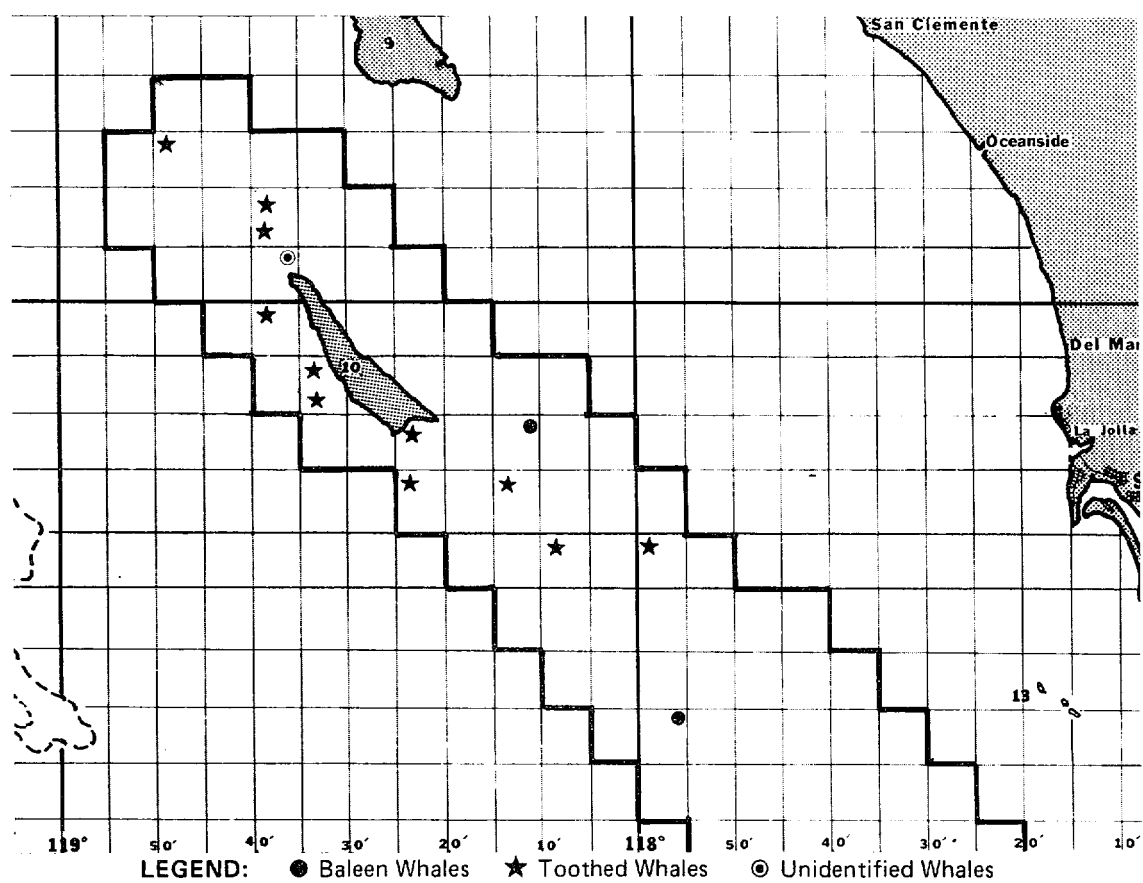
Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Blue whale	1	7.14	1	0.06	1.0	1 1
Minke whale	1	7.14	2	0.11	2.0	2 2
SUBTOTAL	2	14.28	3	0.17	1.5	2 1
TOOTHED WHALES						
Common dolphin	6	42.86	1,220	68.73	203.3	500 20
Pacific white-sided dolphin	4	28.57	470	26.48	117.5	200 50
Risso's dolphin	1	7.14	80	4.51	80.0	80 80
SUBTOTAL	11	78.57	1,770	99.72	160.9	500 20
UNIDENTIFIED WHALES						
small (<20')	1	7.14	2	0.11	2.0	2 2
SUBTOTAL	1	7.14	2	0.11	2.0	2 2
TOTAL	14	100.00	1,775	100.00	126.8	500 1

Of the remaining cetacean population, Pacific white-sided dolphins made up 84.6%. This species was observed twice in association with California sea lions, with feeding evident during one of these encounters.

Two sightings made up the baleen whales recorded in the area: one was a solitary adult blue whale, the other was of two mature minke whales.

Sightings for the period were spread generally from north of San Clemente Is., along the western side of the island and south, following the ridge topography bordering San Clemente Basin (Fig. II-42).

Figure II-42 . Cetacean population distribution:
San Clemente Ridge zone,
July-September, 1975



SAN CLEMENTE RIDGE -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

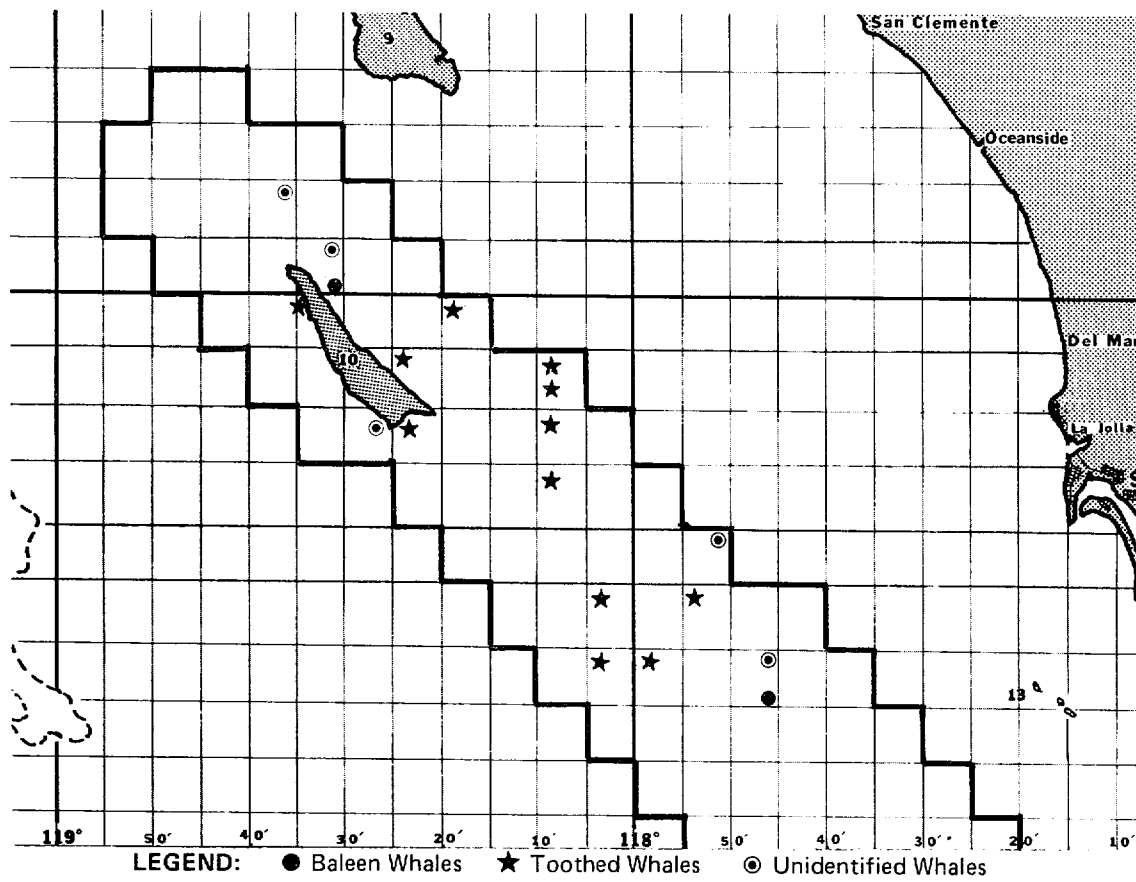
Water temperatures reached peak high levels in October, followed by a cooling trend. Sightings early in the quarter were minimal with an increase in activity toward the end of the quarter. The annual California gray whale migration through the Southern California Bight began in December; a single sighting of four southbound animals was made along the northeast side of San Clemente Island. The only other baleen whale sighting (minke whale) was made in the extreme southern portion of the zone (Table II-56 , Fig. II-43).

TABLE II- 56. Cetacean Population Summary: San Clemente Ridge during October - December, 1975,

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi Lo
BALEEN WHALES						
Gray whale	1	5.26	4	0.37	4.0	4 4
Minke whale	1	5.26	3	0.28	3.0	3 3
SUBTOTAL	2	10.52	7	0.65	3.5	4 3
TOOTHED WHALES						
Common dolphin	2	10.53	9	0.83	4.9	8 1
Dall's porpoise	4	21.05	36	3.33	9.0	25 1
Northern right whale dolphin	2	10.53	4	0.37	2.0	3 1
Pacific white-sided dolphin	4	21.05	1,000	92.51	250.0	600 100
SUBTOTAL	12	63.16	1,049	97.04	87.4	600 1
UNIDENTIFIED WHALES						
Large. (>40')	1	5.26	1	0.09	1.0	1 1
small (<20')	4	21.05	24	2.22	6.0	12 1
SUBTOTAL	5	26.31	25	2.31	5.0	12 1
TOTAL	19	100.00	1,081	100.00	56.8	600 1

Appearance of northern right whale dolphins and Dall's porpoises, both cool-water species, was coincidental with the cooling trend of water temperatures. The Pacific white-sided dolphin population reached its peak during these months, with sightings along the eastern side of San Clemente Is. and over the San Clemente Basin.

Figure II-43 . Cetacean population distribution:
San Clemente Ridge zone,
October-December, 1975



SAN CLEMENTE RIDGE -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

These months showed a decrease of total cetacean population when compared to the previous three-month period. Species diversity increased with sightings of temperate- and warm-water species such as Risso's dolphins, bottlenose dolphins, and pilot whales, which previously had been observed to the north of this zone (Table II-57). Their apparent movement south and offshore coincided with the intrusion of cool water from the north. Five of the sixteen sightings of toothed whales occurred on or near Fortymile Bank, 22 nm (40 km) southeast of Pyramid Head, San Clemente Island (Fig. II-44). As shallow as 41 fathoms (75m), this knoll drops off steeply to the west to more than a mile (1750 m) deep along a surface distance of about 6 nm (11 km). One sighting of four gray whales occurred over this area as well.

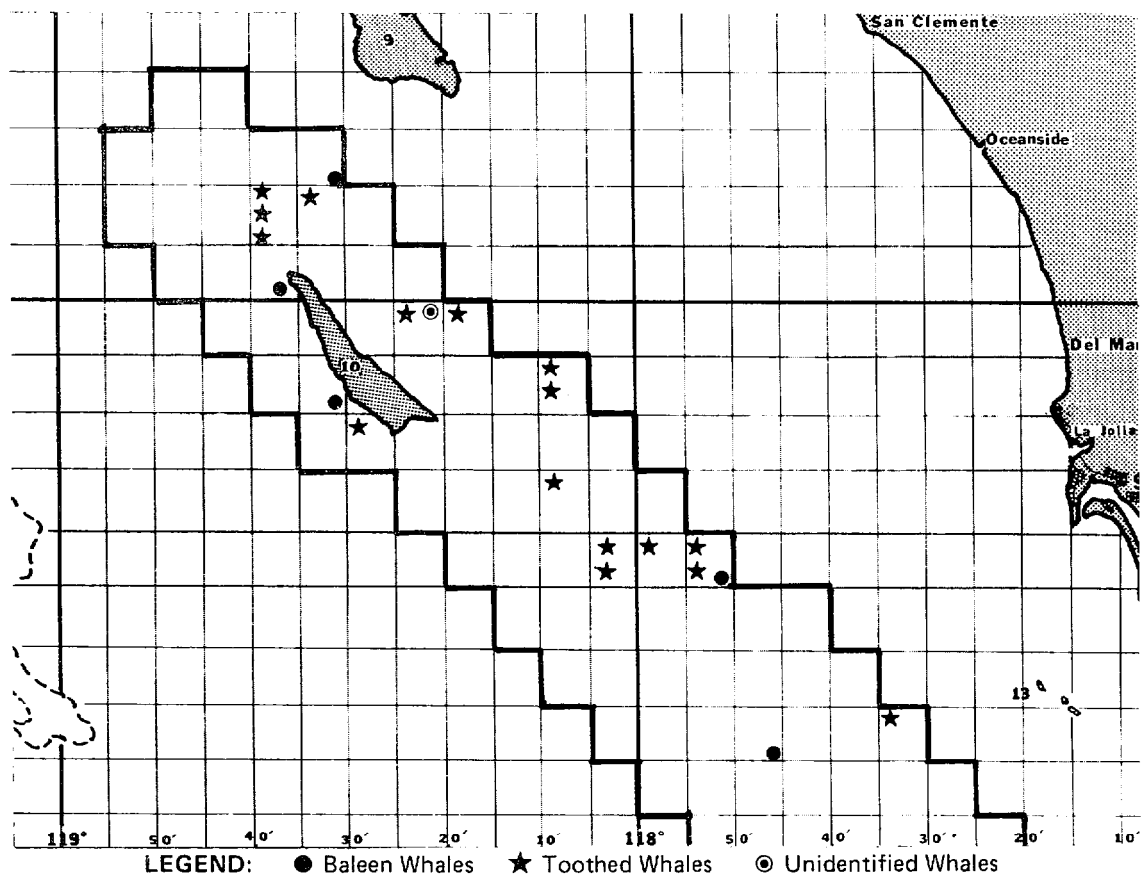
TABLE 11-57. Cetacean Population Summary: San Clemente Ridge during January - March, 1976.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Gray whale	5	22.73	14	4.98	2.8	4 1
SUBTOTAL	5	22.73	14	4.98	2.8	4 1
TOOTHED WHALES						
Bottlenose dolphin	1	4.55	20	7.12	20.0	20 20
Common dolphin	2	9.09	38	13.52	19.0	30 8
Dall's porpoise	6	27.27	23	8.19	3.8	10 1
Killer whale	1	4.55	1	0.36	1.0	1 1
Northern right whale dolphin	2	9.09	70	24.91	35.0	50 20
Pacific white-sided dolphin	2	9.09	18	6.41	9.0	12 6
Pilot whale	1	4.55	45	16.01	45.0	45 45
Risso's dolphin	1	4.55	50	17.79	50.0	50 50
SUBTOTAL	16	72.74	265	94.31	16.5	50 1
UNIDENTIFIED WHALES						
Medium (20' -40')	1	4.65	2	0.71	2.0	2 2
SUBTOTAL	1	4.55	2	0.71	2.0	2 2
TOTAL	22	100.00	281	100.00	12.8	50 1

California gray whales continued their southerly migration during January, with most sightings in the eastern coastal zones. Movement of gray whales during March suggested the northerly migration had begun. Few inshore sightings of northerly migrating gray whales, with or without calves, may indicate a general offshore northern migratory passage.

Cetacean sightings were mainly along the eastern side of San Clemente Is., extending north and south of the island along the lay of the underwater topography, with concentrations of activity over certain irregularities.

Figure II-44 . Cetacean population distribution:
San Clemente Ridge zone,
January-March, 1976



TANNER-CORTÉS BANKS -- April, May, June
(b) Cetaceans

FAUNAL ACCOUNT

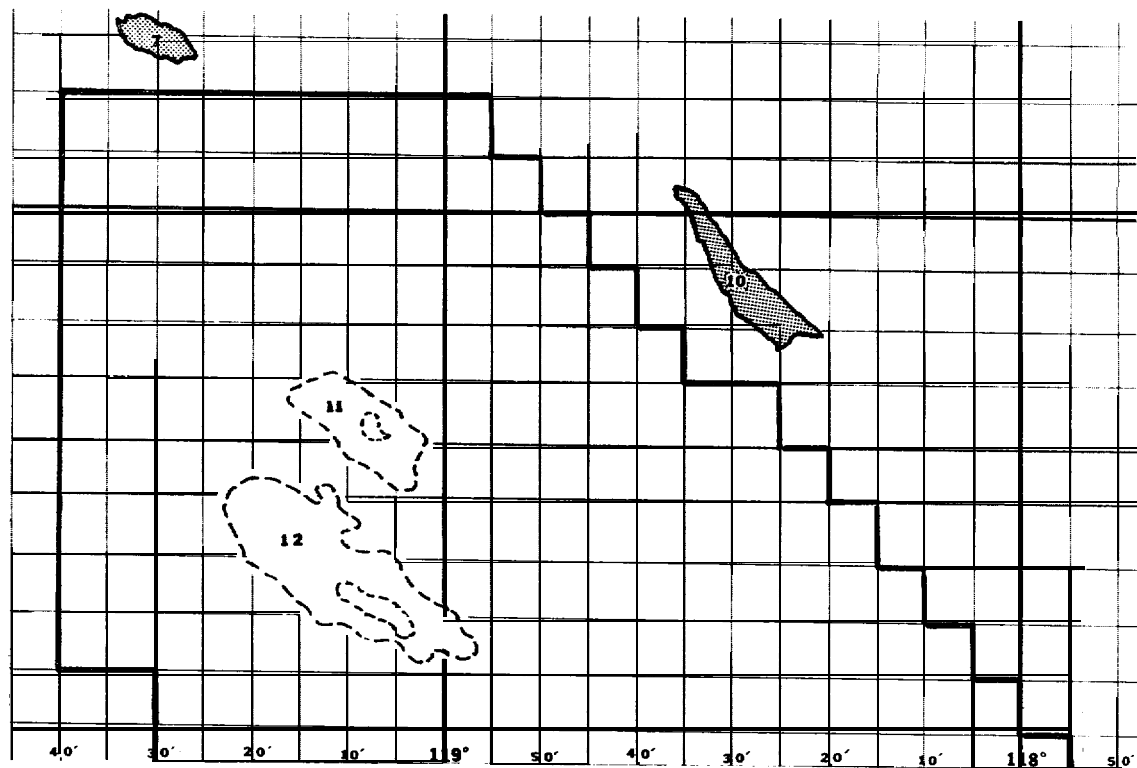
No cetacean sightings were recorded during these months (Table II-58 , Fig. II-45). Water temperatures were warming from their annual low levels. Current data for **this** quarter show this time period to be one **of minimal** cetacean activity.

TABLE II- 58. Cetacean Population **Summary: Tanner-Cortés Banks** during April - June, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range</u>	
BALEEN WHALES							
No sightings reported							
TOOTHED WHALES							
No sightings reported							
UNIDENTIFIED WHALES							
No sightings reported							

Sightings of both baleen and toothed whales occurred in adjacent areas located to the north and east of the Tanner-Cortés Banks, indicating that, although unobserved, these highly mobile animals may well have passed through these waters.

Figure II-45 . Cetacean population distribution:
Tanner-Cortés Banks zone,
April-June, 1975



TANNER-CORTÉS BANKS -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

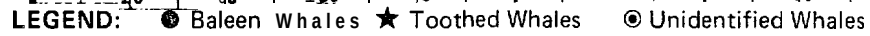
The year's only sightings of sei whales in the Southern California Bight (SCB)--two shipboard observations totaling five animals--were recorded along the western edge of Cortés Bank almost simultaneously in time and within about four km of each other (Table II-59). This area is apparently part of the migratory pathway of some of the less frequently observed baleen whales in the Bight. Two sightings of solitary blue whales were also recorded here; one to the north along the eastern edge of San Nicolás Basin, the other to the south, along the eastern edge of San Clemente Basin (Fig. II-46).

TABLE II- 59. Cetacean Population Summary: Tanner-Cortés Banks during July - September, 1975.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Blue whale	2	16.67	2	0.14	1.0	1 1
Sei whale	2	16.67	5	0.36	2.5	3 2
SUBTOTAL	4	33.34	7	0.50	1.7	3 1
TOOTHED WHALES						
Common dolphin	4	33.33	1,323	94.10	330.8	1,000 11
Pacific white-sided dolphin	2	16.67	70	4.98	35.0	50 20
Risso's dolphin	1	8.33	5	0.36	5.0	5 5
SUBTOTAL	7	58.33	1,398	99.44	199.7	1,000 5
UNIDENTIFIED WHALES						
Medium (20'-40')	1	8.33	1	0.07	1.0	1 1
SUBTOTAL	1	8.33	1	0.07	1.0	1 1
TOTAL	12	100.00	1,406	100.00	117.2	1,000 1

Three species of toothed whales were observed along the southern portion of the Santa Rosa-Cortés Ridge. Common dolphins reached their peak numbers during these summer months, the zonal total representing 11.4% of the species' population for the SCB in this period. Sighting records show this species, as well as Pacific white-sided dolphins, congregated primarily in the southern part of this zone, with scattered small- to medium-sized groups elsewhere throughout the SCB. Water temperatures continued warming to peak high levels at the end of the quarter.

Cetacean population distribution:
Tanner-Cortés Banks zone,
July-September, 1975



TANNER-CORTÉS BANKS -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

Species diversity was the greatest for the year, coinciding with peak population levels in the entire Southern California Bight (SCB). Water temperatures in October were at peak high levels, with a cooling trend starting in November and December.

The year's largest numbers of both Risso's dolphin and Dan's porpoise were seen in this period. Although not uncommon, this mixing of temperate- and cool-water species exemplifies the richness of species variety throughout the SCB. All six sightings of Risso's dolphin were in association with other cetacea; four of the six were also in association with California sea lions, and one sighting included a newborn animal (Table II-60).

TABLE 11-60. Cetacean Population Summary: Tanner-Cortés Banks during October - December, 1975.

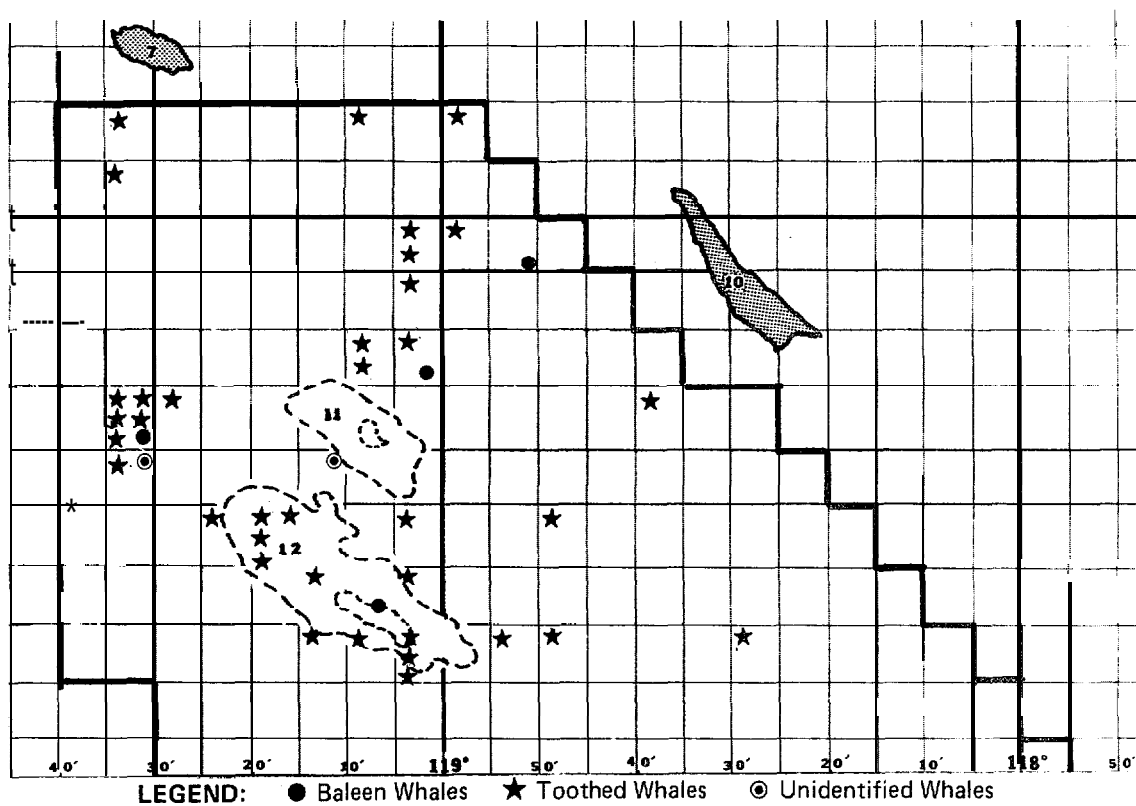
Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi	Lo
BALEEN WHALES							
Fin whale	1	2.33	1	0.08	1.0	1	1
Humpback whale	1	2.33	1	0.08	1.0	1	1
Minke whale	2	4.65	3	0.24	1.5	2	1
SUBTOTAL	4	9.31	5	0.40	1.2	2	1
TOOTHED WHALES							
Common dolphin	9	20.93	489	38.81	54.3	250	1
Dan's porpoise	13	30.23	67	5.32	5.2	12	1
Northern right whale dolphin	5	11.62	566	44.92	113.2	500	4
Pacific white-sided dolphin	4	9.30	81	6.43	20.3	25	12
Risso's dolphin	6	13.95	24	1.90	3.8	12	1
SUBTOTAL	37	86.03	1,227	97.38	33.2	500	1
UNIDENTIFIED WHALES							
Medium (20' -40')	1	2.33	1	0.08	1.0	1	1
small (<20')	1	2.33	27	2.14	27.0	27	27
SUBTOTAL	2	4.66	28	2.22	14.0	27	1
TOTAL	43	100.00	1,260	100.00	29.3	500	1

Common dolphin sightings were concentrated around Tanner and Cortés Banks in small- to medium-sized groups. Minke whales were sighted on Cortés Bank and north of this area along the southern edge of San Nicolás Basin.

One fin whale was sighted in association with common dolphins, Risso's dolphins, and Pacific white-sided dolphins, approximately 15 nm (28 km) northwest of Cortés Bank (Fig. II-47) and about 110 nm (200 km)

off the mainland coast. This area has a shallow peak rising to within 24 fathoms (44 m) of the surface; it is separated from the Santa Rosa-Cortés Ridge by the Tanner Basin, and from the Cortés Bank by a submarine canyon extending to a depth of 740 fathoms (1,366 m). One of five sightings of northern right whale dolphins also occurred in this area. During these months, sightings of this species (566 animals) were more numerous here than elsewhere in the SCB.

Figure II-47 . Cetacean population distribution:
Tanner-Cortés Banks zone,
October-December, 1975



TANNER-CORTÉS BANKS -- January, February, March
(b) Cetaceans

FAUNAL ACCOUNT

The winter months showed the highest cetacean population levels, with almost 40% of the zone's annual total recorded during this period.

Both northern right whale dolphins and Pacific white-sided dolphins reached their peak densities. Three records of fin whales also indicated increased concentrations (Table 11-61); two sightings (a mature pair and a pod of seven adults) were over San Nicolas Basin, and the third (a single adult) was west of Tanner and Cortés Banks (Fig. II-48).

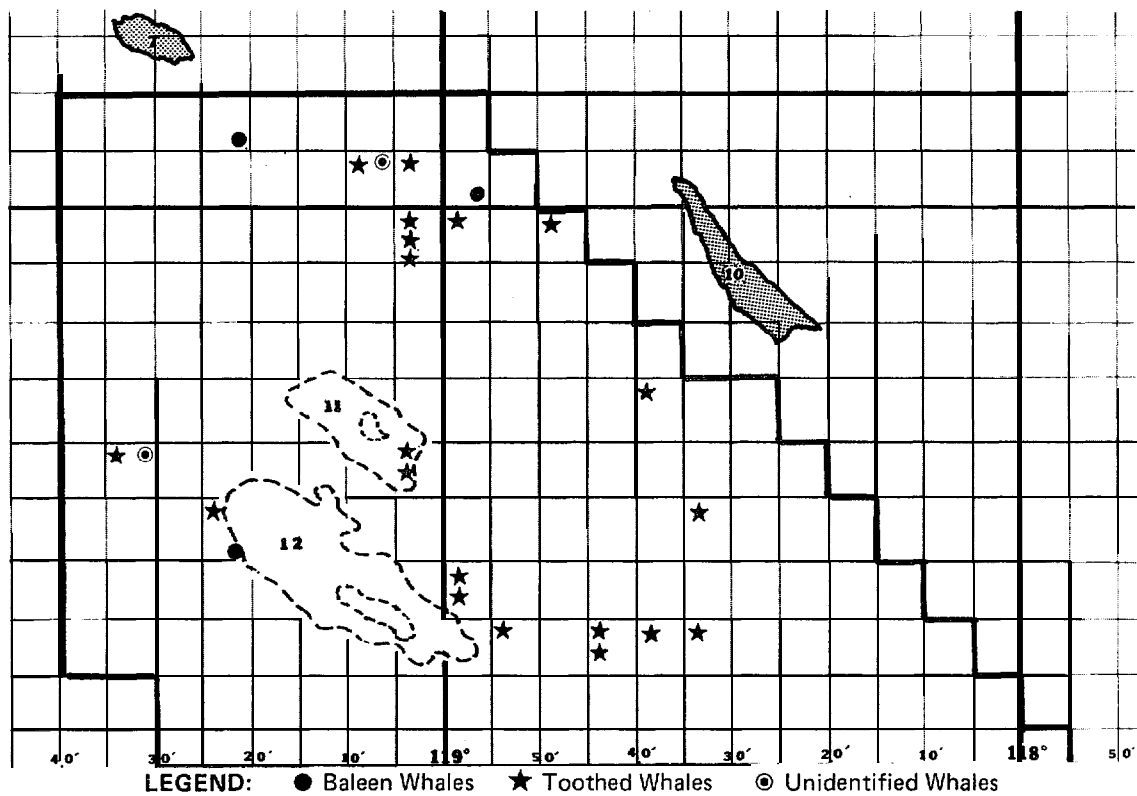
TABLE 11-61. Cetacean Population Summary: Tanner-Cortés Banks during January - March, 1976.

<u>Species</u>	<u>SCHOOL SIGHTINGS</u>		<u>SCHOOL COMPOSITION</u>		<u>SCHOOL SIZE</u>	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
Fin whale	3	11.54	10	0.57	3.3	7 1
SUBTOTAL	3	11.54	10	0.57	3.3	7 1
TOOTHED WHALES						
Common dolphin	2	7.69	800	45.27	400.0	500 300
Dall's porpoise	4	15.38	18	1.02	4.5	6 2
Northern right whale dolphin	10	38.46	644	36.45	64.4	275 5
Pacific white-sided dolphin	3	11.54	278	15.73	92.7	250 8
Risso's dolphin	1	3.85	12	0.68	12.0	12 12
SUBTOTAL	20	76.92	1,752	99.15	87.6	500 2
UNIDENTIFIED WHALES						
Large (>40')	2	7.69	3	0.17	1.5	2 1
Medium (20'-40')	1	3.85	2	0.11	2.0	2 2
SUBTOTAL	3	11.54	5	0.28	1.6	2 1
TOTAL	26	100.00	1,767	100.00	68.0	500 1

Gray whales reached peak numbers in the coastal and intermediate offshore zones, but none were seen in this or adjacent zones to the north and west.

Water temperatures cooled in this quarter toward their annual low level .

Figure II-48 . Cetacean population distribution:
Tanner-Cortés Banks zone,
January-March, 1976



OCEANIC -- April, May, June
 (b) Cetaceans

FAUNAL ACCOUNT

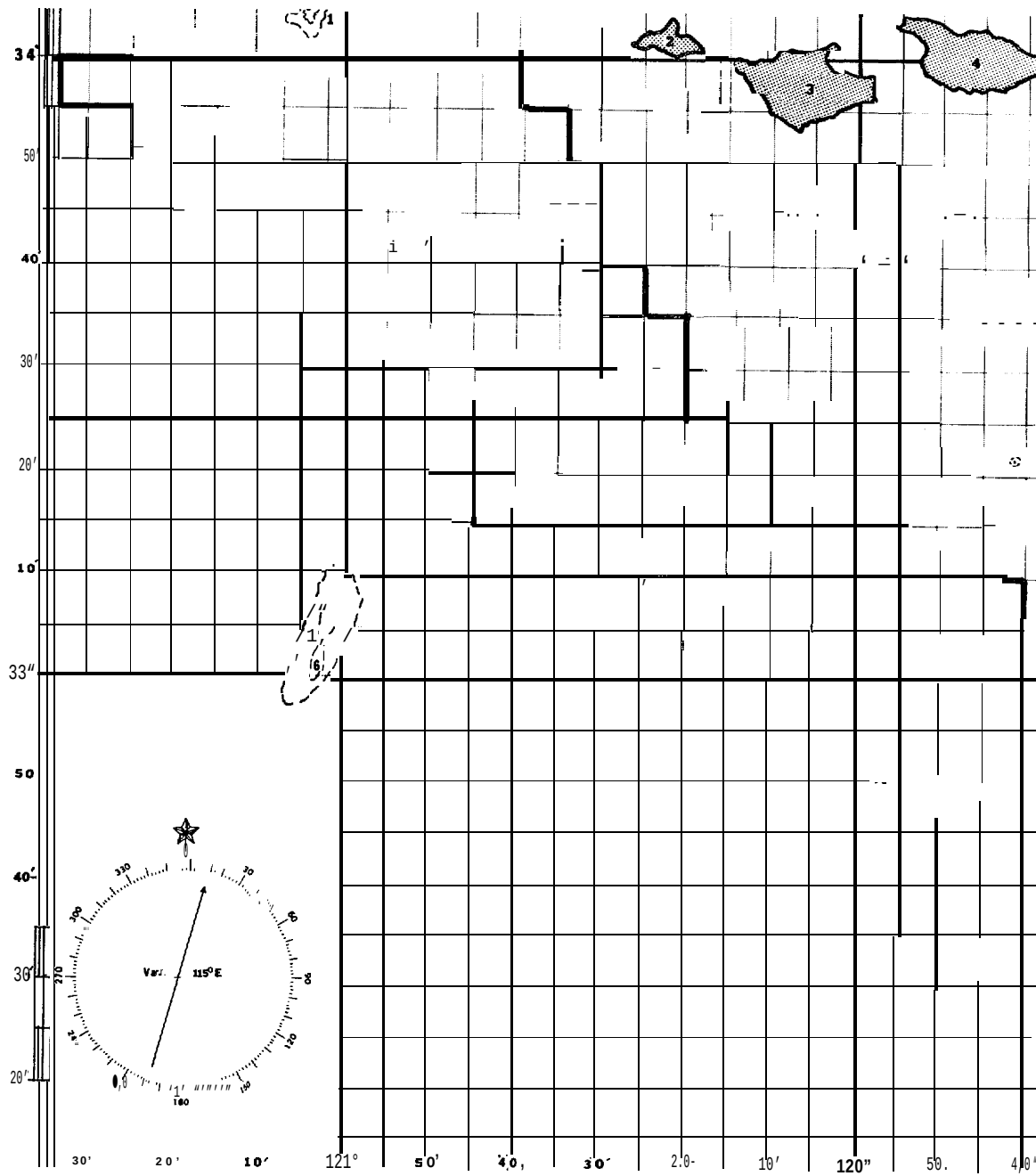
This zone quarter is marked by the lowest water column temperatures of the year. Winds of gale force are often common night and" day. The special problems of the Oceanic zone, coupled with the extreme sea state of the spring quarter, produce a challenging situation for the surveyor.

No sightings were recorded in this zone quarter (Fig. II-49 , Table 11-62).

TABLE 11-62. Cetacean Population Summary: Oceanic zone during April - June, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
	No sightings reported					
TOOTHED WHALES						
	No sightings reported					
UNIDENTIFIED WHALES						
	No sightings reported					

Figure II-49 . Cetacean population distribution:
Oceanic zone,
April-June, 1975



OCEANIC -- July, August, September
(b) Cetaceans

FAUNAL ACCOUNT

Sightings of 219 cetaceans were recorded (Table II-63),
representing 12% of the year's total in this zone.

TABLE II- .63. Cetacean Population Summary: Oceanic zone during July - September, 1975.

<u>Species</u>	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE	
	<u>Number of Sightings</u>	<u>Percent of All Sightings</u>	<u>Number of Individuals</u>	<u>Percent of all Individuals</u>	<u>Average Number Per Sighting</u>	<u>Range Hi Lo</u>
BALEEN WHALES						
No sightings reported						
TOOTHED WHALES						
Common dolphin	3	75.00	211	96.35	70.3	200 3
Risso's dolphin	1	25.00	8	3.65	8.0	8 8
SUBTOTAL	4	100.00	219	100.00	54.6	200 3
UNIDENTIFIED WHALES						
No sightings reported						
TOTAL	4	100.00	219	100.00	54.8	200 3

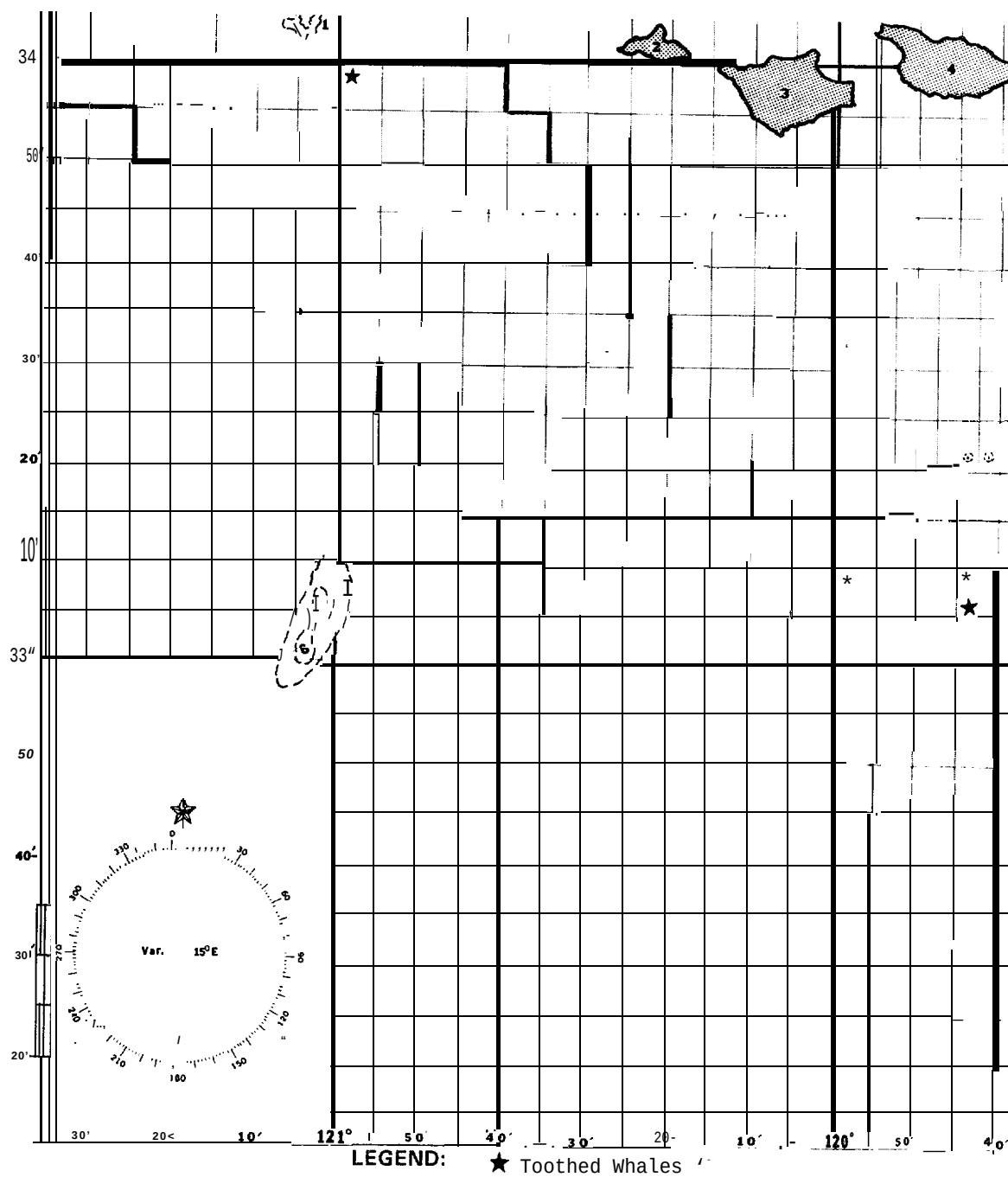
This was generally a period of change in the Oceanic zone. Water column temperatures, which had been at their lowest annual levels during spring quarter, experienced a warming trend. Westerly gales, although still plentiful, began to wane. Cetacean activities were concomitantly on the upswing.

More than 96% of the animals seen were common dolphins. (This species seems to be a seasonal visitor to the Oceanic zone; its presence is apparently dependent on thermally-related factors.) Three sightings were noted west of San Nicolas Is. on the edge of the Santa Rosa-Cortes Ridge (Fig. 11-50). Two groups were very small, totaling three and eight members respectively; the third was composed of 200 individuals, a medium-sized school for this species.

The only other cetaceans seen were eight Risso's dolphins in a school southeast of Rodriguez Dome near the northwest corner of the Patton Escarpment.

No baleen whales were observed.

Figure 11-50 . Cetacean population distribution:
Oceanic zone,
July-September, 1975



OCEANIC -- October, November, December
(b) Cetaceans

FAUNAL ACCOUNT

Six species (totaling 1,547 animals) were observed during this quarter, representing more than 87% of the year's total of cetaceans sighted (Table II-64).

TABLE II- 64. Cetacean Population Summary: Oceanic zone during October - December, 1975.

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Range Hi	Lo
BALEEN WHALES							
Fin whale	2	16.67	4	0.26	2.0	3	1
SUBTOTAL	2	16.67	4	0.26	2.0	3	1
TOOTHED WHALES							
Common dolphin	3	25.00	650	42.02	216.6	500	50
Dan's porpoise	1	8.33	3	0.19	3.0	3	3
Northern right whale dolphin	1	8.33	25	1.62	25.0	25	25
Pacific white-sided dolphin	1	8.33	500	32.32	500.0	500	500
Risso's dolphin	2	16.67	350	22.62	175.0	300	50
SUBTOTAL	8	66.66	1,528	98.77	191.0	500	3
UNIDENTIFIED WHALES							
Small (<20')	2	16.67	15	0.97	7.5	12	3
SUBTOTAL	2	16.67	15	0.97	7.5	12	3
TOTAL	12	100.00	1,547	100.00	128.9	500	1

Autumn in the Oceanic zone is marked by warm water temperatures early in the quarter. Cooling through time, the water column supports different cetacean species both in occurrence and distribution.

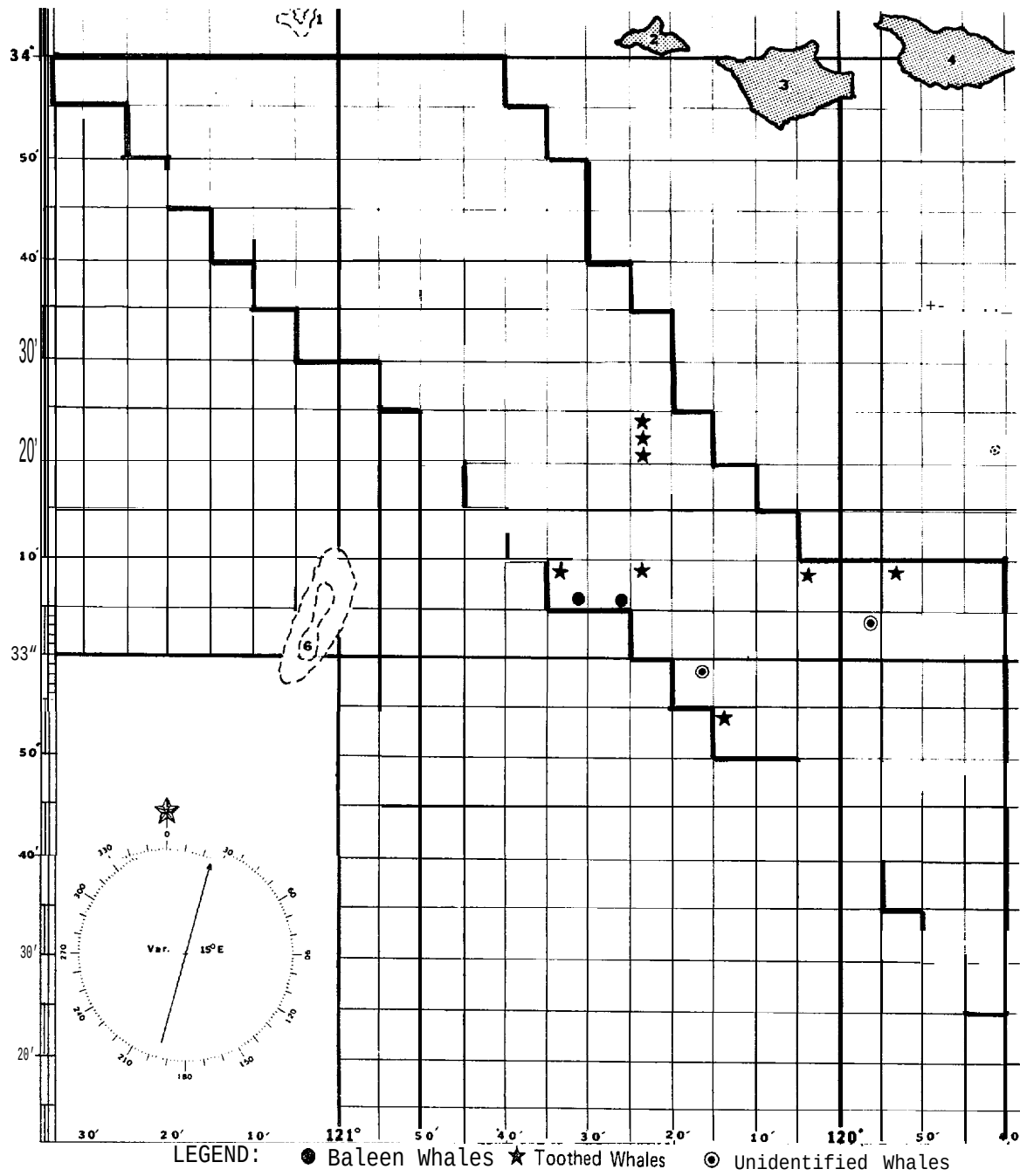
Two fin whale sightings were made east of San Juan Seamount near the Patton Escarpment (Fig. 11-51); one sighting involved three individuals, the other a solitary individual.

Dolphins of five species accounted for eight sightings and comprised over 98% of the animals seen. Species diversity was considerable among these dolphins; members of warm-water species (common dolphin), cosmopolitan species (Risso's dolphin), and cool-water species (Pacific white-Sided dolphin, Dan's porpoise, and northern right whale dolphin) shared the zone during this quarter,

Common dolphins accounted for 42% of the animals seen in the autumn quarter, and were the most numerous species in the zone this year. Two groups totaling 100 and 500 common dolphins each were observed near the Patton Escarpment, as were three DalI's porpoises. West of San Nicolas Is., 500 Pacific white-sided dolphins were seen.

Of particular note was a multiple-association including 300 Risso's dolphins. This was the largest school of this species seen this study year in the Southern California Bight. This school of cetaceans, observed in November, approximately 35 nm (65 km) west of Begg Rock and atop a nameless submarine ridge, also included 50 common dolphins and 25 northern right whale dolphins (warm- and cool-water species respectively). Remaining sightings in this quarter involved a school of 50 Risso's dolphins and two groups of unidentified small cetaceans. These sightings, as well as all the others this quarter, occurred in the area between San Juan Seamount and San Nicolas Is., in the general vicinity of the Patton Escarpment.

Figure 11-51 . Cetacean population distribution:
Oceanic zone,
October-December, 1975



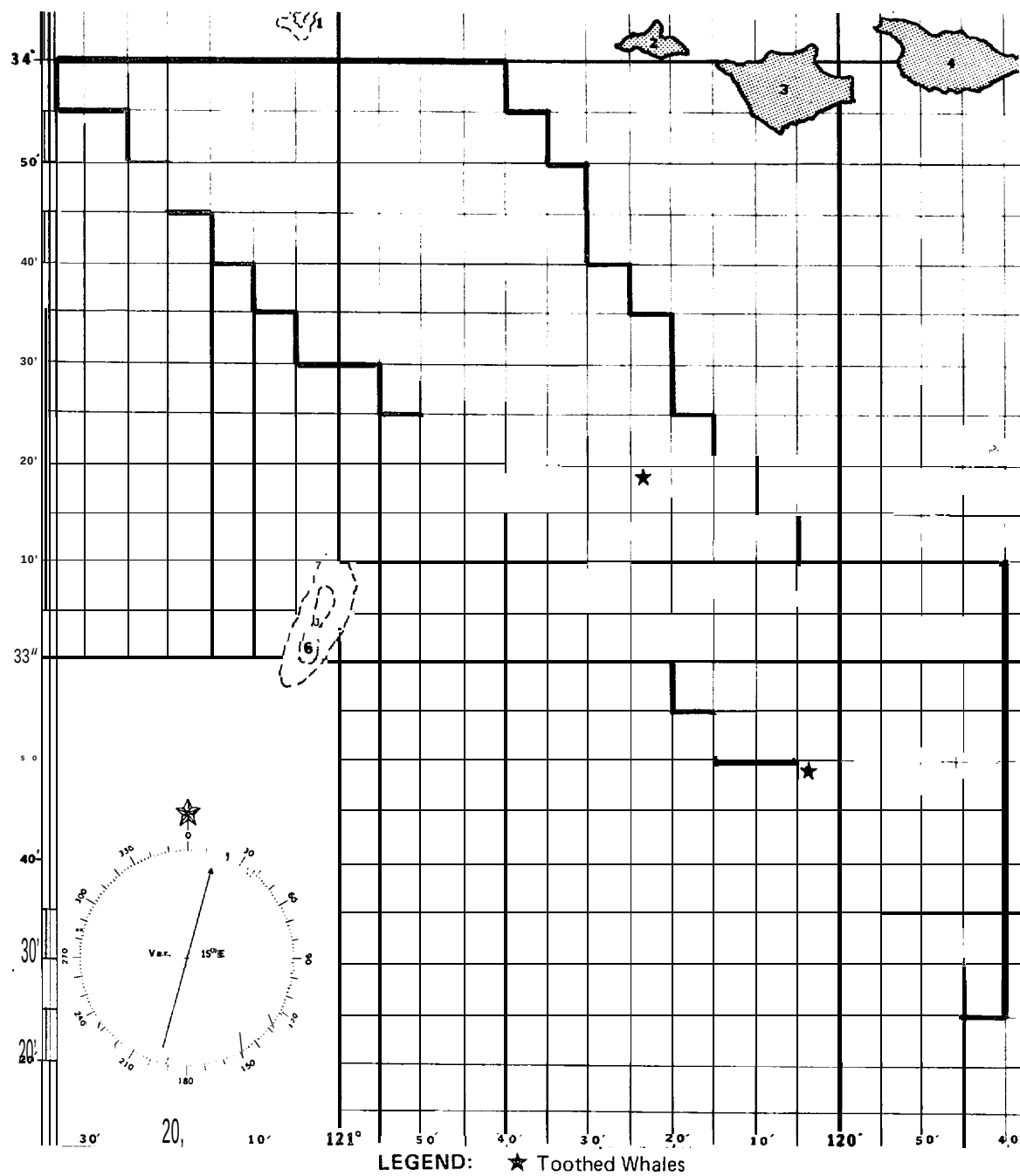
During the winter period, the Oceanic zone was undergoing a cooling trend and, compared with the autumn months, decreasing cetacean activity was evident.

Northern right whale dolphins were the only cetaceans seen--two sightings (groups of six and eight animals) were recorded between San Juan Seamount and San Nicolas Is., in the vicinity of the Patton Escarpment (Table II-65 , Fig. II-52). This cool-water species is noted for its offshore habitat, although in winter its range often extends well inshore.

TABLE II- 65. Cetacean Population Summary: Oceanic zone during January - March. 1976.

Species	SCHOOL SIGHTINGS		SCHOOL COMPOSITION		SCHOOL SIZE		
	Number of Sightings	Percent of All Sightings	Number of Individuals	Percent of all Individuals	Average Number Per Sighting	Hi	Lo
BALEEN WHALES							
No sightings reported							
TOOTHED WHALES							
Northern right whale dolphin	2	100.00	14	100.00	7.0	8	6
SUBTOTAL	2	100.00	14	100.00	7.0	8	6
UNIDENTIFIED WHALES							
No sightings reported							
TOTAL	2	100.00	14	100.00	7.0	8	6

Figure II-52 . Cetacean population distribution:
Oceanic zone,
January-March, 1976



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Sequence of Data

c) Seabirds

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Spring migration and nesting of resident southern California sea birds were in progress during these months. Moderate to very high densities of seabirds (7.5 to 180.7 birds/km²) were encountered at sea in western Santa Barbara Channel; Sooty and Pink-footed Shearwaters and nesting Western Gulls and Cassin's Auklets predominated north and northeast of San Miguel island. Closer inshore, we found several thousand cormorants (mostly Brandt's), western and California Gulls, Pigeon Guillemots and Cassin's Auklets along the coasts of the northern island chain (Table II-66); these species and Brown Pelicans were also abundant on mainland beaches at the eastern end of the channel.

TABLE 11-65. Summary of distribution and numbers of breeding and non-breeding marine birds in Santa Barbara Channel, Spring 1975. No complete island surveys occurred until late June.

	Loons & Grebes	Tube noses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species*
Density at sea ($\bar{x}$ no./km ² $\pm$ s)	0.01 ± 0.03	54.64 ± 66.18	0.02 ± 0.03	0.58 ± 0.79	0.14 ± 0.20	10.37 ± 0.20	2.15 ± 2.26	72.13 ± 61.64
Total no. near island beaches ($\bar{x}$ no./survey)	0	0	see nesting population	7	0	see nesting population	see nesting population	
Total no. on Mainland Beaches ($\bar{x}$ no./survey (no. /km ²))	0 (0.0)	0 (0.0)	37 (12.3)	0 (0.0)	0 (0.0)	251 (71.7)	0 (0.0)	288 (96.0)
Total Nesting population (pairs)	0	I 1,685-1,695	0	0	0	1,681-3,681	10,030	13,397-15,397
Number of Nesting Species	0	1	4	0	0	1	3	9

*Includes passerine, shorebirds, unidentified birds.

We recorded migratory movement of loons (mostly Arctic and Red-throated), grebes, Surf Scoters, and Northern Phalaropes in the inter-island channels, between Anacapa Is. and the mainland, and near Pt. Mugu.

Moderate numbers of beached birds washed up on Santa Barbara Channel beaches during this period. Of these, less than 25% were oiled, whereas the average for all other quarters here was 55.6% (Table II-5). Sooty Shearwaters and Western Gulls comprised the bulk of beach-cast birds.

San Miguel Is. (including Prince Is. and Castle Rk.) supports the largest and most diverse group of nesting seabirds in the Channel Islands. In former years, the diversity and numbers of birds were much greater (Table II-67).

TABLE II- 67 . Summary of the status of nesting seabirds at San Miguel Island, Prince Island and Castle Rock.

<u>Species</u>	San Miguel		Prince island		Castle Rock	
	recorded*		recorded		recorded	
	<u>past max.</u>	1975	<u>past max.</u>	1975 ≥ 1 nest, present	<u>past max.</u>	<u>1975**</u>
Ashy Storm-Petrel	no mention	none seen	400		100	
Brown Pelican	no mention	0	200	0		0
Double-crested Cormorant	25	.	350	20-40	25	
Brandt's Cormorant	"several large colonies"	42	2,500	860	1,500	216
Pelagic Cormorant	100	30	250	1	25	15
Western Gull 1	400	a few	2 4 0	600-700	100-150	a few
Common Murre	no "mention	0	100	0	no mention	0
Pigeon Guillemot	110	140	200	200	30	40
Xantus' Murrelet	no mention	0	4	25	1	
Cassin's Auklet	no mention	0	3,000	9,600 12,800	no mention	
Tufted Puffin	"Common"	0	1 arge colony	0	no mention	0

* Number of pairs presumed nesting; for sources of- historical data see Vol. 111, Appendix 111- A3.

** We were unable to land on Castle Rock in 1975 and data are incomplete.

Declines in numbers of birds and diversity probably resulted from the combined effects of egg collecting, possible changes in food resources (Common Murre, Tufted Puffin; Ainley and Lewis 1974), and contamination with DDT (Brown Pelican, Double-crested and Brandt's Cormorants; Anderson et al. 1969, Gress et al. 1973, Anderson and Anderson 1976). Pelagic Cormorants have also declined dramatically. Western Gulls and Cassin's Auklets, however, appear to have increased in numbers.

Nesting activity began on San Miguel in March, when Cassin's Auklets started to lay and lasted until August when storm-petrels, cormorants, Pigeon Guillemots and late broods of Cassin's Auklets fledged. Maximum nesting activity occurred from April through June or July.

Foods data obtained from young Prince Is. Brandt's Cormorants and Western Gulls are presented in Table II-68 . The cormorants relied exclusively on fish, while gulls, though using a wide variety of foods, fed primarily on squid.

TABLE II-68 . Foods obtained from chicks on Prince Island, 1975.

	Brandt's Cormorant		Western Gull	
Number of samples	3		26	
	% by occur.	% by wt.	% by occur.	% by wt.
<u>Loligo opalescent</u>	0	0	38.0	58.0
Euphausiidae sp.	0	0	7.7	0.8
<u>Sardinops caeruleus</u>	0	0	3.8	1.9
Eel, sp.	0	0	3.8	0.6
Atherinidae sp.	0	0	3.8	10.9
Scorpaenidae sp.	100		0	0
Fish, sp.	67		46.0	16.8
Sea lion placentae	0	0	3.8	3.0
other	0	0	7.0	8.0

Data on foraging distributions were obtained for five of the eight species of seabirds nesting on Prince Island (Table II- 69). Brandt's Cormorants and Pigeon Guillemots were found foraging close to the islands. Most records were within 1-4 km of shore. The large number of guillemots seen 5-7 km out from San Miguel represent a single sighting of 14 birds near Richardson Rk. In contrast, Cassin's Auklets were generally found much farther offshore. Their foraging areas varied between 7 and 17 km north and west of Prince Island.

TABLE 11-69. Summary, average number of sightings on radial transects San Miguel Island, nesting species 1975,

Species ¹	Month	Distance away from island in km										
		0-1.85	1.85-3.70	3.70-5.55	5.55-7.40	7.40-9.25	9.25 -11.1	11.1-12.95	12.95 -14.8	14.8 -16.65	16.65-18.5	
COB	May	4.75	1.00	2.25	0.25	0.50	0	0	0	2		
COB	July	0	0	0	0	0	0	0	0	0	0	
GUW	May	5.00	1.00	2.75	1.25	2.50	1.50	3.00	1.75	-		
GUW	July	0	2.00	1.00	1.00	2.00	0	0	0	0	0	
MLX	May	0	0.75	0	0.50	0	0	0.75	0			
MLX	July	0	0	0	0	0	0	0	0	0	0	
AKC	May	2.50	5.00	15.00	23.50	29.75	17.25	9.25	9.50	-		
AKC	July	0	0	4.00	3.00	0	2.00	21.00	3.00	0	0	
GP	May	1.75	0.75	0.25	3.50	0	0	0	0			
GP	July	0	0	0	0	0	0	0	0	0	0	

¹ COB = Brandt's Cormorant; GUW = Western Gull; MLX=Xantus' Murrelets; AKC = Cassin's Auklet; GP = Pigeon Guillemot.

² no data taken

Western Gulls foraged widely, as shown by radio-tracking during the incubation period. Birds were tracked west of Richardson Rock; between Prince Is. and Brockway Pt., Santa Rosa Island; and along an arc from Gaviota on the mainland to north of Barrington Pt., Santa Rosa Island. A number of gulls foraged in San Miguel Passage and a few were tracked south of Cardwell Pt., San Miguel Island. One color-marked gull from Prince Is. was observed between Santa Rosa and Santa Barbara islands, suggesting that birds from Prince Is. may also wander south and east in search of food.

Data on the status of seabirds nesting on Santa Rosa Is. are sparse. The relatively few birds nesting on the island (Table II- 70) generally utilize inaccessible areas. Only Brandt's Cormorants and Pigeon Guillemots nest in even modest numbers. These low numbers are most likely the result of a lack of nest sites inaccessible to island foxes.

TABLE 11-70 . Summary of the status of nesting seabirds at Santa Rosa Island.

<u>Species</u>	<u>Recorded past max.</u>	<u>1975</u>
Brandt's Cormorant	common	200
Pelagic Cormorant	2	present
Western Gull	several	a few
Pigeon Guillemot	common	present

The numbers of seabirds presently nesting on Santa Cruz Is. and Scorpion Rk. are possibly lower than in the past. Tufted Puffins have disappeared, and possibly Cassin's Auklets have declined. In 1975 we documented for the first time the number of seabirds nesting on Gull Island (Table II- 71).

SANTA BARBARA CHANNEL -- April, May, June
(c) Seabirds (continued)

FAUNAL ACCOUNT

Table II- 71 . Summary of the status of nesting seabirds at Santa **Cruz** Island, GuI 1 Island, and Scorpion Rock.

Species	Santa Cruz Island		Gull Island		Scorpion Rock	
	Recorded past max. *	1975	Recorded past max.	1975	Recorded past max.	1975**
Ashy Storm-Petrel	10	?	no mention	0	7	
Brown Pelican	no mention	0	no mention	0	"small numbers"	80
Double-crested Cormorant	no mention	0	no mention	0	have bred	0
Brandt's Cormorant	0	?	>3 nests present	23	small colony	0
Pelagic Cormorant	no mention	?	no mention	1	have bred	0
Western Gull	no mention	0	present?	31	present?	≈100
Pigeon Guillemot	>30	250	no mention	0	no mention	0
Xantus' Murrelet	no mention	0	no mention	0	several	0
Cassin's Auklet	no mention	0	no mention	69	"many"	1
Tufted Puffin	several	0	no mention	0	no mention	0

* Numbers refer to nesting pairs.

** Data incomplete in 1975 due to restrictions from going ashore while pelicans were nesting.

There have been dramatic decreases in the number of pelicans and cormorants nesting on **Anacapa** Island (Table II-72). These changes are probably related to reproductive failure stemming from chlorinated hydrocarbon pollution (Anderson et al. 1969, Gress et al. 1973, Anderson & Anderson 1976). Additionally, disturbance may have contributed to their decline. The disappearance of auklets and the Tufted Puffin may have been hastened by egg and specimen collectors, but it is also possible that changes in food supplies have affected these species (Ainley and Lewis 1974). In contrast, Western Gull numbers have remained stable or increased.

TABLE II-72 . Summary of the status of nesting seabirds on **Anacapa** Island.

Species	Recorded past max.*	1975
Brown Pelican	5,000	21 2**
Double-crested Cormorant	many	2
Brandt's Cormorant	50	1
Pelagic Cormorant	common	1
Western Gull	1,000	1,000-3,000
Pigeon Guillemot	several	0-8
Xantus' Murrelet	6	?
Cassin's Auklet	may have bred	none seen
Tufted Puffin	common	0

*Numbers refer to nesting pairs.

**Data from Anderson and Anderson (in press)

Seabirds probably nest on Anacapa from February through August. Pelicans are variable in the timing of their nesting and may have eggs any time from late February until early June. Pigeon Guillemots may have eggs as late as 22 June, and there are records of Xantus' Murrelet eggs from the first week of July.

We obtained eight food samples from Western Gull chicks on Anacapa. Of these, fish constituted 74% by weight, and 26% by weight was garbage. This was the only island where Western Gulls fed garbage to their young.

SANTA BARBARA CHANNEL -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

Total avian density at sea varied from 0 to 99 birds/km² in the summer months. A massing of shearwaters in the vicinity of the northern island chain led to very-high total density near Pt. Conception (99 birds/km²) and moderately-high density elsewhere west of longitude 120°W. Cassin's Auklets and Western Gulls from nesting colonies among the northern islands were seen foraging at sea north and northwest of San Miguel Is, in August. Along island shores we found substantial numbers of Brandt's Cormorants and Western Gulls (Table II-73); Pigeon Guillemots, Royal Terns, and Brown Pelicans were seen in small numbers. As in most seasons, San Miguel and Santa Rosa islands harbored the largest number of roosting seabirds.

TABLE 11-73. Summary of distribution and numbers of marine birds in Santa Barbara Channel, Summer 1975 - Anacapa Island
inshore waters were not surveyed by air to avoid disturbance of nesting Pelicans.

	Loons & Grebes	Tubenoses	Pelicans & Cormorants	Geese, Scoters & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0	15.41 ± 30.56	0.80 ± 0.91	0	0	2.23 ± 2.96	1.43 ± 1.61	20.81 ± 28.60
Total no. near island beaches ($\bar{x}$ no. /survey)	0	0	3,656	19	25	2,338	104	6,305
Total no. on Mainland beaches [$\bar{x}$ no. /survey (no. /km)]	0 (0.0)	0 (0.0)	95 (31.1)	1 (0.3)	33 (11.0)	789 (26.30)	0 (0.0)	1,126 (375.3)

Relatively low numbers of beached birds were encountered on Santa Barbara Channel beaches during the summer quarter (Table II-5). Of these, 42.6% were oiled. Most records were of Sooty Shearwaters, especially in July and September, and Western Gulls contributed moderate numbers in the latter month.

Bird densities in Santa Barbara Channel varied from moderate (5 birds/km²) in mid-channel to very high (286 to 341/km²) in the shallow waters off the Santa Barbara and Ventura Co. coastline (Fig. 11-14). The concentrations west of Ventura included loons, Western Grebes, and Western, Bonaparte's, and California Gulls. Loons and grebes were less numerous in mid-channel than farther to the east; almost all birds sighted west of longitude 119°40'W were gulls. A few small alcids and substantial numbers of cormorants and pelicans were found from one to ten km north and northeast of the island chain.

Thousands of cormorants, Brown Pelicans, and Western and California Gulls roosted on both the north and south shores of San Miguel, Santa Rosa, and Santa Cruz Is. in October. Smaller, but still large numbers of these species were present through December (Table II-74). Loons, grebes, and scoters constituted a small but increasing population of the inshore avifauna of the northern islands in October through December.

TABLE II-74 . Summary of distribution and numbers of marine birds in Santa Barbara Channel , Autumn 1975. Anacapa Island inshore waters were not surveyed.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{X}$ no. /km ² $\pm$ 5)	12.12 ± 39.55	0.07 ± 0.22	1.41 ± 2.49	0	39.69 ± 84.51	0.12 ± 0.31	70.54 ± 121.35
Total no. near island beaches ($\bar{X}$ no. /survey)	33	0	8,877	9	1,492	14	11,906
Total no. on Mainland beaches [$\bar{X}$ no./survey (no. /km)]	128 (42.7)	0	147 (48.9)	1 (0.4)	953 (317.6)	0	1,403 (457.7)

Along the Ventura Co. coastline we found many hundreds of Brown Pelicans (predominantly immature birds) and Western, California, and Ring-billed Gulls. Longshore migration of loons, grebes, and scoters was observed in November and December at McGrath S.B., mirroring the concurrent influx of these species into the open waters to the west.

Surveys of Santa Barbara Channel beaches yielded records of moderate numbers of beach-cast birds during the autumn quarter (Table II-5). Sixty-three percent were oiled. Most of the dead and oiled birds were recorded from the north side of Santa Cruz Is. in December. Violent wave action just prior to the China Harbor surveys that month eroded much of the cobblestone beach and exposed many long-dead seabird carcasses. Of 28 beach-cast birds at Santa Cruz Is., 23 were oiled. Sooty Shearwaters, Western and California Gulls, loons, grebes, and cormorants all contributed to the total here this quarter.

During this and the following quarter, Santa Barbara Channel beaches showed the highest numbers and diversity of beach-cast seabirds of our study year.

SANTA BARBARA CHANNEL-- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

Overall bird density was very high in Santa Barbara Channel and in nearshore waters of the northern islands. The eastern half of the Channel harbored large numbers of loons, grebes, murres, and gulls throughout the period (20 to 238 birds/km² in open-ocean waters); small alcids and Northern Fulmars were abundant north of San Miguel Is. in January and March. Cormorants, Brown Pelicans, several species of gulls, scoters, and grebes were found in very large numbers at roosts and in nearshore waters along the mainland and northern shores of the islands (Table II-75).

TABLE II- 75. Summary of distribution and numbers of marine birds in Santa Barbara Channel , Winter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters & Mergansers	Phalaropes	Jaegers ,Gul ls & Terns	Alcids	All Species combined
Density at Sea ($\bar{X}$ no/km ² $\pm$ s)	12.49 ± 33.14	2.11 ± 4.48	1.38 ± 1.96	0.04 ± 0.16	0.31 ± 1.08	8.26 ± 8.90	14.87 ± 16.52	41.90 ± 62.06
Total no. near island beaches ($\bar{X}$ no. /survey)	3,105	0	4,629	1,295	11	5,615	16	17,023
Total no. on Mainland beaches ($\bar{X}$ no. /survey (no. /km)]	19.7 (6.0)	0	3.7 (1,2)	1.0 (0.3)	0	1217.0 (369.0)	0	1333.3 (444.4)

Counts of beached birds on Santa Barbara Channel beaches were highest during this quarter, reaching 2.93 birds/km/month, nearly 60% of which were oiled (Table II-5). Surveys during April 1976 found continuing high beached-bird rates (2.52/km/me), although the oiling percentage dropped to 37.9. Fulmars and kittiwakes comprised the bulk of the beached birds, particularly in February and March. (A major die-off of these two species was recorded throughout California at this time.) January beach surveys recorded fewer total beached birds than in February and March, and fulmars and kittiwakes were not as predominant.

SANTA ROSA RIDGE -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

We recorded moderate to low densities of birds at sea through most of the waters of this area; only near San Nicolas Is. and on the eastern escarpment of the Santa Rosa Ridge was total density more than ten birds/km² (Fig. 11-10). In the latter region Sooty Shearwaters were abundant, moving primarily northwestward as part of the main mass of migration that passed through Santa Cruz Basin.

Migratory activity of Bonaparte's Gulls, terns, and several species of shorebirds (including phalaropes) was seen south of San Miguel Passage in April and early May. Auklets, puffins, and gulls were also found south of San Miguel Island. Inshore near San Nicolas Is. we found Western Gulls and Brandt's Cormorants in large numbers (Table 11-76). Late in June these same waters and those from 5 to 15 km northeast of San Nicolas Is. harbored small numbers of Xantus' Murrelets, probably from the colony on Santa Barbara Island.

TABLE 11-76. Summary of distribution and numbers of breeding and non-breeding marine birds on the Santa Rosa Ridge, spring 1975. No complete island survey occurred until late June.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes & Terns	Jaegers, Gulls	All Species Alcids, combined
Density at sea ($\bar{x}$ No. /km ² $\pm$ s)	1.38 ± 1.83	12.16 ± 26.14	0.02 ± 0.03	0	1.20 ± 1.36	1.28 ± 1.48 29.95 ± 54.19
Total no. near San Nicolas Is. beaches ($\bar{x}$ no. per survey)	0	0	see nesting population	1	0	see nesting population
Total Nesting Population (pairs)	0	0	365	0	720	0 1,085
Number of Nesting Species	0	0	1	0	1	0 2

The past status of seabirds nesting on San Nicolas Is. is poorly documented. In addition to the data presented in Table II-77 , there are unsubstantiated reports that unidentified storm-petrels, Brown Pelicans, and Double-crested Cormorants nested at one time or another.

TABLE II-77. Summary of the status of nesting seabirds on San Nicolas Island.

<u>Species</u>	<u>Recorded past max.</u>	<u>1975</u>
Brandt's Cormorant	A small colony	365
Western Gull	600	720

Reproductive success of Brandt's Cormorants on San Nicolas Is. was generally poor. In 1973 R. Lust (in lit.) documented eggshell thinning in Brandt's Cormorants on San Nicolas Is. which led to total reproductive failure. In other years, it appeared that disturbance of nesting cormorants by persons stationed on the island has led to destruction of cormorant eggs by gulls. In 1975, of 52 active nests counted on 20 April, only 15 had chicks on 19 June. The remainder had been abandoned by 11 June or had otherwise failed.

Though we were unable to obtain adequate data on reproductive success of Western Gulls on San Nicolas Is., it appears to have been low; foxes frequent the colony, and it is likely they take numbers of eggs and chicks.

The mean growth rate of eleven young Western Gulls on San Nicolas Island was 31.5 ± 10.0 g/day. This is relatively high for Western Gull chicks (Hunt and Hunt 1976), and indicates that in 1975 adequate food resources were available to the gulls.

Samples of food used by Western Gulls on San Nicolas Is. were obtained from 21 chicks (Table II-78). Food sources used by these chicks were found to be similar to those used by Western Gull chicks on other islands, but proportions differed. On San Nicolas, fish and sea lion placentae were used more and squid was used less than at Prince Island.

TABLE II-78. Foods obtained from Western Gull chicks on San Nicolas Island.

Food type	% by occurrence	% by weight
<u>Loligo opalescens</u>	10.0	9.0
Gastropod, sp.	5.0	1.0
Euphausiidae sp.	5.0	0.9
<u>Pollicipes polymerus</u>	5.0	0.2
<u>Engraulis mordax</u>	19.0	16.0
<u>Amphistichus argenteus</u>	10.0	9.0
Scorpaenidae, sp.	5.0	3.7
Fish, sp.	48.0	46.0
Sea lion placenta	14.0	14.0

We found low (1.08 birds/km²) to high (52/km²) total densities along the Santa Rosa Ridge in mid-summer (Fig. 11-12). Geographical variation in total density was almost exclusively a function of the distribution of Sooty and Pink-footed Shearwaters. These birds were concentrated south of the northern island chain; most birds were flying west or south. By late September, shearwater numbers had decreased considerably.

Juvenile Brandt's Cormorants and Western Gulls first appeared at sea late in this period. Birds of these two species, Brown Pelicans, and Royal Terns were seen roosting at San Nicolas Is. in moderate numbers (Table II-79).

In late September, we documented southbound migration of Pomarine Jaegers, Sabine's Gulls, and Arctic Terns over and west of the Santa Rosa Ridge.

TABLE II- 79. Summary of distribution and numbers of marine birds on Santa Rosa Ridge, Summer 1975.

	Loons & <u>Grebes</u>	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no./km ² $\pm$ s)	0	6.34 +8.29	0.15 +0.33	0	0.40 +0.80	0.72 +1.06	0.67 +1.38	10.45 +15.28
Total no. near San Nicolas Is. Beaches ($\bar{x}$ no. per survey)	0	0	743	0	0	141	0	1,080

SANTA ROSA RIDGE -- October, November, December
(c) Seabirds

FAUNAL ACCOUNT

The density of all bird species in aggregate was moderate to low in autumn, being highest within ten km of the islands (Fig. 11-14). The species groups that contributed most heavily to elevated total densities near the islands included cormorants, pelicans, jaegers, and gulls. Farther south along the Santa Rosa Ridge, only gulls and small alcids (Cassin's and Rhinoceros Auklets) were common. Migrating Arctic Loons were seen along the Ridge and near San Nicolas Is. in October and November (Table 11-80).

TABLE II - 80. Summary of distribution and numbers of marine birds on Santa Rosa Ridge, Autumn 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species Combined
Density at Sea ($\bar{x}$ no./km ² $\pm$ s)	0.28 ± 0.35	0.14 ± 0.38	0.31 ± 0.81	0.11 ± 0.24	0	4.00 ± 6.23	1.83 ± 2.98	7.37 ± 8.79
Total no. near San Nicolas Is. beaches ($\bar{x}$ no. /survey)	0	0	1,553	1	0	1,118	0	2,968

As in other sectors with islands, the nearshore fauna was large and diverse. The yearly high counts of cormorants and pelicans on shore occurred in October. Certainly most of the cormorants and pelicans and probably most of the gulls that roosted in this area utilized relatively shallow, nearshore waters for feeding during this period. Loons, grebes, and scoters constituted a small but increasing population of the nearshore avifauna of the islands as autumn progressed.

SANTA ROSA RIDGE -- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

Very large numbers of birds were found in shallow-water portions of the Santa Rosa Ridge in these months (Fig. 11-16). The nearshore waters of San Miguel, Santa Rosa, and Santa Cruz islands harbored several thousand cormorants, Eared Grebes, Surf and White-winged Scoters, and Western Gulls. Farther south, we found dense concentrations of Northern Fulmars, Western and California Gulls, Black-legged Kittiwakes, and Cassin's and Rhinoceros Auklets (20 to 156 birds/km²). The larger birds (in association with California sea lions and small cetaceans) were seen feeding on squid (presumably Loligo sp.).

Inshore around San Nicolas Is. we found an average total of about 3,000 Brandt's Cormorants, and Western, Herring, and California Gulls (Table 11-81). Other birds that concentrated close to the four northern islands (grebes, loons, and scoters) were not numerous near San Nicolas Island.

TABLE II- 81. Summary of distribution and numbers of marine birds on Santa Rosa Ridge, Winter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese Cormorants	Scoters & Mergansers	Phalaropes	Jaegers, Gulls & Terns	~~All birds~~	All Species
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0.08 $\pm$ 0.30	1.63 $\pm$ 1.59	0.77 $\pm$ 1.86	0.03 $\pm$ 0.03	3.66 $\pm$ 8.43	23.28 $\pm$ 30.69	6.01 $\pm$ 5.51	43.82 $\pm$ 45.97
Total no. near San Nicolas Is. beaches ($\bar{x}$ no. /survey)	3	0	1,141	1	5	1,359	0	2,968

SANTA CRUZ BASIN -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

Tremendous numbers of Sooty Shearwaters were found over deep water in Santa Cruz Basin (up to 570/km²); overall densities were low to moderate (2 to 12/km²) in shallower water around the rims of the basin. Migratory movement of Sooty Shearwaters was seen south of Anacapa and Santa Cruz islands and in Santa Cruz Channel. Northern Phalaropes, Western Gulls, and Cassin's Auklets also contributed substantially to total densities observed at sea (Table II-82).

TABLE 11- 82. Summary of distribution and numbers of breeding and non-breeding marine birds in Santa Cruz Basin, Spring 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters & Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at sea ($\bar{X}$ no/km ² $\pm$ s)	0.44 $\pm$ 1.01	79.03 $\pm$ 160.19	0.02 $\pm$ 0.03	0 			

Closer inshore we found hundreds of Brandt's Cormorants, Western Gulls, Pigeon Guillemots, Xantus' Murrelets, and Cassin's Auklets south of Santa Cruz and Anacapa islands and within a few km of Santa Barbara Island. Xantus' Murrelets dispersed to sea with their young from the latter island in May; they were seen most commonly north and northwest of there in late May and June. Brown Pelicans were seen foraging a few km south of Anacapa Passage.

Only three dead birds were found on beaches of this region, (south Santa Cruz Is.), none of which were oiled (Table II-5).

The pelicans, cormorants and Tufted Puffins that formerly nested on Santa Barbara Is. have decreased in numbers or disappeared entirely (Table II-83). The reasons for the decline are undoubtedly similar to those which have caused declines in these species on other islands. In addition, on Santa Barbara Is., Cassin's Auklets have declined to the point of being extirpated, though some still nest on cliffs of offshore rocks. This decline may be related to the presence of cats on Santa Barbara Is., though if this be the case, it is hard to explain why murrelets have flourished and apparently increased. Pigeon Guillemot numbers have probably remained stable. The status of Ashy Storm-Petrels at Santa Barbara Is. is not clear. Carcasses have been found in the gull colony, and J. Smail (pers. comm.) has reported the presence of the odor of a storm-petrel nest. As of 1975 no nests have been found, but it is possible that storm-petrels nest on the steep cliffs of offshore rocks.

TABLE II-83 . Summary of the status of nesting seabirds on Santa Barbara Island. *Numbers refer to pairs or estimated numbers of pairs.

<u>Species</u>	<u>Recorded past max.*</u>	<u>1975</u>
Ashy Storm-Petrel	0	None found
Brown Pelican	400	0
Double-crested Cormorant	2,000	10
Brandt's Cormorant	1,000	120
Pelagic Cormorant	Small numbers	1
Western Gulls	1,510	1,162
Pigeon Guillemots	30	80
Xantus' Murrelets	Small numbers	About 1,000
Cassin's Auklet	Large breeding colony	None found
Tufted Puffin	6	0

TOTAL 2,373 pairs

Nesting activity starts on Santa Barbara in March with Brandt's Cormorants and Xantus' Murrelets and continues at least until late July when Western Gull chicks fledge. Data were obtained in 1973 and 1975 for the laying curves of Western Gulls (modal dates of laying 3 May and 12 May respectively). In 1975 the modal dates of the hatching curve for Xantus' Murrelets were between 24 and 29 May.

Reproductive success measurements of Western Gull and Xantus' Murrelets for 1975 were made available to us (Tables II-84,-85). Hatching success in gulls was nil in supernormal clutches and only moderate in clutches of normal size. Fledging success was high. The causes of the somewhat-low hatching success in clutches of normal size is presently not known. Xantus' Murrelet eggs also had low hatching success, although all chicks that hatched survived to leave their nests at the normal time, 1-2 days after hatching. The low murrelet hatching success was the result of desertion by parents, damage by rocks, and surprisingly, predation by mice (Peromyscus maniculatus; 13 eggs).

SANTA CRUZ BASIN -- April, May, June
(c) Seabirds (continued)

FAUNAL ACCOUNT

TABLE II- 84. Summary of reproductive success of Western Gulls on Santa Barbara Island, 1975. Data from the University of California, Irvine, independent study team.

	Clutch of <u>one egg</u>	Clutch of <u>two eggs</u>	Clutch of <u>three eggs</u>	Clutch of <u>four eggs</u>	Clutch of <u>five eggs</u>	<u>TOTAL</u>
Number of nests	1	3	16	2	1	23
Number of eggs	1	6	48	8	5	68
% hatching	0	33%	63%	0	0	32
% surviving to 500 g		100%	89*	.	-	26*

●Three chicks unaccounted for.

TABLE II-85. Summary of reproductive success of Xantus' Murrelets, Santa Barbara Island, 1975.

<u>No. of nests</u>	<u>No. of eggs</u>	<u>Mean clutch size</u>	<u>% of eggs hatching</u>	<u>% of chicks leaving nest</u>
28	54	1.9	54	100%

Weight measurements were obtained from Western Gull and Xantus' Murrelet chicks. The mean growth rate of 14 gull chicks was 29.0 ± 4.18 g, a high value for this species. The weights of Xantus' Murrelet chicks did not change between hatching and nest departure. Observations at night suggest that Xantus' Murrelets do not feed their chicks prior to the chicks' going to sea at the age of two or three days.

Food samples were obtained from 18 Western Gull chicks on Santa Barbara Is. (Table II-86). The heavy use of anchovies and other fish by gulls to feed their chicks is typical of this island's population (Hunt and Hunt 1976) and differs from food use patterns on other islands.

TABLE 11-86. Foods obtained from Western Gull Chicks on Santa Barbara Island.

<u>Food type</u>	<u>% by occurrence</u>	<u>% by weight</u>
<u>Octopoda, sp.</u>	6.0	8.0
<u>Pollicipes polymerus</u>	11.0	0.6
<u>Engraulis mordax</u>	22.0	32.0
<u>Cololabis saira</u>	6.0	3.8
Fish, sp.	61.0	46.0
Sea lion placenta	6.0	4.0
Other	6.0	5.0

Data on foraging areas of Santa Barbara Is. Western Gulls were obtained from color-marked birds, radio-tracking and radial transects. Large numbers of color-marked birds were seen during the incubation period at mainland locations from Redondo Pier to San Pedro Harbor with particularly frequent sightings at a dump on the Pales Verdes Peninsula. Gulls color-marked on Santa Barbara Is. ceased visiting mainland sites once chicks began to hatch, and we found no foods derived from man in Western Gull chicks, thus confirming a shift in foraging patterns with the onset of chick hatching. Other sightings of color-marked gulls included birds flying to and from the mainland and birds foraging near known fishing "hot-spots" at Santa Catalina Is. and Osborn Bank.

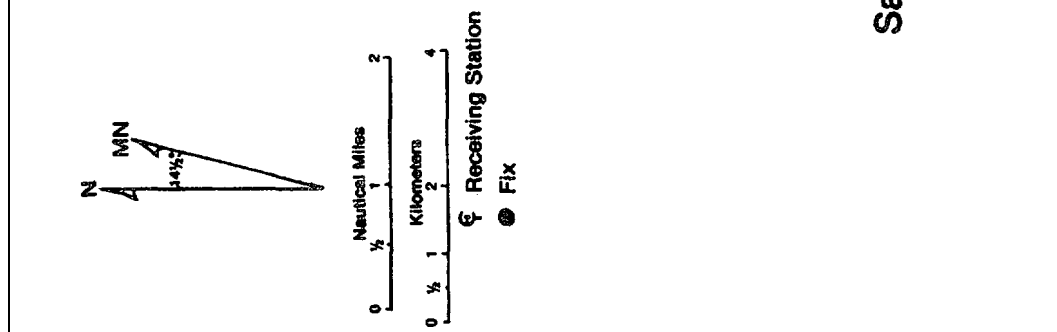
Radio-tracking of adult Western Gulls caught during incubation indicated wide-ranging movements east of Santa Barbara Island. These observations tally well with those obtained from color-marking. They add the important factor of lack of sampling bias, as the returns from color-marking are highly influenced by the locations of observers willing to report sightings.

Color-marking, radio-tracking, and radial transects were also used to discover the foraging areas used by Xantus' Murrelets. Color-marking was not successful, for though the colors took well on the birds, they proved impossible to spot at sea.

Radio-tracking of Xantus' Murrelets at Santa Barbara Is. was more successful (Fig. II- 53). Most fixes were east and north of the island. In two cases we tracked birds which initially flew east and then moved north. Most fixes were at sea and within five km of the island. The greatest distances at which we had radio fixes on Xantus' Murrelets were 9.8 and 11.5 km. These distances may approach the maximum transmitting distances of the small radios.

Sightings of Xantus' Murrelets on radial transects generally agree with findings from radio-tracking, except that the transects revealed a shift in distribution between April and late May. In April, Xantus' Murrelets were generally found very close to Santa Barbara Is., occurring primarily within five km of shore (Fig. II- 54). They were particularly plentiful to the north and east and less so to the south and southwest. In May, murrelets were apparently beginning to disperse from the island vicinity as their chicks went to sea; most sightings were from distances greater than nine km. These results seem to indicate breeding Xantus' Murrelets are closely tied to their nesting islands and that breeding and non-breeding birds are clumped in their distribution.

Figure II-53. Distribution of 23 fixes of four adult Xantus' Murrelets tracked from Santa Barbara Island from 21 through 26 May 1975. The two fixes on the northeastern corner of Santa Barbara Island show one known nest site.



University of California
Coastal Marine Lab., Santa Cruz
Eco/Evol. Biology Dept., Irvine
O.C.S. SO. CALIF. SURVEY

II-256

(c) Seabirds

We found moderate to low numbers of shearwaters passing westward through Santa Cruz Basin in July and August and very few of these birds in September. Evidently in August - September, most of these birds congregate in the waters from the Santa Rosa-Cortés Ridge westward to the continental edge (Patton Escarpment).

Moderate numbers of Brandt's Cormorants, Brown Pelicans, and Western Gulls were recorded roosting on the northern islands and Santa Barbara Island (Table II-87) and foraging in the shallow waters close to the islands. Late in the period migratory phalaropes, Pomarine Jaegers, and Arctic Terns passed through this region in relatively small numbers,

Table II- 87. Summary of distribution and numbers of marine birds in Santa Cruz Basin, Summer 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. / km ² $\pm$ s)	0	4.37 $\pm$ 5.20	1.04 $\pm$ 1.83	0 $\pm$ 1.01	0.60 $\pm$ 1.97	1.40 $\pm$ 0.87	8.04 $\pm$ 9.94
Total no. near Santa Barbara Is. beaches ($\bar{x}$ no. per survey)	0	0	453	0	0	122	22 597

Few birds were found beach-cast on the southern beaches of Santa Cruz Is. during this quarter (Table II- 5). Of five birds recorded, four were found in July. None were oiled.

Total bird density in autumn was variable from place to place within the Santa Cruz Basin area. The highest densities were found in the relatively shallow waters surrounding the Basin (Fig. 11-14). Densities of as high as 68 birds/km² were found at sea southeast of Anacapa Is., but averaged less than 2 birds/km² in central Santa Cruz Basin. All major taxonomic groups were present in the area, though storm-petrels, shearwaters, and fulmars were scarce. Great numbers of pelicans, cormorants, gulls, and jaegers accounted for high overall densities in the waters south of the northern island chain and surrounding Santa Barbara Island. The numbers of pelicans and cormorants at sea decreased from early to late autumn.

The shores of Santa Cruz, Anacapa, and Santa Barbara islands harbored many hundreds of Brandt's Cormorants, Brown Pelicans, and Western and California Gulls (Table II-88).

TABLE II- 88. Summary of distribution and numbers of marine birds in Santa Cruz Basin, Autumn 1975

	Loons & <u>Grebes</u>	<u>Tubenoses</u>	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	<u>Alcids</u>	All Species combined	
Density at Sea ($\bar{x}$ no./km ² $\pm$ s)	0.31 <u>+0.62</u>	0.14 <u>+0.37</u>	4.67 <u>+9.24</u>	0.96 <u>+1.63</u>	0.03 <u>+0.03</u>	4.88 <u>+6.08</u>	0.72 <u>+0.99</u>	11.79 <u>+17.51</u>
Total no. near Santa Barbara Is. beaches ($\bar{x}$ no./survey)	0	0	1,663	3	0	384	16	2,141

As winter approached, low numbers of grebes, loons, and scoters also used the nearshore waters of the islands. Cormorants and pelicans were less numerous onshore in late autumn than in October. Only four beach-cast seabirds were recorded from south Santa Cruz Is. beaches during the autumn quarter (Table II- 5). One of these was oiled, the only such occurrence for this region during our study year.

SANTA CRUZ BASIN -- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

The density of birds in open-ocean waters was moderate to high in the winter months (Fig. 11-16). As with the areas west and south of Santa Cruz Basin, Northern Fulmars, Western and California Gulls, Black-legged Kittiwakes, and Cassin's and Rhinoceros Auklets were the numerically dominant species. South of Santa Cruz and Anacapa islands, we found very large numbers of Eared and Western Grebes, Arctic Loons, Brandt's Cormorants, Surf Scoters, and Western Gulls (Table II-89). Western Gulls and Brandt's Cormorants were also numerous at Santa Barbara Is. in this period, but grebes, loons, and scoters were not.

TABLE II- 89. Summary of distribution and numbers of marine birds In Santa Cruz Basin, Winter 1976.

	<u>Loons & Grebes</u>	<u>Tubenoses</u>	<u>Pelicans & Geese, Scoters Cormorants & Mergansers</u>	<u>Phalaropes</u>	<u>Jaegers, Gulls & Terns</u>	<u>Alcids</u>	<u>All Species combined</u>
Density at Sea ($\bar{X}$ no. /km ² $\pm$ s)	0.49 <u>+0.94</u>	0.79 <u>+0.72</u>	1.03 <u>+2.05</u>	0 <u>+4.76</u>	2.14 <u>+5.40</u>	8.66 <u>+7.20</u>	21.04 <u>+10.42</u>
Total no. near Santa Barbara beaches ($\bar{X}$ no. /survey)	93	0	624	3	0	183	6 844

In late March, we detected the beginnings of northward migration of Arctic Loons, scoters, and Red Phalaropes in Anacapa Passage. This first migratory activity did not seem to involve large numbers of birds.

Surveys of southern beaches on Santa Cruz Is. continued to record low numbers of beached birds (Table 11- 5). Only two were found during these months, a Brandt's Cormorant and a Northern Fulmar, neither of which was oiled.

SANTA MONICA BASIN -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

Bird density was very high (over 400/km²) west and southwest of the Pales Verdes Peninsula but low throughout Santa Monica Basin and south of Pt. Mugu (Fig. 11-10). The great majority of birds consisted of migrating Sooty Shearwaters; Northern Phalaropes, western Gulls, and Cassin's Auklets were present in low densities (Table 11-90). We found migrating Arctic Loons near Pt. Mugu and the Pales Verdes Peninsula in April and early May, but not thereafter. The same was true of migratory Brant.

TABLE II- 90. Summary of distribution and numbers of marine birds in Santa Monica Basin, Spring 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters Phalaropes	Jaegers, Gulls & Terns	Alcids	All species combined
Density at sea ($\bar{X}$ No./km ² $\pm$ S)	0.08 $\pm$ 0.98	135.83 $\pm$ 235.27	0	0.02 $\pm$ 0.04	0.21 2.0.45	1.21 $\pm$ 1.06	0.36 $\pm$ 0.62
Total No. on Mainland beaches [$\bar{X}$ No. /survey (No. /km)]	19 (2.7)	0 (0.0)	9 (1.3)	50 (7.1)	0 (0.0)	85 (12.1)	0 (0.0)
							163 (23.3)

Loons and grebes were uncommon along the mainland beaches included in our surveys; the bulk of their migratory activity was completed by mid-June. Other species common along the mainland included the Double-crested Cormorant, Western, California and Ring-billed Gulls, and Forster's Tern.

Low numbers of beached birds were recorded from this region. None were found to be oiled.

No birds nested here, though considerable foraging was done in open-ocean and nearshore waters by Western Gulls and Brown Pelicans nesting on Anacapa, Santa Barbara, and Santa Catalina islands. Western Gulls also foraged at refuse disposal sites on the mainland.

SANTA MONICA BASIN -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

We found low densities of Brandt's Cormorants, Brown Pelicans, and Western Gulls in Santa Monica Bay in July through September (Fig. 11-12). Other species were scarce until September, when the longshore passage of Northern Phalaropes and Pomarine Jaegers took place (Table 11-91). Censuses on mainland beaches revealed sizeable summering and migrating populations of Brown Pelicans, gulls (primarily Western, Ring-billed, California and Heermann's), and terns (Forster's and Elegant). Several of these populations (Brown Pelican, Heermann's Gull, Elegant Tern) consisted almost entirely of post-breeding dispersants from nesting colonies in Mexican waters.

TABLE II- 91. Summary of distribution and numbers of marine birds in Santa Monica Basin, Summer 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	All Species Altogether	All Species Altogether
Density at Sea ($\bar{x}$ no./km ² $\pm$ s)	0	0.54 ± 0.62	0.37 ± 0.19	0	0.30 ± 0.96	0.36 ± 0.62	0.15 ± 1.56
Total no. on Mainland beaches [$\bar{x}$ no./survey (no./km)]	14 (1.2)	0 (0.0)	265 (22.1)	8 (0.7)	6 (0.5)	815 (67.9)	0 (0.0)
							1,402 (116.8)

Low to moderate numbers of beached birds were found (Table II- 5). Seventeen percent were oiled. Sooty Shearwaters and Western Gulls predominated, but several other species were encountered as well.

SANTA MONICA BASIN -- October, November, December
(c) Seabirds

FAUNAL ACCOUNT

We found huge numbers of Bonaparte's and California Gulls in Santa Monica Basin in November and December, which resulted in extremely high overall avian density (Fig. 11-14). These birds were observed feeding around purse seiners near Redondo Submarine Canyon in December. Loons, Western Grebes, scoters, and Cassin's and Rhinoceros Auklets were present in lower densities throughout the offshore waters of the area.

TABLE 11-92. Summary of distribution and numbers of marine birds in Santa Monica Basin, Autumn 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese Cormorants & Mergansers	Scoters Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0.67 <u>± 1.02</u>	0	1.43 <u>± 1.19</u>	0.26 <u>± 0.63</u>	0 <u>± 957.07</u>	438.48 <u>± 0.89</u>	1,05 <u>± 945.41</u>
Total no. on Mainland beaches [$\bar{x}$ no. /survey ($\bar{x}$ no. /km ²)]	409 (34.1)	0	307 (25.6)	139 (11.55)	0 (84.4)	1,013 (84.4)	0 (168.4)

Beach surveys indicated that many species of winter residents arrived in the area from October through December. The greatest contributors to total numbers on the beaches were Western Grebes, Brown Pelicans, Surf Scoters, and Western, Heermann's, and Ring-billed Gulls (Table II-92). Of the areas censused, the inshore waters and beaches at P.M.T.C. , Pt. Mugu, and Dockweiler S.6, clearly harbored the greatest number of birds.

Low numbers of beached birds were encountered during surveys in the autumn quarter (Table II- 5). Thirty percent were oiled. Most birds were found in December, including many non-marine waterfowl recorded from P.M.T.C. , Pt. Mugu and Pt. Mugu State Beach, both of which are near duck hunting clubs. Western and California Gulls and Western Grebes were the most frequently beach-cast marine birds.

SANTA MONICA BASIN -- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

In the open waters of Santa Monica Basin we found moderate densities of Western and California Gulls, Black-legged Kittiwakes, and Cassin's and Rhinoceros Auklets. The first two gull species were quite numerous inshore at Anacapa Is., Pt. Mugu, and near the Pales Verdes Peninsula. Western, California, and Bonaparte's Gulls were seen feeding on squid near the head of the Redondo Submarine Canyon in January. Along the mainland beaches of this area we found substantial numbers of Eared and Western Grebes, Red-throated and Arctic Loons, Surf Scoters, and the gull species mentioned above. Brown Pelicans decreased in number along these beaches from January through March (Table II-93).

In March, we detected migratory activity near Pt. Mugu and in western San Pedro Channel. In both areas, small numbers of loons, scoters, and Red Phalaropes were observed moving north and northwest.

TABLE 11-93. Summary of distribution and numbers of marine birds in Santa Monica Basin, Winter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Phalaropes	Jaeger, Gulls & Terns	Alcids	All Species combined	
Density at Sea ($\bar{X}$ no. /km ² $\pm$ s)	0.54 +0.54	0.09 <u>+0.22</u>	0 	0.20 <u>$\pm$0.30</u>	0.02 <u>+0.01</u>	10.62 <u>+8.09</u>	1.08 <u>+2.16</u>	13.57 <u>+8.18</u>
Total no. on Mainland beaches($\bar{X}$ no. /survey ($\bar{X}$ no. /km ²)	899.0 (74.9)	0	7.7 (0.6)	307.0 (25.6)	0	609.0 (50.8)	0	2125.0 (177.15)

Surveys of beaches of this sector yielded records of moderate to high numbers-of dead birds, nearly a third of which were oiled (Table II- 5). As in other regions, fulmars and kittiwakes were the most numerous beached birds, particularly during February and March. Western Grebes were found in moderate numbers, while several species of estuarine ducks washed in at P.M.T.C. , Pt. Mugu.

SAN PEDRO BASIN -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

Sooty and Pink-footed Shearwaters and several gull species were extremely abundant in San Pedro Channel in May and June. Total bird density reached over 1,300 birds/km² (May and June flights averaged) north of Santa Catalina Is., reflecting the passage of-migrating-Sooty Shearwaters. South of Long Beach, gulls (Western and Bonaparte's) massed in densities up to 119 birds/km² (Fig. 11-10).

In April "and May we observed migrating loons, scoters, Brant, and Northern Phalaropes between Santa Catalina and the Pales Verdes Peninsula; this activity declined significantly by late May (Table II-94). The southeastern part of this area harbored moderate numbers of Xantus' Murrelets and a few Cassin's Auklets, neither of which were abundant here in other seasons.

TABLE II- 94. Summary of distribution and numbers of breeding and non-breeding marine birds in San Pedro Basin, Spring, 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All species combined
Density at sea ($\bar{x}$ No. /km ² $\pm$ s)	2.10 ± 3.50	194.34 5437.89	0.60 ± 1.19	0.02 tool	2.92 ± 6.00	9.50 ± 22.74	1.35 ± 2.06	250.31 ± 532.81
Total No. near Santa Catalina Is. beaches ($\bar{x}$ no. /survey)	0	0	55	0	0	327	0	382
Total No. on Mainland Beaches [$\bar{x}$ no. /survey (No. /km)]	25 (7.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	292 (88.5)	0 (0.0)	317 (96.1)
Total Nesting Population (pairs)	0	0	0	0	0	25-30	0	25-30
Number of Nesting species	0	0	0	0	0	1	0	1

Mainland beaches and adjacent waters harbored many hundreds of Western Grebes and gulls (Western, California, and Ring-billed) in April and May, but numbers of most species declined in June.

Relatively large numbers of beached birds were encountered during this time, particularly at Huntington State Beach; none of these were oiled (Table 11- 5). Sooty Shearwaters, Western and California Gulls were the most numerous beached birds.

Santa Catalina Is. has apparently never supported large numbers of nesting seabirds. Historical nesting records exist only for Brandt's Cormorants, Western Gulls, and Xantus' Murrelets (the last species, a single bird in 1967 on Bird Rk.-- D. Bleitz, unpubl. notes). Brandt's Cormorants no longer nest on or near Santa Catalina (1974, Jones and Jehl unpubl. notes), and the small Western Gull colony (25-30 active nests)

SAN PEDRO BASIN -- April, May, June
(c) Seabirds (continued)

FAUNAL ACCOUNT

On Bird Rk. remains about the same size as in 1965 and 1966 when Harper (1971) conducted his studies. We counted 50 chicks and seven nests with eggs on 20 June. Food samples were obtained from four of these chicks, three of which contained fish. The contents of one sample could not be identified.

SAN PEDRO BASIN -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

Bird density was generally low in open-ocean waters of San Pedro Channel in mid-summer. Only near mainland and Santa Catalina Is. coasts were resident cormorants and Western Gulls common. Pink-footed Shearwaters and storm-petrels were present in small numbers 35 km southeast of Santa Catalina Island (Fig, 11-12). Mainland beaches supported moderate numbers of Ring-billed, California, and Heermann's Gulls, and Elegant and Forster's Terns all summer (Table II-95). In August and September, Brown Pelicans dispersed northward along the mainland from Mexican nesting colonies.

TABLE II- 95. Summary of distribution and numbers of marine birds in San Pedro Basin, Summer 1975.

	Loons & <u>Grebes</u>	Tubenoses	Pelicans & Geese, Scoters <u>Cormorants</u>	<u>gansers</u>	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{X}$ no. /km ² $\pm$ s)	0	0.36 ± 0.88	0.04 ± 0.07	0	0.30 ± 0.99	0.72 ± 0.88	0.10 ± 0.24	1.61 ± 1.38
Total no. near Santa Catalina Is. beaches ($\bar{X}$ no. per survey)	0	0	26	0	0	183	2	235
Total no. on Mainland beaches($\bar{X}$ no. /survey (no. /km))	1 (0.3)	0 (0.0)	2 (0.6)	0 (0.0)	5 (1.5)	446 (135.2)	0 (0.0)	497 (150.6)

Late in September we recorded migratory activity of phalaropes, jaegers, and Arctic and Common Terns in open-ocean waters; these species materially increased overall bird density in the area from November onward.

Low numbers of beach-cast birds were recorded from this region during this quarter (Table II- 5). Two birds were found in July, none during August, and two more in September. None were oiled.

SAN PEDRO BASIN -- October, November, December
(c) Seabirds

FAUNAL ACCOUNT

Avian density at sea varied from low (1.6 birds/km²) to quite high (almost 150/km²) in the San Pedro Channel-Santa Catalina Is. area in autumn (Fig. 11-14). The highest density was found in mid-channel, northeast of Santa Catalina Island; this concentration consisted almost entirely of California and Bonaparte's Gulls. Brown Pelicans, Brandt's Cormorants, and gulls contributed to elevated densities on the west side of Santa Catalina Island.

Near the island beaches we found relatively few birds (Table II-96); most were gulls and Brandt's Cormorants. Mainland beaches harbored many hundreds of Bonaparte's Gulls and lesser numbers of Western Grebes, loons, and Heermann's Gulls. Large populations of scoters and loons were not seen along the mainland until January.

TABLE 11-96. Summary of distribution and numbers of marine birds in San Pedro Basin, Autumn 1975

	<u>Loons & Grebes</u>	<u>Tubenoses</u>	<u>Pelicans & Geese Cormorants</u>	<u>Scoters & Mergansers</u>	<u>Phalaropes</u>	<u>Jaegers, Gulls & Terns</u>	<u>Alcids</u>	<u>All Species combined</u>
Density at Sea	0	0	3.37	0	0	18.76	0.07	23.20
($\bar{X}$ no. /km ² $\pm$ s)			<u>+3.33</u>			<u>+47.18</u>	<u>+0.19</u>	<u>+51.12</u>
Total no. near Santa Catalina Is. beaches	1	0	34	0		187	0	322
($\bar{X}$ no. /survey)								
Total no. on Mainland beaches [$\bar{X}$ no. /survey	10	0	10	1	0	734	0	799
(no. /km)]	(3.1)		(3.0)	(0.3)		(222.5)		(242.1)

Only five beach-cast birds were found during this quarter (at Huntington State Beach), none of which were oiled (Table 11- 5).

We found very high densities of Bonaparte's and Western Gulls, and lesser numbers of loons (probably Arctic), Northern Fulmars, and small alcids off the Orange Co. coast from January through March.

Around Santa Catalina Is. and along the mainland coast we found several species of loons, grebes, and ducks, many hundreds of gulls (Bonaparte's, California, Ring-billed, Herring, Western and Heermann's), and a scattering of cormorants and Brown Pelicans (Table 11-97). Large groups of birds were seen feeding on spawning squid along the eastern side of Santa Catalina Is. in January and February.

TABLE II- 97. Summary of distribution and numbers of marine birds in San Pedro Basin, Winter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese Cormorants & Mergansers	Scoters Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined	
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	9.88 <u>± 27.73</u>	0.40 <u>± 0.94</u>	0.66 <u>± 1.27</u>	0.03 <u>± 0.04</u>	0.18 <u>± 0.62</u>	12.68 <u>± 17.66</u>	0.54 <u>± 0.50</u>	26.18 <u>± 31.45</u>
Total no. near Santa Catalina Is. beaches ($\bar{x}$ no./survey)	24	0	643	4	0	1,057	0	5,501
Total no. on Mainland beaches [$\bar{x}$ no. /survey (no. /km)]	537.1 (162.7)	0	7.7 (2.3)	4.3 (1.3)	0	520.7 (157.7)	0	1219.9 (369.7)

Beached bird records for this quarter were dominated by the fulmar and kittiwake die-off of February and March (Table II- 5). Nearly 30% of the beached birds were oiled.

Total bird density at sea was very low west and northwest of San Diego in May and June (Fig. 11-10). A few Pink-footed Shearwaters, Western Gulls, and Xantus' Murrelets were seen near Thirtymile Bank; other sightings were restricted to the vicinity of the mainland. Brown Pelicans, presumably individuals dispersing from Mexican colonies, were first seen along the mainland in June (Table II-98). Similarly, Heermann's Gulls, and Royal, Elegant, and Least Terns increased slowly in numbers through May and June as birds from Mexican and San Diego area colonies began dispersing northward. Western Gulls and Brandt's Cormorants, presumably from Islas Los Coronados colonies, were also noted during beach surveys.

TABLE II- 98. Summary of distribution, and numbers of marine birds in San Diego Basin, Spring 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All species combined	
Density at sea ($\bar{X}$ No ./km ² $\pm$ s)	0.44 ± 1.00	0.40 ± 0.97	0.40 ± 0.97	0	0.45 ± 0.73	0	1.72 ± 2.46	
Total No. on Mainland beaches [$\bar{X}$ no. /survey (no. /km)]	252 (12.9)	0 (0.0)	9 (0.5)	5 (0.3)	0 (0.0)	129 (6.6)	0 (0.0)	395 (20.3)

Low numbers of beach-cast birds were found on San Diego area beaches during the spring quarter. None were found to be oiled. No birds nest here, though sizeable portions of the seabird populations that nest on Islas Los Coronados, Baja California, Mexico forage in the waters of this zone.

SAN DIEGO BASIN -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

Bird densities over the open-ocean were generally low in the summer months; combined counts of Leach's and Black Storm-Petrels and Western Gulls gave high densities 15 kmwest of Islas Los Coronados and eight kmwest of Oceanside (Fig. 11-12). Brandt's Cormorants and Brown Pelicans were seen in uniformly low densities throughout the area. The latter species became much more numerous in autumn,

Along the mainland the majority of the summering birds consisted of Western, Ring-billed, and Heermann's Gulls, Elegant Terns and Brown Pelicans (Table 11-99).

TABLE 11-99. Summary of distribution and numbers of marine birds in San Diego Basin, Summer 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0	4.46 ± 2.11	0.23 ± 0.48	0	0	2.30 ± 1.52	0.04 ± 0.19	7.03 ± 11.30
Total no. on Main- land beaches	23	0	11	0	2	574	0	644
($\bar{x}$ no. /survey (no/km))	(1.4)	(0.0)	(0.6)	(0.0)	(0.1)	(33.6)	(0.0)	(37.7)

Low numbers of beached birds were encountered along San Diego area beaches during this quarter. Nearly 20% were oiled, a relatively high figure for this region (Table II- 5). Most records were from July, when Sooty Shearwaters predominated. Western Gulls accounted for most beached birds in September.

Total avian density was low to moderate over open waters in the autumn months, with densities above five birds/km² observed near the Coronado Escarpment and a few km west of Oceanside (Fig. 11-14). The offshore fauna consisted of substantial numbers of gulls (Western, California, and Bonaparte's), and smaller numbers of Brown Pelicans (most numerous in November), Leach's Storm-Petrels, Pomarine Jaegers, Rhinoceros Auklets, and murrelets. Of the latter two groups, murrelets decreased in abundance from October through December, while auklets became more numerous from December onward.

Closer inshore we found large numbers of Brown Pelicans, Bonaparte's and California Gulls, and lesser numbers of loons, Western Grebes, and several species of terns. Pelican numbers decreased progressively as the birds departed to the south. Mainland beaches in the San Diego area harbored hundreds of gulls and Western Grebes and smaller populations of loons and scoters. (Table 11-100)

TABLE 11-100, Summary of distribution and numbers of marine birds in San Diego Basin, Autumn 1975,

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0.70 ± 1.85	0.33 ± 0.58	0.36 ± 0.47	0	2.42 ± 2.62	0.14 ± 0.22	4.01 ± 4.20
Total no. on Mainland beaches [$\bar{x}$ no. /survey ($\bar{x}$ /km)]	183 (9.2)	0	12 (0.6)	87 (4.4)	0 (30.0)	0	876 (44.2)

Beached bird occurrence was quite low during the autumn quarter on the San Diego area beaches. Only five percent of the twenty beach-cast birds were oiled. Western Gulls (five) and Northern Fulmars (four) were most frequently encountered (Table II- 5).

Bird density in the open-ocean waters of San Diego Basin was moderately low throughout the winter. As with other areas to the west, Black-legged Kittiwakes and Northern Fulmars were the dominant species offshore. These were replaced close to the mainland by gulls (Western and California), Western Grebes, and loons. Brown Pelicans declined in abundance as the winter progressed; few were seen in March (Table 11-101).

TABLE 11-101. Summary of distribution and numbers of marine birds in San Diego Basin, Winter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species Combined	
Density at Sea ($\bar{X}$ no./km ² ± s)	0.20 ±0.65	0.20 ±0.36	0.05 ±0.16	0.20 ±0.36	0.39 ±0.87	4.15 ±2.91	0.65 ±1.01	5.84 ±3.47
Total no. on Mainland beaches [$\bar{X}$ no. /survey (no. /km)]	379.6 (16.8)	0	4.7 (0.2)	198.7 (8.8)	0	1360.2 (60.2)	0	2205.0 (97.6)

The beginnings of northward migration were seen in March along San Diego area beaches. Western Grebes, scoters, and other ducks and loons were seen passing north at the same time as a general diminution of numbers of wintering gulls occurred.

Beached bird occurrence was quite high during this quarter due to the die-off of Northern Fulmars and Black-legged Kittiwakes during February and March, extending into April. January beachings were quite low, with only three birds recorded. Less than 15% were oiled (Table II- 5).

SAN CLEMENTE RIDGE -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

As in several other areas of the Southern California Bight in spring 1975, migratory activity of Sooty Shearwaters northwest of San Clemente Is. resulted in elevated overall density figures. These birds were not as common east of longitude 118°30'W as to the west, but Pink-footed Shearwaters were rather uniformly common in all areas. A surprisingly large number of Xantus' Murrelets was seen east of San Clemente Island (Table 11-102), a phenomenon not usually observed before August - September in most years (when birds of Mexican origin enter the area).

TABLE 11-102 Summary of distribution and numbers of breeding and non-breeding marine birds on the San Clemente Ridge, Spring 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{X}$ No./km ² $\pm$ s)	0	9.01 ± 6.68	0	0	0.45 ± 0.53	2.51 ± 3.18	12.73 ± 11.39
Total No. near San Clemente Is. beaches ($\bar{X}$ No. per survey)	0	0	161	0	192	0	457
Total Nesting Population (pairs)	0	0	13	0	31	0	44
Number of Nesting species.	0	0	1	0	1	0	2

As is true for the other large islands, San Clemente has not supported great numbers of nesting seabirds. There are virtually no quantitative historical data. It is possible that Ashy Storm-Petrels and Xantus' Murrelets previously did or presently do nest on the island. We saw one chick and two adult Xantus' Murrelets on the water eight km north of Wilson Cove, which may have come from San Clemente Island.

Brandt's Cormorants probably nested on San Clemente Is. prior to 1972, but the evidence is indirect. However, in 1973, Jones and Jehl (unpubl. notes) observed 22 or more active and old nests in three places. In 1975 we found 13 nests.

Western Gull nesting on San Clemente has been largely undocumented, though scattered records show a few have occupied the island on occasion. We found 31 Western Gull nests on Bird Rk. in northwest harbor. Although we were not able to survey the southeast side of the island thoroughly, it is likely that a few scattered pairs nest along the inaccessible cliffs.

We recorded a few individual Brandt's Cormorants and Western Gulls foraging at distances out to ten km from San Clemente Is. colonies, though it is not at all certain these birds originated from those colonies.

SAN CLEMENTE RIDGE -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

We found low overall bird densities on the open-ocean in mid-summer. Leach's and Black Storm-Petrels, Brown Pelicans, and Western Gulls accounted for most sightings throughout this area; the storm-petrels predominated offshore (particularly near Fortymile Bank), while the other species were most common close to San Clemente Island. Limited numbers of offshore migrants, including Northern Phalaropes, Pomarine Jaegers, and Common Terns, were seen southeast of San Clemente Island in late August and September.

Brandt's Cormorants and Brown Pelicans formed a substantial roost at Northwest Harbor, San Clemente Is. in August; this roost increased in importance in subsequent months (Table 11-103).

TABLE 11- 103. Summary of distribution and numbers of marine birds on San Clemente Ridge, Summer 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese Cormorants & Mergansers	Scoters	Phalaropes	Jaegers & Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no./km ² $\pm$ S)	0.03 ± 0.04	0.24 ± 1.00	0.14 ± 0.21	0	0.10 ± 0.77	0.27 ± 0.50	0	0.78 ± 1.25
Total no. near San Clemente Is. beaches ($\bar{x}$ no. per survey)	0	0	532	0	0	232	0	772

SAN CLEMENTE RIDGE -- October, November, December "'
(c) Seabirds

FAUNAL ACCOUNT

Total bird densities at sea varied from low (1 bird/km²) to moderate (16/km²) in the San Clemente Is. area in autumn (Fig. 11-14). In October and November, we saw primarily Brown Pelicans, and California and Western Gulls in the northwestern part of this area, and these species and murrelets near Fortymile Bank. Migrating Arctic Loons, Brant , and jaegers were common west of the island. In December, we found fewer loons, pelicans, and murrelets; most sightings were of gulls and Rhinoceros Auklets (Table 11-104).

TABLE 11-104. Summary of distribution and numbers of marine birds on San Clemente Ridge, Autumn 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters Phal a ropes	Jaeger, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0.49 ± 1.19	0.40 ± 0.77	0.71 ± 0.88	0.25 ± 0.80	0 ± 3.00	3.19 ± 0.45	5.29 ± 3.89
Total no. near San Clemente Is. beaches ($\bar{x}$ no. /survey)	3	0	942	0	0	336	0 1,602

The size of the cormorant, pelican, and gull roosts in Northwest Harbor, San Clemente Is., increased through autumn. An average of over 700 cormorants and pelicans (combined) was seen in October and December flights.

SAN CLEMENTE RIDGE -- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

Overall densities of birds at sea varied from 0 to 24 birds/km², and were lowest in the southeastern portion of this area and highest between Santa Catalina and San Clemente islands (Fig. 11-16). Western and California Gulls and Black-legged Kittiwakes concentrated between the islands, while kittiwakes and Rhinoceros Auklets were the most common species near Fortymile and Thirtymile Banks. Closer inshore at San Clemente, we observed very large numbers of Brandt's Cormorants, Brown Pelicans, and Western Gulls at Bird Rk., Northwest Harbor; smaller numbers of the same species were found along the western coast of the island (Table 11-105).

TABLE 11-105. Summary of distribution and numbers of marine birds on San Clemente Ridge, Winter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0.17 <u>+0.40</u>	0.41 <u>+0.75</u>	1.82 <u>+4.07</u>	0	0	5.43 <u>+3.46</u>	0.74 <u>+1 .03</u>	8.58 <u>+6.81</u>
Total no. near San Clemente Is. beaches	32	0	1,123	0	0	330	0	2,843

TANNER-CORTÉS BANKS -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

We visited this region only once in April through June--a flight series in the last four days of the period. Very large numbers of shearwaters (to 121 birds/km²) were recorded over the deep waters of San Nicolas Basin, north of Tanner Bank (Table 11-106). Densities of shearwaters were lower west and east of Cortés Bank. We presume that pelagic migrants (gulls, terns, and perhaps alcids) passed through these waters in April and May. No birds nested in this zone.

TABLE II-106. Summary of distribution and numbers of marine birds at sea In the Tanner-Cortés zone, Spring 1975.
There are no beaches or islands in the zone.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Scoters Cormorants & Mergansers	Phalaropes	Jaegers, Gulls & Terns	Alcids	All species combined
Density at sea	0	15.98	0	0	0.14	0.75	21.93
($\bar{X}$ No./km ² $\pm$ s)		± 33.59			± 0.38	± 1.44	± 38.57

TANNER-CORTÉS BANKS -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

The importance of the Tanner-Cortés Banks region changed dramatically in summer; from an area of low density of Shearwaters and Western Gulls in July, the area became a focus of offshore migrant activity in August and September (Table 11-107). Sooty and Pink-footed Shearwaters concentrated between Santa Barbara Is. and Tanner Bank, reaching a high density of 71 birds/km² in early August (Fig. 11-12). Lower densities of Black and Leach's Storm-Petrels, Western Gulls, and murrelets were found over the banks in September. Two cruises in September also produced sightings of infrequently seen birds including Black-footed Albatross, Red-billed Tropicbird, South Polar Skua, and Long-tailed Jaeger.

TABLE II- 107. Summary of distribution and numbers of marine birds in the Tanner-Cortés zone, Summer 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All species combined
Density at Sea ($\bar{x}$ no. /km ² $\pm$ s)	0.02 ± 1.00	4.57 ± 17.71	0.02 ± 0.07	0.02 ± 0.03	0.30 ± 0.72	0.07 ± 0.28	0.04 ± 0.10	5.27 ± 18.20

TANNER-CORTÉS BANKS -- October, November, December
(c) Seabirds

FAUNAL ACCOUNT

Total avian density in autumn varied from 0 to over 28 birds/km², depending on location (Fig. II-14). South of San Nicolas Is. density was low to very-low; only storm-petrels, shearwaters, jaegers, and gulls were present in substantial numbers. Over Tanner and Cortés Banks and in the waters overlying the eastern escarpments of these banks, gulls, jaegers, and small alcids were present in moderate densities (Table 11-108). From 15 to 40 km east of Cortés Bank we found large numbers of Rhinoceros Auklets (to 14 birds/km²); they were less common south of San Clemente Island.

Few loons and grebes were seen in this offshore region. Only in October were southward migrating Arctic Loons seen here; by December, none were present. Similarly, cormorants and pelicans were scarce in the waters near Tanner and Cortés Banks. Substantial numbers of Brown Pelicans were observed, however, northwest and west of San Clemente Is., where they joined in mixed-species feeding assemblages that included gulls and California sea lions.

TABLE 11-108. Summary of distribution and numbers of marine birds at Tanner-Cortés Banks, Autumn 1975.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters	Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined
Density at Sea	0.25	0.54	0.19	0	0.10	3.34	2.23	6.72
($\bar{x}$ no./km ² $\pm$ s)	± 0.45	± 1.11	± 0.38		± 0.28	± 4.33	± 3.92	± 6.94

TANNER-CORTÉS BANKS -- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

Overall bird densities in this area varied from low (1 to 3 birds/km²) to very high (60 to more than 230 birds/km²) in the winter months (Fig. 11-16). Consistently high densities of Northern Fulmars, Black-legged Kittiwakes, and Rhinoceros Auklets were found 25-40 km south of San Nicolas Is. and over Tanner and Cortés Banks (Table 11-109). West of the banks, density decreased as coastal species (Western and California Gulls) and fulmars and kittiwakes declined in numbers. Brandt's Cormorants, Brown Pelicans, and Western Gulls were more numerous in the eastern part of this area than farther offshore. Cassin's Auklets, a conspicuous part of the offshore avifauna north of latitude 33°N, were not numerous in this region.

TABLE 11-109. Summary of distribution and numbers of marine birds at Tanner-Cortés Banks, Minter 1976.

	Loons & Grebes	Tubenoses	Pelicans & Geese, Cormorants & Mergansers	Scoters & Phalaropes	Jaegers, Gulls & Terns	Alcids	All Species combined	
Density at Sea	0	0.74	0.10	0	0.88	25.41	7.40	35.22
($\bar{x}$ no. /km ² $\pm$ s)		± 1.08	± 0.40	± 3.22	± 54.78	± 10.77	± 54.80	

OCEAN IC -- April, May, June
(c) Seabirds

FAUNAL ACCOUNT

The waters west of the 1500 m contour were not sampled until late June, when we found seabird numbers low; presumably, offshore migration of terns, shearwaters, and small alcids had already occurred in this zone.

OCEANIC -- July, August, September
(c) Seabirds

FAUNAL ACCOUNT

Limited sampling of the oceanic zone from the air in August produced only a few records of Sooty Shearwaters. In September, storm-petrels, shearwaters, and migratory jaegers and terns were uncommon near Rodriguez Seamount.

OCEANIC -- October, November, December
(c) Seabirds

FAUNAL ACCOUNT

We sampled relatively little of this area in autumn. For the most part, total bird density was very low; only gulls, small alcids, and a few shearwaters were recorded.

OCEANIC -- January, February, March
(c) Seabirds

FAUNAL ACCOUNT

Bird densities in oceanic waters in mid-winter averaged somewhat below those recorded within 150 km of the coast. We detected no tendency for birds to concentrate near San Juan or Rodriguez Seamounts, though density was higher over the continental slope (Patton Escarpment) than farther offshore. Northern Fulmars, Black-legged Kittiwakes, and several species of alcids (Common Murre, Tufted Puffin, Cassin's and Rhinoceros Auklets) dominated in numbers (Table 11-110).

TABLE 11-110. Summary of distribution and numbers of marine birds in the Oceanic zone. Winter 1976.

	<u>Loons & Grebes</u>	<u>Tubenoses</u>	<u>Pelicans & Geese, Scoters Cormorants & Mergansers</u>	<u>Phalaropes</u>	<u>Jaegers, Gulls & Terns</u>	<u>Alcids</u>	<u>All Species combined</u>
Density at Sea	0	0.88	0	0	1.41	0.84	1.24
($\bar{x}$ no./km ² $\pm$ s)		± 1.59		± 1.82	± 1.21	± 2.13	± 2.26

CONCLUSIONS AND RECOMMENDATIONS



Section I.C
Conclusions and Recommendations

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CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The Southern California Bight (SCB) supports a large and complex marine mammal and bird community, ranking as one of the most diverse faunas in north temperate waters. Not only does the SCB contain the supporting habitats for resident populations, it is a region of overlap for species with more extensive ranges that undergo yearly migrations into the SCB. It also straddles the migration routes of important species such as the California gray whale, fur seals, and many birds that pass through the area at predictable times of the year.

Some animal populations in the SCB are unique in the world by virtue of their small size and isolation from parent populations. The northern fur seal colony at San Miguel Is. and that of Xantus' Murrelets on Santa Barbara Is. are examples. These isolated populations and others, designated as RED FLAG species in Table II-3, are known to be vulnerable to the types of impact normally associated with oil resource development and may have a very limited ability to recover from detrimental impact.

The animal inhabitants of the SCB use the waters and islands in a dynamic way, exhibiting annual cycles of reproduction, dispersion, and migration, plus seasonal changes in distribution of foraging activity. The entire SCB is utilized by higher marine vertebrates; areas used only casually by some species are used intensively by others. Nevertheless, there exist specific areas of extraordinary significance to the animals, where sensitivity to the hazards attending offshore resource development is most acute:

- a) Reproductive areas such as nesting grounds and pinniped rookeries are especially sensitive because animals are concentrated in time and space, vulnerable young are present, animals are subject to heavy energetic demands, and fragile social structures can be easily disrupted.
- b) Feeding grounds are sensitive because these are areas where animals make their living, where animals are concentrated in time and space, and because displacement from optimum feeding grounds to other areas increases the energetic cost of obtaining food.
- c) Traditional migratory pathways are sensitive because animals pass through a corridor where any hazard may affect many animals at once--even an entire world population.

Conclusions (continued)

Areas of Special Sensitivity:

Areas of special sensitivity to impact related to OCS oil resource development identified during the 1975-76 survey are shown in Figure II-55 and described in Table 11-111. Areas are grouped according to three categories:

Category A: Extreme Threat Potential

These areas are of greatest importance to animals because one or more of the following conditions are met:

- 1) year-round heavy use;
- 2) predictable seasonal concentrations of major proportions;
- 3) locations of bird nesting areas or pinniped rookeries;
- 4) presence of especially vulnerable species.

Oil and/or disturbance in these areas constitutes an extreme threat to animal populations. The probability of catastrophic impact--that measure of impact affecting entire populations and from which recovery is uncertain--is great because many animals are concentrated in one place and/or young may be present.

Category B: Substantial Threat Potential

These are the preferred open-water habitats of marine mammals and birds. They are used consistently by several species as feeding grounds. Oil and/or disturbance in these areas constitutes a substantial threat to animal populations. The probability of catastrophic impact is less great because animals are relatively widespread and mobile.

Category C: Moderate Threat Potential

These are areas known for seasonal use either as foraging grounds or migration pathways. Oil and/or disturbance in these areas constitutes a moderate threat to animal populations. The probability of catastrophic impact is not as great because these areas receive only seasonal use.

It is important to realize that marine mammals and birds use all the island and water resources of the SCB. Only areas of extraordinary significance to the animals are listed in Table 11-111.

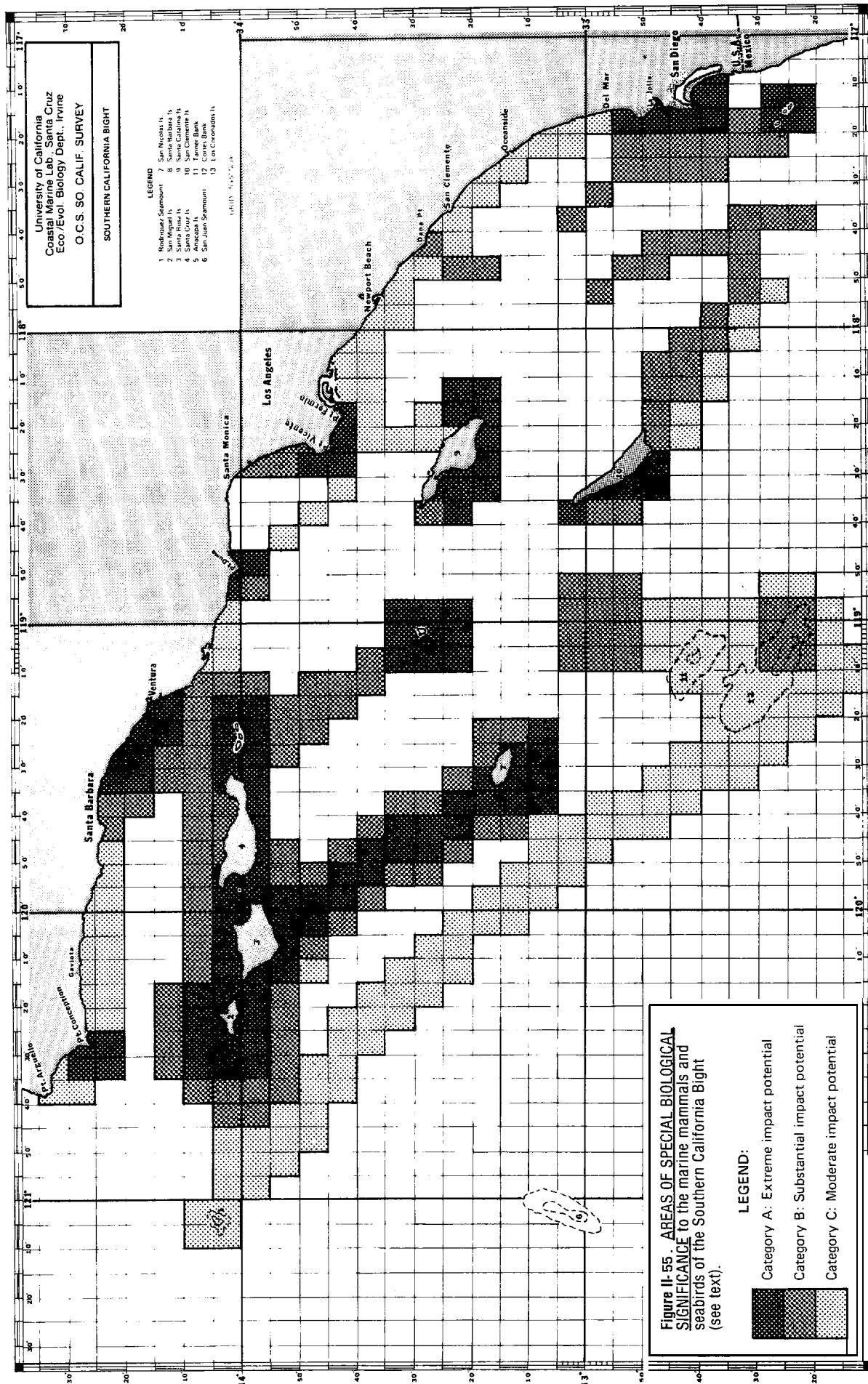


TABLE 11-111. Identification of AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE to the Marine Mammals and Birds of the Southern California Bight.

ZONE	AREA	SIGNIFICANCE
Santa Barbara Channel	Vicinity of San Miguel Is. to distance of 20 km in all directions	Largest pinniped and bird reproductive colonies in the SCB; five species of breeding pinnipeds (including northern fur seal); three species of breeding alcids and three species of breeding cormorants; young-of-the-year present in all seasons; exceptionally heavy use of nearshore waters for foraging; migratory path of gray whales (endangered), extremely high utilization as seasonal foraging area for Pacific white-sided and common dolphins. Seasonal gathering grounds for humpback whales (endangered).
	Vicinity of Santa Rosa and Santa Cruz islands	Presence of major bird colonies, especially alcids, cormorants, and Brown Pelican (endangered); pupping grounds of harbor seals; exceptionally heavy use of nearshore waters by foraging birds and pinnipeds.
	Vicinity of Anacapa Is. and the Ventura Shelf	Second largest seabird colony in the SCB, especially Brown Pelican; exceptionally heavy use of these waters by foraging birds, pinnipeds, and cetaceans; migratory path of gray whales and waterfowl.
	Pt. Conception to distance of 10 km seaward	Funnel for migrating birds, especially shearwaters and Brant; enormous numbers of seabirds; staging area for migrating gray whales.
	Mainland shore to distance of 10 km seaward	Migration path of gray whales and waterfowl.

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

TABLE 11-111. (continued)

ZONE	AREA	SIGNIFICANCE
Santa Rosa Ridge	Vicinity of San Nicolas Is. to distance of 10 km in all directions	Second largest pinniped rookery in the SCB; pups present year-round; major seabird colonies; exceptionally heavy use of nearshore waters for foraging.
	Santa Rosa Ridge from San Nicolas Is. to Santa Rosa Island	Exceptionally heavy use of shallow waters for foraging by birds, pinnipeds, and cetaceans; major migratory pathway of large baleen whales along west flank. Area of greatest open water concentrations of cetacea in the SCB.
Santa Cruz Basin	Santa Barbara Is. to distance of 20 km in all directions	Large and diverse seabird colonies, especially Xantus' Murrelet; important pinniped rookeries and seasonal hauling grounds; exceptionally heavy use of nearshore waters for foraging.
	Eastern sill of Santa Cruz Basin	Major concentrations of cetaceans, especially minke and pilot whales, plus several species of porpoises (Dan's and bottlenose).
	Pt. Dume to distance of 10 km seaward	Migration path of gray whales and waterfowl.
Santa Monica Basin	Vicinity of Pt. Vicente to distance of 10 km seaward	Staging area for migrating gray whales; funnel for migrating birds; extremely heavy use by wintering seabirds. Year-round population of bottlenose dolphins and pilot whales.
	Santa Monica Bay shoreline	Extremely heavy year-round use by foraging seabirds.

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

TABLE 11-111. (continued)

ZONE	AREA	SIGNIFICANCE
San Pedro Basin	Vicinity of Santa Catalina Is. to distance of 10 km in all directions	Major feeding grounds for cetaceans, migration path and milling grounds of gray whales. Area of maximum seasonal concentrations of pilot whales in SCB; harbor seal pupping in spring. Major flyway for loons and Brant.
	San Pedro Channel	Corridor of movement for bottlenose dolphins and pilot whales between mainland and Santa Catalina Island.
	Mainland to distance of 10 km seaward	Migration path of gray whales and waterfowl.
San Diego Basin	Vicinity of Pt. Loma	Staging area for migrating gray whales; very large concentrations of wintering waterfowl.
	Mainland shore to 10 km seaward	Migration pathway of gray whales and waterfowl. Heavy seasonal concentrations of common dolphins in vicinity of Dana Pt.
	Coronado Escarpment	Important pinniped and bird colonies on nearby Los Coronados (Mexico), especially Brown Pelican, extensive use of escarpment waters by massive schools of foraging small cetaceans, especially common dolphins; birds, especially Brown Pelicans; and pinnipeds.
San Clemente Ridge	Vicinity of San Clemente Is. to distance of 10 km in all directions	Sea lion rookery on the west side; important seabird roost at north end, especially Brown Pelican.

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE

TABLE II-111. (continued)

ZONE	AREA	SIGNIFICANCE
San Clemente Ridge (continued)	San Clemente Escarpment	Seasonally important foraging ground for small cetaceans, California sea lions, northern elephant seals, and petrels.
Tanner-Cortés Banks	North rim of the San Nicolas Basin	Major foraging grounds for migrating birds, sea lions, and several species of cetaceans.
	Tanner and Cortés Banks	Moderate to heavy year-round use as a foraging ground for sea lions, migrant-and wintering seabirds, and several species of cetaceans.
Oceanic Zone	No specific areas of use; however, these waters are occupied by migrant northern fur seals in winter and spring; major offshore corridor for migration of large whales (blue, sperm, fin, sei, and humpback--all endangered).	

Recommendations

The conclusion is inescapable that accelerated development of offshore oil resources is likely to be disadvantageous to natural populations of marine mammals and birds. Simply put, new development necessitates an increased level of human activity in the midst of shy and secretive species that only reluctantly coexist with man.

Assuming that increased offshore oil resource development is inevitable, prudence demands that the well-being of neighboring animal populations be considered at all times. Locations of facilities must be chosen so that 1) noise and conspicuous human activity does not disturb animals at places where they concentrate, and 2) downstream drift of uncontained oil does not imperil these same populations.

To minimize detrimental impact to animal populations we recommend:

- 1) that development be prohibited in OCS areas of greatest biological significance (Category A, Fig. II-55). Development in other OCS areas of biological importance (Categories B and C) should proceed only with extreme caution and all appropriate safeguards.
- 2) Should an oil spill occur, the immediate response should be containment:
 - a) restrict the free flow of oil, and
 - b) restrict the spread of floating oil.
- 3) Clean-up and impact assessment activities should proceed in the following sequence:
 - a) From the baseline (this document or Volume III-Principal Investigator Reports), determine the size, location, and vulnerability of animal populations in the area or in the path of drifting oil.
 - b) Give nesting, roosting, hauling, or pupping areas wide berth--the disturbance due to visitation or aerial reconnaissance will compound the effects of oil contamination.
 - c) Retrieve floating oil and initiate clean-up on mainland beaches not subject to the extreme impact of disturbance.

Recommendations (continued)

- d) Conduct impact assessment studies via
 - 1) cautious on-foot surveys of sensitive areas (bird and pinniped colonies) and
 - 2) standard ship and aerial surveys, using methods and timing of the baseline studies.

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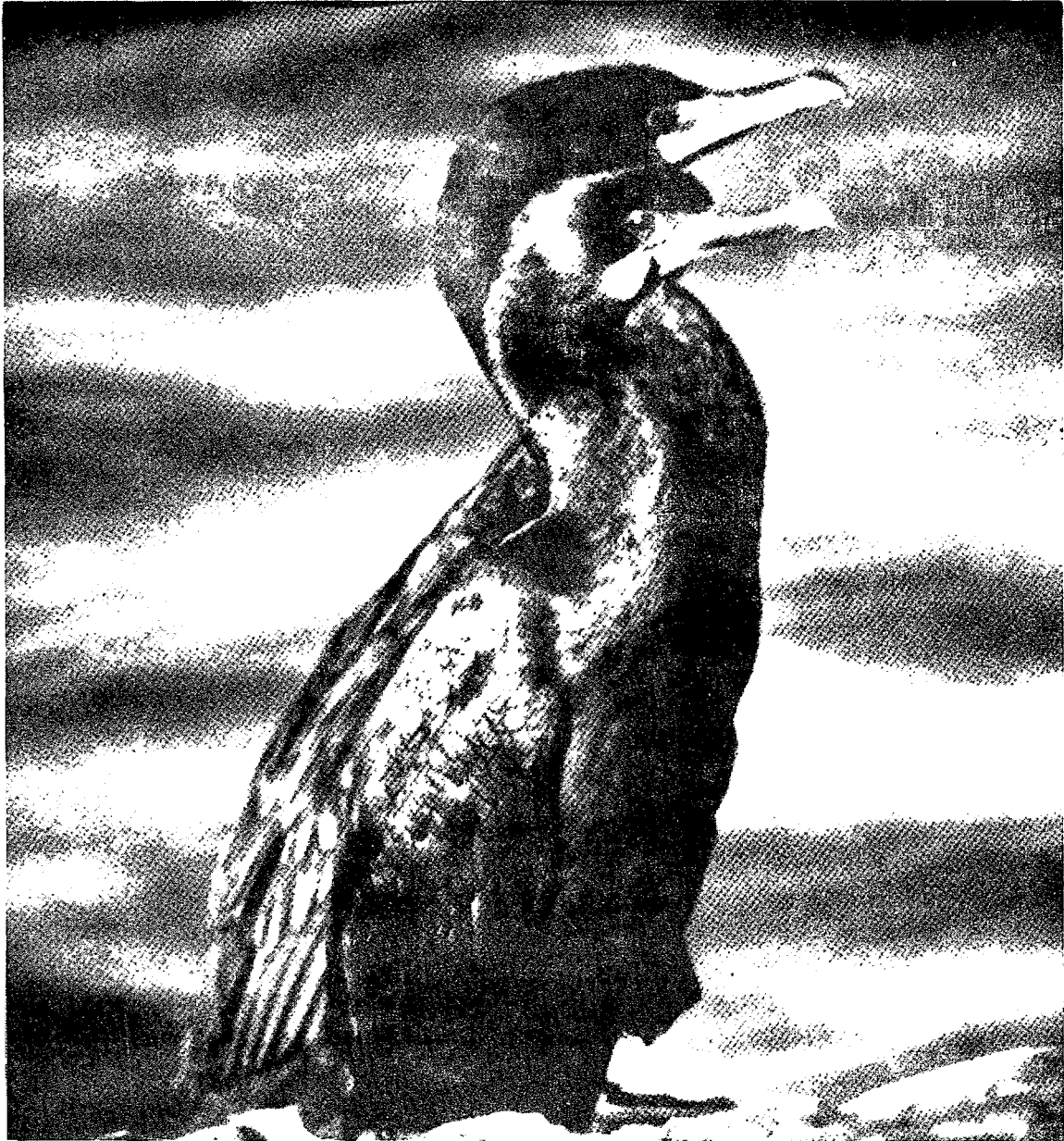
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The BLM has a unique responsibility and opportunity to design regulations and procedures which can protect and promote the continued well-being of these valuable natural resources that will, under proper stewardship, be with us long after the last barrel of oil has been extracted from the Southern California Bight.

LITERATURE CITATIONS



Literature Citations

- Ainley, D. G. and T. J. Lewis. 1974. The history of Farallon Island marine bird populations, 1854-1972. *Condor* 76: 432-446.
- Aldrich, J. W. 1970. Review of the problems of birds contaminated by oil and their rehabilitations. U.S. Dept. Int., Bur. SportFish. Wildl. Res. Publ. 87: 1-23.
- Anderson, D. W. and I. T. Anderson. 1976. Distribution and status of Brown Pelicans in the California Current. *Amer. Birds* 30: 3-12.
- Anderson, D. W., R. W. Risebrough, D. F. Hughes and R. E. Christenson. 1969. Significance of chlorinated hydrocarbon residues to breeding pelicans and cormorants. *Can. Field-Nat.* 83: 93-112.
- Bonnot, P. 1928. Report on the seals and sea lions of California. *Fish Bull.* 14, Calif. Div. Fish and Game. 62 pp.
- Brownell, R. L., Jr. 1971. Whales, dolphins and oil pollution. In D. Straughan (cd.), *Biological and oceanographical survey of the Santa Barbara Channel oil spill, 1969-1970*. Univ. of Southern Calif., Allan Hancock Foundation, vol. 1: 255-276.
- Brownell, R. L. and B. J. Le Boeuf. 1971. California sea lion mortality natural or artifact? In D. Straughan (cd.), *Biological and oceanographical survey of the Santa Barbara Channel oil spill, 1969-1970*. Univ. of Southern Calif., Allan Hancock Foundation, vol. 1: 287-300.
- Carlisle, John G. Jr. 1973. The census of northern elephant seals on San Miguel Island, 1965-1973. *Calif. Fish and Game* 59(4): 311-313.
- Davis, J. E. and S. S. Anderson. 1976. Effects of oil pollution on breeding grey seals. *Marine Pollution Bulletin* 7(6): 115-118.
- Daugherty, Anita E. 1972. *Marine Mammals of California*. 91 pp.
- Gentry, R. L., J. H. Johnson and J. HoIt. 1976. Behavior and biology of northern fur seals, Pribilof Islands. Part III of *Fur Seal Investigations, 1976*. National Marine Fisheries Service, Marine Mammal Division. pp. 26-39.
- Geraci, J. R. and T. G. Smith. 1976. Direct and indirect effects of oil on ringed seals (*Phoca hispida*) of the Beaufort Sea. *J. Fish. Res. Board Can.* 33: 1976-1984.
- Grau, C. R., T. Roudybush, J. Dobbs and J. Wathen. 1977. Altered yolk structure and reduced hatchability of eggs from birds fed single doses of petroleum oils. *Science* 195: 779-781.

Literature Citations (continued)

- Gress, F., R. W. Risebrough, D. W. Anderson, L. F. Kiffand J. R. Jehl, Jr. 1973. Reproductive failures of Double-crested Cormorants in southern California and Baja California. *Wilson Bull.* 85: 197-208.
- Harper, C. A. 1971. Breeding biology of a small colony of Western Gulls (Larus occidentalis wymani) in California. *Condor* 73: 337-341.
- Hartung, R. 1965. Some effects of oiling on reproduction of ducks. *J. Wildl. Manage.* 29: 872-874.
- Hartung, R. 1967. Energy metabolism in oil-covered ducks. *J. Wildl. Manage.* 31: 798-804.
- Hunt, G. L., Jr. and M. W. Hunt. 1976. Gull chick survival: the significance of growth rates, timing of breeding and territory size. *Ecology* 57: 62-75.
- King, W. B. (ed.) 1974. Pelagic studies of seabirds in the central and eastern Pacific Ocean. *Smithson. Contrib. Zool.* 158. 277 pp.
- Leatherwood, S., W. E. Evans and D. W. Rice. 1972. The whales, dolphins, and porpoises of the eastern North Pacific. A guide to their identification in the water. *Nav. Undersea Res. Dev. Cent.* San Diego, N.U.C., T. P. 282: 1-175.
- Le Boeuf, B. J. 1971. Oil contamination and elephant seal mortality: a "negative" finding. In D. Straughan (ed.), *Biological and oceanographical survey of the Santa Barbara Channel oil spill, 1969-1970.* Univ. of Southern Calif., Al Ian Hancock Foundation, vol. 1: 287-295.
- Odell, D. K. 1971. Censuses of pinnipeds breeding on the California Channel Islands. *Jour. of Mammal.* 52(1): 187-190.
- Orr, R. T. 1969. The gray whale "crisis" of 1969. *Pacific Discovery* 22(6): 1-7.
- Shepard, F. P. and K.O. Emery. 1941. Submarine topography off the California coast: canyons and tectonic interpretation. *Geol. Soc. America Spec. Paper No. 31.* 171 pp.

WHALES, WHALING AND OIL ACTIVITY

Report on presentations made at the North Slope Community Information Exchange Program Seminar: "Whales and Oil Activity," July 20-21, 1979. Presentations given at Barrow before members of the Alaska Eskimo Whaling Commission and Mayor Eben Hopson and at Prudhoe Bay for people of Nuiqsut, Kaktovik and Barrow, including members of the North Slope Borough Planning Department.

THE CANADIAN BEAUFORT EXPERIENCE

Cooperation: Oil Industry, Scientists and Whalers - Since 1972, studies of beluga whales in relation to offshore exploration have been conducted in the Mackenzie estuary of the Canadian Beaufort for Imperial Oil Limited (now called Esso Resources Canada Limited). These studies have included bowheads since 1976. Through a cooperative effort among whalers, scientists and the oil industry, the purposes of the research have been (1) to find out in what way the whales use the Mackenzie estuary; (2) what conditions are necessary for successful whaling in the area; and (3) how oil activity can be conducted so that both whaling and oil activity can take place compatibly.

An example of how such a cooperative effort can successfully take place relates to barge traffic in the area. Scientists had noticed that the whales moved at first as far as one and a half miles from the path of a barge which passed through a large concentration of belugas. Upon checking back 30 hours later, however, the scientists discovered that the group of whales had resumed a distribution approximating that observed before the barge passage. Although this tends to suggest that the whales were only temporarily dislocated, such dislocation could prevent whalers from whaling if the barge movement occurred at the wrong time and in the wrong place.

In practice, the biologist responsible to the oil company for monitoring the whales, whalers and oil company activity has been able to see that appropriate steps are taken to enable whalers to go whaling when the conditions are right. Thus he has held barges from moving for as long as 18 hours, enabling the whalers that day to harvest 11 whales. He has also at times advised the company to have the barges travel all at once instead of moving separately, thereby minimizing disturbance to the whales. The location and timing of other oil company operations have also been modified in order to reduce disturbance both to the whales and whalers.

Observations - There are seventeen artificial islands now in the Canadian Beaufort, where drilling has taken place in all seasons of the year since 1973. Neither the beluga whales nor the bowheads have shown adverse reaction to artificial islands; they simply swim around them. The whales have travelled freely past man-made islands located in their travel route along the Tuktoyaktuk Peninsula. Further, there is no evidence that the bowheads, whose distribution was recorded by commercial whalers around the turn of the century, now avoid areas where there is current activity from gravel islands. In fact, beluga whales have been observed to come within one-half mile of an island where a rig was actually drilling. Also dredging -- a stationary sound source -- appears to have less of an effect in terms of noise disturbance than the temporary effect of barge movement. Also of note, members of the Alaska Eskimo Whaling Commission have expressed the view that belugas are more sensitive to sound disturbance than bowheads, although there is disagreement on this matter.

THE CALIFORNIA EXPERIENCE

The Santa Barbara Blowout - In 1969 the worst thing that one can imagine for an oil company or for the whales off California actually happened: an oil blowout occurred near Santa Barbara. Scientists who had been studying the gray whale migration patterns for years knew that 90 percent of the whales followed a migration route within three miles of the coast. At the time of the blowout, the whales had already gone south, and there was great fear that the whales, particularly the cows and calves, might die or be injured on their journey north because of the oil spill.

Scientists and State and Federal officials combined their efforts with concerned citizens to try to maneuver the animals away from their traditional route in order to get them to avoid the oil slick. They used aircraft and boats, and, though the whales would temporarily stray from their route as they were being herded, the effort was in vain: the whales went back to their usual migration path close to shore, heading for the oil slick despite the people's efforts.

Prior to the spill and for a number of years, scientists had been searching beaches after each migration had taken place to count the whales that had beached and to collect and analyze data to learn more about the whales. In an average year, three whales would be found beached. The search on the beaches after the blowout was greatly intensified. Among the searchers were scientists from National Marine Fisheries Service and the California Department of Fish and Game.

In an average year, three beached whales would normally be found. In the year of the blowout, five were found, but not one of the deaths was attributed by the scientists to the oil spill. Two whales did have evidence of oil externally, but there was no evidence of oil inside whatsoever: not in the lungs, the liver, the brain, the heart, etc. Thus, the scientists concluded that none of the whales' deaths could be attributable to the oil spill.

Since that time, the gray whale population in the area has dramatically increased. Whereas in 1969 there were some 6,000 animals, according to National Marine Fisheries Service population counts, by 1978 the number of gray whales had increased to some 15,000. The increase is such that there is a good possibility that the United States will follow the international example and soon remove the gray whale from the list of endangered species.

Interestingly, although the population has more than doubled, the number of whales found beached each year has hardly increased to the same degree at all. Last year, five were found on the beaches. Also, during this period, from 1969 to 1978, the amount of shipping in the area has doubled, military activity has multiplied five-fold, drilling operations have increased and sports fishing is a major attraction in the area. But the whales still follow the same migration route close to the shore. . .

Structures in the Migration Route - When scientists learned that a pier extending well offshore was being planned, they became greatly concerned that the pier would interfere with the gray whales' migration. They feared that (1) the whales might crash into the object since it was situated right in the middle of the migration route or (2) the whales might wander way offshore to avoid it and not return to their long-established migration route close to shore.

Experience showed that both fears were unwarranted. The pier has since been built, and now there are several other piers stretching across the migration route as well. The whales either swim out around it, returning to their route or some swim right under it between the pilings.

Reactions to Noise - Scientists have been greatly concerned about the tremendous increase in noise along the California coast, particularly since the gray whales migrate so close to shore. They are exposed to a wide variety of man-made noises not to be found in arctic waters: pleasure boating, commercial fishing, military aerial bombing, missile firing, naval bombardment, jet aircraft landings and takeoffs, along with heavy shipping activity and widespread offshore exploration and production. A number of experiments were thus conducted to determine whether industrial noises under water might be interfering with the whales' ability to communicate.

*John Ford (1977) Acoustic Study
Superior Cal
Communications
Hager*

One theory why the whales seem to have adapted so well to underwater noise is that it appears that they are capable of tuning out other sounds in order to continue to be able to communicate. It is similar to a situation where people are in a crowded room where everyone is talking with someone else. In order to hear the person speaking to you, you tune out on the other sounds and concentrate on the voice of the person speaking to you. That is what the scientists believe the whales do also.

Other experiments have indicated that low frequency industrial sounds decay rapidly in the water. Because whales are thought to communicate at very low frequencies and to hear so much better than human beings, the scientists conducting the experiments raised the sensitivity of the hydrophone recordings eight-fold so that what they were picking up in the way of sound under water was actually multiplied to eight times the normal volume. They discovered that the industrial noise could not be identified apart from other ocean noises even as close as one mile away. Further, if the wind level was 5-10 miles an hour, the industrial sound couldn't be identified even as close as a half mile away. It also appears that whales don't seem to react so much to a stationary sound source.

Gray whales migrating close off the California coast thus seem to have adapted quite rapidly to a wide variety of man-made noises and objects following their traditional migration route despite the changes. It is possible that other types of whales could also adapt: experiences in the Canadian Beaufort indicate that they can.

CONCLUSION

The evidence from studies off California and in the Canadian Beaufort suggest that whales have a large capacity for adapting to man-made changes in their environment while maintaining their traditional migration routes. The types of whales that have been studied in the effort to determine their reaction specifically to oil activity include gray, beluga and bowhead whales, although more time has been spent to date on gray and beluga whales. The Canadian experience also suggests that a cooperative effort can be undertaken to ensure that oil activity and whaling need not be sacrificed one for the other with scientists, whalers and oil company people working together. Such an effort has been underway in Canada since 1976, and, if the December 1979 lease sale is conducted in the Alaska Beaufort, it is not unreasonable to expect that a similar program can also be undertaken in Alaska.

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