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INFORMATION CENTER



by

Jay Langfelder, *et al.*
Tom French,
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U. S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

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INTRODUCTION

Inlets that exist through sandy barrier islands are subject to considerable migration as a result of wave forces and littoral currents. Many inlets seem to go through stages much like rivers in that they change shape and location and then return to an earlier and more youthful stage. Apart from the obvious navigation problems associated with changes in inlet shape and location, these migrations can cause considerable loss of property adjacent to the inlet. The purpose of this study is to review the historical record of most of North Carolina's inlets as indicated by aerial photographs dating back to 1938. A knowledge of the historical behavior of the inlets is useful when attempting to predict the future migrations of these same inlets. It is fully appreciated that the historical movements of the inlets, as indicated by the aerial photographs, are certainly limited in that they merely represent the inlets at specific times when the photography was actually made. Very significant changes in inlet configuration can occur quite rapidly, and therefore, important changes could have occurred between successive photographs. However, the photographs do present an accurate description of the inlet at the time the photographs were made.

This report is intended to be mainly a photographic display of the history of most of North Carolina's inlets. A brief description and various measurements that were made on the inlets are also included. The difficulty of numerically characterizing the changes in inlet configuration should be recognized, since the values that are obtained are highly dependent on the actual locations of the measurement points. However, the data tables are considered useful for obtaining a general pattern of inlet behavior.

STUDY PROCEDURE

A series of aerial photographs were studied for each inlet south of Cape Lookout for the maximum periods 1938 to 1971 or 1972. In most cases six photographs were available for each inlet. Where a scale is approximately the same for each photograph, the inlets have been aligned in a horizontal direction so that inlet migration can readily be seen on the photography. Since, in most cases, the scale is approximately the same, the relative size of the inlet during any time is also readily visible.

The table of inlet characteristics for each inlet indicates the gorge width and the change in the gorge width, the channel width and the change in the channel width, and the migration of both the gorge and channel. The gorge is defined as the location along the channel that has the narrowest cross-section. The channel is defined as the deeper portion of the inlet at the gorge where the majority of flow occurs. The gorge width and channel width are both indicated in terms of feet, whereas the changes in gorge and channel width are indicated in feet per year. The total migration can be obtained by multiplying the migration in feet per year by the number of years between successive photography. Net migration of the gorge of each inlet is given at the bottom of each table with maximum movements occurring during any one continuous period also shown.

The measurements that are included in the tables were obtained, in most cases, from enlarged rectified photographs which allowed more accurate measurements to be made. In the columns where migration is indicated the symbols S, W, N, and E are used to indicate the direction of migration. Since most of the inlets are not actually north and south or east and west, the direction corresponding closest to the direction of movement has been used.

In addition to the above, the report presents information on each individual inlet. In general, some description of the inlet, something about migration trends, and future trends are included. Quite obviously, the information on future trends was developed from the results of this historical study and is merely intended to indicate possible future trends. Certainly, more study should be made of migration trends before management decisions are based on these results.

Figure One presents the location of each of the inlets that are discussed in the remainder of the report. The information on the inlets is presented starting with the southernmost inlet in North Carolina and proceeding northward.

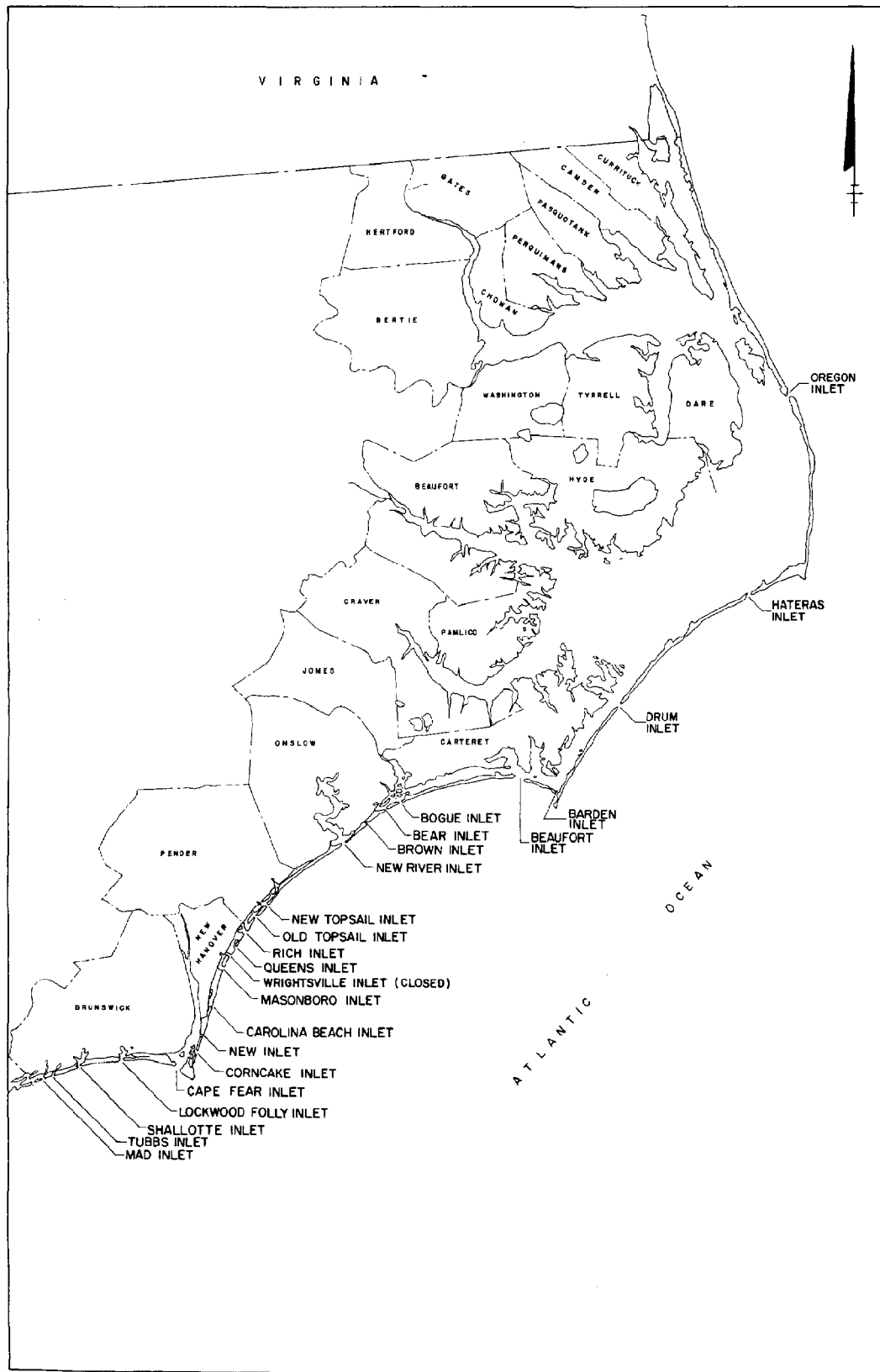


FIGURE 1. LOCATION OF NORTH CAROLINA'S INLETS

MAD INLET

Description

Mad Inlet is the southernmost inlet in North Carolina and is also one of the smallest inlets on the North Carolina coast. Its average width is approximately 400 to 800 feet. It is bounded on the south by Bird Island and on the north by Sunset Beach. Bird Island to the south of the inlet consists of a low sandy area which is subjected to periodic flooding during periods of high tide. It generally lacks vegetative cover and appears to be easily erodible. Sunset Beach to the east generally consists of somewhat higher ground.

Mad Inlet presently has an "S" shaped configuration and is extremely long compared to its width. The major flow through Mad Inlet comes from the marshes directly behind the inlet and from two drainage channels, Blane Creek and Salt Boiler Creek, which drain the inlet and also connect with the Intercoastal Waterway to the north.

Migration Trends

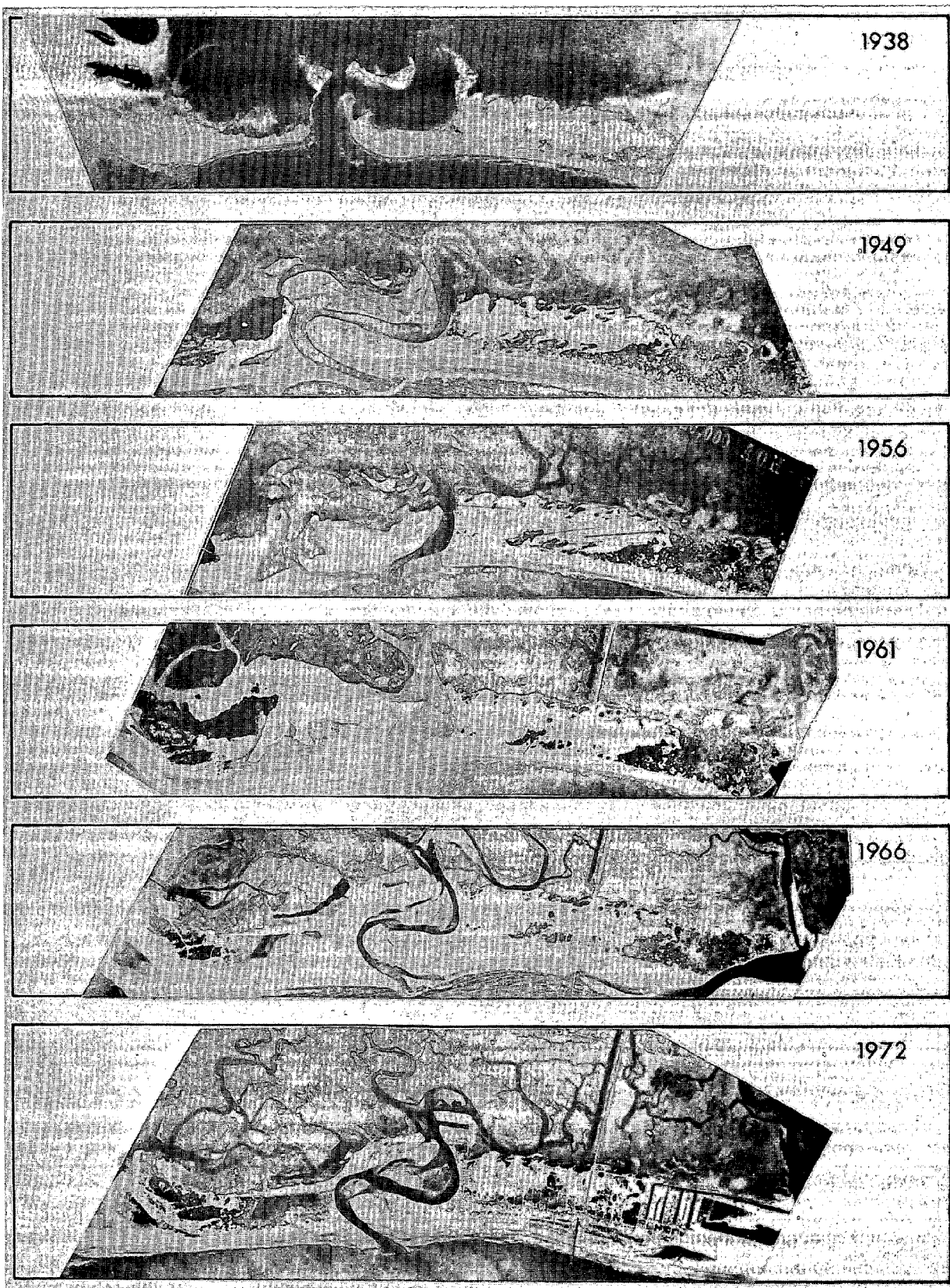
The general trend of Mad Inlet has been to migrate from the east to the west. As the length of the Inlet becomes excessive, and probably associated with a storm condition, a breakthrough can occur to the east. This produced the sand island that can be seen in the 1956 photography. Since the general littoral drift in this area is to the west, this sand island eventually merges into the high ground to the west. The maximum gorge movement that occurred during any successive increments between photography is about 2813 feet to the east or 444 feet per year between 1949-1956. This movement was caused by a breaching of the Inlet to the north. The net movement of the Inlet from 1938 to 1972 has been 610 feet to the east. It can be noted from the figure that the configuration of the Inlet in 1972 is essentially the same as the configuration in 1949.

Future Trends

It appears that Mad Inlet will continue to migrate to the west and retain the "S" shape characteristic because of the reversals in littoral drift. Based on the similarity of the position in 1949 and 1972, it appears certain that this Inlet will breach the island to the east and form a new one as was observed in the 1956 photography.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	660	-9	248	7	12 W	23 W	17 W	7 W
1949	552							
1949	552	29	265	-7	457 N	430 E	444 E	461 E
1956	736							
1956	736	21	333	36	162 W	128 W	145 W	91 W
1961	840							
1961	840	-19	300	-49	204 W	223 W	213 W	237 W
1966	745							
1966	745	57	219	9	84 W	150 W	117 W	96 W
1972	411							
Net Gorge Migration 155(ft) E					Maximum Gorge Migration 2813(ft) E (1949-1956)			

MAD INLET



APPROXIMATE SCALE: 1" = 3333'

TUBBS INLET

Description

Tubbs Inlet is located just east of Mad Inlet in Brunswick County and is approximately 1450 feet in width. Sunset Beach is located to the west, and Ocean Isle Beach is located to the east. The Ocean Isle Beach is a long, low, narrow sand spit built from the east-west littoral flow. On the Sunset Beach side of the Inlet a low unvegetated sand spit presently exists.

Migration Trends

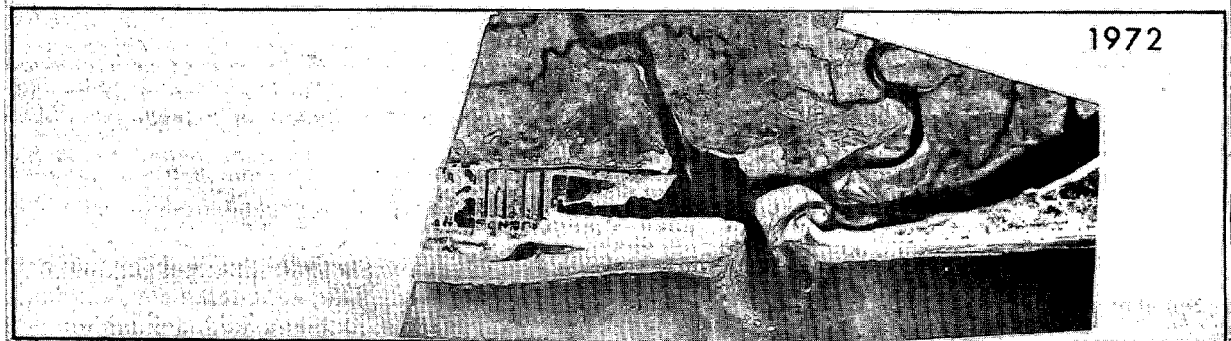
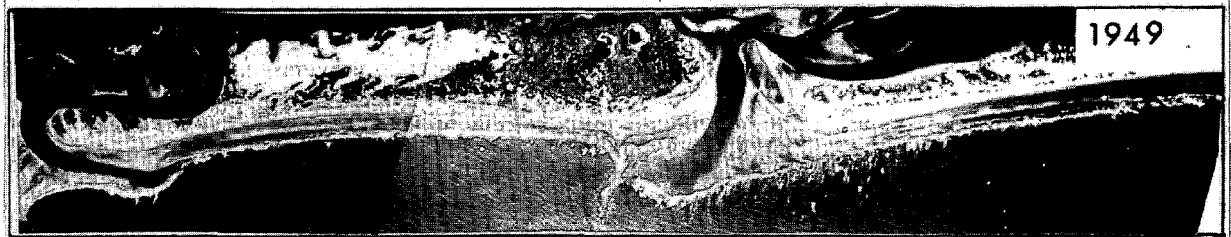
From 1938 to 1966, the Inlet showed a steady westernly migration of over 1800 feet west. During this period, the gorge of Tubbs Inlet was generally decreasing in width, from about 1750 feet in 1938 to 719 feet in 1966. In 1969, the Inlet was dredged closed and later reopened at approximately the same location as the 1938 position or about one half mile to the east. Since the Inlet was reopened in 1969 it appears to be widening.

Future Trends

It is difficult to determine if littoral drift will again cause migrations similar to the previous ones, but it is likely. When migrations occur, they probably will be similar, if not faster, due to lack of vegetation on the west boundary. Therefore, it can be anticipated that the Inlet will migrate to a location similar to its location in 1966.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge E side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	1754							
1949	985	-66	432	11	7 E	59 W	26 W	15 W
1949	985							
1956	556	-66	368	-41	52 W	117 W	85 W	80 W
1956	556							
1961	865	62	334	37	112 W	70 W	91 W	100 W
1961	865							
1966	719	-31	515	35	103 W	118 W	110 W	88 W
1966	719							
1972	1452	122	465	-47	*This inlet was closed in 1969 by pumping of dredge spoil and was opened by dredging and blasting later in 1969 at approximately the same location as it existed in 1938.			
Total Gorge Migration (ft) 1849 S/W					Maximum Gorge Migration (ft) 1849 W (1938-1966)			

TUBBS INLET



APPROXIMATE SCALE: 1" = 3333'

SHALLOTTE INLET

Description

Shallotte Inlet is bounded on the west by Ocean Isle Beach and on the east by Big Beach. Its gorge has averaged from 850-1300 feet in width. It is generally a short inlet compared to its width. In the 1972 photographs the main channel showed a marked easterly flow with the offshore bar indicating a easterly littoral drift.

Big Beach is a narrow island with very little vegetation, although it has a rather substantial marsh area behind the beach. Ocean Isle Beach is somewhat wider with some areas of denser vegetation than Big Beach. Shallotte River, Saucepan Creek and the western branch of the Intracoastal Waterway empty into the Inlet. The primary flow comes from the Shallotte River and the western section of the Intracoastal Waterway.

Migration Trends

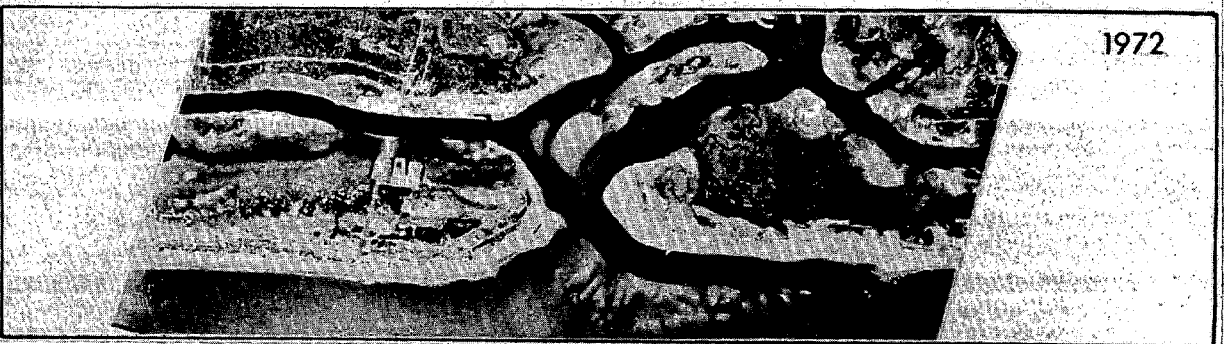
This Inlet has moved very slowly back and forth from east to west with no general trend toward the east or the west. There are two characteristics of the Inlet, however, that have changed over the last forty years: the location of offshore bar and the amount of cut-back the islands suffer from the Inlet. Since 1938 the direction of the main channel has been shifting to a more easterly direction on the ocean side of the Inlet. This has caused a movement of the offshore from the west side of the Inlet to the east side of the Inlet. The shoreline on each side of the Inlet has experienced shoreline erosion for a considerable distance.

Future Trends

On Big Beach, the zone of migration extends up to the area of the 1956 washover, and it is possible that under severe storm conditions a new inlet might open here. On Ocean Isle, the zone only extends a couple of hundred feet west of the present end of Ocean Isle Beach. There is a potential danger of beach front erosion if the offshore channel changes its direction, which it may well do. West to east littoral drift will occur for a while as indicated by recent photography and will then probably stabilize or reverse flow again.

INLET CHARACTERISTICS								
Year	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft)	Migration Of Gorge S/W side (ft/yr)	Migration Of Gorge N/E side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	1314							
1949	858	-46	722	-27	17 W	58 W	38 W	28 W
1949	858	6	563	-4	10 W	17 W	13 W	18 W
1956	901							
1956	901	34	456	-37	12 E	42 E	27 E	33 E
1961	1073							
1961	1073	-29	358	-2	40 W	66 W	53 W	35 W
1966	929							
1966	929	11	581	77	10 E	19 E	15 E	62 E
1972	993							
Total Gorge Migration (ft) 544 S/W					Maximum Migration (ft) 506 S/W (1938-1956)			

SHALLOTTE INLET



APPROXIMATE SCALE: 1" = 3333'

LOCKWOOD FOLLY INLET

Description

Lockwood Folly Inlet is located in the vicinity of Lockwood Folly River which feeds the Inlet by way of two channels. It is bounded on the east by Long Beach and on the west by Holden's Beach. Both beach fronts are presently suffering erosion from the Inlet. In 1972 the Inlet was approximately 800 feet wide and the main channel was on the eastern side of the gorge.

Migration Trends

The position of the Inlet appears to be rather stable with the west side experiencing only small movements. The east side is experiencing greater movements as the Inlet narrows and widens. Over the 34 year period studied, this Inlet has averaged less than 4 feet per year in a westwardly direction with a net movement of 115 feet to the west.

Between 1949-1956, Long Beach was breeched, and a new inlet was formed east of Lockwood Folly Inlet. Holden's Beach was cut back a little more, but some spoil was placed on the north-east corner. The offshore bar diminished in size, and the channel was able to penetrate the bar.

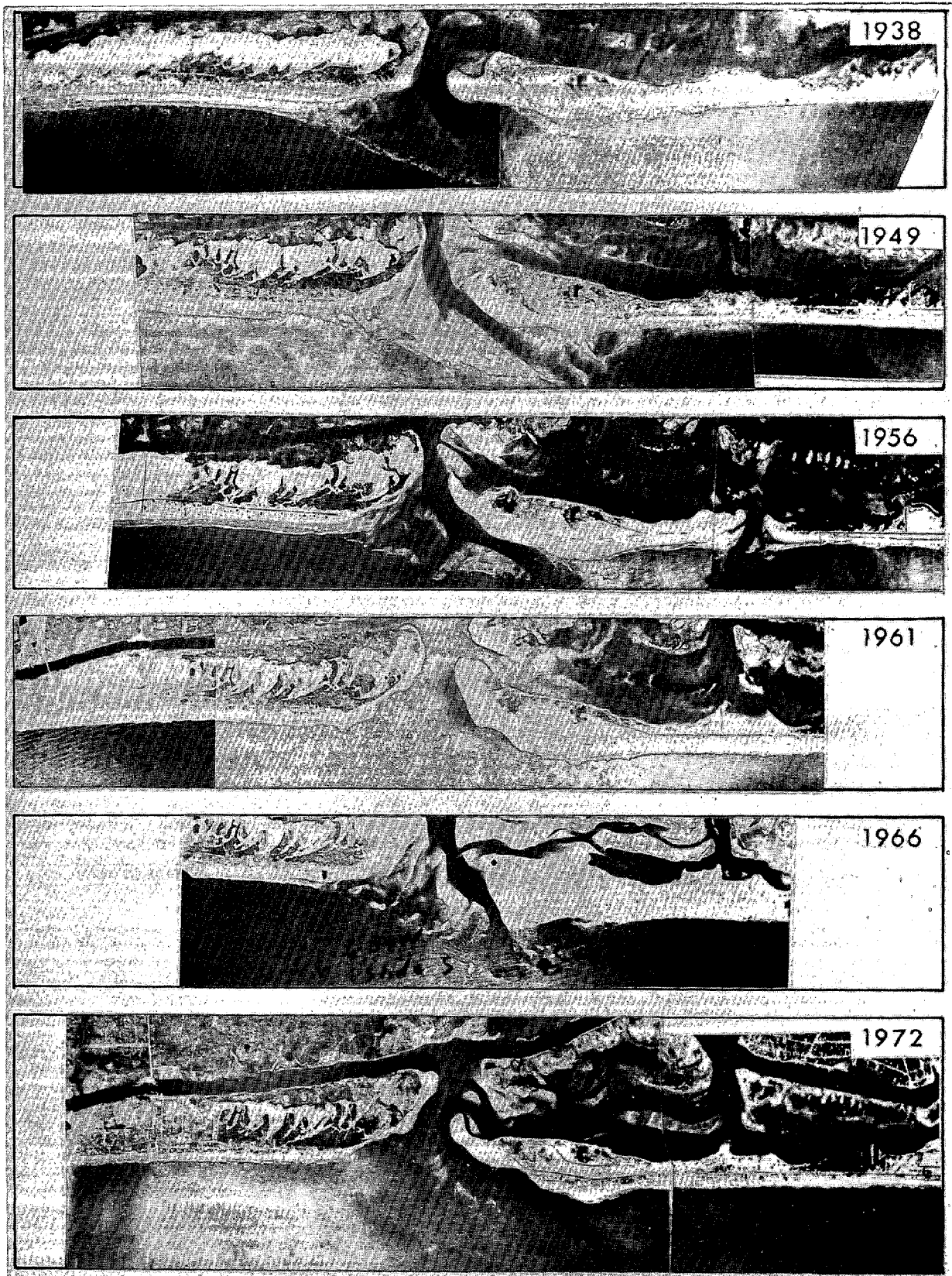
Between 1956-1961, the new inlet disappeared, and the offshore sand bar was less pronounced. The inlet also widened during this period.

Future Trends

The position of this Inlet appears to be relatively stable and is controlled, no doubt, by the location of Lockwood Folly River. However, since the River flow is divided by an island behind the present location of the Inlet, there is a possibility that a new inlet could again be formed approximately in the location of the inlet that existed in 1956. Since this area is now developed, it would be more difficult for such an Inlet to form than it has been in the past. It is unlikely that the Inlet will experience considerable movement to the west.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge E side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	870							
1949	1430	48	648	14	4 W	43 E	20 E	5 E
1949	1430	-95	454	-87	5 W	99 W	52 W	49 W
1956	826							
1956	826	24	347	70	14 W	18 E	2 E	26 E
1961	941							
1961	941	196	665	58	16 W	171 E	78 E	40 E
1966	1958							
1966	1958	-198	584	-87	26 E	173 W	75 W	20 E
1972	793							
Total Gorge Migration (ft) 115 W					Maximum Gorge Migration (ft) 441 W (1966-1972)			

LOCKWOOD FOLLY INLET



APPROXIMATE SCALE: 1" = 3333'

CAPE FEAR INLET

Description

Cape Fear Inlet is one of the widest inlets of North Carolina with an average width of over a mile. It is fed by the Cape Fear River and is located in east Brunswick County. The Inlet is bound on the west by Fort Caswell and Caswell Beach and on the east by Smith Island.

This Inlet depth is maintained by dredging. It appears to be very stable with strong flow from the Cape Fear River.

Migration Trends

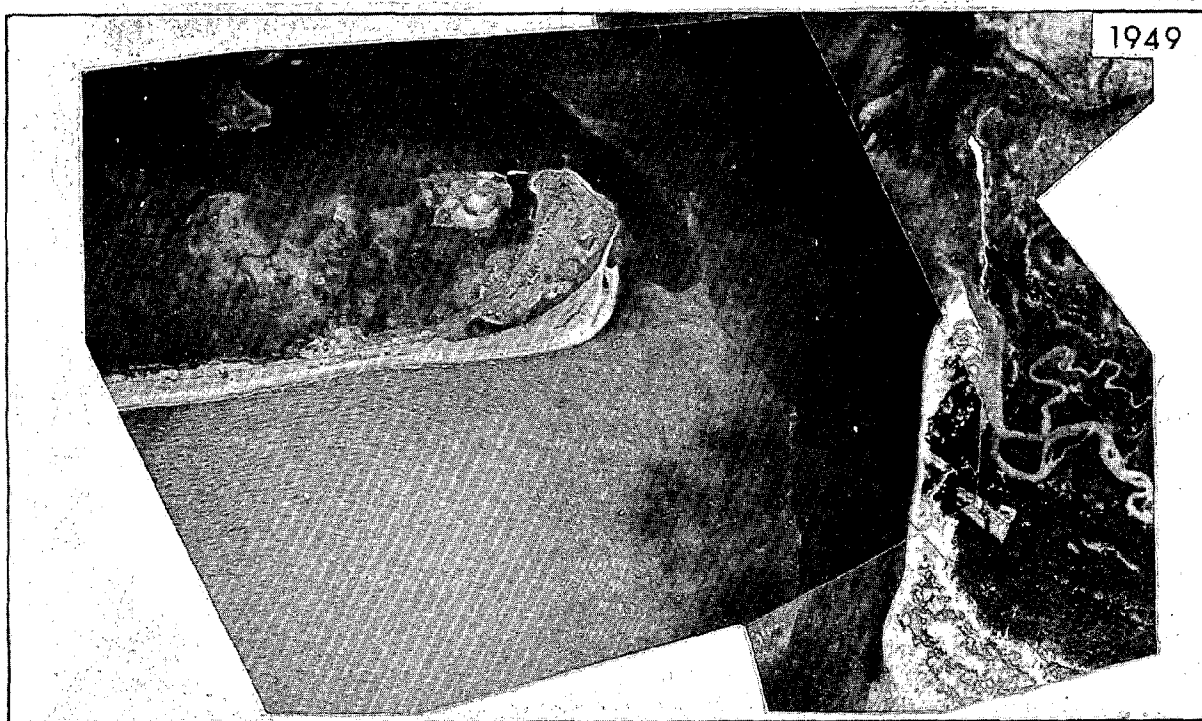
Migration is almost negligible compared to the size of the Inlet. Most of the erosion and accretion does appear to be in the area of Fort Caswell, with the maximum accretion being 44 ft/yr between 1956-1961. The eastern side has experienced essentially no migration due to a barrier provided by Smith Island. It should be noted that the migration of the Inlet has been well back of the south face of Smith Island, which tends to have a protective effect on the stability of the Inlet.

Future Trends

Little change can be expected to occur in the location of this Inlet. It is relatively stable and is steadily maintained by dredging for purposes of navigation.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge E side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1949	6015							
1956	5821	-28	3946	5	31 E	6 W	12 E	12 W
1956	5821							
1961	5706	-23	3805	-64	44 E	1 W	22 E	11 E
1961	5706							
1972	5880	16	3354	-53	6 W	4 W	5 W	40 E
Total Gorge Migration (ft) 133 E Maximum Gorge Migration (ft) 187 E (1949-1961)								

CAPE FEAR INLET



APPROXIMATE SCALE 1" = 3333'

CORNCAKE

Description

Corncake was at one time a fairly wide inlet which began silting around 1938 and was almost completely shut off by 1956. Located at the southern part of New Hanover, it is fed by the Cape Fear River and is bound on both sides by low sandy beaches with little vegetation.

Migration Trends

Corncake is presently closed. However, when it was open, it experienced a strong south-westerly migration of over 1500 feet between 1938 to 1949, after which it became shallow, and flow and migration seemed to cease.

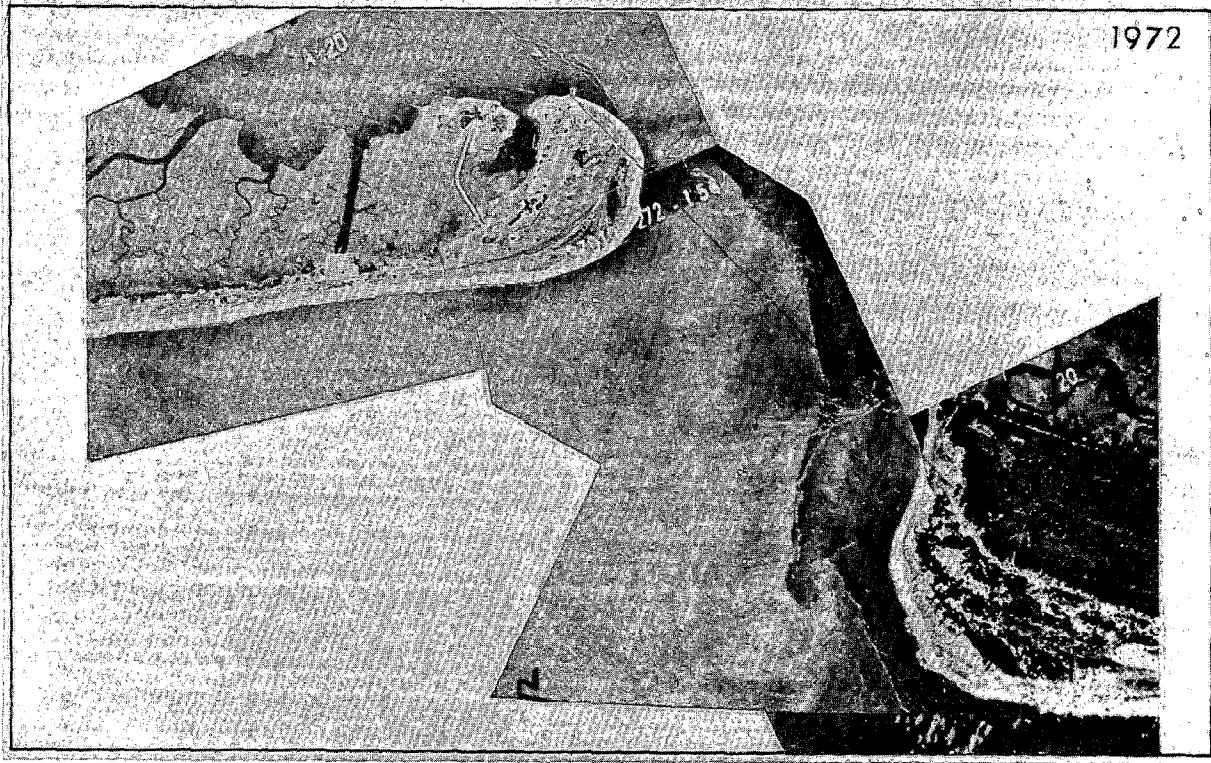
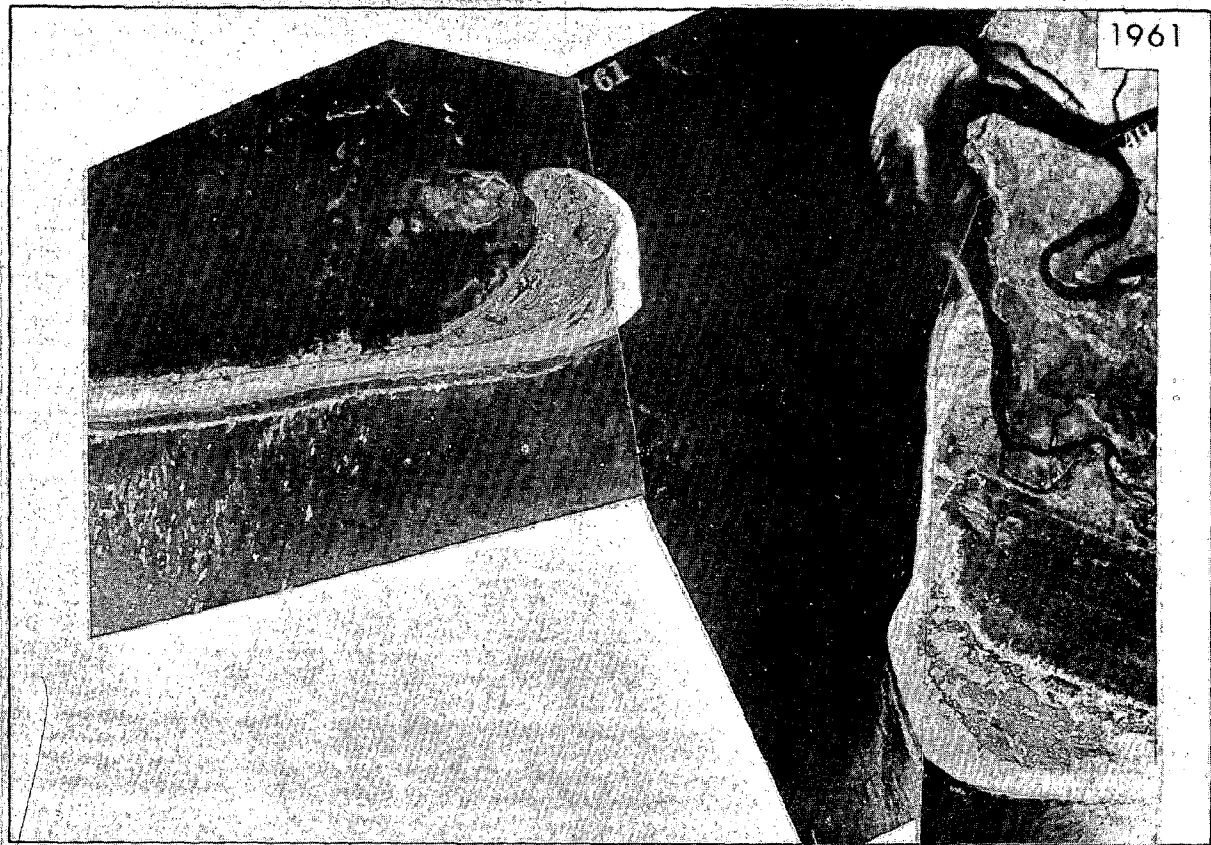
Future Trends

Corncake at one time was moving southernly at a high rate due to strong littoral drift from north-east to south-west which created a large sand spit. Increased silting and vegetation growth probably stopped much of the flow from the Cape Fear side. Since New Inlet is just to the north and was moving south at a high rate, it probably took over what little flow Corncake was receiving from the Cape Fear River.

New Inlet may continue moving south until it reaches the location of the old Corncake Inlet. It may possibly become a new Corncake in the same location if it breaches through to the north.

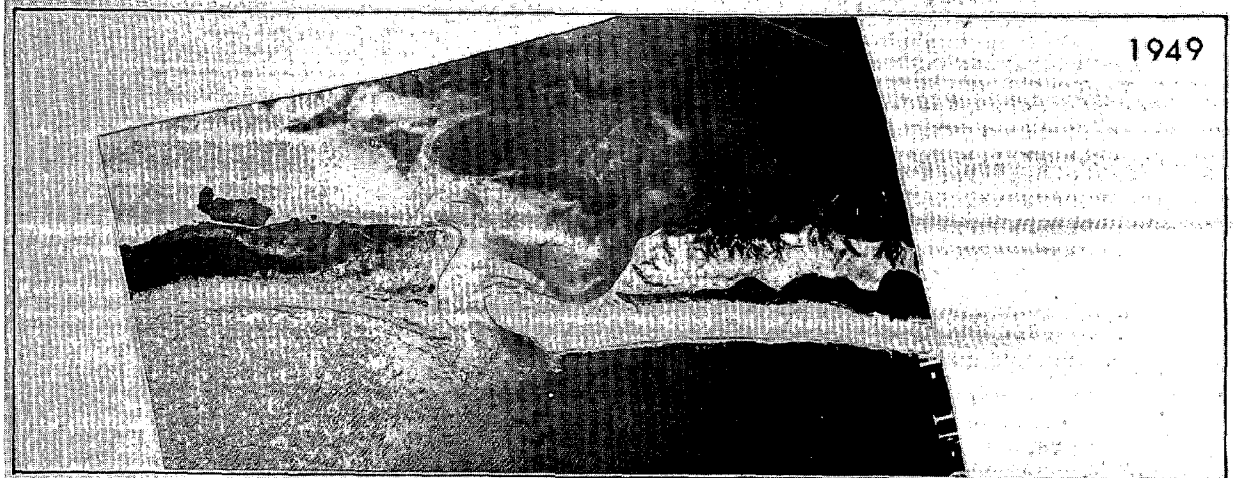
<u>INLET CHARACTERISTICS</u>								
Year	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	901							
1949	814	-8	447	-9	135 S	143 S	139 S	144 S
1949	814							
1956	546	-39	243	-45	66 N	18 N	42 N	90 N
1956	Closed shortly thereafter							
Total Gorge Migration (ft) 1244 S					Maximum Gorge Migration (ft) 1534 S (1938-1949)			

CAPE FEAR INLET



APPROXIMATE SCALE: 1" = 3333'

CORNCAKE INLET



APPROXIMATE SCALE: 1" = 3333'

NEW INLET

Description

New Inlet opened sometime after 1938 as evidenced by 1938 photography. Early in its existence the Inlet was wide with a poorly defined channel and gorge, which have since narrowed extremely and have become better defined. The present gorge and channel are located just north-east of the old Corncake location. They are bound by low sandy areas on both sides with sparse land and vegetation behind. Cape Fear River supplies the fresh water flow for this Inlet.

Migration Trends

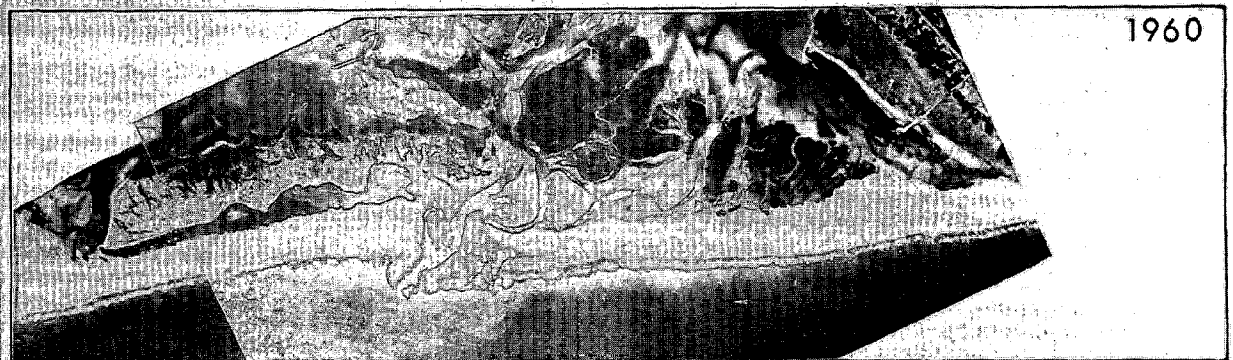
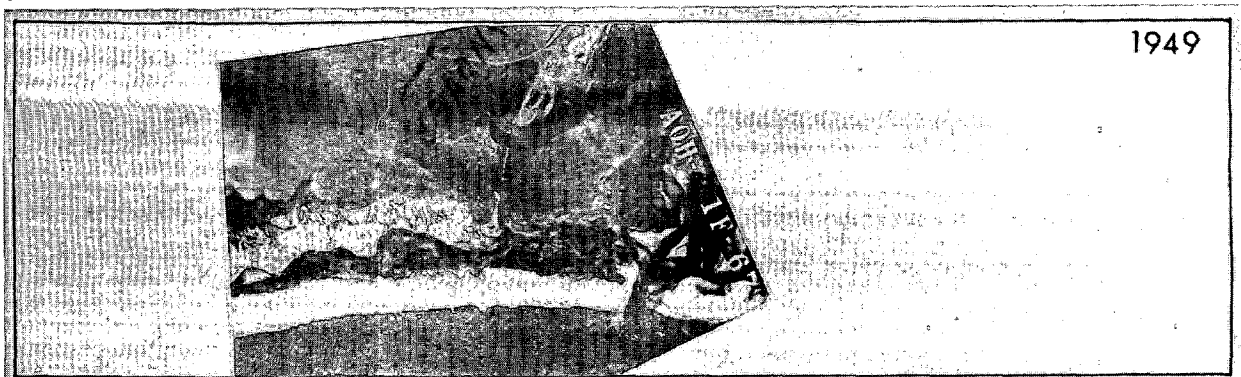
New Inlet has experienced the greatest migration of any Inlet studied. It has migrated to the south over seven thousand feet in approximately 23 years. The channel and gorge appear to be better defined and more stable than in previous times.

Future Trends

It appears that this Inlet will continue to migrate in a southerly direction although the length of the inlet is becoming quite long. This would increase the probability of an inlet breakthrough to the north of the present location with the subsequent shoaling of the present inlet. The southerly migration would probably continue after a possible new inlet was formed.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1949	603							
1956	1016	60	283	5	345 S	287 S	316 S	251 S
1956	1016							
1960	1284	58	282	-8	279 S	216 S	247 S	231 S
1960	1284							
1972	300	-88	164	-6	296 S	370 S	337 S	343 S
Total Gorge Migration (ft) 7112 S					Maximum Gorge Migration (ft) 7112 S (1949-1972)			

NEW INLET



APPROXIMATE SCALE: 1" = 3333'

CAROLINA BEACH INLET

Description

Carolina Beach Inlet is located in New Hanover County at the north end of Carolina Beach. The gorge of the Inlet averages about 530 feet with a width in 1972 of approximately 670 feet.

Migration Trends

The Inlet is a relatively new Inlet because it was opened in 1952. From 1956, the Inlet seems to be generally moving to the north-west at about 23 feet per year. It has, however, changed its characteristics since 1956.

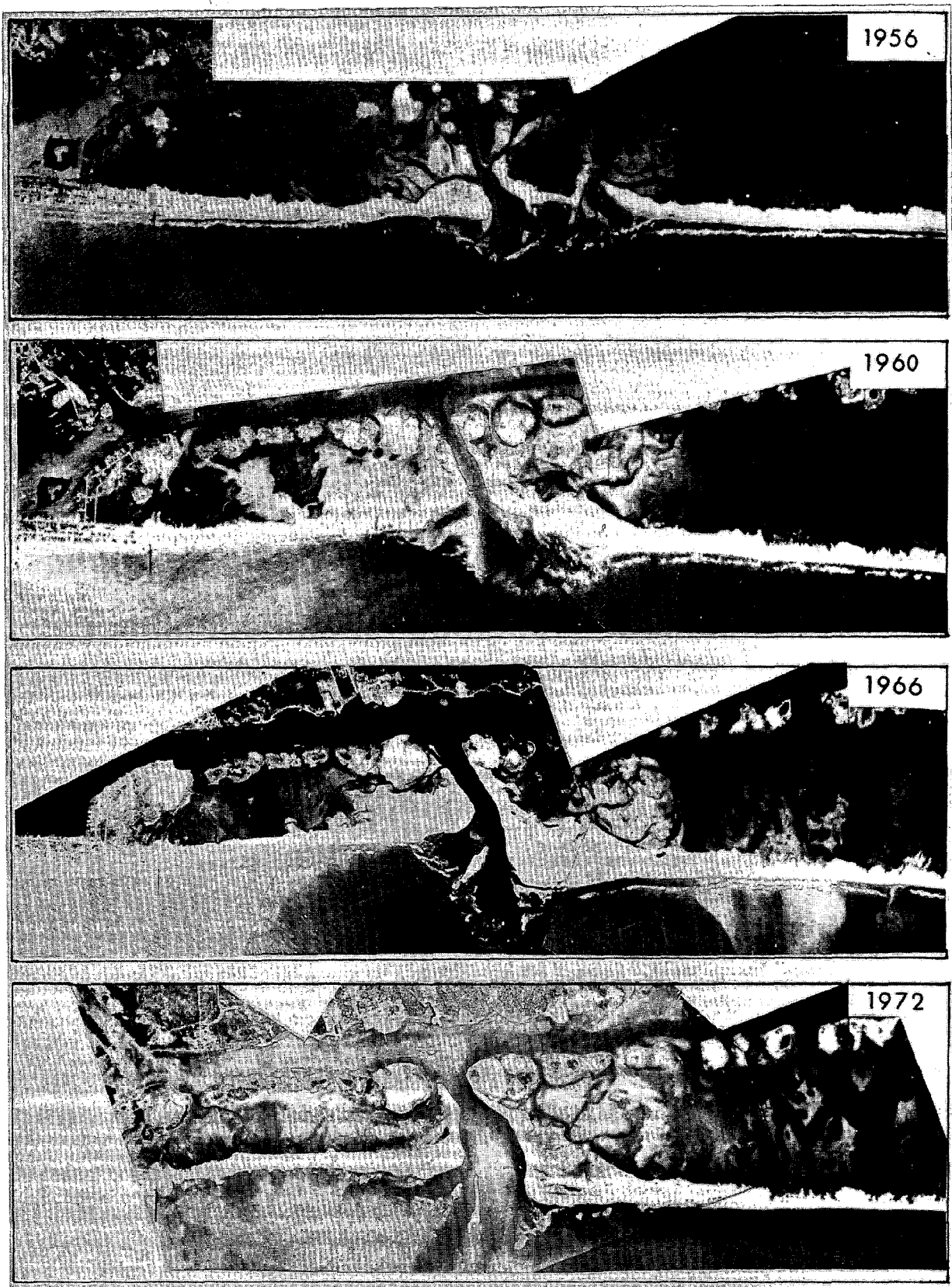
In 1956, the Inlet had two openings separated by a small marsh island with a rim of beach sand. The northern channel was narrow and winding while the one to the south was slightly wider and fairly straight. By 1960, the southern channel had shortened and widened and moved north approximately 20-30 feet. The northern channel had almost completely disappeared except for a small trickle over the beach front. South of the main channel there appeared to be several small washover areas. In 1960, the mouth of the Inlet had a funnel shape, but by 1966 most of the funnel shape of the Inlet was gone. The small washover areas had also completely disappeared. There was a small amount of accretion on the north side and some slight erosion on the south side of the Inlet. By 1972, the gorge of the Inlet had moved inland, and the seaward end of the Inlet had widened considerably. There seems to be some accretion on the north side and erosion on the south side of the Inlet taking place.

Future Trends

This Inlet seems to be moving toward the north at about 23 feet per year. The barrier islands on either side of the Inlet are subject to occasional storm overwashes which are evident in some areas. It would thus appear that the Inlet could move in either direction several hundred feet depending on the severity of the weather conditions.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1956	507	-26	316	-36	35 N	16 N	25 N	29 N
1960	385							
1960	385	32	209	-10	24 N	58 N	41 N	50 N
1966	557							
1966	557	19	366	60	5 S	14 N	4 N	6 N
1972	667							
Total Gorge Migration (ft) 361 N								
Maximum Gorge Migration (ft) 361 N (1956-1972)								

CAROLINA BEACH INLET



APPROXIMATE SCALE 1" = 3333'

MASONBORO INLET

Description

Masonboro Inlet is located in central New Hanover County at the south end of Wrightsville Beach. Hewlett Creek and Bradley Creek connect the Inlet to the Intracoastal Waterway. The gorge of the Inlet has varied from about 850 to 3575 feet in width and is extremely short compared to its width. The Inlet is bounded on the north by Wrightsville Beach and on the south by Masonboro Island.

The south end of Wrightsville Beach has been artificially stabilized by a jetty. The north side of the Inlet has, therefore, remained relatively stable compared to the south side which has experienced considerable movement, particularly, between 1938-1961. There is evidence of storm overwash in the area south of the present Inlet.

Migration Trends

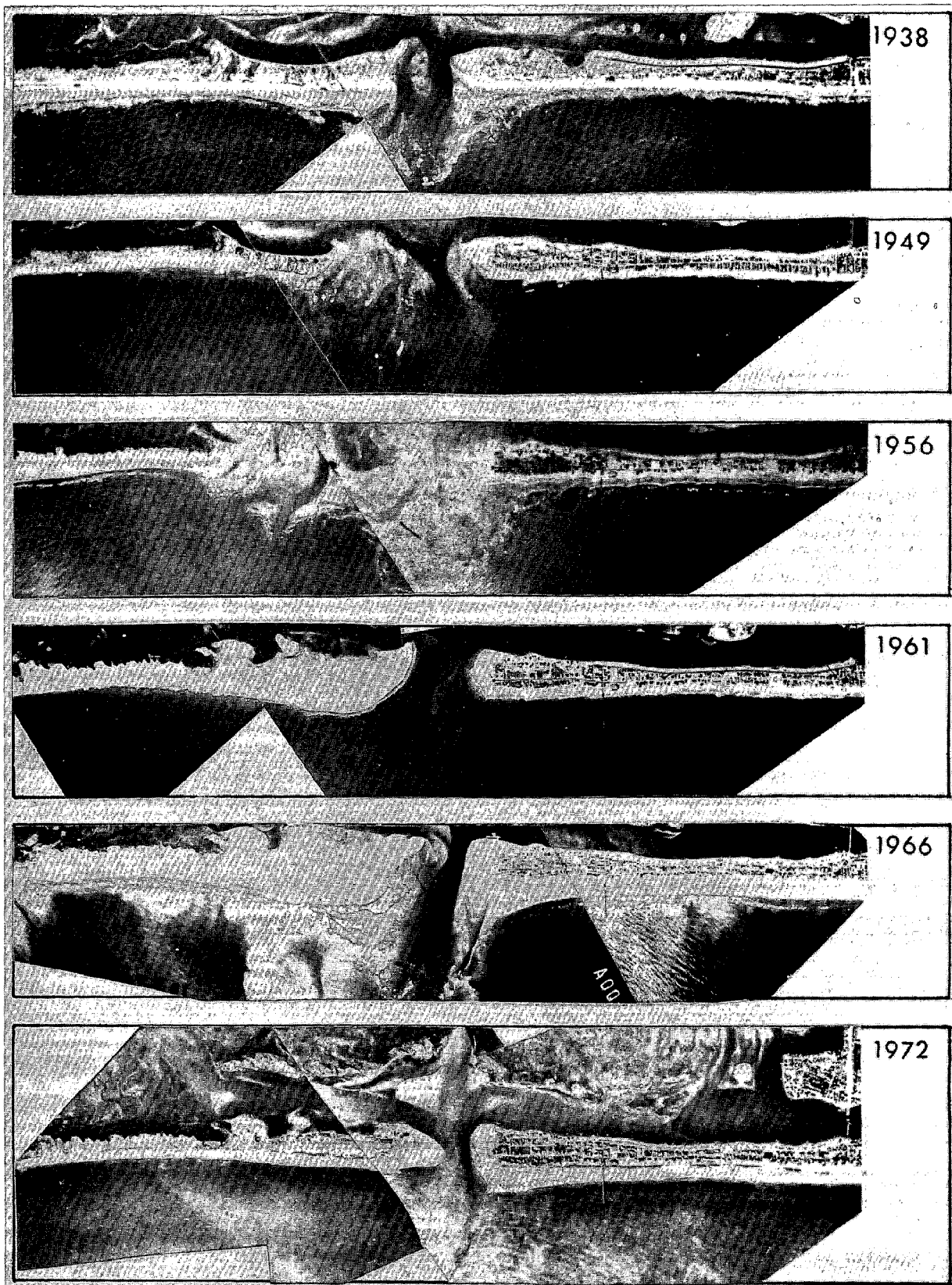
From 1938 to 1961, the major movement of the Inlet was in the migration of the south side which first causes the Inlet to widen, form a secondary channel, and finally narrow. In 1965, a long jetty was constructed on the Wrightsville Beach side of the Inlet, and an artificial dune was built up on the ocean side of the island. From 1961 to 1966, Wrightsville Beach was experiencing a small amount of accretion, and Masonboro Island was suffering erosion on the ocean side next to the Inlet. From 1966 to 1972, this Inlet migrated to the north with the channel presently located adjacent to the jetty.

Future Trends

The stabilizing jetty on the north side of the Inlet will obviously prevent any significant amount of northerly migration. Since the Inlet has been partially stabilized and is periodically dredged, it is unlikely that the Inlet will widen significantly. The jetty on the north significantly reduces the southern littoral flow and; therefore, relatively small southerly migration may be anticipated in the future.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	1276							
1949	3363	+180	846	39	151 S	14 N	68 S	25 S
1949	3363							
1949	3363	-33	917	-48	21 S	13 N	4 S	195 S
1956	3576							
1956	3576							
1956	3576	-420	890	52	447 N	27 N	237 N	190 N
1961	1556							
1961	1556							
1961	1556	-68	495	-53	16 N	54 S	19 S	42 N
1966	1205							
1966	1205	-61	282	48	97 N	34 N	65 N	34 N
1972	846							
Total Gorge Migration (ft) 610 N					Maximum Gorge Migration (ft) 1424 N (1956-1972)			

MASONBORO INLET



APPROXIMATE SCALE: 1" = 33.33'

QUEENS INLET (MASON INLET)

Description

Queens Inlet is bound on the south side by Wrightsville Beach and on the north side by Figure Eight Island. The southern end of Figure Eight Island has recently been modified by dredging. This end of the island has minimal vegetative cover but has recently undergone extensive development. The northern end of Wrightsville Beach has high land elevations close to the end of the Inlet. The Inlet was about 900 feet in width in 1972 and is fed by three major channels: Page Creek, Howe Creek, and one connected only to the Intracoastal Waterway.

Migration Trends

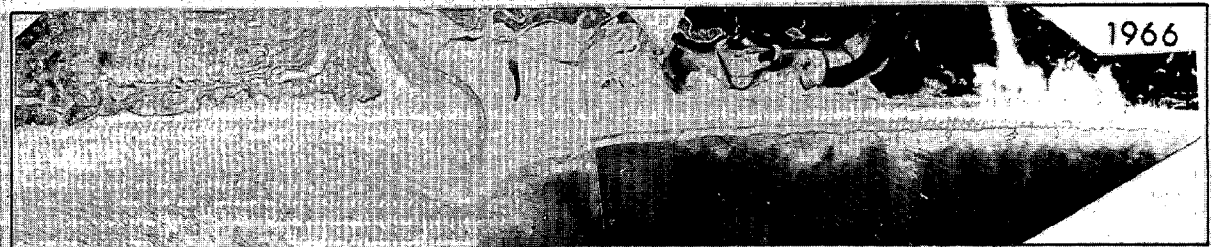
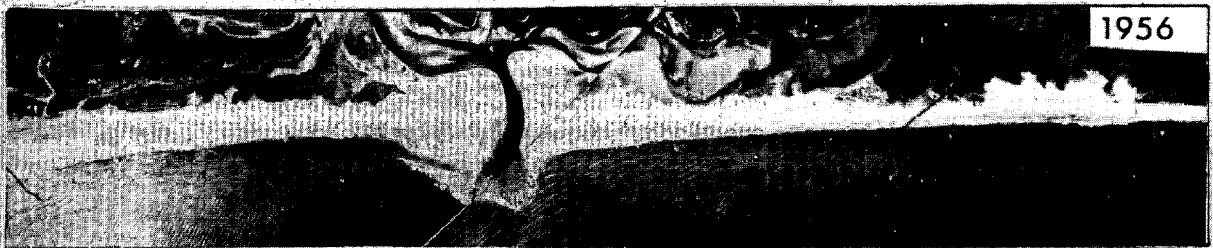
Queens Inlet seems to be moving generally north to south; however, the dramatic change in curvature of the Inlet indicates littoral drift is acting to influence the shape of the Inlet. From 1938 to 1949 and from 1956 to 1960, southerly migration was significant. Between 1938-1960, the sand spit from Figure Eight Island was extending southward continuously. This movement forced the channel to the south, eroding the end of the sand spit next to Wrightsville Beach. From 1960 to 1965, there was a reversal of the trend, and the Inlet migrated about 230 feet to the north. Page Creek, which runs into Middle Sound at the back of Figure Eight Island, was almost silted in by 1966; however, dredging before 1972 has reopened Page Creek. Howe Creek has a straight run through the Inlet, had a deep channel and was fairly clear of bars in 1966. By 1972, after Page Creek was dredged out almost completely, Howe Creek had begun to silt up. The channel is now about the same width as the gorge.

Future Trends

It can be expected that Queens Inlet will continue to migrate to the south due to the predominant southerly littoral drift. Fairly high ground exists rather close to the south of the Inlet, and the Inlet does not have a history of extremely rapid movement to the south; therefore, it would be expected that relatively slow southerly migration can be expected to continue for some time.

INLET CHARACTERISTICS								
Year	Average Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft/yr)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Inlet Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	606							
1949	2100	129	271	7	147 S	22 S	85 S	86 S
1949	2100	-88	251	-19	61 S	160 S	110 S	31 S
1956	1540							
1956	1540	-139	162	-13	91 S	245 S	168 S	265 S
1960	892							
1960	892	20	141	3	37 N	48 N	42 N	66 N
1966	996							
1966	996	-20	356	67	4 N	15 S	6 S	50 S
1972	876							
Total Gorge Migration (ft) 2278 S					Maximum Gorge Migration (ft) 2471 S (1938-1960)			

QUEEN S INLET



APPROXIMATE SCALE 1" = 3333'

RICH INLET

Description

Rich Inlet is located on the Pender County - New Hanover County line with Figure Eight Island to the south. The gorge of the Inlet has recently averaged about 2000 to 2500 feet in width. The Inlet is short compared to its width with the major flow through the Inlet coming from the marshes behind the Inlet and two natural channels, Nixon and Green, which connect it to the Intracoastal Waterway.

The island to the north has recently become considerably more vegetated close to the Inlet. A curved sand spit existed on the south side of the Inlet in 1972. The channel is presently (1972) rather narrow and is located on the north side of the Inlet.

Migration Trends

The south side of the Inlet is generally migrating to the south, even though the main channel has recently been on the north side of the gorge. Significant changes in the size of the Inlet have occurred particularly between 1949 and 1960. During this period, as well as from 1966 to 1972, there has been considerable migration of the Inlet to the south, except for the 1949 to 1956 period when migration was to the north.

Between 1956 and 1960, a new inlet formed through the Island to the north about 1 mile north of Rich Inlet. By the 1966 photographs, however, it was completely filled in with vegetation beginning to form in the area.

Future Trends

Rich Inlet has a southerly motion on the order of 38 feet per year. It appears that this will continue unless there is some depletion of the littoral flow or a breakthrough occurs to the north after southerly migration has continued for some time.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	2072							
1949	2038	-3	402	8	63 S	67 S	65 S	23 N
1949	2038	208	982	171	2 N	211 N	106 N	93 N
1956	3344							
1956	3344	-295	1001	-218	59 N	237 S	89 S	52 N
1960	1947							
1960	1947	4	400	-31	55 S	53 S	54 S	5 S
1966	1965							
1966	1965	84	357	17	106 S	10 S	96 S	34 S
1972	2460							
Total Gorge Migration (ft)			1277 S	Maximum Gorge Migration (ft) 1189 S (1956-1972)				

RICH INLET



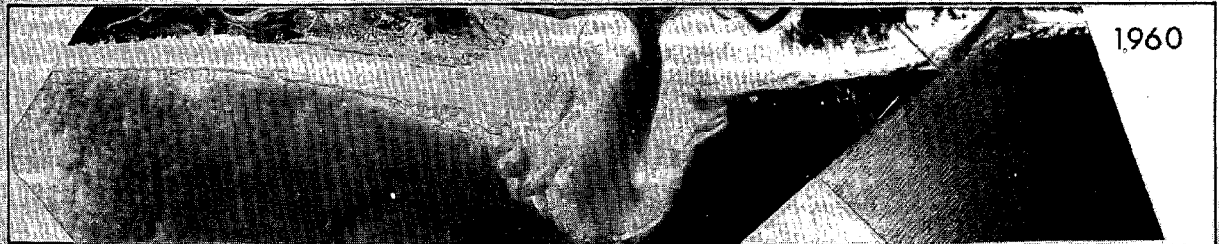
1938



1949



1956



1960



1966



1972

APPROXIMATE SCALE: 1" = 3333'

OLD TOPSAIL INLET

Description

Old Topsail Inlet is in Pender County, south of New Topsail Beach, and it is separated from New Topsail Inlet by a small sand island. It is smaller than New Topsail, averaging only 1200 feet in width. The length of the Inlet is small compared to its width.

Migration Trends

The Inlet is generally moving from the north to the south. Four of the five periods studied show migration in a southerly direction with a maximum migration of 1179 feet, or 238 feet per year, occurring in the period between 1961-1966. The only period that did not show southerly movement was between 1938-1949, and this movement to the north-east was only about 408 feet. The net migration for the forty-year period was 2707 feet.

Future Trends

Future trends are difficult to define for this Inlet, since it seems to be traveling to the south so consistently. The north side has become stabilized with vegetation as it continues to move in a southerly direction. It could be anticipated that the Inlet may migrate back to the north side of its 1949 location, and it might be expected that the southern end of the Inlet could migrate approximately 1,000 feet to the south of the 1972 location.

INLET CHARACTERISTICS								
Year	Gorge Width (ft.)	Gorge Width Change (ft/yr)	Channel Width (ft.)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	654	71	324	-2	3 N	68 N	35 N	8 S
1949	1466							
1949	1466	-73	340	9	38 S	109 S	73 S	39 N
1956	1010							
1956	1010	-33	284	-33	145 S	176 S	160 S	205 S
1961	839							
1961	839	222	201	1	350 S	129 S	238 S	214 S
1966	1938							
1966	1938	-120	202	1	48 S	170 S	109 S	118 S
1972	1230							
Net Gorge Migration (ft)		2707 S		Maximum Gorge Migration (ft)		3115 S (1949-1972)		

OLD TOPSAIL INLET



APPROXIMATE SCALE: 1" = 3333'

NEW TOPSAIL INLET

Description

New Topsail Inlet is located at the southern end of New Topsail Beach. It averages 1250 feet in width with the gorge staying relatively perpendicular to the beach front and being rather short compared to its width.

The island to the south, which is only a mile in length, is a low sandy area with sparse ground vegetation. The island to the north is 21 miles long with fairly dense ground vegetation and many stands of trees, and it seems to have a generally higher elevation than the island to the south. The main channel of this Inlet is on the south side of the gorge, and it appears that the major ebb flow comes from Banks Channel and a small channel from the Intracoastal Waterway.

Migration Trends

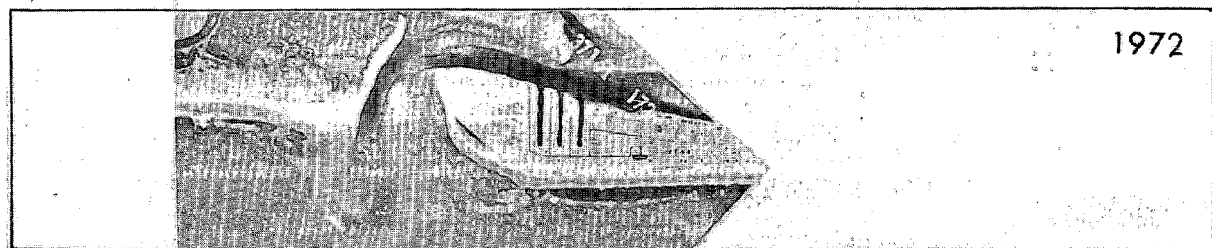
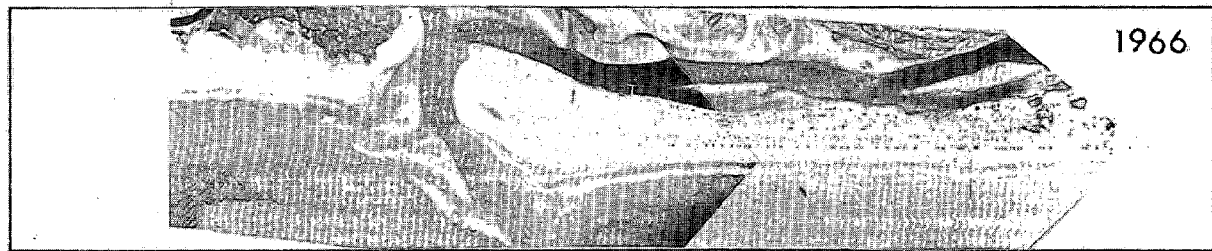
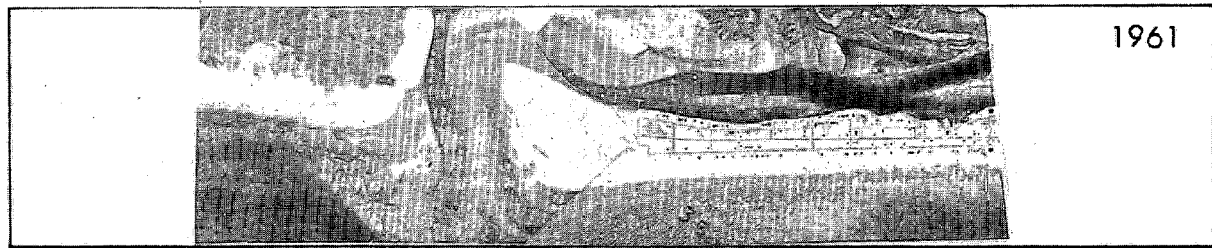
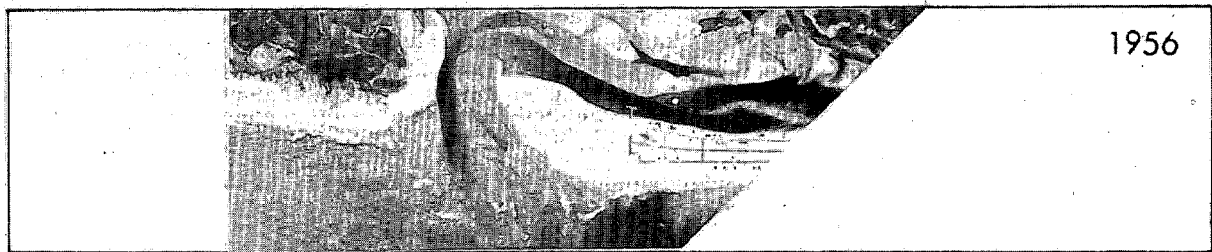
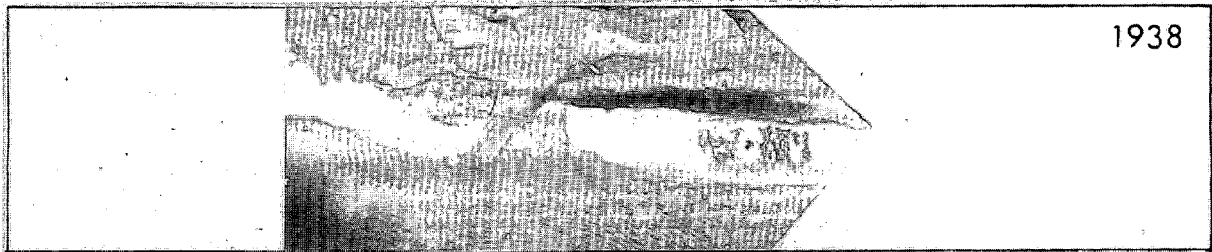
The Inlet is moving generally from north to south with five periods studied showing migration to the south of over 25 feet per year. The maximum migration occurred in the period between 1949-1956, and the net movement was 1286 feet west. The total southerly migration for the thirty-four year period was 2680 feet.

Future Trends

It appears that this Inlet will continue to migrate to the south; although, a breakthrough of an inlet several thousand feet to the north certainly would be possible. The southern migration could extend another 2,000 feet to the south where Howard Creek makes a sharp turn to the northeast.

INLET CHARACTERISTICS								
Year	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	1387							
1949	2043	57	587	-30	57 S	2 N	28 S	65 S
1949	2043	-152	303	-36	131 S	280 S	205 S	169 S
1956	1090							
1956	1090	101	239	19	92 S	10 N	41 S	81 S
1961	1609							
1961	1609	-84	545	105	3 S	98 S	50 S	-76 N
1966	1195							
1966	1195	6	611	-73	106 S	100 S	103 S	167 S
1972	1229							
Total Gorge Migration (ft)			2680 S					
			Maximum Gorge Migration (ft) 2680 S (1938-1972)					

NEW TOPSAIL INLET



APPROXIMATE SCALE: 1" = 3333'

NEW RIVER INLET

Description

New River Inlet is located in Onslow County between the south end of Onslow Beach and the north end of Topsail Beach. The gorge of the Inlet averages about 770 feet in width with the channel existing on the southern side of the gorge. The Inlet is fed by New River through one channel; however, some flow occurs through the tidal marshes behind the barrier islands.

Migration Trends

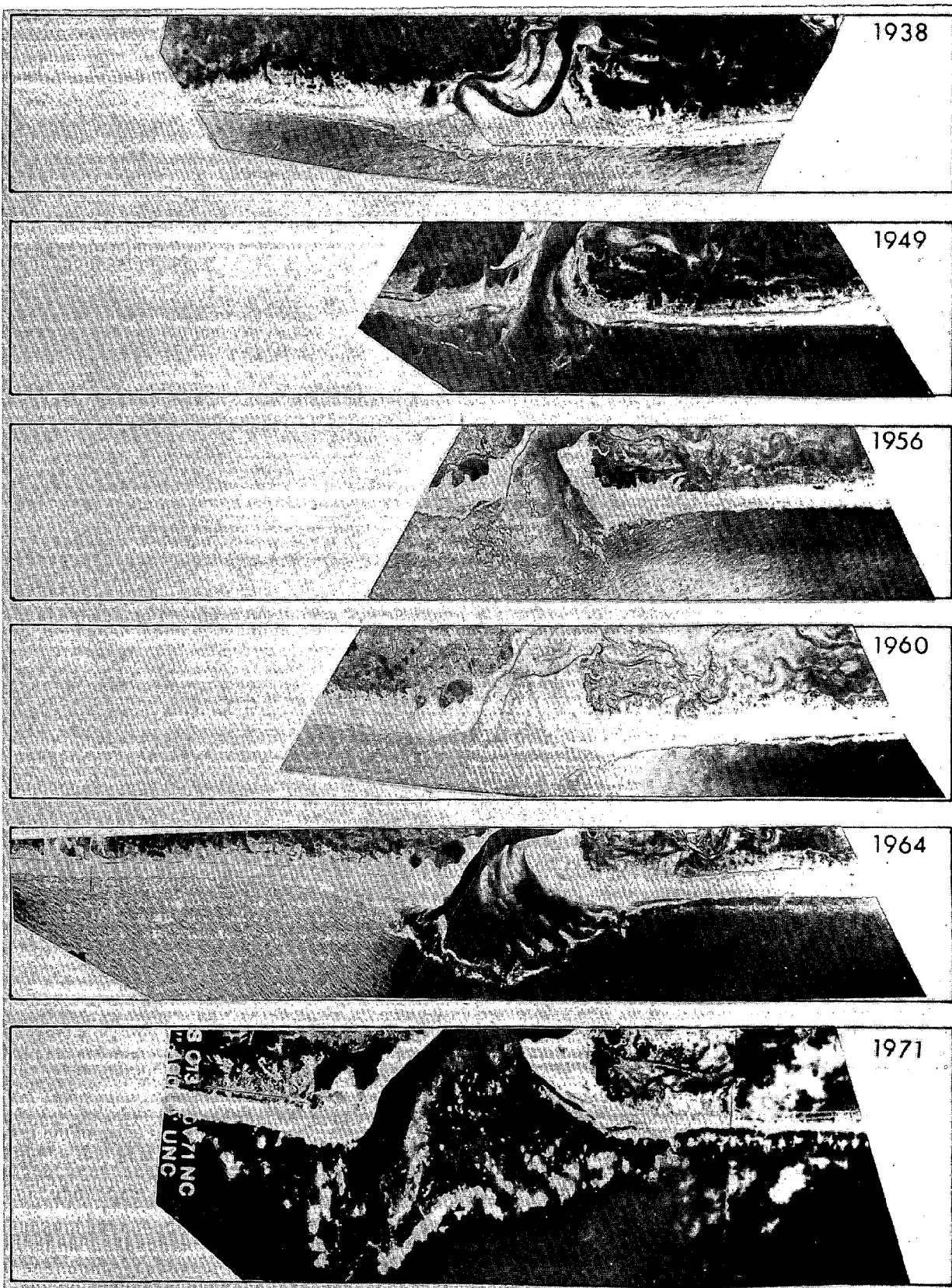
The Inlet tends to move southward, extending the southern end of Onslow Beach and eroding the northern end of Topsail Beach. In 1938, New River Inlet had an unusual S-shape which broke through on the north prior to the 1949 photography. Since 1949, the Inlet has kept its shape and has been widening continuously with the exception of the period from 1956 to 1960. The most drastic increase in width occurred from 1964 to 1971.

Future Trends

It can be expected that the Inlet will continue to migrate from the southern edge of its location in 1938 and the northern edge of its location in 1949.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	330		253	12	195 N	235 N	215 N	203 N
1949	774	39						
1949	774	24	443	38	76 S	52 S	64 S	44 S
1956	925							
1956	925	-48	494	-29	9 S	62 S	36 S	46 S
1960	694							
1960	694	18	486	38	1 N	22 N	11 N	16 N
1964	750							
1964	750	51	489	-21	35 S	6 N	15 S	58 S
1971	1142							
Total Gorge Migration (ft) 1818 N					Maximum Gorge Migration (ft) 2472 N (1938-1949)			
					*Since 1949 migration has been primarily S			

NEW RIVER INLET



APPROXIMATE SCALE: 1" = 3333' (1971: 1" = 2000')

BROWN INLET

Description

Brown Inlet is located in northern Onslow County. It is one of the smaller inlets and averages only 875 feet in width. The main channel of the Inlet is fairly straight and recently averaged less than one third the width of the gorge. The Inlet is fed by two primary channels: the south channel which is an extension of Freeman's Creek, and the north channel which extends just up to the Intracoastal Waterway.

Migration Trends

Brown Inlet has moved south steadily in every period of study except one, which was between 1949-1956, when the Inlet only widened and did not move at all. The 1938 photograph shows a large sand spit extending from the end of Onslow Beach, possibly indicating that the Inlet was moving north prior to this time.

The Inlet seems to maintain a rather funnel-like appearance with the main channel projecting more or less directly into the area.

Future Trends

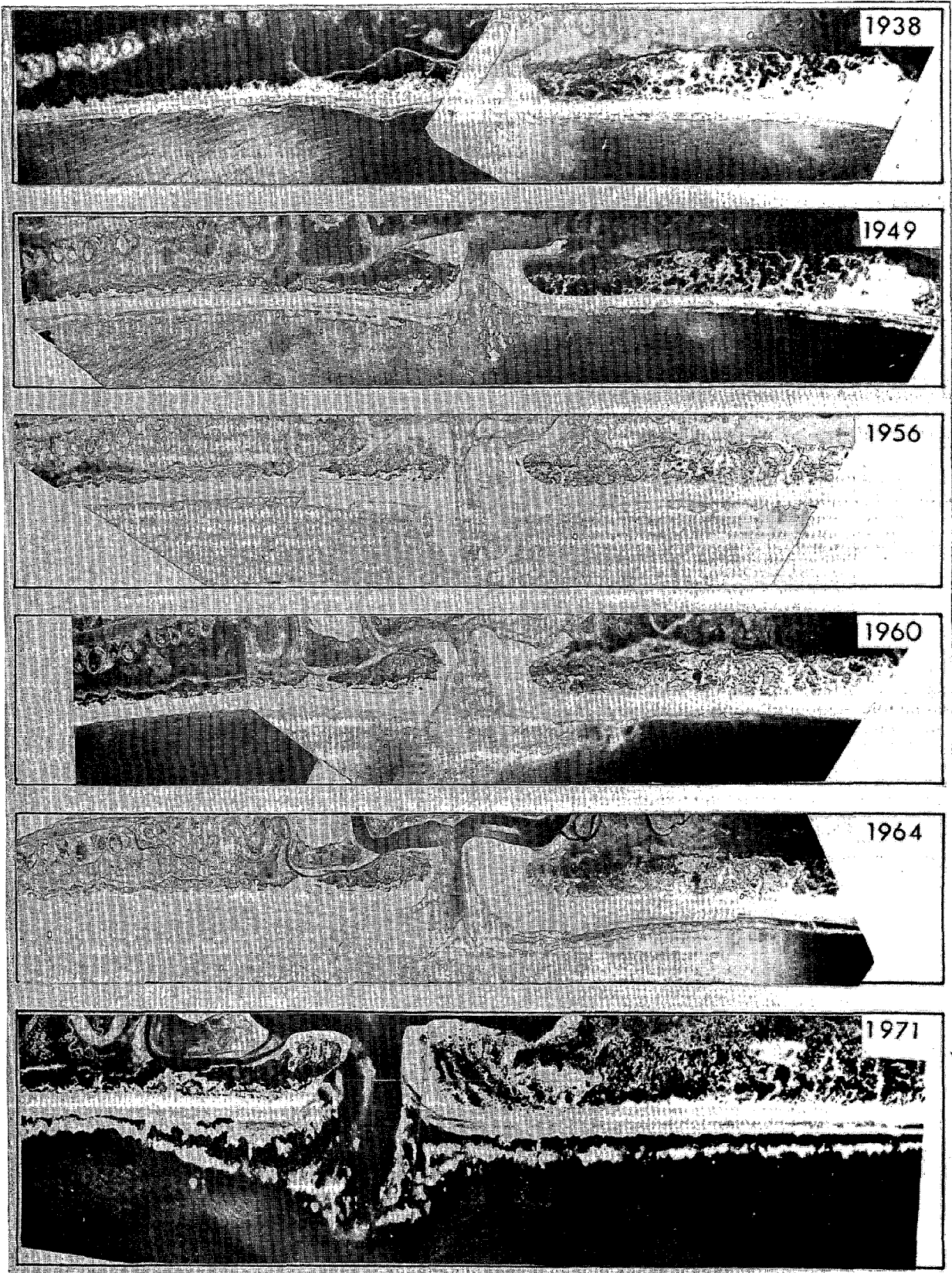
The Inlet will probably continue to move southward. The 1971 photography shows Onslow Beach eroding and the island to the north becoming more stable due to increased vegetation.

One of the channels connecting this Inlet to the Intracoastal Waterway is located some distance to the south, and the history of movement due to littoral drift is also in this direction.

There is a possibility of a breakthrough where the western channel approaches the east side of the island. Accreted land to the north is becoming more heavily vegetated and is, therefore, much more stable than in the past history.

INLET CHARACTERISTICS								
Year	Average Gorge Width (ft)	Gorge Width Channel (ft/yr)	Average Channel Width (ft/yr)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Inlet Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	490	26	344	5	55 S	35 S	45 S	60 S
1949	786							
1949	786	77	311	-21	36 S	36 N	0.0	37 S
1956	1257							
1956	1257	-59	178	-29	33 S	-98 S	65 S	21 S
1960	970							
1960	970	-31	174	41	61 S	-103 S	82 S	2 S
1964	870							
1964	870	-1	257	4	43 S	44 S	43 S	15 S
1971	863							
Total Gorge Migration (ft) 1431					Maximum Gorge Migration (ft) 1431			

BROWN INLET



APPROXIMATE SCALE: 1" = 3333' (1971: 1" = 2000')

BEAR INLET

Description

Bear Inlet is located at the northern end of Onslow County and is bound on the north by Bear Island. It is a moderate size inlet averaging about 1500 feet in width. Four primary channels feed this inlet with the one farthest south being Bear Creek and the other three channels all extending from the Intracoastal Waterway.

Migration

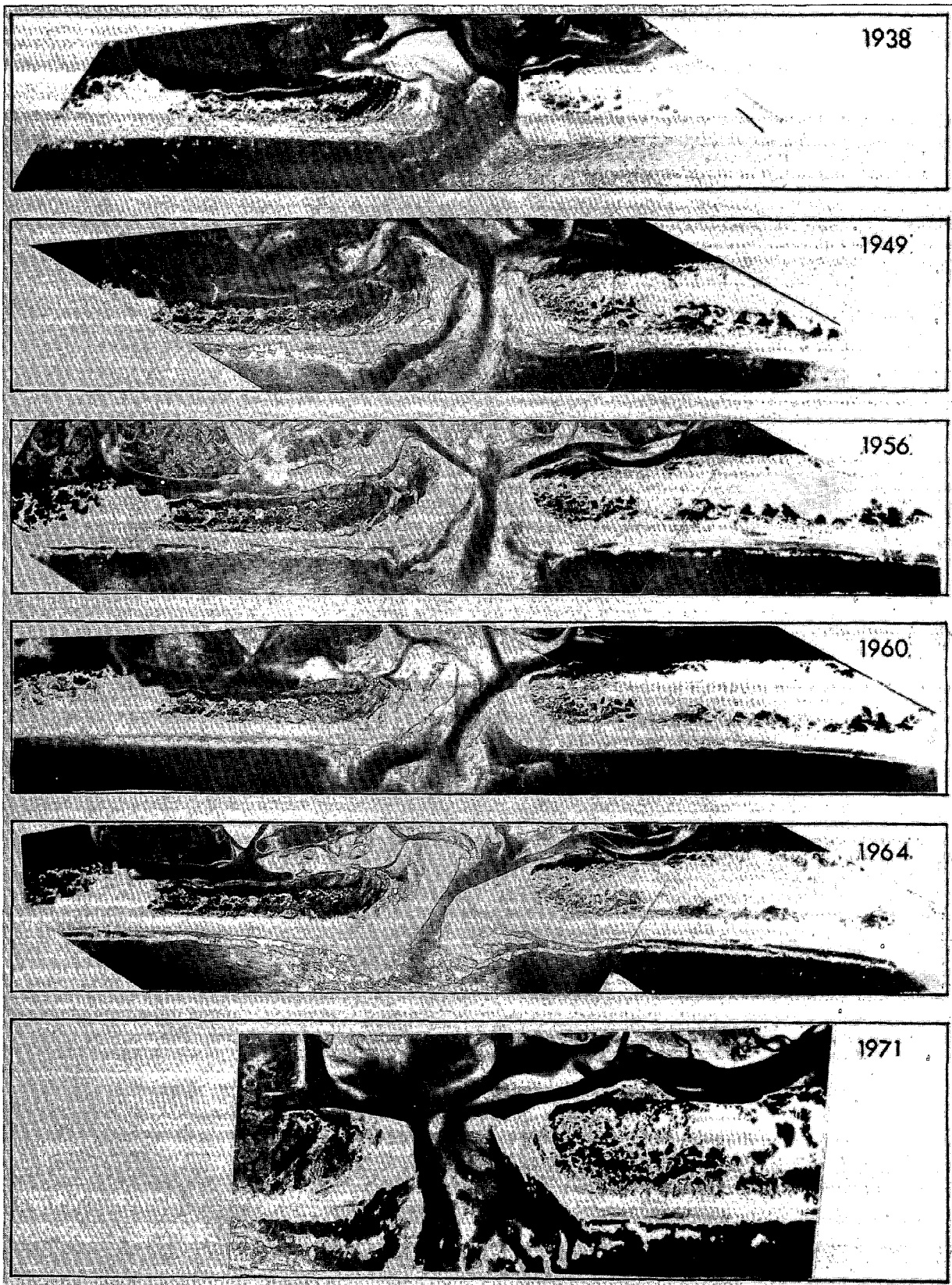
Bear Inlet has a fairly stable location; however, the shape has varied considerably during the period of study. The net motion from 1938 has been 179 feet east. Bear Inlet does not seem to be moving a great deal in either direction. The Inlet appears to move in a north-south cycle, eroding possibly several hundred feet of the ends of the islands and then replacing the material on the next cycle.

Future Trends

There is an area several hundred yards southwest of the end of the south island that might be endangered by severe storm conditions. The Inlet is unvegetated. Since 1956, the wind has been moving sand across the inlet and depositing it in the channel behind the island. During a very heavy storm, this would be a potential washover area with the possibility of forming a new inlet.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge S side (ft/yr)	Migration Of Gorge N side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	2560							
1949	1395	-103	320	-1	90 N	14 S	38 N	60 S
1949	1395							
1956	991	-65	361	13	47 N	28 S	9 N	15 N
1956	991							
1960	1752	158	379	-10	116 S	48 N	34 S	23 N
1960	1752							
1964	1310	-137	506	94	40 N	78 S	19 S	96 S
1964	1310							
1971	1178	-17	450	-54	2 S	20 S	11 S	76 S
Total Gorge Migration (ft) 179 N					Maximum Gorge Migration (ft) 488 N (1938-1956)			

BEAR INLET



APPROXIMATE SCALE: 1" = 3333' (1971: 1" = 2000')

BOGUE INLET

Description

Bogue Inlet, one of the largest North Carolina inlets, is located at the mouth of White Oak River near Swansboro, North Carolina. It is bound on the east by Bogue Banks and on the west by Bear Island with Dudley Island existing directly behind the Inlet. The Inlet has two primary fresh water sources, White Oak River and Queen Creek. The Inlet mouth is formed by two crescent shaped spits of sand. These spits are relatively unstable and are continuously in motion as is the entire gorge of the Inlet. The motion of the entire gorge is, however, much slower than that of the sand spits. The sand spits may shift radically in just a few months or even a few days under severe storm conditions, but the gorge shifts usually occur over a period of years.

Migration Trends

During the period of study the net trend in migration for Bogue Inlet was to the east. The Inlet swings from east to west with the longest motion in the east direction, producing a net travel of approximately 1300 feet. This Inlet has always been extremely wide compared to the channel flow which is from the east and the west. The 1949 photography shows two main channels which may indicate the excessive width of the gorge.

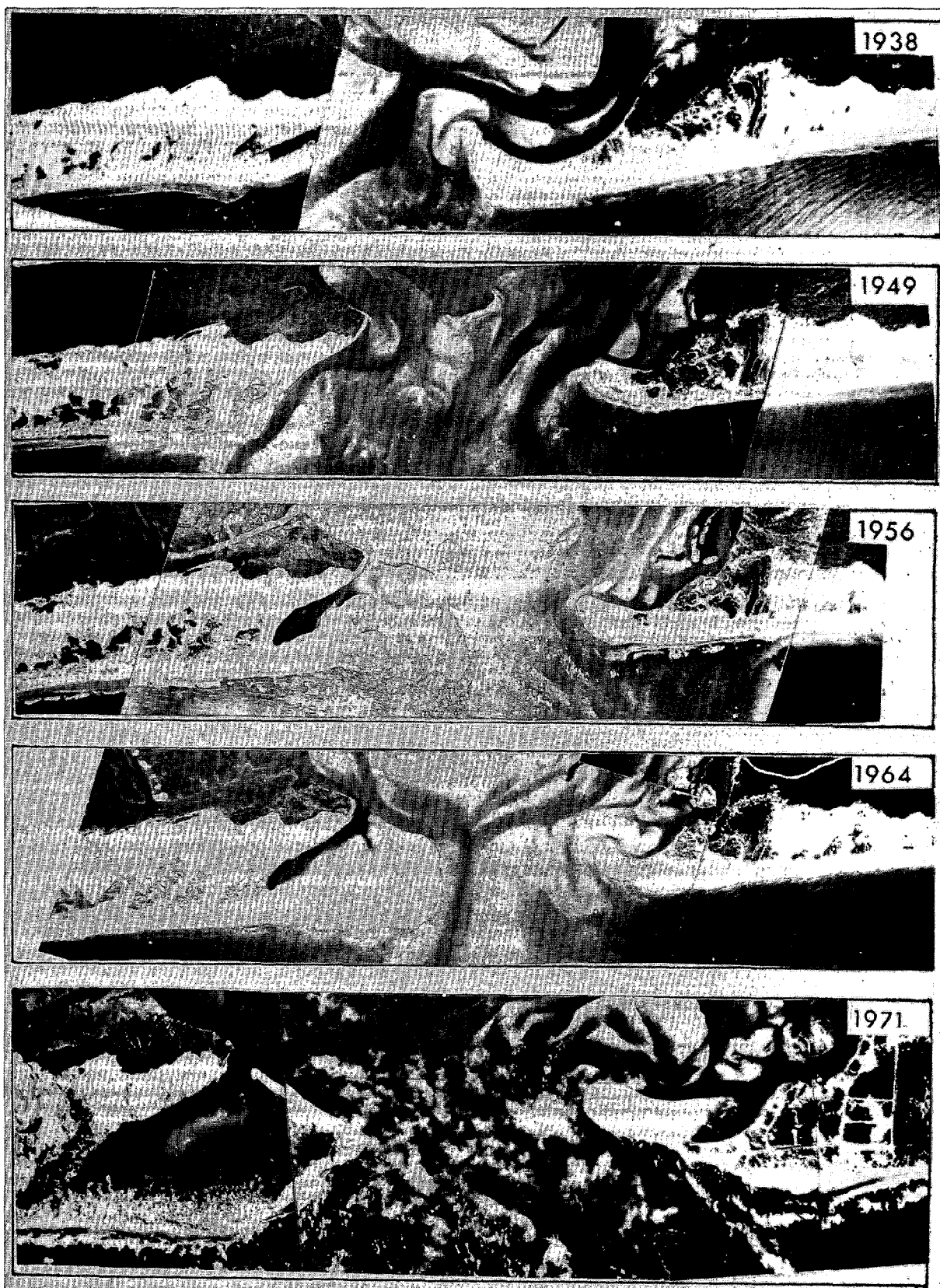
Bogue Inlet has recently undergone a large-scaled, short-term shift. The eastern spit has extended a great distance out into the gorge and has been cut from the main body of Bogue Banks, thus creating a new inlet.

Future Trends

Bogue Inlet has a migration zone stretching 1500 feet from the edge of the vegetation on the east and the west banks. Long-term migration is relatively small, but rather large short-term movements may be anticipated in the future.

INLET CHARACTERISTICS								
Year	Gorge Width (ft)	Gorge Width Change (ft/yr)	Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge E side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1938	2532							
1949	6519	346	1059	71	75 W	270 E	97 E	284 E
1949	6519							
1956	5327	-187	4246	291	6 E	185 W	90 W	219 W
1956	5327							
1960	3911	-300	2206	-473	379 E	70 E	224 E	11 E
1960	3911							
1964	3862	-15	698	-246	93 E	60 E	76 E	323 W
1964	3862							
1971	3308	-72	1104	208	39 W	110 W	75 W	137 W
Total Gorge Migration (ft)			1274 E	Maximum Gorge Migration (ft) 1300 E (1938-1964)				

BOGUE INLET



BEAUFORT INLET

Description

Beaufort Inlet is a major inlet in North Carolina that separates Bogue Banks to the west and Shackleford Banks to the east. Newport River to the south and the North River from the north supply the fresh water flow to this Inlet. Fort Macon is located on the western side of the Inlet and has been stabilized with a number of short groins and, fairly recently, with a major jetty. Shackleford Banks to the east is undeveloped, and historically there has been a rather significant sand spit extending from the vegetated areas to the east of the Inlet. Beaufort Inlet is one of the widest inlets in North Carolina averaging over a mile in width.

Migration Trends

Since 1953, Beaufort Inlet appears to be continually narrowing in width principally through accretion of Shackleford Banks on the east side of the Inlet. The location of Morehead City Channel through the Inlet varies; however, it generally seems to exist on the western side of the Inlet. There seems to be a tendency for deposition of sand on the east side during the ebb flow condition. The 1964 photography indicates that the elevation of this sand has risen above the water level and has now become a part of Shackleford Banks. The 1971 photography indicates that some vegetation is beginning to form on this sand spit, and in fact, the sand spit is continuing to migrate to the west.

Zone of Migration

Due to the construction of the protective works on the east side of Fort Macon, it is anticipated that, unless a major storm produces a breakthrough, the west side of Beaufort Inlet can be expected not to migrate any significant distance. The 1971 photography indicates a zone of possible overwash on the east side, and it is possible that during a major weather event a breakthrough could occur several thousand feet to the east of the present Inlet. This would at least temporarily produce two inlets with a sand island between them. The zone of migration for Beaufort Inlet might extend approximately from an area where the heavy vegetation exists on the east side in the 1939 photography to the present location on the west side of the Inlet.

Year	INLET CHARACTERISTICS							
	Gorge Width (ft)	Gorge Width Change (ft/yr)	Average Channel Width (ft)	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge E side (ft/yr)	Net Gorge Migration (ft/yr)	Net Channel Migration (ft/yr)
1939	7132	69	1802	39	63 W	7 E	28 W	35 E
1953	8144							
1953	8144	-283	2507	165	10 W	290 E	140 E	83 W
1958	6723							
1958	6723	-496	2956	13	1 E	501 W	250 W	43 W
1964	4131							
1964	4131	-51	*	*	70 E	27 W	22 E	
1971	3739							

Net Gorge Migration (ft) 836 W

Maximum Gorge Migration (ft) 1308 W (1958-1964)

*These data cannot be determined from the photograph

BEAUFORT INLET



APPROXIMATE SCALE: 1" = 3333'

BEAUFORT INLET



APPROXIMATE SCALE: 1" = 3333' (1971); 1" = 2000'

BARDEN INLET

Description

Barden Inlet is located northwest of Cape Lookout where the general orientation of the shoreline changes from essentially north-south along Core Banks to essentially east-west along Shackleford Banks. The southerly migration of Cape Lookout has extended the Cape well below Barden Inlet. The ebb flow comes from Back Sound and Core Sound which feeds the Inlet through Lighthouse Channel. The Inlet is approximately 1800 feet wide with the main channel located on the east side of the Inlet. However, at the location it enters the ocean, it curves to the west and away from the Cape to follow the coastline southward.

Migration Trends

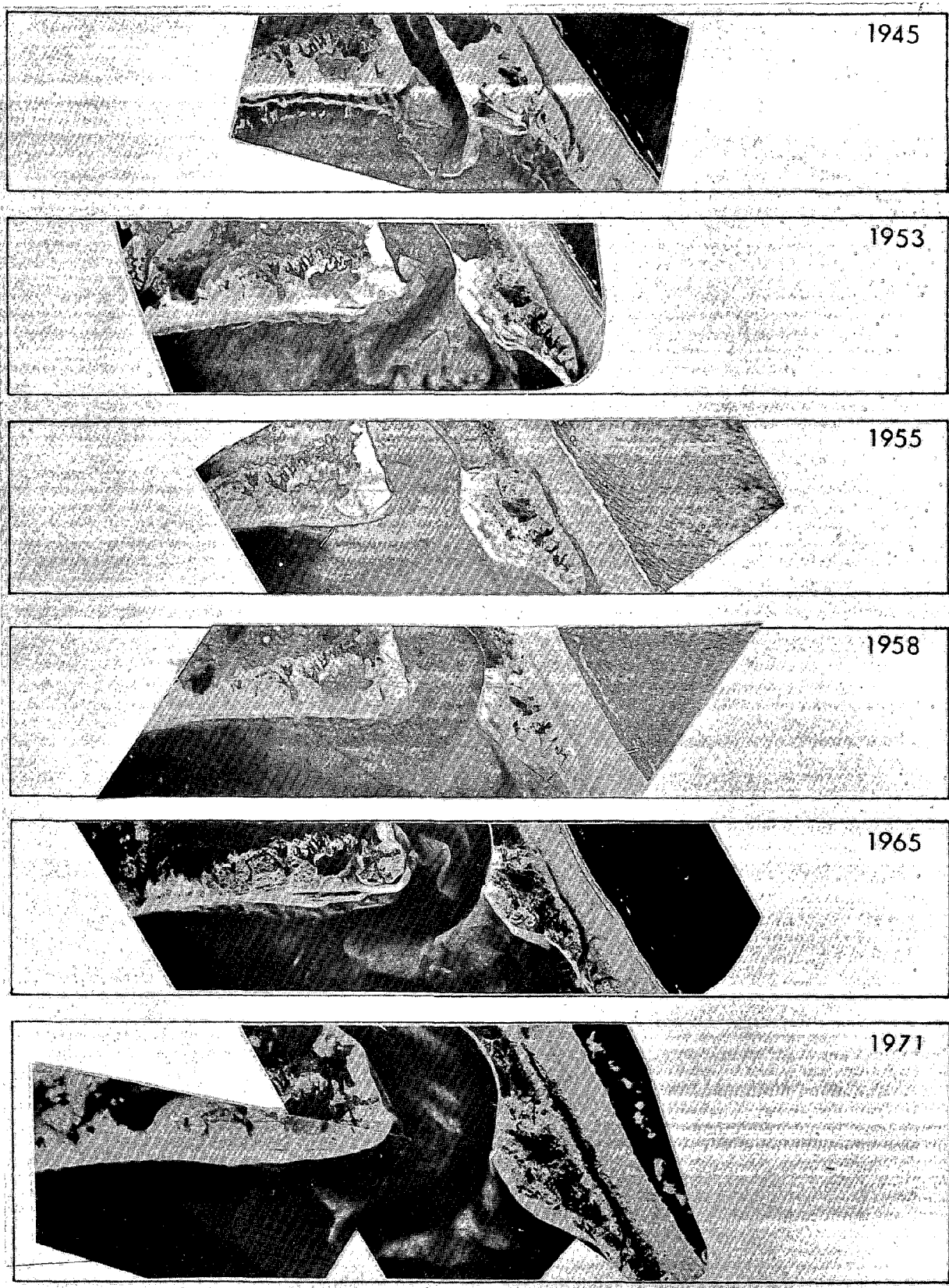
Barden Inlet has generally widened from 1945 to the present time; although, from 1965 to 1971 it did narrow somewhat. The east side of the Inlet has generally shown a history of migration to the east with the west side migrating both to the east and to the west. The net migration of the gorge during the period of study has been to the east. The main channel of Barden Inlet has always been on the east side and is, no doubt, producing this easternly migration. It appears possible that a continued easternly migration of Barden Inlet will produce a breakthrough along Core Banks resulting in the formation of a new inlet and the subsequent closing of the present Inlet.

Zone of Migration

The zone of migration is difficult to predict for Barden Inlet. Because the Inlet has been moving steadily to the east, it seems reasonable that the westernly side should be considered more or less stable. As noted previously, it is possible that the Inlet will eventually cause a breaching of Core Banks on the ocean side, resulting in the formation of a new easternly directed inlet. If this should occur, the southern end of Core Banks will become a separate island.

INLET CHARACTERISTICS								
Year	Average Gorge Width	Gorge Width Change (ft/yr)	Average Channel Width	Channel Width Change (ft/yr)	Migration Of Gorge W side (ft/yr)	Migration Of Gorge E side (ft/yr)	Net Inlet Migration (ft/yr)	Net Channel Migration (ft/yr)
1945	918	49	633	8	23 W	25 E	1 E	-1 E
1953	1329							
1953	1329	84	829	60	34 W	49 E	7 E	-24 E
1958	1782							
1958	1782	8	963	-8	-20 E	27 E	23 E	-27 E
1965	1835							
1965	1835	-9	506	6	9 E	E	6 E	1 W
1971	1766							
Total Gorge Migration (ft) 251					Maximum Gorge Migration (ft) 251			

BARDEN INLET



APPROXIMATE SCALE: 1" = 3333' (1971: 1" = 2000')

COASTAL ZONE
INFORMATION CENTER

