CHARLES A. TRIPLEHORN

A Review of the Genus Zopherus of the World (Coleoptera: Tenebrionidae)

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY NUMBER 108

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ERRATA FOR SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY, NUMBER 108

Third line from bottom in Abstract should read:

valid. Three new species are described: *Z. solieri* (Mexico), *Z. xestus* (Texas), and

Page 6, item 4 should read:

4. Dorsum of both pronotum and elytra largely white, especially laterally.
nodulosus haldemani Horn

Dorsum of both pronotum and elytra largely black; black spots not confined to medial areas ..... (3) ***nodulosus nodulosus*** Solier*

ABSTRACT

Triplehorn, Charles A. A Review of the Genus *Zopherus* of the World (Coleoptera: Tenebrionidae). *Smithsonian Contributions to Zoology,* number 108, 24 pages, 4 plates. 1972. — The genus *Zopherus* consists of 19 species and 2 subspecies which inhabit the Western Hemisphere from western North America to Venezuela. The three Casey genera, *Megazopherus, Zopherinus,* and *Zopherodes,* are placed in synonymy with *Zopherus,* and of the 23 names proposed by Casey, only two are considered valid. Three new species are described: *Z. solieri* (Mexico), *Z. Xestus* (Texas), and *Z. championi* (Mexico and Texas). A key to the known species of *Zopherus* and a discussion of each species is presented.

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Charles A. Triplehorn

A Review of the Genus *Zopherus* of the World (Coleoptera: Tenebrionidae)

Introduction

The most recent comprehensive survey of this interesting group of beetles was by Casey (1907a). In his paper he divided the genus *Zopherus* into four genera, three of which *(Megazopherus, Zopherinus,* and *Zopherodes)* were new, and he described a number of new species which were included in keys along with his concept of previously known species. It should be pointed out that Casey did not always correctly establish the identity of species described by earlier workers and consequently made many errors and created numerous synonyms.

In the same year Casey (1907b) described eight more new species of *Zopherodes* which were, as was his custom, presented in the form of a key. This key did not include previously described species, so the reader was forced to use two separate keys. In my work with the Tenebrionidae, I found it impossible to use either key. As it turned out, all of the species described in the second paper (1907b) are synonyms of previously described species, but until this was established, determinations at the species level were uncertain.

Blaisdell (1931) presented a key to the California species of *Zopherodes* from which he omitted *Z. granicollis* Horn, perhaps the most characteristic member of the genus in the California fauna. He also described *Z. sanctaehelenae* in that paper.

The purpose of the present paper is to present a key to the known species of *Zopherus,* to clarify a considerable number of synonyms, and to summarize our knowledge to date of the biology and distribution of the group.

History

Gray (1832) published brief descriptions with colored illustrations of two new species of Coleoptera which established the starting point for the history of the genus *Zopherus.* He identified one of these (plate 124: figure 3) in the caption (page 796) as *"Zophorus chilensis,* the type of a new genus near *Zophosis."* The other species (plate 50: figure 5) he called *Zophorus mexicanus.*

Laporte (1840: 205) called attention to an error in translitteration from the Greek and spelled the name *"Zopherus."* It is clear that he was only emending Gray's spelling and therefore should not be cited as the author of the genus as many subsequent authors and catalogers have done.

Solier (1841:30) placed *Zopherus* in his tribe Zophérites, along with *Nosoderma* Dejean and *Diceroderes* Solier. It is interesting that he cited Hope as

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author of *Zopherus* and listed *nervosus, nodulosus, mexicanus,* and *laevicollis,* all of which are now valid species. No mention is made of *chilensis.*

Hope (1840:110) likewise is often cited as the author of *Zopherus* and of *Zopherus mexicanus.* He merely mentioned the generic and specific name and the locality (Mexico). He cannot possibly be credited with authorship of the genus since, at best, his name would be a nomen nudem.

Lacordaire (1859:91) followed Solier in the tribal arrangement, his spelling of the tribe differing slightly (Zophérides). He also correctly cites Gray as the author of *Zopherus.*

Zopherus was the genus into which LeConte, Horn, and Champion placed the species which they described. The genus was thus well known and very stable until Casey (1907a) divided it into four genera. He designated a type species for each as follows: *Megazopherus* containing only *chilenis* Gray; *Zopherodes* with *tristis* LeConte as type species; *Zopherinus* with *limbatus* Casey as type species, and *Zopherus* Gray with *mexicanus* Gray as type species.

In the same year Casey (1907b) published a larger paper on North American Tentyriinae in which he assigned the four genera listed above to the tribe Zopherini. Gebien (1910:93) classified the group in the subfamily Zopherinae which included essentially Casey's tribes Zopherini and Nosodermini.

Böving and Craighead (1931:41), basing their conclusions for the most part on larval studies, created a separate family, Zopheridae, for those beetles in Casey's tribes Zopherini and Nosodermini. Family status for the group was also given by Crowson (1955:116, 127), Boddy (1965:77), and Watt (1967: 82). I do not feel that there are strong enough arguments for a separate family and I concur with Arnett (1963:662), who places the group in the tribe Zopherini, subfamily Asidinae.

Morphology

All members of the genus *Zopherus* are elongate and subcylindrical, with extremely thick and hard integuments. In pinning them it is frequently necessary to first drill a hole in the elytra before the pin can be inserted. Despite this hardness, the elytra and pronotum are easily scored with a sharp instrument, the integument having the physical properties of an extremely hard wax.

COLORATION.—North of the Rio Grande River all but two of the species are entirely black or have faint traces of white or gray on the flanks of the pronotum. In the New World Tropics, all of the species are patterned, sometimes boldly, in black and white. Although these colors provide useful characters, they are subject to considerable variation, much of it apparently due to abrasion. Moreover, soon after death, the body rapidly exudes grease which hardens to a tarlike consistency, causing even the boldly patterned black and white species to become uniformly shiny black. Surface sculptures (punctures and tubercles) are likewise obliterated by the grease. It is necessary, therefore, to soak specimens in ether or other grease solvent for at least 30 minutes before drawing conclusions in regard to color and sculpture. I have repeatedly (up to eight times) restored the color in a number of specimens in this manner, only to find them completely black again in less than a week. Luster ranges from shiny to dull.

SCULPTURE.—Most of the species of *Zopherus* have tubercles of some sort on the elytra. These may be in the form of large, slightly raised areas or they may be small and distinctly verrucose. The pronotum may be tuberculate, granulate, or simply punctured, and this is also true of the prosternum, prosternal process, and ventral surface of the pronotum. Surface sculpture provides many of the most useful characters for species discrimination, even though there is much intraspecific variation.

HEAD. — The head is retracted into the prothorax beyond the eyes, which are thus entirely concealed from above when the head is in repose. Blaisdell (1931:113) was the first to point out the enormous size of the clypeus, which occupies three fourths or more of the exposed front of the head. The feebly indicated frontal sutures extend backward and inward to just before the eyes and join on the interocular surface, which is also concealed from above when the head is in repose. The labrum is transverse and its anterior margin is densly fringed with rather long, golden hairs. The mandibles are massive, broadly truncate, or feebly bidentate apically. The eyes are narrow, transverse, flattened, and very finely facetted.

ANTENNAE. — The antennae are short and stout, with the apical three segments fused into a compact, oblong club. An elongate patch of yellow hairs is present at the apex of the club, with smaller patches of yellow hairs on the apicolateral portions of seg-

ments 9 and 10 (Figure 7). The antennae are usually retained within deep, entire fossae located on the ventral side of the prothorax of all species. These fossae are usually rounded apically (Figure 6) but in some species they are appendiculate (Figure 5).

PRONOTUM. — The pronotum is usually longer than broad, the apical margin is always broader than the basal margin, and the lateral margins are frequently prominent or even angulate opposite the apex of the antennal fossae on the ventral surface. A distinct marginal bead is never present laterally or apically but the base may be reflexed.

SCUTELLUM. — The scutellum is small and inconspicuous, usually hidden beneath the base of the pronotum when the body is in repose.

ELYTRA. — The elytra are fused but the sutural line is always apparent. The apices are always conspicuously sculptured, either with deep grooves or prominent, flattened or globose tubercles. The flanks of the elytra are rounded and the epipleura are absent.

ABDOMEN.—The terminal abdominal sternum presents some interesting modifications which are useful taxonomically. These are folds or ridges, referred to in this paper as "calli," and are discussed under each species. Usually a conspicuous, compact patch of golden hairs is present at the extreme apex of the terminal abdominal sternum.

LEGS. — The ventral surfaces of the femora, tibiae, and tarsi are clothed on each side with dense and extremely fine and compact ridges of golden hairs that extend from base to apex of each extremity, and conspicuously outline the bare central portion. These ridges of hair also occur around the periphery of the distal end of the tibiae, and similar dense patches of hair completely clothe the trochanters and form a pointed tuft at the apex of each tarsus between the claws.

SEXUAL CHARACTERS. — I have found no external morphological characters to separate the sexes. Females tend to be somewhat larger and stouter than males, but body proportions are, in general, unreliable in determining sex. Neither male nor female genitalia proved useful in species discrimination. The aedeagus of *Z. chilensis* is illustrated (Figure 8).

Classification

The three genera, *Megazopherus, Zopherodes,* and *Zopherinus,* described by Casey are untenable, and it is necessary to reduce them all to synonyms of *Zopherus*. That they fall into fairly well-defined species groups cannot be denied, but to attempt to force them into a rigid system of higher categories creates more problems than it solves. Casey, as was his practice, based the primary taxonomic category — the species — one step lower than he should have. Most of the forms he considered to be species are herein shown to be merely normal intraspecific variations.

Zopherus is a perfect group to illustrate Casey's approach to taxonomy. Of the 23 species described in his three papers (1907a, 1907b, 1924), only two names are retained — *uteanus,* a valid species, and *ventriosus,* which is here considered a subspecies of *granicollis*. Casey redescribed *elegans* Horn four times and *tristis* LeConte three times. He created seven synonyms of *gracilis* Horn, at the same time failing to identify any of his specimens as *gracilis*. Sixteen of the 23 species were based on unique specimens, and it soon became evident to me that Casey was describing individuals and not species. He felt obligated to place all of the described species into his expanded system, and he had to guess on the placement of a number of them. On many of them he guessed wrong.

Synoptic Catalog of *Zopherus*

Zopherus Gray, 1832:796.
- *Megazopherus* Casey, 1907a:36.
- *Zopherinus* Casey, 1907a:36.
- *Zopherodes* Casey, 1907a:36.

1. *chilensis* Gray, 1832:796.
   - *insignis* Blanchard, 1861: pl. 7A, fig. 6.
   - *bremei* Guérin-Méneville, 1844:18.
   - *moreletii* Lucas, 1852:XXIII.
2. *nervosus* Solier, 1841:42.
   - *pectoralis* LeConte, 1851:130.
   - *reticulatus* (var.) Champion, 1884:43.
   - *compactus* Champion, 1884:43.
   - *marmoratus* Casey, 1907a:36.
3. *nodulosus nodulosus* Solier, 1841:43.
   - *variolosus* Sturm, 1843:349.
   - *sallaei* (var.) Champion, 1884:42.
   - *verrucosus* (var.) Champion, 1884:43.
   - *nodulosus haldemani* Horn, 1870:271.
4. *jourdani* Sallé, 1849:301.
   - *mexicanus* (auct., nec. Gray)
   - *costaricensis* Champion, 1884:40.

5. *jansoni* Champion, 1884:39.
6. *mexicanus* Gray, 1832:796.
   maculatus Champion, 1884:41.
7. *angulicollis* Champion, 1884:42.
8. *laevicollis* Solier, 1841:46.
   venosus (var.) Champion, 1884:40.
   tuberculatus Champion, 1884:41.
   limbatus (Casey), 1907a:37.
9. *xestus,* new species
10. *solieri,* new species
    elegans Champion (nec. Horn), 1892:489.
11. *championi,* new species
    elegans Champion (nec. Horn), 1892:489.
12. *tristis* LeConte, 1851:130.
    aequalis (Casey), 1907a:38.
    variabilis (Casey), 1907b:464.
    incrustans (Casey), 1907b:464.
13. *concolor* LeConte, 1851:130.
    guttulatus Horn, 1867:160.
    morosus (Casey), 1907b:465.
14. *gracilis* Horn, 1867:162.
    pudens (Casey), 1907a:40.
    caudalis (Casey), 1907a:41.
    lugubris (Casey), 1907a:41.
    pruddeni (Casey), 1907a:41.
    luctuosus (Casey), 1907a:41.
    elongatus (Casey), 1907b:466.
    geminatus (Casey), 1907b:467.
15. *uteanus* (Casey), 1907a:40.
    mormon (Casey), 1907a:40.
16. *granicollis granicollis* Horn, 1885:160.
    induratus (Casey), 1907a:39.
    californicus (Casey), 1907b:466.
    prominens (Casey), 1924:305.
    granicollis ventriosus (Casey), 1907a:39.
    parvicollis (Casey), 1907b:466.
17. *opacus* Horn, 1867:161.
18. *elegans* Horn, 1870:272.
    otiosus (Casey), 1907a:39.
    verrucipennis (Casey), 1907b:465.
    circumductus (Casey), 1924:304.
    woodgatei (Casey), 1924:305.
19. *sanctaehelenae* (Blaisdell), 1931:111.

Acknowledgments

None of the species of *Zopherus* may be considered common and some are very rare. The 2,429 specimens upon which this report is based came from numerous sources, and I am indebted to many institutions and individuals for lending their collections to me and for allowing me to retain them for an extended period.

I am especially grateful to Miss C. M. F. von Hayek of the British Museum (Natural History) for making available to me virtually all of the specimens entrusted to her care, especially the George C. Champion material, which proved invaluable in working out the Central American species. Through the courtesy of the late Dr. Harold J. Grant, Jr., of the Academy of Natural Sciences of Philadelphia, I was able to study all of Horn's material. Mr. T. J. Spilman allowed me free use of the Casey collection at the United States National Museum and helped in countless other ways. To these three I express a special note of thanks.

A number of people have made a special effort to collect specimens of *Zopherus* for me. Prominent among these are Frank J. Moore, Josef N. Knull, William Tyson, Richard L. Berry, my wife, Wanda Elaine, and two sons, Bradley A. and Bruce W. Triplehorn. All of the photographs were taken by Richard C. Arnold of the Photography Department, The Ohio State University, whose painstaking skill with the camera and interest in the project is evident. Donald J. Borror and T. J. Spilman read the manuscript and contributed many valuable suggestions. The efforts of all these people are greatly appreciated.

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The following list of abbreviations represents the deposition of specimens mentioned in this paper and the individuals responsible for initiating the loans to me:

AMNH American Museum of Natural History, New York: Patricia Vaurie and Lee H. Herman, Jr.

ANSP Academy of Natural Sciences of Philadelphia: Harold J. Grant, Jr.

ASU Arizona State University, Tempe: Frank F. Hasbrouck and Stanley C. Williams.

BMNH British Museum (Natural History), London: C. M. F. von Hayek and J. Balfour-Browne.

BYU Brigham Young University, Provo, Utah: Vasco M. Tanner.
CAS California Academy of Sciences, San Francisco: Hugh B. Leech.
CAT Charles A. Triplehorn private collection.
CMP Carnegie Museum, Pittsburgh: George Wallace.
CNC Canadian National Collection, Ottawa: Henry F. Howden and J. M. Campbell.
CU Cornell University, Ithaca, New York: L. L. Pechuman and Henry Dietrich.
DEB David E. Bixler private collection.
DZSP Departamento de Zoologia, São Paulo, Brazil: F. S. Pereira and Hans Reichardt.
FMNH Field Museum of Natural History, Chicago, Illinois: Rupert L. Wenzel.
FSCA Florida State Collection of Arthropods, Gainesville: Robert E. Woodruff and Howard V. Weems, Jr.
HFH Henry F. Howden private collection.
INHS Illinois Natural History Survey, Urbana: Leonora K. Gloyd and Milton W. Sanderson.
INIA Instituto Nacional de Investigaciones Agricolas, Chapingo, Mexico: Francisco Pacheco M. and Alejandro Ortega C.
JAB Joseph A. Beatty private collection.
JMC J. M. Campbell private collection.
KSU Kansas State University, Manhattan: Carl W. Rettenmeyer.
KWB Kirby W. Brown private collection.
LBSC Long Beach State College, Long Beach, California: Elbert L. Sleeper.
MCZ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts: John F. Lawrence and P. J. Darlington, Jr.
MINN University of Minnesota, St. Paul: Edwin F. Cook.
MSU Michigan State University, East Lansing: Roland L. Fischer.
NC Neil Chernoff private collection.
OSU The Ohio State University, Columbus.
RLB Richard L. Berry private collection.
RS Ronald Somerby private collection.
TAM Texas Agricultural and Mechanical University, College Station: Horace R. Burke.
UA University of Arizona, Tuscon: Floyd G. Werner.
UAlb University of Alberta, Edmonton: George E. Ball.
UCB University of California at Berkeley: Paul D. Hurd, Jr., and Jerry Powell.
UCD University of California at Davis: Robert O. Schuster.
UCR University of California at Riverside: Everett I. Schlinger.
UIDA University of Idaho, Moscow: William F. Barr.
UMo University of Missouri, Columbia: Wilbur R. Enns.
UNA University of Northern Arizona, Flagstaff: C. D. Johnson.
UNeb University of Nebraska, Lincoln: Warren T. Atyeo.
UNev University of Nevada, Reno: Ira La Rivers.
USNM United States National Museum, Washington, D.C.: T. J. Spilman.
USU Utah State University, Logan: George F. Knowlton.
WR William Rosenberg private collection.
WT William Tyson private collection.
VMK Vernon M. Kirk private collection.

Key to World Species of *Zopherus*

(*Species has not been taken in the United States)

1. Elytra abruptly inflexed at the sides, the inflexed sides more or less flat and having the aspect of true epipleura; body feebly constricted between thorax and abdomen
(1) ***chilensis*** Gray*

Elytra not abruptly and less widely inflexed at sides; body strongly constricted between thorax and abdomen 2

2. Elytra distinctly quadrituberculate at apex, the inner pair of tubercles smaller and more terminal in position 3

Elytra bituberculate at apex or with only a short oblique ridge on each side of apex 5

3. Ventral surface of pronotum with coarse tubercles ..... (2) ***nervosus*** Solier*
   Ventral surface of pronotum smooth 4
4. Dorsum of both pronotum and elytra largely white, especially laterally. ***nodulosus haldemani*** Horn
   Dorsum of both pronotum and elytra largely black; black spots not confined to medial areas ..... (3) ***nodulosus nodulosus*** Solier*
5. Elytral apex distinctly bituberculate 6
   Elytral apex with only oblique swollen ridges on each side 11
6. Apical elytral tubercles globose and prominent 7
   Apical elytral tubercles large and flattened 8
7. Base of elytra strongly reflexed, prominent ..... (5) ***jansoni*** Champion*
   Base of elytra rounded, not prominent ..... (4) ***jourdani*** Sallé*
8. Apical elytral tubercles almost contiguous at base, suture not swollen between them (Figure 2); color dull black ..... (7) ***angulicollis*** Champion*
   Apical elytral tubercles well separated at base with suture strongly swollen between them (Figure 1); color either entirely black or black and while 9
9. Ventral callus of terminal abdominal sternum feebly arcuate at base (Figure 4) (6) ***mexicanus*** Gray*
   Ventral callus of terminal abdominal sternum strongly trilobed (Figure 3) 10
10. Dorsum more or less tuberculate or coarsely wrinkled; surface usually with considerable amount of white ..... (8) ***laevicollis*** Solier*
    Dorsum almost smooth, usually entirely black ..... (9) ***xestus***, new species
11. Lateral portions of elytra and pronotum white 12
    Entire dorsum unicolorous 14
12. Pronotum with punctures more or less muricate; prosternum with strong tubercles anterior to coxae; apical elytral ridges prominent and separated from sutural ridge by a distinct groove ..... (18) ***elegans*** Horn
    Pronotum with simple punctures; prosternum coarsely punctured, not tuberculate; apical elytral ridges feebly developed and continuous (at least at base) with elevated sutural ridge 13
13. Pronotum with lateral white borders having numerous black tubercles scattered over surface; apical elytral ridges separated from raised sutural ridge except at extreme apex; lateral areas of elytra more black than white; length 17–20 mm ..... (10) ***solieri***, new species*
    Pronotum with lateral white borders having only a few minute flecks of black; apical elytral ridges broadly in contact with raised sutural ridge; lateral areas of elytra more white than black; length 12–15 mm ..... (11) ***championi***, new species
14. Elytra smooth or with minute, widely scattered muricate punctures; sometimes with scattered vermiculate lines ..... (14) ***gracilis*** Horn
    Elytra with distinct tubercles 15
15. Elytra abruptly narrowed at base and apex (humeri forming rather broad "shoulders"); elytra abruptly and steeply declivous behind and with margins parallel (12) ***tristis*** LeConte
    Elytra gradually narrowed to base (humeri not forming distinct "shoulders"); elytra gradually declivous behind and with margins arcuate 16
16. Pronotal punctures simple, widely separated; elytra with large, prominent, more or less contiguous tubercles ..... (13) ***concolor*** LeConte
    Pronotal punctures more or less muricate, sometimes granulate, at least laterally; elytral tubercles variable, either large or fine 17
17. Elytral tubercles small, subequal in size to those of pronotum, widely separated 18
    Elytral tubercles always much larger than those of pronotum, closely spaced, sometimes contiguous 19
18. Dorsal surface of elytra between tubercles shiny ..... (19) ***sanctaehelenae*** Blaisdell
    Dorsal surface of elytra between tubercles dull, opaque ..... (17) ***opacus*** Horn
19. Clypeal punctures coarse, deep and closely spaced; robust species, pronotum usually narrower than elytra 20
    Clypeal punctures small, shallow and widely separated; species of slender proportions, pronotum usually as wide as or wider than elytra 21

20. Elytral tubercles large, their bases usually more or less contiguous; lateral tubercles similar to those of dorsum ..... (16) ***granicollis granicollis*** Horn
Elytral tubercles smaller, well separated, lateral ones conspicuously transversely elongate ..... ***granicollis ventriosus*** (Casey)
21. Elytral tubercles subequal in size, uniformly and densely distributed .... (15) ***uteanus*** (Casey)
Elytral tubercles of two distinct sizes—large, shiny, conspicuous ones and small to minute ones sparsely scattered over opaque areas between large ones.
(18) ***elegans*** Horn (melanistic phase)

1. *Zopherus chilensis* Gray

PLATE 2: FIGURE 9

Zophorus chilensis Gray, 1832:796, tab. 124, fig. 3.
Zopherus bremei Guérin-Méneville, 1844:18.—Brême, 1844: 307, tab. 9, fig. 2.
Zopherus Moreletii Lucas, 1852:xxiii (nomen nudem).
Zopherus insignis Blanchard, 1861: tab. 7*a*, fig. 6.
Zopherus chiliensis, Champion, 1884:38.
Zopherus chilensis, Champion, 1892:488.
Megazopherus chiliensis, Casey, 1907a:36.
Megazopherus chilensis, Casey, 1907b:461.

This, the largest species in the genus, may be recognized by the abruptly inflexed sides of the elytra which resemble true epipleura. The constriction between pronotum and elytra is less than in any other member of the group. The size and coloration are extremely variable, but most specimens show large amounts of white. Usually the entire dorsum is a dull white with a few dark tubercles showing through. The apex of the elytra is distinctly bituberculate, each tubercle globose and prominent.

I have seen none of the types, but there can be little doubt that all of the names listed above refer to the same species. Both Champion and Casey originally spelled the specific name "chiliensis" and later spelled it "chilensis," which is the correct spelling. Both authors credited the species to Gray.

This insect has entered the popular literature under the name "jewelled beetle" or "Makech." Jewels, pearls, and bits of chenille are glued to the elytra and pronotum, and the living beetle is tethered by a gold chain as a living piece of costume jewelry. Many specimens have been confiscated at United States ports of entry, although it is doubtful that the insect would become established, much less a pest of any consequence.

MEASUREMENTS.—Length 34–46 mm; width 13–17 mm.

SPECIMENS EXAMINED.—73 from the localities that follow. COLOMBIA: Bonda, Papare. COSTA RICA: Chiriqui Bay. EL SALVADOR: Quetzaltepeque, Santa Tecla. GUATEMALA: Asunción Mita, Jutiapa. HONDURAS: Naco River near Corradia, San Pedro Sula. MEXICO: Chilpancingo and La Unión in Guerrero; Mérida and Progreso in Yucatan; 24 miles northwest of Ocozocoautla in Chiapas; Xalostoc in Morelos; Tehuantepec and Achazumba in Oaxaca. PANAMA: Santa Fé in Darien. VENEZUELA: Puerto Cabello. Specimens have been taken in every month of the year.

2. *Zopherus nervosus* Solier

PLATE 2: FIGURE 10

Zopherus nervosus Solier, 1841:42, tab. 2, figs. 8–15.—Champion, 1884:43; 1892:490.
Zopherus pectoralis LeConte, 1851:130.
Zopherus nervosus var. *reticulatus* Champion, 1884:43.
Zopherus compactus Champion, 1884:43, tab. 2, fig. 4 [new synonymy].
Zopherus marmoratus Casey, 1907a:36 [new synonymy].

This distinctive species is largely black. Both the thorax and elytra are strongly convex, and the ventral surface of the pronotum is always coarsely and conspicuously tuberculate. The ventral callus of the apical abdominal sternum is evenly and rather feebly emarginate, not much swollen, and the associated patch of yellow hairs is much smaller than is usual in other species. In all specimens examined, the apex of the antennal fossa is appendiculate.

The names listed above in synonymy appear to represent merely color or slight structural variations of the same species. I have studied 13 specimens of Champion's *Biologia Centrali-Americana* series, representing those named by him as *compactus, nervosus,* and variety *reticulatus.* In addition I have examined Casey's 4 specimens of *Z. marmoratus* from Guerrero, Mexico, and have labeled and hereby designate the first specimen of the series as lectotype. All 4 specimens also bear a USNM type number 46343.

All specimens I have seen range from very dark *(compactus)* to mostly white *(reticulatus, marmoratus),* with typical *nervosus* intermediate between the two extremes. The lightest specimens seen are from Omilteme and Mochitlán, Guerrero.

MEASUREMENTS.—Length 17.0–30.5 mm; width 6.4–12.6 mm.

SPECIMENS EXAMINED.—35 from the localities that follow. MEXICO: Mochitlán and Omilteme in Guerrero; La Parada, Juquila, Tepanzacoalco, and 6.6 miles south of Valle Nacional in Oaxaca; Jalapa and Orizaba in Veracruz.

3. *Zopherus nodulosus nodulosus* Solier

PLATE 2: FIGURE 11

Zopherus nodulosus Solier, 1841:43.—Champion, 1884:42; 1892:489, tab. 22, fig. 6.
Zopherus variolosus Sturm, 1843:349, tab. 5, fig. 2.—Haldeman, 1852:376.
Zopherus nodulosus var. *sallaei* Champion, 1884:42; 1892:490.
Zopherus haldemanni var. *verrucosus* Champion, 1884:43, tab. 2, fig. 5 [new synonymy].

This is a somewhat variable species in several respects and it is understandable that varieties have been named. Specimens are always conspicuously marked in black and white, the lighter individuals being those referred to by Champion as the typical *nodulosus.* Individuals with a greater proportion of the dorsal surface black in color, Champion called variety *sallaei,* with variety *verrucosus* somewhat intermediate between the two.

The formation of the transverse callus at the apex of the terminal abdominal sternum varies from simply emarginate anteriorly to almost completely divided into two distinct lobes. The antennal fossae are appendiculate and the ventral surface of the pronotum is usually smooth, but occasionally may have several rather coarse tubercles.

Several unusual specimens are worthy of special mention. In one from Santo Domingo, Oaxaca (BMNH), there are numerous strong tubercles on the ventral surface of the pronotum as in *nervosus* Solier; the ventral surface is largely white and the femora are white except at the extreme base and apex. Another specimen exhibiting the same modifications is from 2 miles south of Tuxtla Gutiérrez, Chiapas (UCal). A specimen from Chilpancingo, Guerrero (MCZ), is almost completely black and the dorsal surface is smooth. This is probably an old abraded individual.

I have studied 16 of Champion's specimens, including both of the forms which he described, and am convinced that only one species is involved. Champion studied the type of *Z. variolosus* Sturm and pronounced it identical with this species.

MEASUREMENTS.—Length 14.1–28 mm; width 5.5–11.2 mm.

SPECIMENS EXAMINED.—137 from the localities that follow. MEXICO: El Zapotal, 2 miles south of Tuxtla Gutiérrez in Chiapas; Acapulco, Chilpancingo, 38 miles south of Iguala, Omilteme and Taxco in Guerrero; San Miguel and Zacualtipán in Hidalgo; Ajijic and Guadalajara in Jalisco; Mexico, Distrito Federal; 16 miles south of Arteaga in Michoacan; Cuernavaca and Tejalpa in Morelos; Compostela and Ixtlán del Rio in Nayarit; Calpulalpan, Juquila, Oaxaca, and Santo Domingo in Oaxaca; 82 km northeast of Tehuacán in Puebla; 34.1 miles north and 40 miles south of Tamazunchale in San Luis Potosi; 14 miles east of Landa de Matamoros in Queretaro; Hermosillo in Sonora; Cañon de Santa Anna, Rancho La Mariposa, Muzquiz in Coahuila; Tampico in Tamaulipas; Jalapa, Orizaba, and Presidio in Veracruz. Specimens were collected in every month except November at altitudes of from 5,200 to 6,800 feet.

Zopherus nodulosus haldemani Horn, new combination

PLATE 2: FIGURE 12

Zopherus haldemani Horn, 1870:271.—Champion, 1884:43.—Casey, 1907b:463.

This subspecies is apparently a continuation of the trend from the dark (*nodulosus*) to the lighter (*sallaei*) form. This is the lightest form of the series and, as Casey (1907b:463) remarks, is rather constant in coloration. The sutural rows of black blotches are contiguous and form a continuous black band from base to apex. There is also an irregular longitudinal black band on the pronotum. The lateral areas of both pronotum and elytra are predominately white.

Because the constant pattern of coloration appears to be geographic, it seems advisable to retain the trinomial for this and the previous taxon. Most of the specimens seen from north of the Rio Grande River are readily separable from those from Mexico.

MEASUREMENTS.—Length 14.6–29.4 mm; width 5.7–11.3 mm.

SPECIMENS EXAMINED.—379 from the localities that follow. UNITED STATES. TEXAS: Austin, Bastrop, Benchley, Berclair, Brenham, Brownsville, Brownwood, Calvert, Camp Bullis, Camp Swift, College Station, Columbus, Corpus Christi, Cypress Mill, Deckers Prairie, Dime Box, Fort Sam Houston, Galveston, Handley, Hearne, Kerrville, Lackland Air Force Base, Lexington, Luling, Montell, New Braunfels, Palmetto State Park, Roma, Rock Island, Round Mountain, Sabinal, Salado, San Antonio, Seagraves, Taylor, 15 miles north of Temple, Twin Sisters, Uvalde, Victoria, Waco, Dimmitt County, Eastland County, Gillespie County, Grimes County, Harris County, Limestone County, Montague County. MEXICO. NUEVO LEON: Horsetail Falls, 25 miles south of Monterrey; Chipinque Mesa, near Monterrey. SAN LUIS POTOSI: El Salto Falls. DURANGO: 5 miles southwest of Cuencamé.

I have seen specimens labeled "Guatemala," "California," "Monticello, Florida," and "Louisiana" and am inclined to discount all except possibly the latter. Specimens have been taken in every month except February and December.

4. *Zopherus jourdani* Sallé

PLATE 2: FIGURE 13

Zopherus jourdanii Sallé, 1849:301, pl. 8: fig. 4.
Zopherus mexicanus (auct., nec. Gray).
Zopherus costaricensis Champion, 1884:40, tab. 2, fig. 1 [new synonymy].

This species may be separated from *Z. jansoni* by the rounded and less prominent elytral base and in not having the sides of the terminal elytral tubercles in contact with the lateral margins; otherwise these two species are quite similar in coloration and in having distinctly bituberculate elytral apices. Both have a pronounced dark band on the anterior pronotal margin, which in *jourdani* is almost always crescent shaped (rounded posterior margins) and in *jansoni* is rectangular. This character is fairly reliable but not without exception.

Coloration is variable. Specimens from Mexico have larger black elytral tubercles than those from farther south. The lightest specimens are from Costa Rica and it is to this form that Champion assigned the name *costaricensis*. A series of 24 specimens from 6 miles east of San Cristóbal, Chiapas, Mexico, collected 6 and 22 July 1957 by J. A. Chemsak and B. J. Rannells (CAS) are the darkest I have seen and are quite uniform througout the series. The disc of the pronotum is almost entirely black as is the central portion of the elytra.

In specimens from Costa Rica the black areas of the elytra (tubercles and spots) are smaller and more numerous, and the raised areas of the pronotum are for the most part surrounded by white, giving the entire dorsum a decided salt-and-pepper appearance.

In intermediate areas, specimens run the gamut between the two extremes mentioned above. Specimens from Guatemala and Honduras may indicate clinal variations; however, two specimens from Chiapas, Mexico, are identical in coloration to those typical of Costa Rica. Considering the small number of specimens available from Honduras, Guatemala, and Nicaragua, it seems best not to speculate upon the meaning of this variability.

The ventral surface of the pronotum is very densely and strongly tuberculate, and the antennal fossae, while usually more less appendiculate apically, are frequently rounded or truncate. Occasionally the fossae will be appendiculate on one side and rounded on the other side of a single individual.

Sallé (1849) states that the natives of Guatemala call this insect "Caméléon" in reference to its ability to go for long periods of time without food. In Costa Rica it is known locally as "Duerme Niño" because of its deathfeigning behavior when disturbed.

MEASUREMENTS.—Length 17.7–36 mm; width 6.1–12 mm.

SPECIMENS EXAMINED.—187 from the localities that follow. BRITISH HONDURAS: Punta Gorda, Rio Sarstún. COSTA RICA: Alajuela, Azahar de Cartago, Cachí, Coronado, Guadalupe, La Palma, Monte Redondo, Monteverde, Navarro, Pacayas, Puntarenas, Rio Sucio, Salinas, San Francisco, San José, Santa Cruz, Volcán Irazú. EL SALVADOR: 10 km west of Santa Ana, Santa Tecla, Sonsonate. GUATEMALA: Capetillo, Chocoyos, Guatemala City, Panajachel, Totonicapán, Yepocapa. HONDURAS: El Zamorano, Las Limas, Rosario, San Luis, Tegucigalpa, Yoro. MEXICO: 8 km south of Bochil, Chenalhó, 10 miles northwest of Comitán, Pinca La Isle, Montidello Lake, 4.6 miles north of Ocozocuautla, 6 miles east of San Cristóbal, Tapachula, 3 miles southeast of La Trinitaria (all in Chiapas); Oaxaca in Oaxaca; Jalapa in

Veracruz. NICARAGUA: 5 miles south of Jinotega, Managua, Volcan Viejo.

Specimens have been collected in every month at altitudes ranging from 2,500 to 9,800 feet. It has been taken on pine in Honduras and data accompanying Costa Rica specimens are as follows: "under bark," "on balsa," "on tree trunk."

5. *Zopherus jansoni* Champion

Zopherus jansoni Champion, 1884:39, tab. 2, fig. 2.

This is a species of more slender body proportions than *jourdani*. Differences between the two are summarized under the latter species.

MEASUREMENTS.—Length 19.7–27 mm; width 6.2–9.0 mm.

SPECIMENS EXAMINED.—22 from the localities that follow. COSTA RICA: La Caja, Lindora Farm, Pacayas, Pozo Azul de Pirrís, Puntarenas, San José. NICARAGUA: Chontales, 5 miles south of Jinotega. Specimens have been taken in January, April, June, November, and December.

6. *Zopherus mexicanus* Gray

PLATE 2: FIGURE 14

Zopherus mexicanus Gray, 1832:796, pl. 50: fig. 5; pl. 69: figs. 4*a-g*.—Champion, 1892:489.
Zopherus maculatus Champion, 1884:41.

So few specimens of this species have been seen that I can add nothing to what Champion has already reported. Champion himself, after studying Gray's type of *mexicanus*, placed his species *maculatus* in synonymy with it and I have accepted his decision.

Zopherus mexicanus looks very much like *laevicollis* but has smaller, better defined apical tubercles of the elytra, and the ventral callus of the terminal abdominal sternum is feebly arcuate rather than trilobed (Figure 4). Specimens of the small series available vary considerably in coloration, from largely white to one which is completely black (Linares in Nuevo Leon, [CAS]).

MEASUREMENTS.—Length 14.6–24.2 mm; width 5.1–9.5 mm.

SPECIMENS EXAMINED.—9 from the localities that follow. MEXICO: Cuernavaca in Morelos (CU); Linares in Nuevo Leon (CAS); Zacualtipán in Hidalgo (BMHN); State of Jalisco (BMNH).

7. *Zopherus angulicollis* Champion

PLATE 3: FIGURE 15

Zopherus angulicollis Champion, 1884:42, pl. 2; fig. 6.

This species, as indicated by the key, is similar to *mexicanus, xestus,* and *laevicollis* in having large, flattened tubercles on the elytral apex. In *angulicollis* these tubercles are better developed than in the other three species and are almost contiguous at their bases (Figure 2). The prominent sutural ridge that separates the elytral tubercles in the other three species is not at all developed in *angulicollis*. The development of the ventral callus of the apical abdominal sternum is intermediate between the simply arcuate form of *mexicanus* and the strongly trilobed condition of *laevicollis* and *xestus*. It is not at all like *guttulatus* (= *concolor*) as suggested by Champion.

MEASUREMENTS.—Length 17.0–18.7 mm; width 5.9–7.1 mm.

SPECIMENS EXAMINED.—I have studied the unique type from Pinos Altos, Chihuahua, Mexico (BMNH), and can report one additional specimen labeled as follows: Tres Rios, Chihuahua, Mexico, 29 June 1958, Tanner-Robinson (in collection of Dr. Vasco M. Tanner, Brigham Young University).

8. *Zopherus laevicollis* Solier

PLATE 3: FIGURE 16

Zopherus laevicollis Solier, 1841:46.—Champion, 1884:40.
Zopherus laevicollis var. *venosus* Champion, 1884:40; 1892:488. [new synonymy].
Zopherus tuberculatus Champion, 1884:41, tab. 2, fig. 3. [new synonymy].
Zopherinus limbatus Casey, 1907a:37 [new synonymy].

This is an extremely variable species in dorsal coloration, luster, and sculpture. Coloration ranges from completely black individuals to specimens in which the dorsal surface is in greater part white, with prominent black, flattened tubercles. In some specimens the tubercles are large and numerous and are arranged in definite longitudinal rows. In others the tubercles tend to coalesce and form wavy transverse plicae. A few individuals have the tubercles well separated and surrounded by the white ground color. Two specimens are entirely black, without trace of white markings whatsoever. Surface luster ranges from dull to distinctly shining. This species may be

distinguished from all other species of *Zopherus* except *xestus* by the peculiar formation of the ventral callosity of the terminal abdominal sternum. In both *laevicollis* and *xestus* there is a prominent ridge projecting cephalad from the normal bilobed callosity, causing this structure to appear trilobed as described by Solier.

After studying a good series of Champion's specimens of *venosus* and specimens which he determined as *laevicollis*, I concur with his earlier (1884) conviction that they are not separable. I have seen only one of Champion's two specimens of *tuberculatus* from Santo Domingo, Oaxaca, Mexico, mentioned in the *Biologia* and see no reason for separating that species from *laevicollis*.

MEASUREMENTS.—Length 13.7–22.4 mm; width 4.9–8.2 mm.

TYPES.—*Zopherinus limbatus* Casey. The Casey collection contains 6 specimens bearing the USNM type number 46366. All are from Amecameca, Morelos, Mexico, collected by Höge. I have selected and labeled the first one of the series a lectotype. All of the Casey specimens fall well within the range of variation observed in the numerous examples of this species that were studied. Casey had one specimen determined as *laevicollis*, also from Amecameca. To me it appears identical to those he called *limbatus*. One of his specimens of *limbatus* bears a *"Z. venosus"* label. Apparently Casey saw so few specimens of *laevicollis* that he had no concept of its range of variability.

SPECIMENS EXAMINED.—216 from the localities that follow. MEXICO. CHIAPAS: 10 miles north of Tuxtla Gutiérrez. CHIHUAHUA: 30 miles west of Belleza. COAHUILA: 33 miles southeast of Saltillo. DISTRITO FEDERAL: 15 miles south of El Guarda, Mexico City, Tacubaya. DURANGO: 6 miles northeast of El Salto, San Miguel, Tepehuanes. GUERRERO: Acapulco, Mochitlán. HIDALGO: Zacualtipán. JALISCO: Mazamitla. MEXICO: Amecameca, Chapingo, Otumba. MICHOACAN: Uruapan. MORELOS: Cuernavaca. NUEVO LEON: Galeana, 10 miles east of San Roberto. OAXACA: Juquila Mixes, La Parada, Ruinas de Mitla, Salina Cruz, Santo Domingo, 17.2 miles northwest of Tehuantepec, Km 180-212 Puerto Escondido Highway, 22.3 miles west northwest of Zanatepec. PUEBLA: 3 miles northeast of Zacatepec. TLAXCALA: Apizaco. VERACRUZ: Jalapa, Las Vigas, Tlapacoyan. Champion listed it from the following localities: Sierra de San Miguelito (San Luis Potosí), San Andrés Chalchicomula (Puebla), Juquila and Calpulalpan (Oaxaca). Specimens have been taken in every month except March.

9. *Zopherus xestus*, new species

PLATE 3: FIGURE 17

DESCRIPTION.—*Holotype*, sex undetermined. Elongate, moderately robust, dull, velvety black in color. Head entirely black, epistomal margin evenly and deeply emarginate, dorsal surface minutely and very sparsely punctate, punctures not evidently setigerous; ventral surface smooth except for a few feeble punctures on anterolateral margins; mentum transversely trapezoidal, apical margin bisinuate with prominent anterior angles, finely and very sparsely punctate. Pronotum in dorsal view exactly as broad as long, sides strongly and evenly arcuate, with a slight prominence above apex of antennal fossa and five rather prominent tubercles on basal half of lateral margins; sinuate just before base, apical margin broadly and shallowly emarginate, the angles bluntly rounded, basal margin slightly rounded, thickened medially, angles rather sharply rectilinear; surface black except for feeble indications of white or gray lines parallel to and just within lateral borders, very minutely and sparsely punctulate; ventral surface densely opaque with a few small, widely scattered punctures on prosternum; antennal fossae rounded apically. Elytra slightly less than twice as long as broad, sides evenly rounded, base broadly and deeply emarginate, as wide as pronotal base; humeri acute and prominent, basal margin distinctly thickened and reflexed; apical tubercles smooth, shiny, separated from lateral margin by dull ground color and a few small punctures forming a fine groove; sharply separated from raised sutural margin by deep grooves; surface practically smooth, with a series of shallow, irregular, and poorly defined lines producing a wavy pattern over entire surface; very minutely and sparsely punctulate; black in color, with feeble indications of white or gray lines forming a fine network in depressions along lateral border. Mesosternum and metasternum densely opaque, minutely and sparsely punctulate; abdominal sterna likewise sparsely punctate, except on caudal margins of segments 3 and 4 where punctures are more numerous and closely spaced; ventral callus of terminal abdominal sternum trilobed, with the median lobe

rounded and prominent, the usual patch of yellowish hair present. Legs coarsely but sparsely punctured.

VARIATION.—The specimen selected as the holotype is almost intermediate in intensity of elytral sculpturing. Some specimens are smoother and show a lesser amount of white on lateral portions of the pronotum and elytra. This I take to be a result of aging and wear. This species is most like *laevicollis* Solier and is the only one north of the Rio Grande River which has the trilobed ventral abdominal callus and the large flattened tubercles at the apex of the elytra.

MEASUREMENTS.—Holotype: Length 22.4 mm; width 8.2 mm. Paratypes: Length 16.8–24.8 mm; width 6.0–8.8 mm.

SPECIMENS EXAMINED.—Holotype: Brewster County, Texas, Big Bend National Park, The Basin of Chisos Mountains, 8 August 1962, C. A. Triplehorn (OSU). 37 paratypes from same locality, 5 May–3 September, collected by C. A., W. E., B. A., and B. W. Triplehorn, D. J. and J. N. Knull, Howden and Becker, W. R. M. Mason, R. and A. Graves, J. A. Brubaker, R. L. Berry and F. J. Moore, R. and L. Hamilton and Howard V. Weems, Jr., (OSU, CNC, FSCA, RLB, TAM, UCR); (1) Big Bend National Park, Green Gulch (5700′), 24 July 1968, J. E. Hafernik (TAM); (1) Big Bend National Park, Panther Junction (4,000 feet) 29-30 April 1959, Howden and Becker (CNC); (1) Davis Mountains, Jeff Davis County, Texas, 19 June 1958, D. J. and J. N. Knull (OSU).

10. *Zopherus solieri*, new species

Zopherus elegans Champion (nec Horn), 1892:489.

DESCRIPTION.—Holotype, sex undetermined. Moderate in size, robust, black and white, dull in luster. Head entirely black, epistomal margin evenly and rather deeply emarginate, frons somewhat swollen in front of eyes, dorsal surface finely and sparsely punctate, each puncture with a short, inconspicuous, yellowish seta; ventral surface smooth except for a few coarse punctures; mentum broadly transverse, apical margin bisinuate with angles lobed and prominent, coarsely and sparsely punctured. Pronotum in dorsal view slightly broader than long, sides strongly arcuate, somewhat angulate above apex of antennal fossae, briefly sinuate just before base, apical margin broadly and shallowly emarginate, the angles bluntly rounded, basal margin feebly rounded, uniformly thickened, angles obtusely rounded; surface, except for lateral borders, black and alutaceous with moderately coarse, shallow, widely spaced punctures; white lateral borders occupying about one ninth the pronotal width on each side, inner border poorly defined; numerous, dense, shining black tubercles prominent within white borders; ventral surface black; antennal fossae rounded apically with angle somewhat upturned; prosternum coarsely and densely punctured, prosternal process shallowly excavate between coxae, ventral surface of prothorax with a few scattered, coarse punctures. Elytra almost twice as long as broad, sides evenly rounded, base broadly and shallowly emarginate, slightly wider than pronotal base, coarsely tuberculate with humeri prominent; apical ridges black, moderately swollen, oblique, very narrowly in contact with raised suture where it passes between them, mostly distinct from lateral margin except at extreme apex; surface strongly sculptured with irregular flattened tubercles which are confusedly arranged and tend to coalesce, forming wavy transverse plicae, punctures extremely fine and sparsely distributed; median seven ninths black in color and alutaceous, outer borders white, densely spotted with black, fairly regular, raised tubercles which frequently are contiguous, inflexed portion entirely black, finely and sparsely punctured. Mesosternum and metasternum coarsely and densely punctured, abdominal sterna sparsely punctured, with punctures of varying size, ventral callus of terminal abdominal sternum with an acutely rounded and prominent median lobe produced cephalad, the usual patch of yellowish hairs present. Legs entirely black except for the dense rows of yellowish hairs, coarsely and conspicuously punctured.

VARIATION.—The greatest variation observed is in the extent of the white borders of the elytra. The white in some of the specimens occupies as much as one quarter of the width of the elytra on each side, with a few small white patches on the disc. Not all of the specimens have the apex of the antennal fossae upturned; this character is subject to variation in this as in several other species of *Zopherus*.

MEASUREMENTS.—Holotype: Length 18.2 mm; width 6.6 mm. Paratypes: Length 17.1–20.3 mm; width 6.3–7.2 mm.

SPECIMENS EXAMINED. — Holotype and five paratypes, all from Villa Lerdo, Durango, Mexico, collected by Höge (BMNH); one paratype, same data

(ANSP, Horn collection 7216); one paratype, same data (MCZ), obviously obtained through exchange from Champion.

11. *Zopherus championi*, new species

PLATE 3: FIGURE 18

Zopherus elegans Champion (nec Horn), 1892:489, tab. 22, fig. 7.

DESCRIPTION.—Holotype, sex undetermined. Short, stout, black and white, dull in luster. Head entirely black; epistomal margin evenly and feebly emarginate, dorsal surface coarsely but shallowly and sparsely punctured, each puncture with a short, coarse, yellowish seta, ventral surface smooth except for a few widely spaced punctures laterally; mentum broadly transverse, apical margin bisinuate with angles lobed and prominent, coarsely and sparsely punctured. Pronotum in dorsal view just slightly broader than long, sides strongly arcuate, somewhat angulate above apex of antennal fossae, abruptly and briefly sinuate just before base, apical margin broadly and shallowly emarginate, the angles bluntly rounded, basal margin slightly rounded, thickened medially, angles obtusely rounded; surface, except for lateral borders, black and alutaceous with widely spaced, fairly coarse but extremely shallow punctures, white lateral borders occupying less than one seventh the pronotal width on each side, inner border rather irregular, a few very small black spots within white margins, these more numerous anteriorly; ventral surface black; antennal fossae rounded apically, prosternum coarsely, deeply, and densely punctured, prosternal process shallowly excavate between coxae, ventral surface of prothorax entirely smooth, impunctate. Elytra about two thirds as wide as long, sides evenly rounded, base broadly and deeply emarginate, slightly wider than pronotal base, humeri acute and prominent; apical ridges black, moderately swollen, oblique, broadly in contact with raised suture where it passes between them, also continuous with apical margin; surface feebly irregular without distinct tubercles, punctures coarse, shallow, and very sparsely distributed, median three fifths black in color and alutaceous, outer borders white, irregularly spotted with black blotches, inflexed portion entirely black, coarsely and sparsely punctured. Mesosternum and metasternum coarsely and irregularly punctured; abdominal sterna coarsely and densely punctured medially but practically impunctate laterally; ventral callus of terminal abdominal sternum trilobed with the median lobe acutely rounded and prominent, the usual patch of yellowish hair present. Legs entirely black, except for the usual pattern of yellowish hairs, conspicuously punctured.

VARIATION. — The elytral sculpturing in some of the specimens is somewhat more irregular than in the type, with an approach to distinctly flattened tubercles. The series is, for the most part, remarkably constant in coloration and general appearance.

MEASUREMENTS. —Holotype: Length 13.3 mm; width 5.3 mm. Paratypes: Length 11.9–15.1 mm; width 4.3–5.6 mm.

SPECIMENS EXAMINED. — Holotype and four paratypes from Villa Lerdo, Durango, Mexico, collected by Höge (BMNH). The holotype is the specimen from which Champion's illustration was prepared. Paratypes: (1) Huasteca Canyon, near Monterrey, Nuevo Leon, Mexico, 11 July 1963, H. F. Howden (CNC); (1) same locality and date, R. H. Arnett, Jr., and E. R. Van Tassell (FSCA); (1) Sanderson, Texas, 7 August 1959, R. B. Selander and J. C. Schaffner (JMC). One additional specimen, not designated a paratype because the white pattern cannot be seen: Sanderson, Texas, 6 June 1956, H. and A. Howden (OSU).

12. *Zopherus tristis* LeConte

PLATE 3: FIGURE 19

Zopherus tristis LeConte, 1851:130.—Horn, 1867:161; 1870:272; 1894:347.

Zopherodes tristis, Casey, 1907a:38.—Blaisdell, 1923:243; 1931:113.

Zopherodes aequalis Casey, 1907a:38 [new synonymy].

Zopherodes variabilis Casey, 1907b:464 [new synonymy].

Zopherodes incrustans Casey, 1907b:464 [new synonymy].

This is one of the easiest species of *Zopherus* to recognize, but one of the most difficult to characterize. The body is subcylindrical, greatly thickened dorsoventrally, with the elytral margins parallel throughout a greater portion of their length and abruptly constricted at the base and apex. The apical declivity is more abrupt and steeper than in any other species. The elytral tubercles are usually rather flattened with their hind margins somewhat truncate. Most specimens have the pronotum coarsely punctured, but several have coarsely granulate punctures as in *granicollis;* the prosternum is coarsely punctured. Sometimes the

flanks of the pronotum and elytra are encrusted with a whitish substance, and this may frequently be restored by soaking the specimen in ether. It appears to be of no taxonomic significance.

Casey (1907b:467) considered regarding the species he named *aequalis, incrustans,* and *variabilis* as subspecies of *tristis.* I have examined the types and they all fall well within the range of variation exhibited by *tristis.*

MEASUREMENTS. — Length 10.5–22 mm; width 3.9–7.6 mm.

TYPES. — *Zopherus tristis* LeConte (not seen). Type locality: "in deserta fluminis Colorado." *Zopherodes aequalis* Casey. Holotype (USNM 46350). Arizona (Gila Valley), Dunn. *Zopherodes variabilis* Casey. I have selected and so labeled the first of six specimens under this name in the Casey collection as lectotype. All were collected in the Baboquivari Mountains, Arizona, by F. H. Snow and bear a USNM type number 46351. This series is quite variable in size and sculpture, but one of them (the third) is a perfect match for the type specimen of *aequalis* Casey. *Zopherodes incrustans* Casey. Holotype (USNM 46349). Tucson, Arizona, F. H. Snow.

SPECIMENS EXAMINED. — 276 from the localities that follow. UNITED STATES. ARIZONA: Ajo, Baboquivari Mountains, Buckeye, Bumble Bee, Chandler, Florence, Granite Reef, Mesa, Nogales, Organ Pipe Cactus National Monument, Parker, Phoenix, Prescott, Riverside, Safford, San Carlos Lake, Santa Catalina Mountains, Tacna, Tempe, Tucson, Vail, Wellton, 12 miles east of Wenden, Wickenburg, Yuma. CALIFORNIA: Blythe, Borrego, Calexico, Caliente, Coachella Valley, Carrizo Springs, Holtville, Imperial, Indio, Laguna, Palm Springs, Palo Verde, Thermal, Winterhaven, Yuma. TEXAS: One specimen with State label only, probably in error. MEXICO. BAJA CALIFORNIA: Comondu, Loreto, Mulege, 1 mile south of Puerto Escondido, 10 miles south of Punta Prieta, San Domingo, 5 miles south of San Miguel, 25 miles south of Santa Rosalia. SONORA: Guaymas, Hermosillo, Pesqueria. Specimens have been collected in every month except December.

13. *Zopherus concolor* LeConte

PLATE 3: FIGURE 20

Zopherus concolor LeConte, 1851:130.
Zopherus guttulatus Horn, 1867:160 [new synonymy].
Zopherodes concolor, Casey, 1907a:38.
Zopherodes guttulatus, Casey, 1907a:39.
Zopherodes morosus Casey, 1907b:465 [new synonymy].

This species is characterized by its coarse elytral sculpturing, consisting of large, rounded tubercles which are usually contiguous at their bases and frequently form transverse wavy plicae. The pronotal punctures are sparse and simple, at least never forming rough granules, and the prosternum is usually roughly sculptured with punctures rather than raised tubercles. The form described by Horn as *guttulatus* has a somewhat linear arrangement of the elytral tubercles, but there are many intermediates connecting this form with the more typical sculpture. Casey's specimens of *morosus,* including the lectotype, are very typical *concolor.*

In several specimens it has been possible to bring out a white lateral border, almost identical to that of *elegans,* by prolonged soaking in ether. Specimens of *elegans* may be distinguished by the much finer elytral sculpture, the coarsely granulate pronotal punctures, and the strongly tuberculate prosternum.

MEASUREMENTS. — Length 12.4–22.8 mm; width 4.5–8.2 mm.

TYPES. — *Zopherus concolor* LeConte. Holotype (not seen). Near Santa Fe, New Mexico.

Zopherus guttulatus Horn. Lectotype (ANSP 3921). Texas (southwestern); one paratype labeled same as lectotype.

Zopherodes morosus Casey. Three specimens from Cloudcroft, New Mexico, 9,000 feet, W. Knaus, represent this species in the Casey collection. The first specimen has been selected and so labeled a lectotype by me. Both specimens also bear a USNM type number 46352.

SPECIMENS EXAMINED. — 121 from the localities that follow. UNITED STATES. NEW MEXICO: Albuquerque, Bandelier National Monument, Bent, Cloudcroft, Conchas Dam, Coolidge, Corona, Duran, High Rolls, Hot Springs, Jemez Springs, Las Vegas, Mayhill, Mescalera Reservation, Omega, Romeroville, Ruidoso, Santa Fe, Tecolote. TEXAS: Davis Mountains, Lake Buchanan (Llano County), Pine Springs (Culberson County), 20 miles northwest of San Antonio, 16 miles south of Sheffield (Terrell County), 35 miles west of Toyah (Culberson County), Real County. One specimen from Nogales, Arizona (WR), but data may not be authentic. Specimens have been

collected from 11 June to 19 December, but by far the largest numbers were taken in June.

14. *Zopherus gracilis* Horn

PLATE 3: FIGURE 21

Zopherus gracilis Horn, 1867:162; 1870:272.
Zopherodes pudens Casey, 1907a:40 [new synonymy].
Zopherodes caudalis Casey, 1907a:41 [new synonymy].
Zopherodes lugubris Casey, 1907a:41; 1911:254 [new synonymy].
Zopherodes pruddeni Casey, 1907a:41 [new synonymy].
Zopherodes luctuosus Casey, 1907a:41 [new synonymy].
Zopherodes elongatus Casey, 1907b:466 [new synonymy].
Zopherodes geminatus Casey, 1907b:467 [new synonymy].

This is the smoothest known member of the genus *Zopherus*. Typically, the elytra are smooth but may have fine, remotely spaced punctures and scattered, randomly arranged wavy incised lines. This species occurs from the Grand Canyon area of Arizona to southeastern Arizona, southwestern New Mexico, and into at least northern Sonora, Mexico. It is especially abundant in the Chiricahua Mountain area, where sizable series have been taken at night on bark of pine.

Z. gracilis varies clinally from south to north in the intensity of elytral sculpture and punctation. Specimens from southeastern Arizona (Chiricahuas) and adjacent regions of New Mexico are almost invariably perfectly smooth, whereas those from Flagstaff and the south rim of Grand Canyon sometimes approach *uteanus* in sculpture. It is thus not too surprising that Colonel Casey proposed seven names for some of the variations observable in this species. It is rather unforgivable that he did not recognize Horn's *gracilis*. Four of Casey's "species" are represented only by the unique types, two others by only two specimens each, and the remaining one by three specimens. It is obvious that he was describing specimens rather than species.

The apical ridges of the elytra are poorly defined and only slightly swollen. They are in more or less continuous contact with the lateral and apical margins of the elytra and are separated from the apical sutural elongation by a deep groove except at the extreme apex. The ventral callus of the terminal abdominal segment is broadly arcuate, with an acutely rounded and prominent median lobe directed cephalad. The prosternum is coarsely tuberculate and the antennal fossae are rounded apically.

MEASUREMENTS. — Length 11.6–21.7 mm; width 3.8–8.4 mm.

TYPES. — *Zopherus gracilis* Horn. Arizona (in the neighborhood of Fort Whipple, fide Horn). I have not seen the type which is stated by Horn to be in the LeConte collection; however, I have seen four specimens from Horn's collection.

Zopherodes pudens Casey. Holotype (USNM 46346) Ari[zona]. This unique specimen represents the maximum elytral sculpture in the Casey collection. It is rather typical of those found in the Flagstaff area.

Zopherodes caudalis Casey. Holotype (USNM 46363), Ari[zona]. A unique. The long terminal grooves of the elytra are not really so striking as Casey suggests.

Zopherodes lugubris Casey. This species is represented in the Casey collection by two specimens: the first labeled "Oslar, Tucson, Arizona," designated as *lugubris* in Casey's handwriting, and the second labeled simply "Ariz." A note in the box, presumably by L. L. Buchanan, states that "Casey evidently synonymyzed *lugubris* with *pruddeni* and then selected two Arizona examples to represent the former." These two specimens are so unlike in elytral sculpture that I am surprised that Casey did not describe them as distinct. Both, however, are typical *gracilis*. The type locality was originally designated as "Grand Canyon of the Colorado" but later changed by Casey (1911: 254) to "near Tucson." The original type of *lugubris*, a unique, now stands under *Z. pruddeni* (see remarks below).

Zopherodes pruddeni Casey. Three specimens stand under this name in the Casey collection. I have selected and so labeled the first one in the series, said by Casey to be from the Grand Canyon of the Colorado, as lectotype. This specimen also has a USNM type number 46361. The original description indicates that this species was described from a unique specimen. A second specimen under this name in Casey's collection and labeled the same way is doubtless the original type of *lugubris* (USNM 46362). A third specimen, labeled simply "Ariz," is apparently not from the same locality as the other two. All three are alike in sculpture and exhibit no departure from normal variation in this species.

Zopherodes luctuosus Casey. Holotype (USNM 46365), Ari[zona]. A unique which comes closest to

Horn's concept of *gracilis* among all of the specimens in Casey's collection.

Zopherodes elongatus Casey. Casey had two specimens under this name, both labeled Ari[zona] and USNM type number 46364. I hereby designate, and have so labeled the first of these, a lectotype. This form is no more slender than others I have seen.

Zopherodes geminatus Casey. Holotype (USNM 46355), Ari[zona], Fort Apache, according to Casey. The twinning of elytral punctures upon which Casey largely bases this species is not a unique character for I have seen it in occasional individuals from various parts of Arizona and New Mexico.

We may arrange the forms described as species by Casey (and here reduced to synonyms of *gracilis*) in order of increasing intensity of elytral sculpture as follows: *luctuosus* (practically smooth), *geminatus, lugubris, caudalis, pruddeni, elongatus,* and *pudens* (actually somewhat tuberculate). As stated before, these form a fairly constant cline from south to north.

SPECIMENS EXAMINED. — 591 from the localities that follow. UNITED STATES. ARIZONA: Ash Fork, Bright Angel Camp, Cameron, Chiricahua Mountains, Crown King, Flagstaff, Fort Grant, Fort Valley, Galiuro Mountains, Globe, Graham Mountains, South rim of Grand Canyon, Huachuca Mountains, Jerome, Mesa, Morrison, Nogales, Oak Creek Canyon, Oracle, Patagonia, Peach Springs, Pine, Portal, Prescott, Riverside, Ruby, Santa Catalina Mountains, Santa Rita Mountains, Seligman, Seven Springs, Sierra Ancha Mountains, Tombstone, Williams. NEW MEXICO: Lordsburg, Rodeo, Silver City. MEXICO. 10 miles east of Cananea in Sonora. Specimens have been collected from April to December.

15. *Zopherus uteanus* (Casey), new combination

PLATE 4: FIGURE 22

Zopherodes uteanus Casey, 1907a:40.
Zopherodes mormon Casey, 1907a:40 [new synonymy].

This species is very similar in appearance to *Z. opacus* Horn in its uniformly dull dorsal surface luster. Some specimens also approach *Z. granicollis ventriosus* in elytral sculpture but may be distinguished by the fine, sparse punctation of the head. In *granicollis ventriosus* the punctures of the head are very coarse and dense. The elytral sculpturing consists of small, shiny tubercles separated by dull interspaces. Typically these tubercles are so densely spaced that their bases are more or less contiguous, but sometimes they are smaller and more distantly spaced, approaching the situation in *opacus*. It is this latter variation that Casey named *mormon*. Enough intermediate forms have been studied to convince me that only one species is involved. In all specimens examined the pronotum is coarsely and densely granulate-punctate.

MEASUREMENTS. — Length 14.0–22.0 mm; width 4.6–8.0 mm.

TYPES.—*Zopherodes uteanus* Casey. Holotype (USNM 46344), southwestern Utah.

Zopherodes mormon Casey. Holotype (USNM 46345), Utah (no specific locality).

Each of the above is represented in the Casey collection by only the unique holotype, and this is another instance in which Casey described specimens and not species.

SPECIMENS EXAMINED. — 81 from the localities that follow. UNITED STATES. ARIZONA: Grand Canyon National Park (North Rim), Kaibab National Forest. CALIFORNIA: Granite Mountains near Cottonwood Springs (San Bernardino County). NEVADA: Baker, Ely, Kyle Canyon in Charleston Mountains (Clark County), Lee Canyon in Spring Mountains (Clark County). UTAH: Arches National Monument, Bears Ears (Elk Ridge), Beaver, Bryce Canyon, Dividend, Eureka, LaSal, Leeds, Lehi, Marysvale, Montezuma Creek (San Juan County), Natural Bridges National Monument, Nephi, Paria, Parowan, Pine Valley, Saint George, Stockton, Zion National Park. Collection dates are from 15 April to 11 September. I have collected this species under bark of dead pines in Arches National Monument and under chips of cut pine on the ground in Bryce Canyon.

16. *Zopherus granicollis granicollis* Horn

PLATE 4: FIGURE 23

Zopherus granicollis Horn, 1885:160.
Zopherodes induratus Casey, 1907a:39 [new synonymy].
Zopherodes californicus Casey, 1907b:466 [new synonymy].
Zopherodes prominens Casey, 1924:305 [new synonymy].

The elytra of this robust species are typically coarsely tuberculate, the tubercles closely spaced and more or less contiguous at their bases. The pronotum is coarsely and densely, frequently granulately punctured, and

the punctures of the head are coarse, deep, and closely spaced. The dorsal surface is dull in luster.

This, the nominate subspecies, inhabits the mountains of southern California, and northern Baja California. I have seen only one specimen from Arizona and one from Nevada (Casey's type of *Z. induratus* from Las Vegas). An interesting and rather uniform series of 14 specimens from Death Valley National Monument was studied. These appear to be somewhat intermediate between this and the following subspecies (*ventriosus*), the elytral tubercles being a little smaller and more widely spaced. The lateral elytral tubercles, however, are not transversely elongated as in typical *ventriosus*. I have seen this same condition in series in which most individuals were coarsely tuberculate and had assumed that it represented older specimens in which the elytra were eroded. This cannot be the case with the Death Valley specimens since they were reared from pine roots *(Pinus monophylla)* by W. H. Tyson and pinned immediately. More finely sculptured specimens of this species may be separated from *Z. uteanus* by the more robust body proportions and the coarsely and densely punctured clypeus.

MEASUREMENTS. — Length 12.6–20.5 mm; width 4.4–7.4 mm.

TYPES. — *Zopherus granicollis* Horn. Holotype (ANSP 3922), California; a square yellow label indicating "northern part of Lower California."

Zopherodes induratus Casey. Holotype (USNM 46359), Julian, California. The unique type is a typical specimen of *granicollis;* the only noteworthy feature is the lack of a cephalad-projecting spur on the ventral abdominal callus. This is unusual but not unprecedented since I have seen several other specimens with the same modification.

Zopherodes californicus Casey. Holotype (USNM 46357), Cal[ifornia]. In the unique type specimen, the elytral tubercles are eroded and form transverse, wavy plicae, a variation not uncommon in *Z. granicollis.*

Zopherodes prominens Casey. Holotype (USNM 46360), Las Vegas, Nevada, 26 May 1905, Tom Spaulding. This specimen, also a unique, falls well within the range of variation in this subspecies, the pronotal punctures having perhaps a sparser arrangement than usual.

SPECIMENS EXAMINED.—126 from the localities that follow. UNITED STATES. ARIZONA: Yuma County. CALIFORNIA: Claremont, Cleghorn Canyon, Crestline, Crystal Lake, Cuyamaca Rancho State Park, Death Valley National Monument, Fillmore, Herron Hill, Hesperia, Idyllwild, Joshua Tree National Monument, Julian, Lake Arrowhead, Littlerock, Mount Wilson, Newhall, Palm Springs, Pasadena, Potrero, Providence Mountains, San Bernardino Mountains, San Gabriel Mountains, San Jacinto Mountains, Santa Barbara, Santa Rosa Mountains. NEVADA: Las Vegas. MEXICO. BAJA CALIFORNIA: Ensenada, Rumorosa, 2 miles south of El Toro (Sierra Juarez). Specimens have been collected in every month except November and December.

Zopherus granicollis ventriosus (Casey), new combination

PLATE 4: FIGURE 24

Zopherodes ventriosus Casey, 1907a:39.
Zopherodes parvicollis Casey, 1907b:466 [new synonymy].

This subspecies differs from the nominate subspecies in having much finer elytral tubercles, with the lateral ones always transversely elongate. The pronotal punctures are variable as in typical *granicollis,* varying from coarsely muricate to granulate. Except for the previously mentioned Death Valley specimens, I have seen no intermediate specimens between the two subspecies, *granicollis* and *ventriosus,* apparently occupying reciprocal ranges. No specimens are available from the broad area which separates the two.

MEASUREMENTS.—Length 14.5–21.0 mm; width 6.0–7.0 mm.

TYPES. — *Zopherodes ventriosus* Casey. Holotype (USNM 46356), California (southern, fide Casey).

Zopherodes parvicollis Casey. Holotype (USNM 46358), Round Meadow Giant Forest, California, Hopping.

Both of these are very similar in sculpture, the principal difference being that the latter is very dull in surface luster. Both are represented in the Casey collection by uniques.

SPECIMENS EXAMINED. — 48 from the localities that follow. UNITED STATES. CALIFORNIA: Cedar Grove, Dalton Creek at 4,800 feet, Huckleberry Meadow, Kings River, Millwood, and Woods Creek in Fresno County; Saline Valley in Inyo County; Kern

River Camp 3, Sequoia National Forest, and Mill Potrero in Kern County; Bass Lake and Sugar Pine in Madera County; Miami Ranger Station at 4–5,000 feet in Mariposa County; Colony Mill, Davenport, Atwells Mill, Kaweah, Lloyd Meadow, Round Meadow Giant Forest, and Wells Mill in Tulare County. Specimens have been collected from 3 April to 16 October.

17. *Zopherus opacus* Horn

PLATE 4: FIGURE 25

Zopherus opacus Horn, 1867:161; 1870:272.
Zopherodes opacus, Casey, 1907a:40.

The elytral tubercles in this species are extremely small and widely separated. The broad expanses between tubercles are densely opaque and dull in luster. The pronotal punctures are coarsely muricate and closely spaced, and the prosternum is coarsely and densely, sometimes rugosely, punctured.

MEASUREMENTS. — Length 13.0–20.3 mm; width 4.9–7.2 mm.

TYPES. — Holotype (ANSP 3923) Nevada (no specific locality).

VARIATION. — In one of two specimens from Mono County, California, the elytral tubercles are transversely elongate, with thin linear crests and a bit closer together than usual. Horn had a similar specimen from Nevada, so I assume that this can be regarded as normal intraspecific variation. It should be noted that Casey's concept of this species was correct, although he had only one specimen in his collection.

SPECIMENS EXAMINED. — 21 from the localities that follow. UNITED STATES. CALIFORNIA: 9 miles west of Lone Pine, Westgard Pass and Whitney Portal in Inyo County; Convict Lake and Long Valley in Mono County and Sage Flats (not located). NEVADA: Ruby Substation, 10 miles southwest of Wells (6,000 feet) in Elko County; Cody Basin and Reno in Washoe County. UTAH: State label only. Specimens have been taken from 25 February to 12 August.

Zopherus opacus is most like *Z. uteanus* Casey but also bears some resemblance to *Z. granicollis ventriosus*. It displays by far the dullest surface luster of any known member of the genus and should be easily recognized.

18. *Zopherus elegans* Horn

PLATE 4: FIGURE 26

Zopherus elegans Horn, 1870:272.
Zopherodes otiosus Casey, 1907a:39 [new synonymy].
Zopherodes verrucipennis Casey, 1907b:465; 1911:254.
Zopherodes elegans, Casey, 1911:254.
Zopherodes circumductus Casey, 1924:304 [new synonymy].
Zopherodes woodgatei Casey, 1924:305 [new synonymy].
Zopherodes otiosus var. *verrucipennis,* Casey, 1924:305.

This attractive and interesting species is easily identified by the whitish lateral borders of the pronotum and elytra. The pronotum is always coarsely granulate-punctate, and the prosternum is distinctly tuberculate rather than punctate. The elytra are sculptured with rounded tubercles which vary somewhat in size, shape, and arrangement. In some specimens they are arranged in longitudinal rows (Casey's *woodgatei*) and in some they are randomly scattered (Casey's *circumductus*). Usually the tubercles are so large that at least some of their bases are contiguous, often forming transverse, wavy plicae. Occasionally they are smaller and completely isolated from one another, in which case there are usually much smaller tubercles scattered within the more or less opaque interspaces. The white areas surround the lateral tubercles of both pronotum and elytra, causing the black crests of the tubercles to stand out in bold relief. In 12 specimens it was impossible to produce the white lateral areas, even by long periods of soaking in several solvents. Except for the uniform black color, these specimens are identical in sculpture and body proportions to typical *elegans*. It is to this melanistic phase that Casey assigned the name *Z. otiosus*. I see no reason to retain it as even a varietal name. The 12 completely black specimens studied are from the following localities: ARIZONA: Eagar, Pinal Mountains, White Mountains, 8–15 miles northeast of Whiteriver. NEW MEXICO: Apache National Forest, Fort Wingate (lectotype and paratype of *otiosus* and holotype of *verrucipennis*), Gallup. UTAH: Moab.

MEASUREMENTS: Length: 15–21 mm; width: 5.3–7.6 mm.

TYPES. — *Zopherus elegans* Horn. Holotype (ANSP 3920), Cañon de Chelly, Arizona (not New Mexico as stated by Horn).

Zopherodes otiosus Casey. The first of the two specimens under this name in the Casey collection has been selected and so labeled a lectotype by me. Both

specimens also bear a USNM type number 46353 and are from Fort Wingate, New Mexico.

Zopherodes verrucipennis Casey. Holotype (USNM 46354), Fort Wingate, New Mexico.

Zopherodes circumductus Casey. Holotype (USNM 46347), Fort Wingate, New Mexico.

Zopherodes woodgatei Casey. Holotype (USNM 46348), Jemez Springs, New Mexico.

SPECIMENS EXAMINED (in addition to the melanistic specimens listed above). — 41 from the localities that follow. UNITED STATES. ARIZONA: Chinle, Kayenta, Leupp, Marsh Pass, Tuba City. COLORADO: Durango, Mesa Verde National Park, Montezuma National Forest. NEW MEXICO: Albuquerque, Apache National Forest, 11 miles west of Bernalillo, Bloomfield, Magdalena. UTAH: Moab, Torrey. Specimens have been collected from 20 May to 29 August.

To clarify the above synonymy, it should be mentioned that both *circumductus* and *woodgatei* are typical *elegans* in that they both have the white-bordered elytra and pronotum. *Zopherodes otiosus* appears to be a melanistic phase of *elegans,* and *verrucipennis* was placed as a synonym of *otiosus* by Casey himself (1911:254). Later (1924:305) Casey decided that *verrucipennis* should be considered a variety of *otiosus,* and the two were retained as separate entities in Casey's collection according to L. L. Buchanan, who transferred the collection from boxes to unit trays.

Zopherus elegans Horn was reported from Durango, Mexico, by Champion (1892:489, tab. 22 fig. 7). These specimens are not *elegans* at all but rather two undescribed species. These are described earlier in this paper as *solieri* and *championi.*

19. *Zopherus sanctaehelenae* (Blaisdell), new combination

PLATE 4: FIGURE 27

Zopherodes sanctaehelenae Blaisdell, 1931:111.

This interesting species apparently represents an outlying isolated population derived from the same ancestral stock as was *Z. granicollis.* Because of its disjunctive distribution and constant morphological characteristics, I prefer to regard it as a distinct species.

Blaisdell described this species in great detail from 30 specimens, and the few additional specimens collected since then do not modify his description in any way. *Z. sanctaehelenae* may be distinguished from all other North American species of the genus except *opacus* and the more strongly sculptured specimens of *gracilis* by the very fine, widely spaced elytral tubercles. From the latter two species it may be separated by the more robust body proportions.

MEASUREMENTS. — Length 13.0–21.0 mm; width 5.5–8.0 mm.

TYPES.—Holotype, male (CAS 2986) and allotype, female (CAS 2987), Mount Saint Helena, Napa County, California, 15 March (not July, as stated by Blaisdell) 1930, A. T. McClay, T. W. Serins, E. G. Linsley.

SPECIMENS EXAMINED. — 23 (including 10 paratypes labeled same as holotype and allotype). UNITED STATES. CALIFORNIA: Mount Saint Helena and Pope Valley, both in Napa County. Specimens have been taken from 22 February to 9 May.

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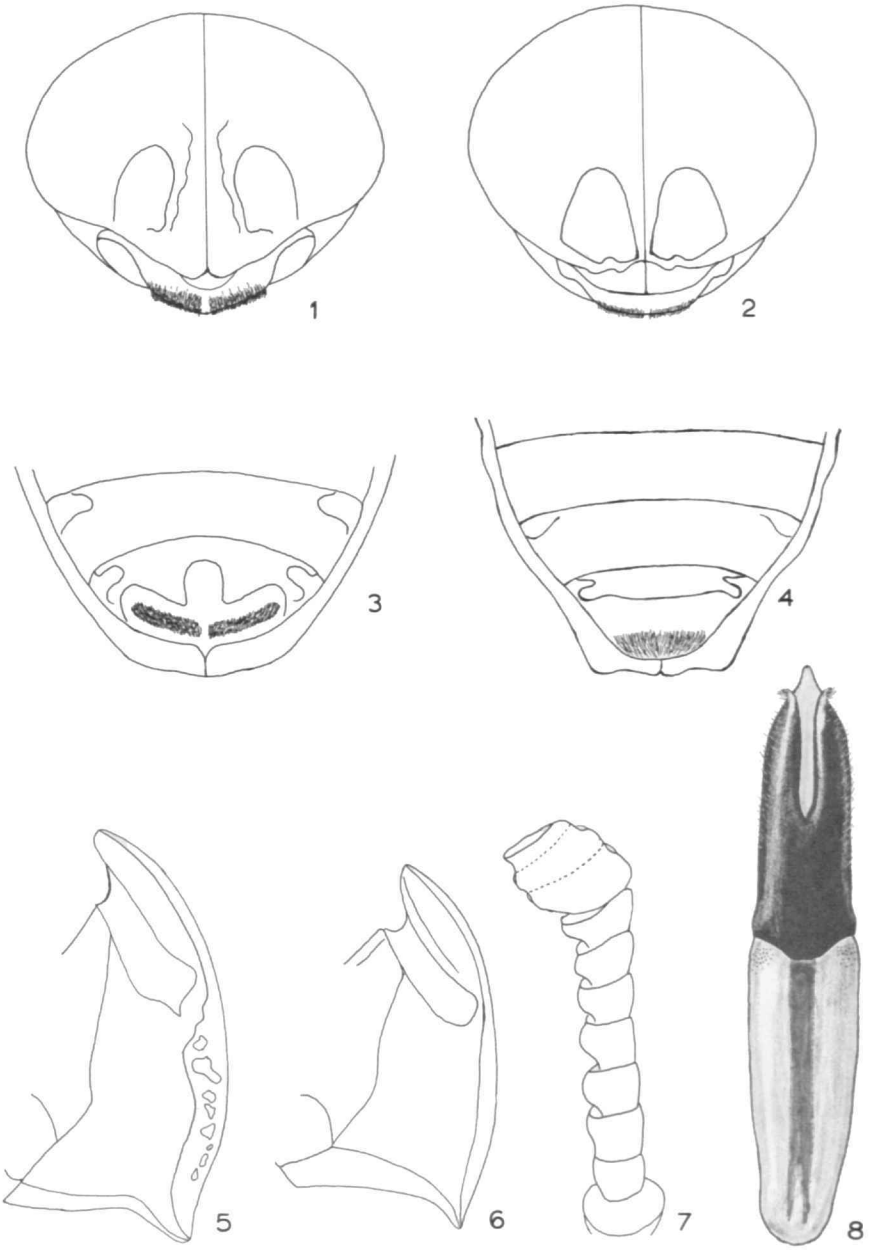

PLATE 1.—Genus *Zopherus:* 1, *Z. laevicollis* Solier, elytral apex; 2, *Z. angulicollis* Champion, elytral apex; 3, *Z. laevicollis* Solier, ventral aspect of abdomen showing trilobed callus of terminal sternum; 4, *Z. mexicanus* Gray, ventral aspect of abdomen showing arcuate callus of terminal sternum; 5, *Z. nodulosus haldemani* Horn, ventrolateral aspect of prothorax showing appendiculate apex of antennal fossa; 6, *Z. xestus* new species, ventrolateral aspect of prothorax showing rounded apex of antennal fossa; 7, *Z. nodulosus haldemani* Horn, antenna; 8, *Z. chilensis* Gray, aedeagus (length: 6.8 mm.).

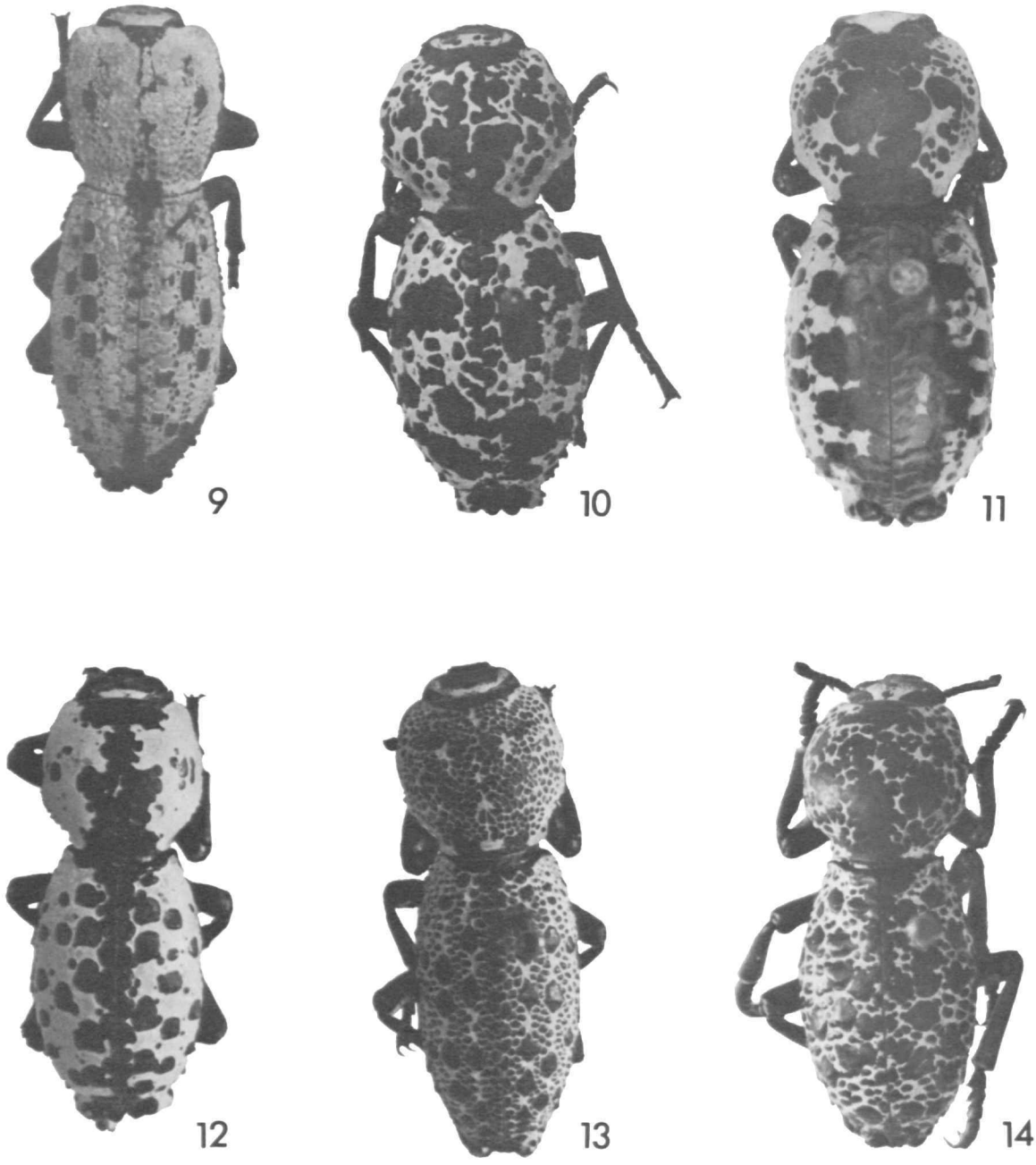

PLATE 2.—Genus *Zopherus:* 9, *Z. chilensis* Gray, El Salvador (length: 42.5 mm); 10, *Z. nervosus* Solier, Guerrero, Mexico (length: 24.6 mm); 11, *Z. nodulosus nodulosus* Solier, Sonora, Mexico (length: 21.7 mm); 12, *Z. nodulosus haldemani* Horn, Bastrop, Texas (length: 23.1 mm); 13, *Z. jourdani* Sallé, Tegucigalpa, Honduras (length: 25.8 mm); 14, *Z. mexicanus* Gray, Hidalgo, Mexico (length: 19.3 mm).

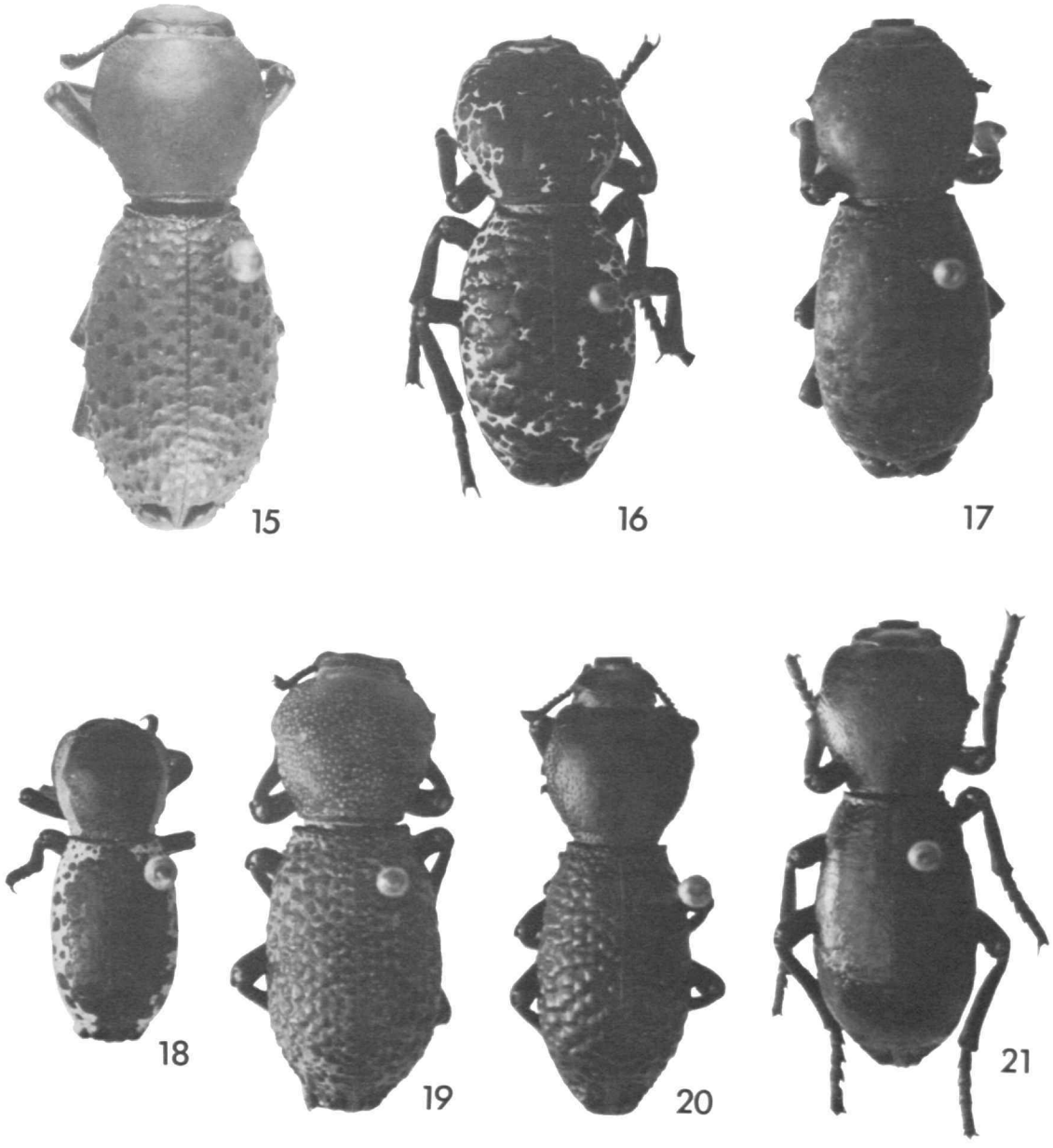

PLATE 3.—Genus *Zopherus:* 15, *Z. angulicollis* Champion, Chihuahua, Mexico (length: 18.7 mm); 16, *Z. laevicollis* Solier, Chapingo, Mexico (length: 19.9 mm.); 17, *Z. xestus,* new species, Chisos Mountains, Texas (length: 20.4 mm); 18, *Z. championi,* new species, Sanderson, Texas (length: 14.3 mm); 19, *Z. tristis* LeConte, Baja California, Sur, Mexico (length: 20.0 mm); 20, *Z. concolor* LeConte. Bandelier National Monument, New Mexico (length: 19.8 mm); 21, *Z. gracilis* Horn, Ruby, Arizona (length: 18.2 mm).

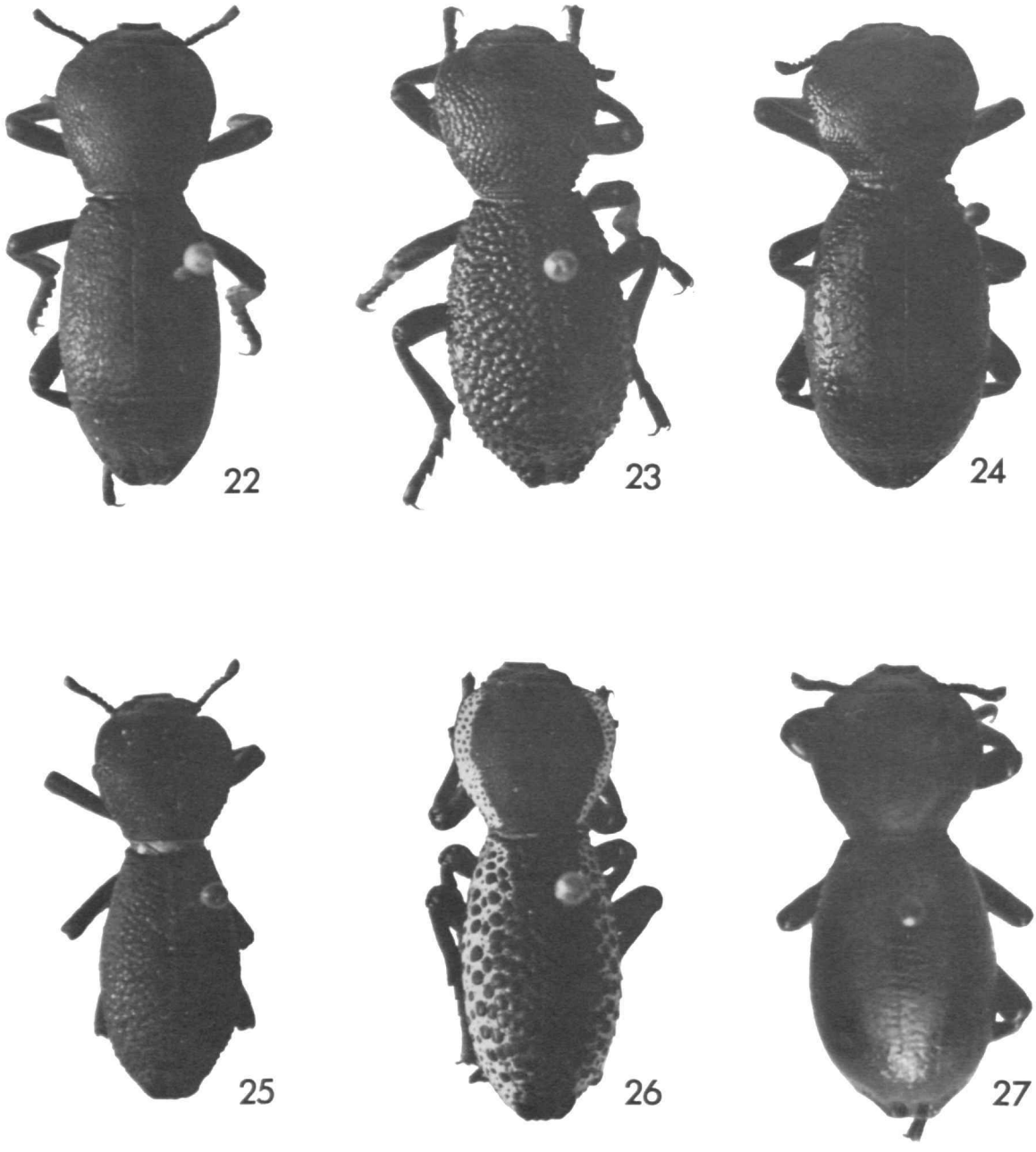

PLATE 4.—Genus *Zopherus:* 22, *Z. uteanus* (Casey), Utah (length: 16.2 mm); 23, *Z. granicollis granicollis* Horn, Berkeley, California (length: 19.0 mm); 24, *Z. granicollis ventriosus* (Casey), Sugar Pine, California (length: 17.3 mm); 25, *Z. opacus* Horn, Nevada (length: 17.2 mm); 26, *Z. elegans* Horn, Sandoval County, New Mexico (length: 18.8 mm); 27, *Z. sanctaehelenae* (Blaisdell), Mount Saint Helena, California (length: 17.9 mm).

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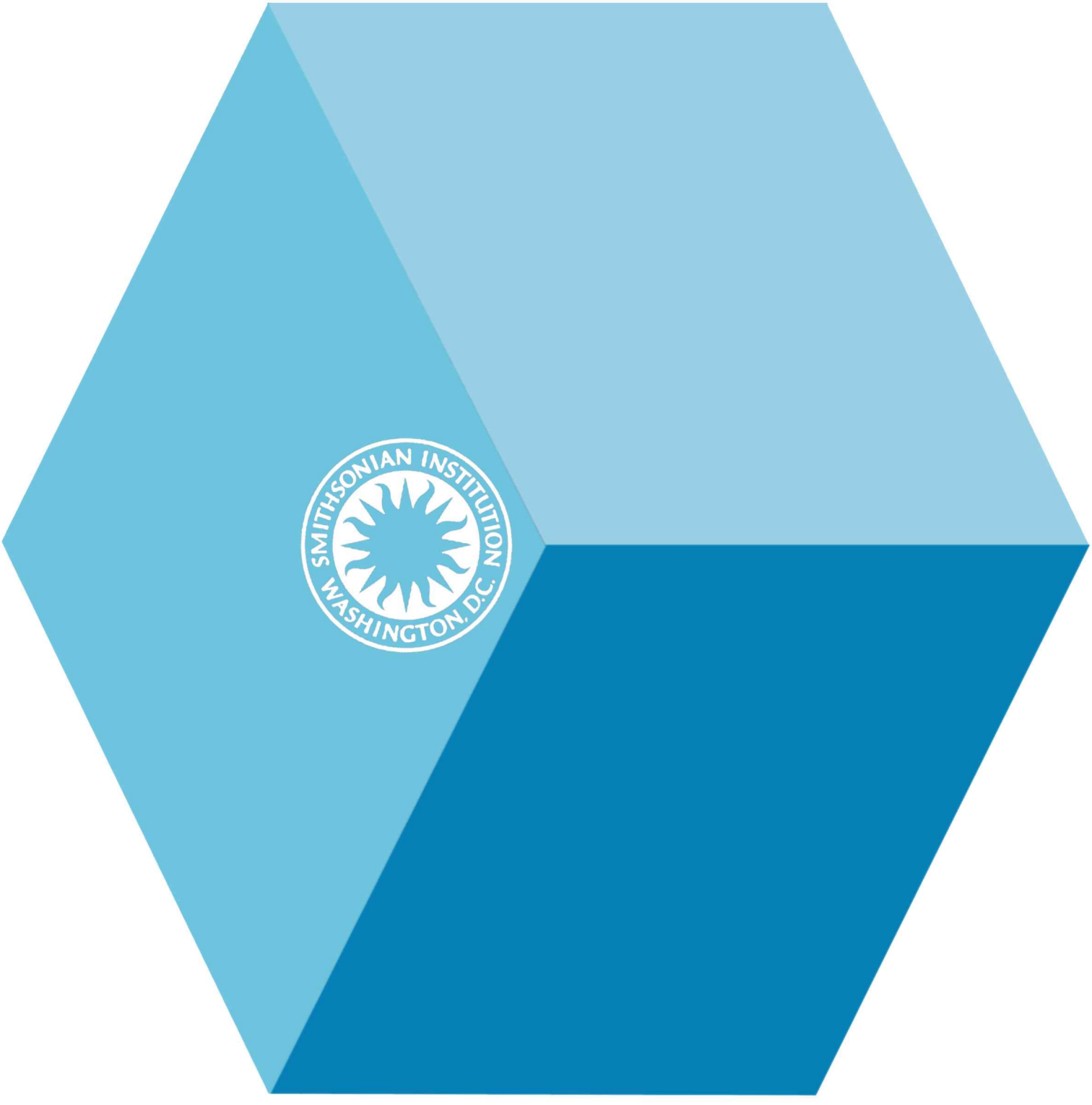
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