

THE SPECIES OF GIZZARD SHADS
(DOROSOMATINAE) WITH
PARTICULAR REFERENCE TO THE
INDO-PACIFIC REGION

GARETH NELSON AND M. NORMA ROTHMAN

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 150 : ARTICLE 2 NEW YORK : 1973

THE SPECIES OF GIZZARD SHADS
(DOROSOMATINAE) WITH PARTICULAR
REFERENCE TO THE INDO-PACIFIC REGION

GARETH NELSON

Associate Curator
Department of Ichthyology
The American Museum of Natural History

M. NORMA ROTHMAN

Scientific Assistant
Department of Ichthyology
The American Museum of Natural History

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 150 : ARTICLE 2 NEW YORK : 1973

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY
Volume 150, article 2, pages 131–206, figures 1–13, tables 1–5, maps 1–4

Issued March 19, 1973

Price : \$3.20 a copy

CONTENTS

ABSTRACT	135
INTRODUCTION	135
Material and Acknowledgments	135
Institutional Abbreviations	136
Counts and Measurements	136
Literature	137
SYSTEMATICS	138
Subfamily Dorosomatinae Gill	138
Tribe Anodontostomatini Herre	139
Genus <i>Anodontostoma</i> Bleeker	141
<i>Anodontostoma chacunda</i> (Hamilton)	141
Genus <i>Gonialosa</i> Regan	147
<i>Gonialosa manmina</i> (Hamilton)	147
<i>Gonialosa modesta</i> (Day)	149
Genus <i>Nematalosa</i> Regan	149
<i>Nematalosa arabica</i> Regan	149
<i>Nematalosa come</i> (Richardson)	150
<i>Nematalosa erebi</i> (Günther)	152
<i>Nematalosa galathea</i> , New Species	158
<i>Nematalosa japonica</i> Regan	159
<i>Nematalosa nasus</i> (Bloch)	161
<i>Nematalosa vlaminghi</i> (Munro)	163
Tribe Clupanodontini Whitley	164
Genus <i>Clupanodon</i> Lacepède	164
<i>Clupanodon punctatus</i> (Temminck and Schlegel)	164
<i>Clupanodon thrissa</i> (Linnaeus)	169
Tribe Dorosomatini Gill	170
Genus <i>Dorosoma</i> Rafinesque	170
Subgenus <i>Dorosoma</i> Rafinesque	170
<i>Dorosoma anale</i> Meek	170
<i>Dorosoma cepedianum</i> (Lesueur)	170
<i>Dorosoma chavesi</i> Meek	172
<i>Dorosoma smithi</i> Hubbs and Miller	173
Subgenus <i>Signalosa</i> Evermann and Kendall	173
<i>Dorosoma petenense</i> (Günther)	173
Key to the Species of Gizzard Shads of the Indo-Pacific Region	174
LITERATURE CITED	180
INDEX	204

ABSTRACT

THE INDO-PACIFIC fishes commonly called gizzard shads include two tribes (the Anodontostomatini and Clupanodontini) and at least 12 species (*Anodontostoma chacunda*, *Gonialosa manmina*, *G. modesta*, *Nematalosa arabica*, *N. come*, *N. erebi*, *N. galathea*, new species, *N. japonica*, *N. nasus*, *N. vlaminghi*, new combination, *Clupanodon punctatus* and *C. thrissa*). These species are generally better defined and more easily recognized by nonmeristic characters than by counts of scales, fin rays, vertebrae, ventral scutes, and predorsal bones. The North American gizzard shads include one tribe (Dorosomatini) and, as currently recognized, five

species (*Dorosoma anale*, *D. cepedianum*, *D. chavesi*, *D. smithi*, and *D. (Signalosa) petenense*), defined primarily on the basis of meristic characters. This paper reviews the taxonomy of the Indo-Pacific species and provides a key for their identification, an account of their variation and distribution, and an analysis of their scientific literature. For North American species, references to recent literature are included. The gut of the gizzard shads differs from that of other clupeoids in having a third primary flexure. The tribes recognized are based partly on the variations of the third flexure.

INTRODUCTION

THE gizzard shads were last revised on a worldwide basis by Regan (1917), who commented on their close relationship to the Indo-Pacific genera *Hilsa* and *Gudusia* and the West African genus *Ethmalosa* (see also G. J. Nelson, 1970a). Nonetheless, the gizzard shads, particularly the North American species of the genus *Dorosoma*, have often been placed in a distinct family or subfamily, although their relationships to other clupeoid fishes have remained little studied. The status and interrelationships of many of the species and genera of gizzard shads have continued in a preliminary stage of analysis. The biology and systematics of the North American species have been most recently summarized by Carlander (1969) and R. R. Miller (1950, 1960, 1964), whose papers should be consulted for detailed accounts. The Indo-Pacific genera and some of their species have been dealt with by Whitehead (1962, 1965, 1966, 1967, 1969a, 1969b, ms), Talwar and Whitehead (1971), and Whitehead, Boeseman, and Wheeler (1966).

The gizzard shads may be considered to comprise one subfamily of three tribes: the Anodontostomatini, Clupanodontini, and Dorosomatini. There is some small body of evidence, partly unpublished, that each of the tribes is a monophyletic assemblage, but how the tribes might be interrelated among themselves is problematical. We hope to deal elsewhere with the evidence relating to the higher classification of gizzard shads.

MATERIAL AND ACKNOWLEDGMENTS

The material available for study (about 5500 specimens) includes most of the specimens already reported in the literature, most of which were found to be extant in museum collections. However, a considerable part of the study material has not yet been reported on, having been collected in recent years by the George Vanderbilt Foundation (in the Gulf of Thailand), U.S. Bureau of Commercial Fisheries (in the coastal waters of India), and the American Museum of Natural History (from fresh and coastal waters of Western Australia). The collectors of this material include Mr. F. H. Berry (U.S. Bureau of Commercial Fisheries), Mr. W. H. Butler (Western Australian Museum and the American Museum of Natural History), Dr. H. A. Fehلمان and Dr. R. R. Rofen (both from the George Vanderbilt Foundation), and Dr. D. E. Rosen (the American Museum of Natural History). The collecting in Australia was done with the financial support of Mr. James Greenway, Jr., (the American Museum of Natural History), and the cooperation of Dr. D. L. Ride (Western Australian Museum) and Dr. D. L. Serventy (Commonwealth Scientific and Industrial Research Organization, Helena Valley, W.A.). This study was supported in part by Grant GB8589 from the National Science Foundation.

For loan of material we are indebted to Dr. T. Abe, Tokyo University; Dr. M.-L. Bauchot,

Muséum National d'Histoire Naturelle, Paris; Dr. M. Boeseman, Rijksmuseum van Natuurlijke Historie, Leiden; Drs. D. M. Cohen and R. V. Miller, U.S. Bureau of Commercial Fisheries; Mrs. M. M. Dick, Harvard University; the Director, Muséum d'Histoire Naturelle, Lyon; Dr. W. N. Eschmeyer, California Academy of Sciences; Dr. W. C. Freihofer, Stanford University; Dr. R. H. Gibbs, U.S. National Museum; Dr. P. H. Greenwood and Mr. P. J. P. Whitehead, British Museum (Natural History); Dr. P. Kähnsbauer, Naturhistorische Museum, Vienna; Dr. C. Karrer, Humboldt Universität zu Berlin; Dr. L. W. Knapp, Oceanographic Sorting Center, Smithsonian Institution; Dr. R. McKay, Western Australian Museum; Dr. D. Menasveta, Department of Fisheries, Bangkok; Dr. R. R. Miller, University of Michigan; Dr. J. Nielsen, Universitets Zoologiske Museum, Copenhagen; Drs. J. Paxton and F. Talbot, Australian Museum; Dr. S.-C. Shen, National Taiwan University, Taipei; Mrs. M. M. Smith, Rhodes University, Grahamstown; Prof. E. Tortonese, Museo Civico di Storia Naturale "G. Doria," Genova; Dr. J. C. Tyler, Academy of Natural Sciences of Philadelphia; Mr. L. P. Woods, Field Museum of Natural History, Chicago. We are indebted also to Mr. H. Jessen, Naturhistoriska Riksmuseet, Stockholm, for radiographs of specimens in the Linnean Collection, Uppsala University; to Dr. Paxton for radiographs of specimens in the Australian Museum; and to Mr. Whitehead for radiographs of specimens in the British Museum (Natural History) and for reading and commenting on the manuscript.

INSTITUTIONAL ABBREVIATIONS

AM, Australian Museum
 AMNH, the American Museum of Natural History
 ANSP, Academy of Natural Sciences of Philadelphia
 BMNH, British Museum (Natural History)
 CAS, California Academy of Sciences
 DFB, Department of Fisheries, Bangkok
 FMNH, Field Museum of Natural History
 GVF, George Vanderbilt Foundation (California Academy of Sciences)
 LCUU, Linnean Collection, Uppsala University
 MCZ, Museum of Comparative Zoology, Harvard University
 MNHN, Muséum National d'Histoire Naturelle, Paris
 MHNL, Muséum d'Histoire Naturelle, Lyon

MSNG, Museo Civico di Storia Naturale "G. Doria," Genova
 NMW, Naturhistorische Museum, Vienna
 RMNH, Rijksmuseum van Natuurlijke Historie, Leiden
 RUSI, J. L. B. Smith Institute of Ichthyology, Rhodes University
 SOSO RN, Smithsonian Oceanographic Sorting Center (reference number)
 SU, Stanford University (collection transferred to California Academy of Sciences)
 USNM, National Museum of Natural History, Smithsonian Institution
 WAM, Western Australian Museum
 ZMB, Zoologisches Museum, Humboldt Universität, Berlin (DDR)
 ZMUC, Universitets Zoologiske Museum, Copenhagen
 ZSI, Zoological Survey of India

COUNTS AND MEASUREMENTS

The vertebra counted as first is that bearing the first neural spine, and the vertebra counted as last is preural 1 (i.e., the urostyle of R. R. Miller, 1960, p. 372; 1964, p. 443; the terminal vertebra of Gosline, 1960, fig. 6; the preural 1 of Nybelin, 1963, p. 489; Cavender, 1966, figs. 3-4; Monod, 1967, fig. 9; 1968; Patterson, 1967, fig. 8). The vertebra counted as the first caudal is that bearing an enclosed haemal canal, as indicated in radiographs. Prepelvic scutes are those with arms ascending anterior to the base of the pelvic rays, and postpelvic scutes are those with arms ascending posterior to the base. Beneath the base of the pelvic rays is generally one "subpelvic" scute (rarely, two subpelvic scutes) with small arms ascending toward the anterior of the base of the pelvic rays. This scute has sometimes been considered a member of the prepelvic series (e.g., by Hubbs and Miller, 1941; G. J. Nelson, 1970b), but usually a member of the postpelvic series (e.g., by R. R. Miller, 1950; Hildebrand, 1964, p. 259; Whitehead, personal commun.). This subpelvic scute is here included neither in prepelvic nor postpelvic counts.

Horizontal scale rows on the trunk were counted on the left side from the origin of the dorsal to the origin of the pelvic fins, omitting predorsal and ventral scutes, and median predorsal scales (paired predorsal scales were counted). Horizontal scale rows on the caudal peduncle were counted on the left side where the peduncle is narrowest, omitting median dorsal

and ventral scales (invariably present). Lateral scales were counted beginning with those posterior to the operculum, in a horizontal series extending along the middle of the flank and caudal peduncle to the base of the caudal rays.

Counts of dorsal and anal rays, vertebrae, scutes, and predorsal bones were generally made for all available specimens, by examination of radiographs and the specimens themselves; counts given in parentheses represent the condition observed in the modal 90 percent of the specimens (tables 1-4). Counts of pectoral rays, pelvic rays, scale rows, and lateral scales were generally made for small samples of the study material, usually 10 to 20 specimens; counts given in parentheses represent the usual condition observed in the modal majority of the specimens (such counts based on samples of the study material are marked with an asterisk *). Length measurements, made with a millimeter ruler are of standard length, i.e., the length from snout tip to the base of the middle caudal rays.

LITERATURE

Fowler (1941) compiled the literature for the

Indo-Pacific Dorosomatinae. In that account the species are not accurately recognized. Some of the literature references consequently do not pertain to the species recognized by Fowler. This literature has been reviewed by us, to the extent that it has been available to us, and is listed for each species. In the reference section for each species the scientific names used and the names of the authors using them are listed alphabetically. Locality information is included when given, except for specimens subsequently catalogued in a permanent collection and available for reexamination during the present study. Their catalogue numbers are given in lieu of locality information, which is included in the lists of specimens examined. To the extent possible, all of the localities at which a species has been collected are given either in the list of references or in the list of specimens examined. Anomalous geographical records are set off by quotation marks.

For North American Dorosomatinae, R. R. Miller (1950, 1964) and Carlander (1969) summarized the literature to about 1960. References since 1960, exclusive of mimeographed reports are included here for each species.

SYSTEMATICS

SUBFAMILY DOROSOMATINAE GILL, 1862

Dorosomatinae GILL, 1862, p. 55 (type genus: *Dorosoma* Rafinesque, 1820).

DIAGNOSIS: Clupeid fishes with jaws and gill arches toothless in adults; gillrakers of first arch not overlapping; fifth ceratobranchials expanded, meeting in midline; large epibranchial organs; pyloric region of gut enlarged and muscular, forming gizzard-like structure; stomachic diverticulum absent in adults; hindgut with third primary flexure; last dorsal ray of most species prolonged as a filament; no bilobed dermal outgrowth from vertical edge of cleithrum.

NOTES: In relation to a microphagous type of diet, the gut of the gizzard shads has been long known to be highly specialized, with toothless jaws and gill arches (e.g., G. J. Nelson, 1967a, 1967b), large epibranchial organs (type 5 of Bertmar, Kapoor, and Miller, 1969; see also Svetovidov and Skvorzowa, 1968), a muscular stomach (gizzard), numerous caeca, and a long intestine (Harder, 1958a). The differentiated, muscular stomach, of course, was the reason for the "gizzard" shads to be so named. The gizzard, however, is not in itself a character diagnostic for dorosomatines, for a well-differentiated gizzard occurs in other clupeoids (e.g., *Brevoortia*, *Ethmidium*), and the stomach is more or less muscular, if not actually gizzard-like, in several other genera (e.g., *Hilsa*, *Gudusia*, *Ethmalosa*, *Opisthonema*). Certain of them (*Hilsa*, *Gudusia*, *Ethmalosa*) are probably closely related to gizzard shads (see above), and the tendency toward gizzard formation may be an indication of this relationship, and a character useful in defining a somewhat more inclusive systematic grouping (e.g., the Dorosomatinae of G. J. Nelson, 1970a, p. 16). But we have noted another gut character diagnostic for gizzard shads (Dorosomatinae, as usually understood, including Indo-Pacific forms): the third primary flexure (a term in agreement with Harder's, 1958a, fig. 1, generalized scheme for the clupeoid gut). The third primary flexure (figs. 1-3) occurs in all known species of gizzard shads and is absent, so far as known, from all other clupeoids (Harder, 1958a, 1958b; personal

observ.). In Indo-Pacific species the third flexure may form a simple, uncoiled loop, as in *Anodontostoma*, *Gonialosa*, and *Nematalosa* (figs. 1A-C, 3A), or, as a result of secondary flexure, a coiled loop, as in *Clupanodon* (figs. 2A, 3B). In North American species, with one apparent exception, there are additional secondary flexures of a characteristic pattern (figs. 2B, 2C, 3C, 3D), the ontogenetic development of which is shown by Bodola (1966, fig. 14). The one apparent exception occurs within, and perhaps characterizes one segment of the populations currently attributed to *Dorosoma petenense*; whereas the gut of specimens from Guatemala and southern Mexico have not only the secondary flexures characteristic of all other species of *Dorosoma*, and usually additional flexures as well (figs. 2C, 3D, 3E), the gut of examined specimens from the United States has a simple, uncoiled loop (Harder, 1958b, fig. 49; R. V. Miller, 1964; Schmitz and Baker, 1970, fig. 2; personal observations of specimens from Oklahoma, Texas, Louisiana, and Florida).

In comparison with the gut of other clupeoids, it is apparent that the simple loop of the Indo-Pacific forms is primitive, relative not only to the coiled gut of *Clupanodon*, but also to the secondarily flexed gut of *Dorosoma* (the simple loop of *Dorosoma petenense* is perhaps a secondary condition). It is possible to derive one type of gut from another in sequence (figs. 3A-D), and, accordingly, it is possible that *Dorosoma*, here assumed to be a monophyletic group of five species, is more closely related to *Clupanodon* (two species) than to any other species or assemblage. Other advanced characters (e.g., the nonoverlapping predorsal scales) would tend to confirm this concept of relationship. Yet *Clupanodon*, like other Indo-Pacific species of gizzard shads, has only one supramaxillary, and the dentary of *Clupanodon punctatus* has occasionally been compared with the flared dentary of the other Indo-Pacific species (Herre and Myers, 1931). After examination of alizarin specimens, we agree that the dentary of *C. punctatus* and that of *C. thrissa* are somewhat different, but do not agree that the dentary of *C. punctatus* is significantly flared like that of *Anodontostoma*, *Gonialosa*, and *Nematalosa*. At present, however, the interrelationships

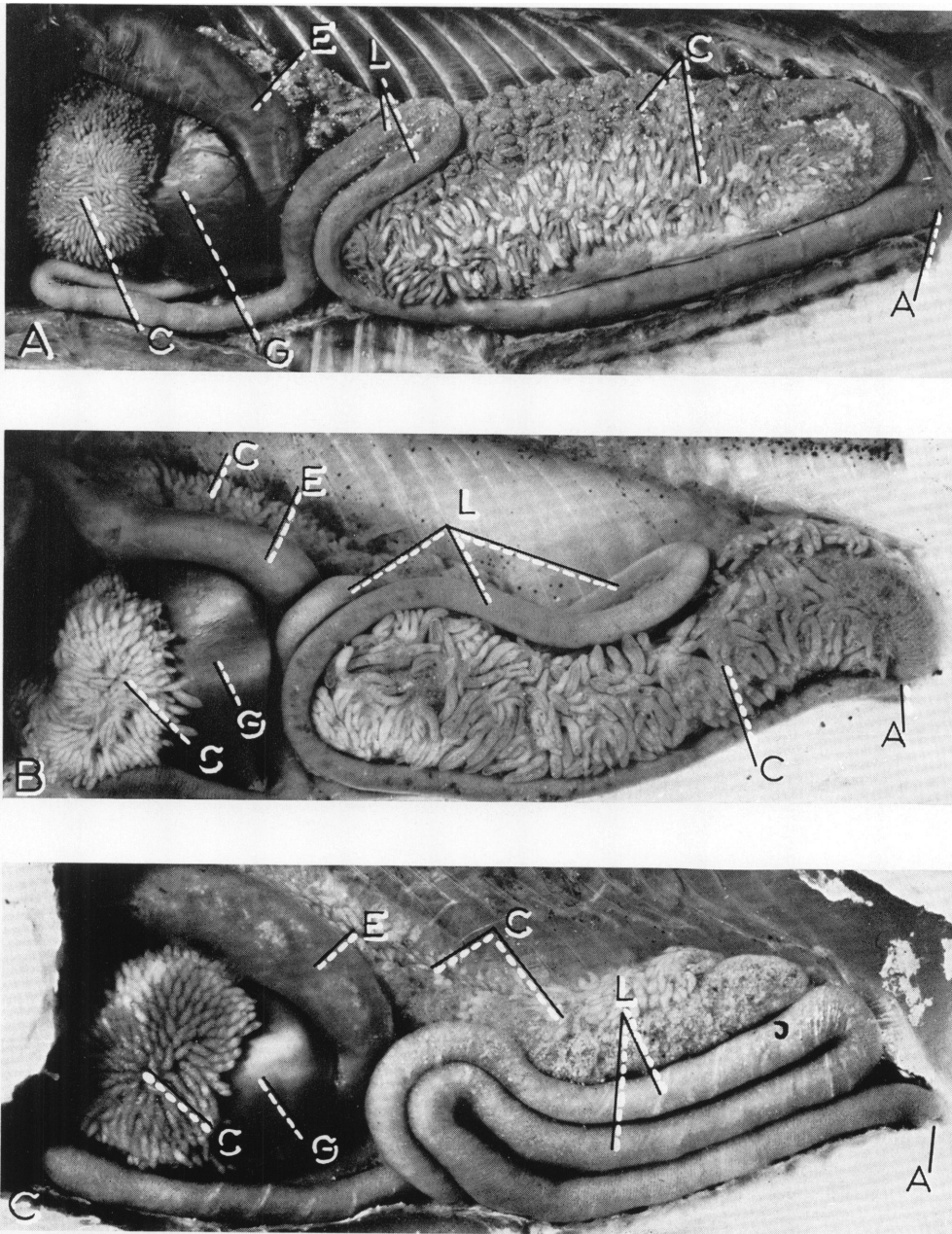


FIG. 1. Abdominal cavity and gut, lateral view of left side. A. *Nematalosa galathea*, new species, AMNH 28928, 124 mm. B. *Nematalosa erebi*, AMNH 28083, 75 mm. C. *Anodontostoma chacunda*, AMNH 28116, 68 mm.

Abbreviations: A, anus; C, caeca; E, esophagus; G, gizzard; L, loop formed by third primary flexure.

of the main groups of gizzard shads, the Anodontostomatini, Clupanodontini, and Dorosomatini, remain problematical and await further comparative study.

TRIBE ANODONTOSTOMATINI HERRE, 1933
 Anodontostomidae HERRE, 1933b, p. 6 (type genus:
Anodontostoma Bleeker, 1849).
 Nematalosidae DERANIYAGALA, 1952, p. 21 (type

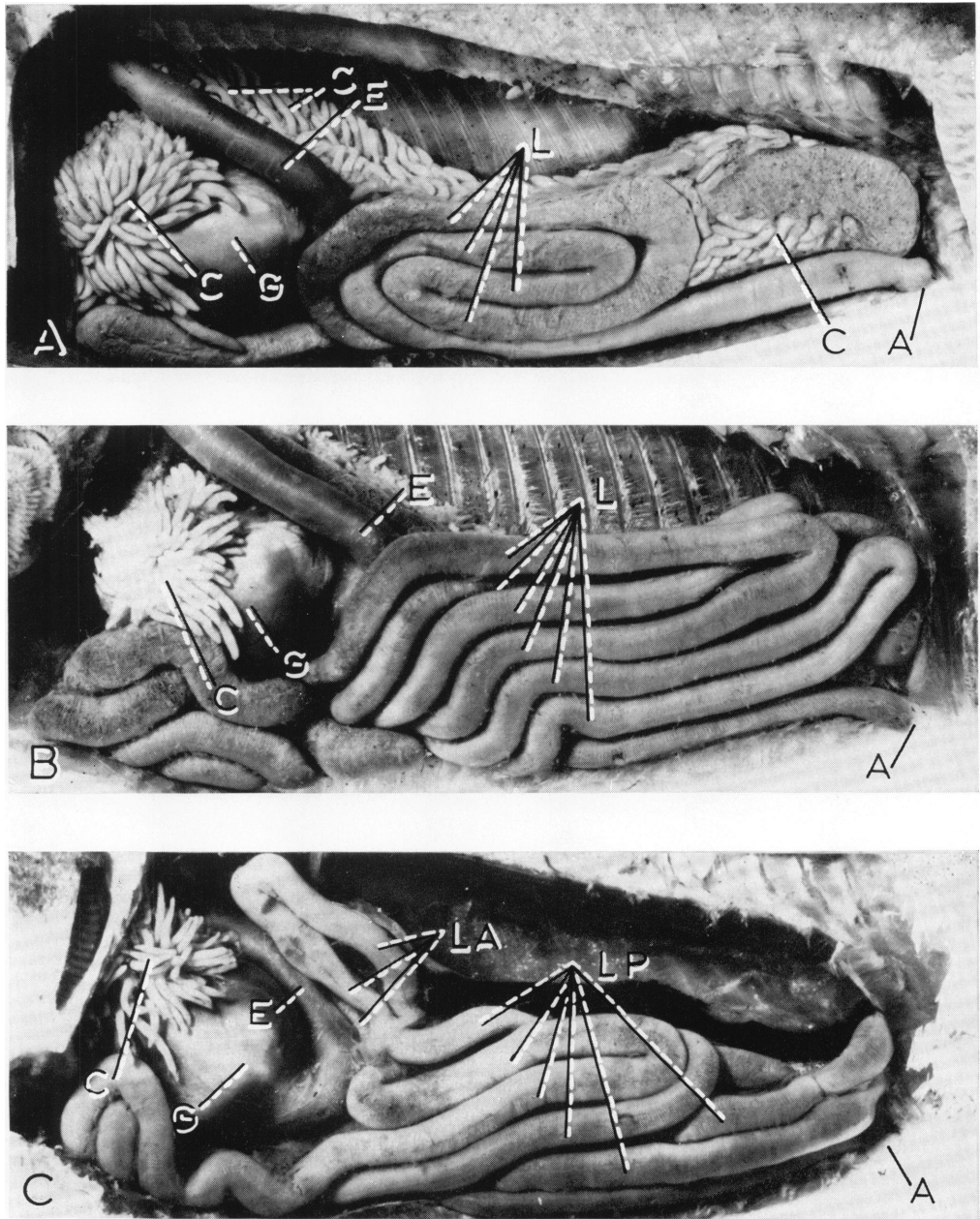


FIG. 2. Abdominal cavity and gut, lateral view of left side. A. *Clupanodon punctatus*, AMNH 27731, 94 mm. B. *Dorosoma anale*, AMNH 25498, 114 mm. C. *Dorosoma petenense*, AMNH 25786, 114 mm.

Abbreviations: A, anus; C, caeca; E, esophagus; G, gizzard; L, loop formed by third primary flexure; LA, anterior part of loop; LP, posterior part of loop.

genus: *Nematalosa* Regan, 1917).

DIAGNOSIS: One supramaxillary; dentary flared outward in front of maxillary; predorsal scales (paired or median) covering midline;

dorsal scutes absent; third infraorbital variable, but generally expanded, with a definite anterior edge forming an oblique or vertical margin extending ventrally to preopercle anterior to

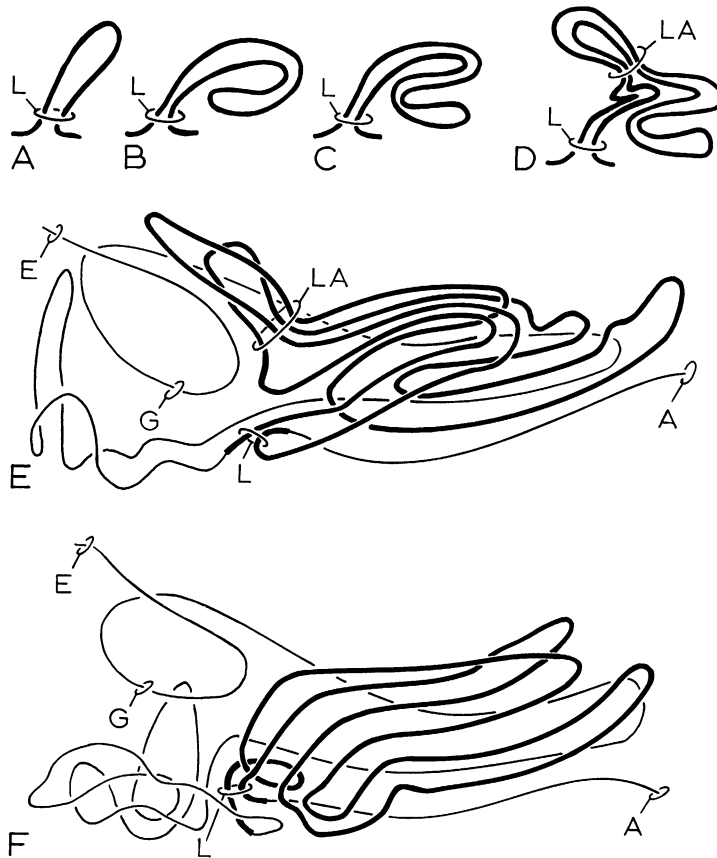


FIG. 3. A-D. Tracing of the course of the loop formed by third primary flexure in Anodontostomatini (A), Clupanodontini (B) and Dorosomatini (C and D). E-F. Tracing of the course of the gut in *Dorosoma petenense* (E, cf. fig. 2C) and *Dorosoma anale* (F, cf. fig. 2B).

Abbreviations: A, anus; E, esophagus; G, gizzard; L, loop formed by third primary flexure; LA, anterior part of loop.

angle; third intestinal flexure forming a simple loop.

NOTES: Little is known about the phyletic interrelationships of the species of anodontostomatins. The genera recognized here, although they have been and remain typologically conceived, have been in common use since Regan's (1917) revision. Their adoption here implies no firm belief in their phyletic integrity or ultimate utility.

GENUS *ANODONTOSTOMA* BLEEKER, 1849

Anodontostoma BLEEKER, 1849, p. 15 (type species [monotypy]: *Anodontostoma hasseltii* Bleeker, 1849 = *Anodontostoma chacunda*).

DIAGNOSIS: Anodontostomatins with the last

dorsal ray not prolonged as filament; level of mouth below level of eye in adults; third infra-orbital moderately expanded, its anterior edge oblique; predorsal scales median; maxillary straight, thin, tapering terminally; lateral scales few (usually fewer than 40); trunk scales few (usually fewer than 15).

Anodontostoma chacunda (Hamilton, 1822)
Jordan and Seale, 1905¹

Figures 1C, 4A, 4B

Clupanodon chacunda HAMILTON, 1822, p. 246 (type

¹The citation for authors of a new binomial combination follows the parentheses that enclose the name of the original author, as recommended by the International Code of Zoological Nomenclature (Stoll, 1961, p. 51).

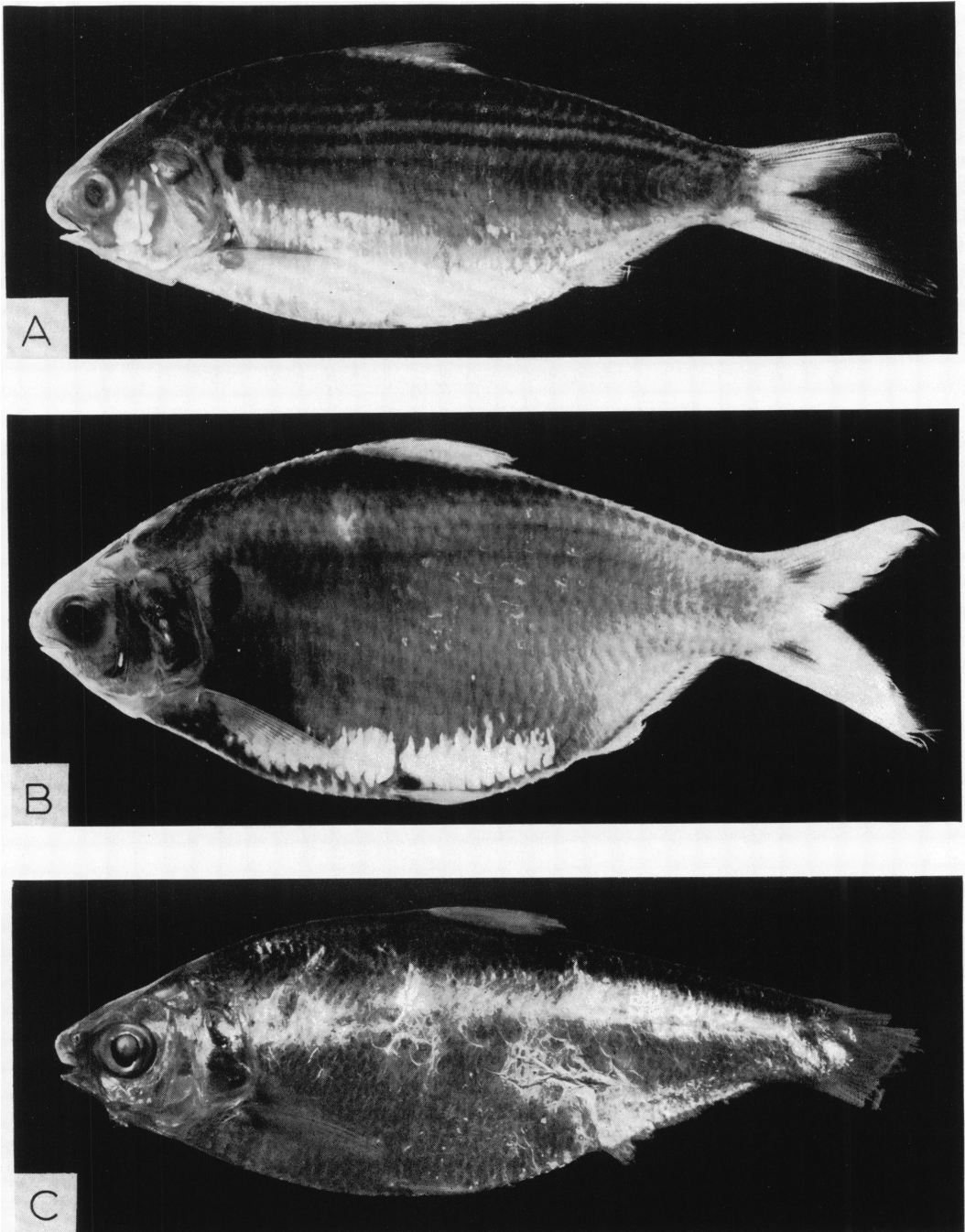
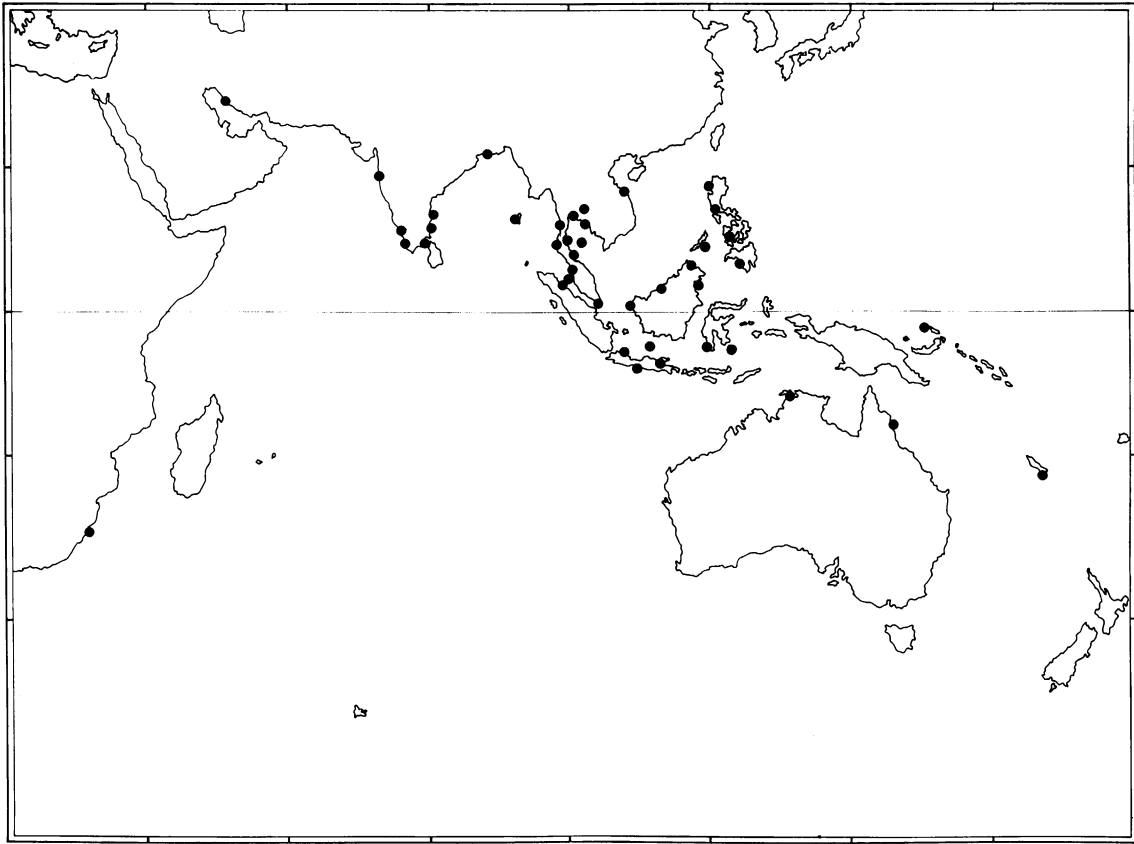


FIG. 4. A. *Anodontostoma chacunda*, FMNH 72259, Philippines, 168 mm. B. *Anodontostoma chacunda*, SOSC RN 381, India, 128 mm. C. *Gonialosa manmina*, BMNH 1872.4.17.40, 113 mm.

specimen [Whitehead, 1968, p. 32]: status unknown. Type locality: Gangetic estuaries).
 ?*Clupanodon chanpole* HAMILTON, 1822, p. 249 (type

specimen [Whitehead, 1968, p. 32]: status unknown. Type locality: ponds and ditches of Bengal).
Anodontostoma hasseltii BLEEKER, 1849, p. 15 (type



MAP. 1. *Anodontostoma chacunda*, collection localities of specimens examined.

specimen [Whitehead et al. 1966, p. 89]: RMNH 7082 [specimen examined]. Type locality: Madura Straits, Java Sea).

Chatoessus selangkat BLEEKER, 1852b, p. 458 (type specimen [lectotype here designated, cf. Whitehead et al. 1966, p. 90]: BMNH 1867.11.28.64 [specimen examined]. Type locality: Muntok, Batavia).

Chatoessus breviceps PETERS, 1877, p. 848 (type specimen [Whitehead, personal commun.]: ZMB 9818 [specimen examined]. Type locality: New Hanover).

DIAGNOSIS: Same as that of genus (monotypic).

MERISTICS: Dorsal rays: iii–vi (iv or v) unbranched, 13–16 (14 or 15) branched, 17–21 (18–20) total. Anal rays: ii–iv (ii or iii) unbranched, 12–22 (16–19) branched, 14–25 (19–22) total. Vertebrae: 11–15 (11–13) abdominal, 26–31 (28–30) caudal, 39–42 (40 or 41) total. Ventral scutes: 15–18 (17) prepelvic, 1 subpelvic, 8–12 (10 or 11) postpelvic, 26–30 (28 or

29) total. Predorsal bones 7–9 (8). Pectoral rays 14–17 (15 or 16). * Pelvic rays 7 or 8 (8). * Scale rows: 12–15 (13 or 14) * trunk, 6 * caudal peduncle. Lateral scales 34–41 (35–39).*

DISTRIBUTION: (marine, but entering rivers): South Africa (Natal), Arabia, India, Ceylon, Thailand, Vietnam, Malaya, Indonesia, Australia (Northern Territory, Queensland), New Guinea, Bismarck Archipelago, New Caledonia, Philippine Islands, Caroline Islands.

SPECIMENS EXAMINED: (575) AMNH 15882, 1 specimen, 107 mm. (Borneo, Pontianak), Batavia Zeevisscherij Inst., 1941; 17541, 19886, 2, 85–105 mm. (Java, Djakarta Mkt.), Batavia Zeevisscherij Inst., 1941; 28116, 13, 29–78 mm., Timor Sea (Australia, Northern Territory, Darwin), G. J. Nelson, W. H. Butler, and D. E. Rosen, 1969; 28139, 2, 31–34 mm. (Australia, Queensland, Cooktown), C. L. Smith and J. C. Tyler, 1969; 30107, 2, 115–116 mm.; 30109, 5, 100–110 mm. (Singapore), 1971.

ANSP 53474-5, 2, 116-122 mm. (Singapore), Singapore Dept. Fish., 1931; 61413, 61605, 2, 40-62 mm., Gulf of Thailand (Thailand), R. M. de Schauensee, 1934; 63377-9, 3, 65-66 mm. (Philippines, Luzon, San Fernando Ilocos Sur), J. Clemens, 1923; 63196, 63384, 2, 83-105 mm. (Philippines, Luzon, Orani), J. Clemens, 1923; 74857, 2, 112-113 mm. (India, Kerala, Kozhikode), 1922; 77268, 7, 50-115 mm. (Sumatra, Medan), G. Vanderbilt Sumatra Exp., 1939.

BMNH 1858.8.15.88, 1858.8.15.97-98, 4, 70-92 mm. (India), G. R. Waterhouse; 1862.11.1.201-2, 2, 110-119 mm. (Thailand), C. Jamrach; 1866.8.14.117, 1, 119 mm., R. Damon; 1867.11.28.64, 1867.11.28.661, 2, 118-119 mm., P. Bleeker; 1868.1.28.10, 1, 73 mm. (Sarawak), V. Doria; 1888.11.6.51-2, 2, 133-134 mm. (India, Madras), Thurston; 1889.2.1.1858, 1, 116 mm. (India), F. Day; 1889.2.1.1859-61, 3, 67-134 mm. (India, Madras), F. Day; 1889.2.1.1863, 1, 88 mm. (Andamans), F. Day; 1894.1.19.76, 1, 106 mm. (Sarawak), J. Brooke; 1898.4.2.251-2, 2, 95-104 mm., Menam River (Thailand), Royal Siamese Museum; 1898.12.24.53-4, 1899.1.24.16-8, 4, 85-122 mm., T. W. Townsend; 1966.2.28.26, 1, 48 mm. (Thailand); 1967.11.13.56-7, 2, 41-45 mm. (Singapore); uncat. a, 1, 114 mm. (Singapore); uncat. b, 1, 107 mm. (Sumatra).

CAS 24828, 1, 95 mm. (Thailand, Songkhla Mkt.), H. A. Fehlman and R. R. Rofen, 1957; 24829, 46, 93-117 mm. (Thailand, Chon Buri Mkt.), R. R. Rofen, 1957; 24830, 2, 119-124 mm. (Thailand, Rayong, Ban Paknam Prasae Mkt.), R. R. Rofen et al. 1957; 24831-3, 13, 100-118 mm. (Thailand, Bangkok Mkt.), 1960-1961; uncat. (GVF 1548), 9, 93-117 mm. (Thailand, Chon Buri Mkt.), 1957; uncat. (GVF 1503), 7, 89-118 mm. (Thailand, Songkhla Mkt.), H. A. Fehlman and R. R. Rofen, 1957; uncat. (GVF 1585), 1, 81 mm. (Thailand, Rayong, Ban Paknam Prasae Mkt.), 1957; uncat. (GVF 1590), 3, 76-80 mm. (Thailand, Rayong), R. R. Rofen, 1957; uncat. (GVF 1592), 1, 67 mm., Mae Nam Chanthaburi River (Thailand, Chanthaburi, Tha Chalaep), R. R. Rofen, 1957; uncat. (GVF 1913), 1, 69 mm. (Carolines, Yap), 1959; uncat. (GVF 2207), 6, 55-70 mm., Andaman Sea (Thailand, Ranong, Goh Kol Thee), H. A. Fehlman et al. 1960; uncat. (GVF 2208), 77, 31-37 mm., Andaman Sea (Thailand, Ranong, Goh Phi), H. A. Fehlman et al. 1960; uncat. (GVF 2571),

1, 111 mm. (Thailand, Chumphon), 1961; uncat. (GVF 2863), 1, 53 mm., Batangas Bay (Philippines, Luzon, Batangas), I. Ronquillo and R. R. Rofen, 1953; uncat. (GVF 2873), 1, 101 mm., Manila Bay (Philippines, Luzon), 1953; uncat. (GVF 2876), 2, 105 mm., Manila Bay (Philippines, Luzon, Novatas), I. Ronquillo, 1953.

DFB uncat., 1, 111 mm. (Thailand, Trad, Chang Island), T. Wongratana, 1965; uncat., 1, 120 mm. (Thailand, Songkhla), T. Wongratana, 1966.

FMNH 2368, 1, 135 mm. (India, Madras), F. Day; 15678-80, 3, 83-102 mm. (Java, Djakarta), Chancellor-Stuart Exp., 1929; 40878, 1, 114 mm. (India, Kerala, Kozhikode), A. W. Herre, 1941; 45827, 1, 119 mm., Johore Shoals (Malaya), Hendrickson, 1953; 46969, 2, 114-119 mm., Manila Bay (Philippines, Luzon), A. W. Herre, 1933; 47434, 1, 117 mm. (Singapore), A. W. Herre, 1934; 51565-7, 25, 34-85 mm. (North Borneo), R. F. Inger, 1950; 52412, 1, 118 mm. (Java, Djakarta), M. Weber; 70256, 1, 105 mm. (India, Canara), F. Day; 72259, 2, 159-168 mm. (Philippines, Palawan, Puerto Princesa Mkt.), U.S. Navy, 1962.

MCZ 17632a, 1, 76 mm. (East Indies), W. H. Putnam; 17924, 1, 115 mm. (Philippines, Luzon, Manila); 17929, 1, 108 mm. (Singapore); W. H. Putnam; 26321, 1, 59 mm. (Singapore); 30368, 5, 67-80 mm. (Malaya, Penang), L. P. Ward, 1860; 30831, 4, 85-114 mm. (Java, Djakarta), O. Bryant and W. Palmer, 1909.

MHNL 3702, 6, 75-111 mm. (Vietnam), G. Tirant, 1881.

NMW 4343, 1, 112 mm. (Singapore); 4349, 1, 55 mm. (Java, Tjilatjap), Breitenstein, 1891.

RMNH 2685, 2, 81-113 mm. (Java), H. Kuhl and J. C. van Hasselt, ca. 1821; 3312, 4, 97-120 mm. (Celebes, Makasar), D. M. Piller; 3319, 2, 111-117 mm. (Java, Djakarta), P. Bleeker, 1879; 7082, 1, 100 mm. (Java), P. Bleeker, 1879; 8616, 1, 100 mm. (India, Madras), F. Day; 8033, 7, 107-119 mm. (Java, Djakarta), P. Bleeker; 10497, 1, 121 mm. (Celebes, Muna Island), Sunda Exp., 1909; 17021, 3, 57-101 mm. (Java), Inland Fish., 1938; 17022, 4, 97-102 mm. (Java, Tandjung Petjnan), Inland Fish., 1938; 17548-51, 25, 38-113 mm. (East Indies), P. Buitendijk, 1904-1930; 17649, 10, 38-86 mm. (Sumatra, Belawan, Deli), P. Buitendijk, 1925-1930; 17650, 2,

74–120 mm., Java Sea, P. Buitendijk, 1906–1911; 17651, 21, 58–114 mm. (Java), P. Buitendijk, 1905–1929; 17652, 2, 63–71 mm. (Java, Surabaya), P. Buitendijk, 1930; 17681–3, 6, 38–114 mm. (East Indies), J. Kruisinga and J. von Bemmelen, 1879–1895; 17775, 19, 49–118 mm. (Java), P. Bleeker.

RUSI 1008, 1, 47 mm. (Natal).

SOSC RN 334, 1, 65 mm. (India, Maharashtra, Bombay), F. H. Berry (field numbers 66–3, 66–6), 1966; 1, 135 mm. (India, Madras, Madras), F. H. Berry (66–7), 1966; 1, 117 mm. (India, Madras, Porto Novo), F. H. Berry (66–17), 1966; 1, 119 mm. (India, Madras, Thirumullivasal), F. H. Berry (66–25), 1966; 1, 119 mm., Gulf of Mannar (India, Madras, Tuticorin), F. H. Berry (66–43), 1966; 20, 93–107 mm. (India, Kerala, Cochin and Ernakulam), F. H. Berry (66–53), 1966; 5, 73–117 mm. (India, Kerala, Cochin), F. H. Berry (66–55, 66–58), 1966; 6, 87–112 mm. (India, Kerala, Neendakarai), F. H. Berry (66–57), 1966; RN 381, 5, 118–128 mm. (India, Madras, Pondicherry), F. H. Berry, Oct. 5, 1966; 1, 99 mm. (India, Madras, Thirumullivasal), F. H. Berry, Oct. 8, 1966; 4, 64–131 mm. (India, Madras, Porto Novo), F. H. Berry, Oct. 12–16, 1966.

SU 20312, 4, 72–130 mm. (Philippines, Luzon, Manila), R. G. McGregor; 29635, 1, 112 mm. (Philippines, Panay, Iloilo), A. W. Herre, 1933; 30534, 1, 121 mm. (India, Andhra Pradesh, Uppada), Vizagapatam Res. Sta., 1932; 30573, 1, 51 mm. (India, Andhra Pradesh, Vizagapatam), Madras Fish. Dept., 1933; 30712, 6, 41–128 mm. (Sumatra), A. W. Herre, 1934; 33663, 7, 70–75 mm., Sandakan Bay (North Borneo), A. W. Herre, 1937; 34144, 1, 117 mm., Manila Bay (Philippines, Luzon), A. W. Herre, 1936; 37207, 1, 88 mm. (Burma, Mergui Archipelago, Mergui Mkt.), A. W. Herre, 1937; 38386, 1, 127 mm. (Philippines, Panay, Iloilo), A. W. Herre, 1940.

UMMZ 189663, 7, 66–111 mm. (Java, Djakarta Mkt.), J. D. Hardenberg and C. L. Hubbs, 1929; 190396, 1, 83 mm., Gulf of Siam (Thailand), K. F. Lagler et al. 1964.

USNM 51981, 4, 60–88 mm. (Philippines, Negros), B. Dean, 1901; 56031, 1, 162 mm., Rio Grande de Mindanao (Philippines, Mindanao), Philippine Government; 56065, 1, 142 mm. (Philippines, Luzon, Bacoor), Philippine Government; 56308, 2, 72–108 mm., Manila Bay (Philippines, Luzon, Cavite), G. A. Lung;

72515–6, 4, 91–118 mm. (Java, Djakarta), O. Bryant and W. Palmer, 1909; 120842, 2, 31–39 mm. (North Borneo, Sebatik Island), U.S.S. *Albatross*, 1909; 120843, 9, 34–39 mm. (Philippines, Panay), U.S.S. *Albatross*, 1908; 143394, 1, 199 mm. (Carolines, Yap), D. G. Frey, 1946; 149725, 3, 58–64 mm. (India, Kerala, Travancore); 182230, 1, 182 mm., Noumea Harbor (New Caledonia, Bai Uari), Trevorshine, 1944; 190083, 10, 77–100 mm., Sandakan Bay (North Borneo), U.S.S. *Albatross*, 1908; 190084, 2, 32–47 mm. (Philippines, Mindanao, Cotabato), U.S.S. *Albatross*; 190085, 14, 94–115 mm. (Philippines, Luzon, Manila Mkt.), U.S.S. *Albatross* 1908; 190086, 1, 107 mm. (Philippines, Luzon, Cavite), U.S.S. *Albatross*, 1908; 190087, 1, 100 mm. (Philippines, Panay, Iloilo Mkt.), U.S.S. *Albatross*, 1908; 190088, 3, 71–84 mm. (North Borneo, Sebatik Island), U.S.S. *Albatross*, 1909; 190089, 1, 98 mm., Malampaya River (Philippines, Palawan), U.S.S. *Albatross*, 1908; 190090, 1, 70 mm., Lingayen Gulf (Philippines, Luzon), U.S.S. *Albatross*, 1909.

ZMB 9818, 1, 175 mm. (Bismarck Archipelago, New Hanover).

ZMUC C9, 1, 79 mm. (Thailand), Hovmöller; C10, 1, 116 mm., Persian Gulf, H. Blegvad, 1937; C11, 1, 127 mm., Persian Gulf (Iran), H. Blegvad, 1938; 89–91, 3, 102–115 mm., Malacca Strait (Malaya, Penang), *Galathea* Exp., 1846; 92–93, 2, 98–112 mm. (Singapore), *Galathea* Exp., 1846; 94, 1, 112 mm., (East Indies), Eschricht; 95–96, 2, 118–129 mm. (Malaya, Malacca), M. Jensen; P18516, 1, 94 mm. (Thailand), T. Mortensen, 1900; P18517, 1, 101 mm. (Thailand), T. Mortensen, 1899; P18411–2, 2, 120–124 mm., Malacca Strait (Thailand), Thai-Dansk Exp., 1966; P18413–4, 2, 107–108 mm. (Java, Djakarta Mkt.), 1922; P18415–6, 2, 113–118 mm. (Thailand), Thai-Dansk Exp., 1966; P18417, 1, 42 mm. (East Indies), Thomsen, 1880.

REFERENCES: *Anodontostoma breviceps*: Jordan and Seale, 1906, p. 187 (name). Regan, 1917, p. 316 (reference).

Chatoessus breviceps: Günther, 1909–1910, p. 380 (reference).

Anodontostoma chacunda: Annigeri, 1967, p. 25 (spawning. India, Mysore). Anon., 1957–1967 (fishery [as gizzard shad], Philippines). Bal et al. 1959, pp. 8, 15 (air bladder, labyrinth). Banasopit and Wongratana, 1967, p. 4 (name). Basheeruddin and Nayar, 1961, p. 171 (juven-

- iles. India, Madras). Bean and Weed, 1912, p. 592 (USNM 72515-6, MCZ 30831). Bennet, 1968 (parasites. India, Maharashtra). Bensam, 1967 (epibranchial organ). Blanco, 1938, p. 506 (Philippines: Babuyan, Luzon). Breder and Rosen, 1966, p. 89 (reproduction). Chacko, 1949, p. 87 (food. India, Madras). Chopra, 1951, p. 49 (fishery. India). Devanesan and Chidambaram, 1941, pp. 259-261; 1942, p. 180 (egg, larva. India, Kerala); 1953, p. v (name). Domantay, 1940, p. 98 (Philippines, Mindanao); 1958, p. 33 (name). Evermann and Seale, 1907, p. 54 (USNM 56065). Fowler, 1918, p. 62 (Philippines); 1924, p. 39 (ANSP 74857); 1927, p. 258 (ANSP 63377-9, 63384, 63196); 1928, p. 32, 1938b, p. 25 (compiled); 1931a, p. 78, fig. 7 (India; Philippines); 1931b, p. 443 (ANSP 53474-5); 1934a, p. 86 (Thailand, Bangkok); 1934b, p. 387 (reference); 1935, p. 90 (ANSP 61413, 61605); 1940, p. 370 (ANSP 77268); 1941, p. 549 (in part, except for USNM 190091). Halstead, 1967, pp. 65, 606, pl. 1, fig. 3 (toxins). Herre, 1933a, p. 2 (North Borneo); 1933b, p. 6 (Philippines, Negros); 1934b, p. 15, 1959, p. 70 (Philippines); 1940b, p. 10 (SU 37207); 1941, p. 335 (reference); 1953, p. 62 (compiled). Herre and Myers, 1931, p. 237 (Philippines, Luzon); 1937, p. 13 (SU 30712). Hora, 1924, p. 481 (Thailand, Songkhla). Inger, 1955, p. 56 (FMNH 51565-6). Intengan et al. 1956, p. 207 (food value). Jacob, 1948, pp. 159-160 (biology. India, Madras). James and Adolph, 1971, p. 541 (India, Madras). Jones, 1951, p. 125 (references). Jones and Bensam, 1968, p. 116 (references). Jones and Sujansingani, 1954, p. 262, (India, Orissa). Jordan and Richardson, 1908, p. 236 (Philippines); 1910, p. 7 (compiled). Jordan and Seale, 1905a, p. 771 (USNM 51981); 1906, p. 187 (name); 1907, p. 5 (USNM 56308). Kuronuma, 1961, p. 3 (name). Love, 1970, pp. 300, 421 (reference). Matsubara, 1955, p. 188, 1963, p. 188 (reference). A. G. K. Menon 1966, p. 375 (India, Madras). M. A. S. Menon, 1963, p. 52 (name). Misra, 1947b, p. 397 (reference); 1953, p. 383, fig. 8c, 1959, p. 125, fig. 50 (after Day, 1878, pl. 160, fig. 3), (India). Misra and Menon, 1966, pp. 408, 417 (distribution). Munro, 1955, p. 29, pl. 6, fig. 80 (after Bleeker, 1872, pl. 261, fig. 6), (Ceylon); 1958, p. 117 (New Guinea); 1967, p. 43, pl. 3, fig. 31 (after Bleeker, 1872, pl. 261, fig. 6), (description). Murty, 1969, p. 4 (India). G. J. Nelson, 1970a, pp. 12, 15, fig. 9D (branchial structure). Oshima, 1926, p. 2 (Hainan). T. V. R. Pillay, 1967, p. 649 (name). Rao, 1965, pp. 89-101 (biology. India, Andhra Pradesh). Rasalan, 1957, p. 61 (name). Regan, 1917, p. 316 (India; East Indies). Rofen, 1963, p. 215, fig. (Thailand). Roxas, 1934, pp. 233, 256, pl. 1, fig. 13, pl. 3, fig. 1 (Borneo; Samar; Philippines: Balabac, Guimaras, Leyte, Luzon, Masbate, Mindanao, Mindoro, Panay). Roxas and Martin, 1937, p. 23 (compiled). Seale, 1908, p. 529 (Philippines); 1910, p. 96 (toxicity). H. M. Smith, 1945, p. 51 (Thailand). H. M. Smith and Seale, 1906, p. 74 (Philippines, Mindanao). Suvatti, 1936, p. 13, 1950, p. 196 (Thailand). Tchang, 1957, pp. 341, 344 (distribution). Tortonese, 1939, p. 46 (Java). Umali, 1934, p. 371, 1936, p. 59, fig. 23, 1937, p. 235, 1950, p. 4 (Philippines). Villadolid, 1937, p. 216 (Philippines, Luzon). Whitehead, 1965, p. 263 (ZMUC C10-11); 1966, p. 49 (reference); 1967, p. 95 (identification); 1969a, p. 243, fig. 21 (compiled). Whitehead et al. 1966, p. 88 (synonymy). Wongratana, 1968, p. 11 (Thailand).
- Chatoessus chacunda*: Anon., 1929, p. 174 (MHNL 3702). Bhattacharya, 1920, pp. 67, 71 (aortic ligament). Bleeker, 1851a, p. 160, 1852b, p. 446, 1859b, pp. 361, 373 (Bangka); 1851c, p. 472 (Riouw); 1852a, pp. 230, 249 (Moluccas); 1852c, pp. 3 ff., 1853f, pp. 14, 74, 1854-1857b, p. 18, 1856b, p. 26, 1857a, p. 19, 1857b, p. 11, 1858a, p. 28, 1858b, p. 437, 1859a, p. 169, 1860c, p. 58, 1860d, p. 27, 1860e, p. 48, 1863a, p. 156 (compiled); 1852e, p. 723, 1853b, p. 182, 1854b, p. 476, 1854c, p. 68, 1854e, p. 314, 1855b, p. 158, 1855d, p. 108, 1855f, p. 299, 1861c, p. 62, 1865c, p. 291 (name); 1853d, pp. 428, 435, 1858c, p. 2, 1858-1859b, p. 2 (Borneo); 1854a, p. 51 (Halmahera); 1854d, pp. 227, 237 (Celebes); 1855g, p. 395, 1858-1859c, p. 408 (Java); 1857c, pp. 8, 26 (Ambon); 1858d, pp. 243, 250 (Singapore); 1858-1859a, pp. 4, 9 (Sumatra); 1861b, p. 240 (Bali). Borodin, 1932, p. 70 (New Caledonia). Cantor, 1849, p. 1293, 1850, p. 311 (Malaya). Day, 1865a, p. 313 (India, Kerala); 1865b, p. 242, 1878, p. 632, pl. 160, fig. 3, 1889, p. 386 (description); 1870, p. 700 (Andamans). Duncker, 1904, p. 185 (reference). Elera, 1895, p. 582 (compiled). Gogorza y Gonzalez, 1887, p. 300 (name). Günther, 1868, p. 411 (Cochin, Pinang and BMNH 1858.8.15.88, 1858.8.15.97-98, 1862.11.1.201-2, 1867.11.28.64, 1868.1.28.10, uncat. b). Hornell, 1918, p. 92 (name). Hyrtl,

1855, pp. 49, 52, pl. 2, fig. 1 (epibranchial organ, gut). Jenkins, 1910, p. 131 (Pakistan). Jerdon, 1851, p. 146 (name). Károli, 1882, p. 183 (Singapore; Borneo). Kner, 1867, p. 337 (Java). Macleay, 1883b, p. 593 (New Guinea). Martens, 1876, p. 404 (Philippines, Luzon). R. S. N. Pillay, 1929, p. 355 (India, Kerala). Sorley, 1933, p. 160 (name). Tirant, 1886 (in Anon., 1929, p. 116), (MHNL 3702). Valenciennes, 1848, p. 111 (description). Weber, 1894, pp. 427 ff. (East Indies); 1895, p. 261 (Ambon).

Dorosoma chacunda: Bapat, 1955 (egg, spawning. India, Madras). Bleeker, 1868, p. 294 (name); 1872, p. 143, pl. 261, figs. 5–6 (compiled). Blegvad and Løppenthin, 1944, pp. 28, 59 (ZMUC C10, C11). Bourret, 1927, p. 301 (name). Chabanaud, 1926, p. 7 (name). Chacko 1950, p. 170 (egg, larva. India, Madras). Chevey, 1934, pp. 111, 208 (synonymy). Delsman, 1923, p. 43, 1926a, p. 223, 1926b, pp. 389–393, figs. 1–5, 1933, pp. 247–249 (vertebral number, egg, larva. Java). Delsman and Hardenberg, 1934, p. 134, figs. 89, 91 (after Weber and de Beaufort, 1913, fig. 14), (biology. Java). Fowler, 1931b, p. 443 (ANSP 53474–5). Hardenberg, 1931, pp. 96 ff. (Sumatra); 1934, p. 305 (name); 1936, p. 227, 1937, p. 8 (Borneo). Hiyama, 1941, pl. 21. C. N. Maxwell, 1921, pp. 18, 78, 86 (Malaya). Pearson and Malpas, 1926, pp. 66, 161 (Ceylon). Vialli, 1926, pp. 175 ff. (epibranchial organ). Vinciguerra, 1926, p. 616 (Borneo). Weber and de Beaufort, 1913, p. 25, fig. 14 (Java; Sumatra; Nias; Borneo).

Anodontostoma chanpole: Banasopit and Wongratana, 1967, p. 4 (name). Fowler, 1941, p. 549 (reference). Whitehead, 1962, p. 101 (key); 1967, p. 95 (synonymy).

Chatoessus chanpole: Beavan, 1877, p. 117 (reference). Bleeker, 1853f, pp. 14, 24, 74 (compiled). Günther, 1868, p. 410 (India, Bengal). Károli, 1882, p. 183 (Java; Singapore). Valenciennes, 1848, p. 116 (reference).

Dorosoma indicus: Chauduri, 1916, p. 419 (India, Orissa).

Gonostoma javanicum: Hyrtl, 1855, p. 49 (epibranchial organ, gut).

Chatoessus selangkat: Bleeker, 1852c, pp. 4 ff., 1854–1857b, p. 18, 1856a, p. 21, 1858e, p. 437, 1859a, p. 170, 1860e, p. 48 (compiled); 1852e, p. 723, 1853a, p. 161, 1853b, p. 182, 1854d, p. 237, 1858a, p. 13, 1859b, p. 373, 1865c, p. 291 (name); 1852f, pp. 740, 747, 1855f, p. 283, 1856b, pp. 10, 26 (Celebes); 1855c, pp. 393,

402, 1857c, pp. 8, 26 (Ambon); 1855g, pp. 395, 397, 1857d, p. 480 (Java); 1856c, p. 419, 1860a, p. 139 (Bangka).

GENUS *GONIALOSA* REGAN, 1917

Gonialosa REGAN, 1917, p. 315 (type species [Jordan, 1920, p. 560]: *Chatoessus modestus* Day, 1869).

Indialosa HERRE AND MYERS, 1931, p. 238 (type species [original designation]: *Clupanodon manmina* Hamilton, 1822).

DIAGNOSIS: Anodontostomatins with the last dorsal ray not prolonged as a filament; level of mouth above lower level of eye in adults; third infraorbital moderately expanded, its anterior edge oblique; predorsal scales paired and overlapping; posterior end of maxillary expanded and curved downward; lateral scales numerous (more than 40); trunk scales numerous (more than 15).

Gonialosa manmina (Hamilton, 1822)

Regan, 1917

Figure 4C

Clupanodon manmina HAMILTON, 1822, p. 247 (type specimen [Whitehead, 1968, p. 32]: status unknown. Type locality: freshwater branches of Ganges).

Clupanodon cortius HAMILTON, 1822, p. 249 (type specimen [Whitehead, 1968, p. 32]: status unknown. Type locality: Brahmaputra River near Goyalpara).

DIAGNOSIS: A *Gonialosa* with numerous (50–60) lateral scales; body slender (30–40% standard length).

MERISTICS: Dorsal rays: iii or iv unbranched, 11–13 branched, 14–17 (15–17) total. Anal rays: ii or iii unbranched, 20–24 (21–24) branched, 22–27 (24–27) total. Vertebrae: 11–13 (12–13) abdominal, 31–33 (32 or 33) caudal, 44 or 45 total. Ventral scutes: 16–19 prepelvic, 1 subpelvic, 11–13 postpelvic, 28–33 total. Predorsal bones 9 or 10 (9). Pectoral rays 15 or 16.* Pelvic rays 8.* Scale rows: 23–26* trunk, 10 or 11* caudal peduncle. Lateral scales 50–60.*

DISTRIBUTION: (freshwater): Ceylon, India (Orissa, Uttar Pradesh, Bengal, Assam), Andaman Islands.

SPECIMENS EXAMINED: (15) ANSP 83988, 2 specimens, 54–57 mm., Hooghly River (India, Bengal, Barrackpore).

BMNH 1858.8.15.60.17–18, 4, 82–93 mm. (India), G. R. Waterhouse; 1867.2.14.42, 1,



FIG. 5. A. *Gonialosa modesta*, BMNH 1889.2.1.1879, 82 mm. B. *Nematalosa arabica*, BMNH 1962.3.13.1-6, 113 mm. C. *Nematalosa come*, USNM 99640, 134 mm.

86 mm., Playfair; 1872.4.17.40, 4, 86-113 mm. (India, Bengal), I. C. Jerdon; 1889.2.1.1864, 1, 100 mm. (India, Assam), F. Day.

RMNH 8615, 1, 95 mm. (India, Assam), F. Day.

USNM 165043, 2, 50-51 mm. (India, Bengal), S. L. Hora.

REFERENCES: *Chatoessus cortius*: Beavan, 1877, p. 117 (reference). Bleeker, 1853f, pp. 14, 76 (compiled). Günther, 1868, p. 410 (BMNH

1858.8.15.60.17-18; 1867.2.14.42). Valenciennes, 1848, p. 115 (reference).

Chatoessus manmina: Beavan, 1877, p. 117 (reference). Bleeker, 1853f, pp. 14, 24, 76 (compiled). Day, 1869a, p. 385 (India, Orissa); 1873, p. ccc (description). Günther, 1861, p. 226 (Nepal). Valenciennes, 1848, p. 114 (reference).

Gonialosa manmina: David, 1954, p. 251 (India, Bengal). Herre, 1940a, p. 1 (Andamans); 1941, p. 335 (reference). Herre and Myers, 1931, p. 238 (reference). Misra, 1947b, p. 397 (reference); 1953, p. 383, 1959, p. 124, fig. 48 (after Day, 1878, pl. 160, fig. 2), (India). Misra and Menon, 1966, pp. 407, 416 (distribution). Regan, 1917, p. 315 (India, Assam). Srivastava, 1968, p. 12, fig. 7 (after Day, 1878, pl. 160, fig. 2), (India, Uttar Pradesh).

Chatoessus manminna: Bhattacharya, 1920, p. 67 (aortic ligament). Day, 1878, p. 633, pl. 160, fig. 2, 1889, p. 386 (description).

Gonialosa manminna: Bertmar et al. 1969, p. 7 (epibranchial organ). Fowler, 1941, p. 548 (compiled). Job et al. 1955, p. 31 (India, Orissa). Munro, 1955, p. 29, pl. 6, fig. 79 (after Day, 1878, pl. 160, fig. 2), (Ceylon). G. J. Nelson, 1970a, pp. 12, 15 (branchial structure). Rajan et al. 1968, p. 82 (India, Orissa). Shaw and Shebbeare, 1937, p. 14, fig. 5 (after Day, 1878, pl. 160, fig. 2). Whitehead, 1962, p. 101 (key).

Gonialosa modesta (Day, 1869) Regan, 1917

Figure 5A

Chatoessus modestus DAY, 1869b, p. 622 (type specimen [Talwar and Whitehead, 1971, p. 73]: ZSI 2695. Type locality: Bassein River).

DIAGNOSIS: A *Gonialosa* with few (40-45) lateral scales; body deep (40-50% standard length).

MERISTICS: Dorsal rays: iii or iv unbranched, 11-13 branched, 15-17 total. Anal rays: iii unbranched, 21-24 branched, 24-27 total. Vertebrae: 10-13 abdominal, 31-33 caudal, 43-45 total. Ventral scutes: 16-18 prepelvic, 1 subpelvic, 10 or 11 postpelvic, 27-30 total. Predorsal bones 8-10. Pectoral rays 14 or 15.* Pelvic rays 8.* Scale rows: 16-18* trunk, 7 or 8* caudal peduncle. Lateral scales 40-45.*

DISTRIBUTION: (freshwater): Burma.

SPECIMENS EXAMINED: (8) BMNH 1889.2.1. 1879, 1 specimen, 82 mm. (Burma), F. Day; 1891.11.30.391-5, 5, 60-78 mm., Sittang River

(Burma), E. W. Oates; 1893.2.16.75, 1, 68 mm. (Burma, Tenasserim), L. Fea.

RMNH 8617, 1, 92 mm. (Burma, Tenasserim), F. Day.

REFERENCES: *Gonialosa modesta*: Bertmar et al. 1969, p. 7 (epibranchial organ). Fowler, 1941, p. 548 (compiled). Herre and Myers, 1931, p. 238 (reference). Menon and Yazdani, 1968, p. 98 (types). Regan, 1917, p. 315 (Burma). Whitehead, 1962, p. 101 (key).

Chatoessus modestus: Day, 1873, p. ccc, 1878, p. 633, pl. 160, fig. 1, 1889, p. 386 (description).

Gonialosa modestus: Misra, 1947b, p. 397 (reference); 1953, p. 383, fig. 6e (after Day, 1878, pl. 160, fig. 1), (identification). Misra and Menon, 1966, pp. 407, 417 (distribution).

GENUS *NEMATALOSA* REGAN, 1917

Nematalosa REGAN, 1917, p. 313 (type species [Jordan, 1920, p. 560]: *Clupea nasus* Bloch, 1795).

Fluviolosa WHITLEY, 1943a, p. 170 (type species [original designation]: *Chatoessus elongatus* Macleay, 1883).

DIAGNOSIS: Anodontostomatins with the last dorsal ray prolonged as a filament; level of mouth variable; third infraorbital variably expanded; predorsal scales paired and overlapping; posterior end of maxillary expanded and curved downwards; lateral scales numerous (more than 40); trunk scales numerous (more than 15).

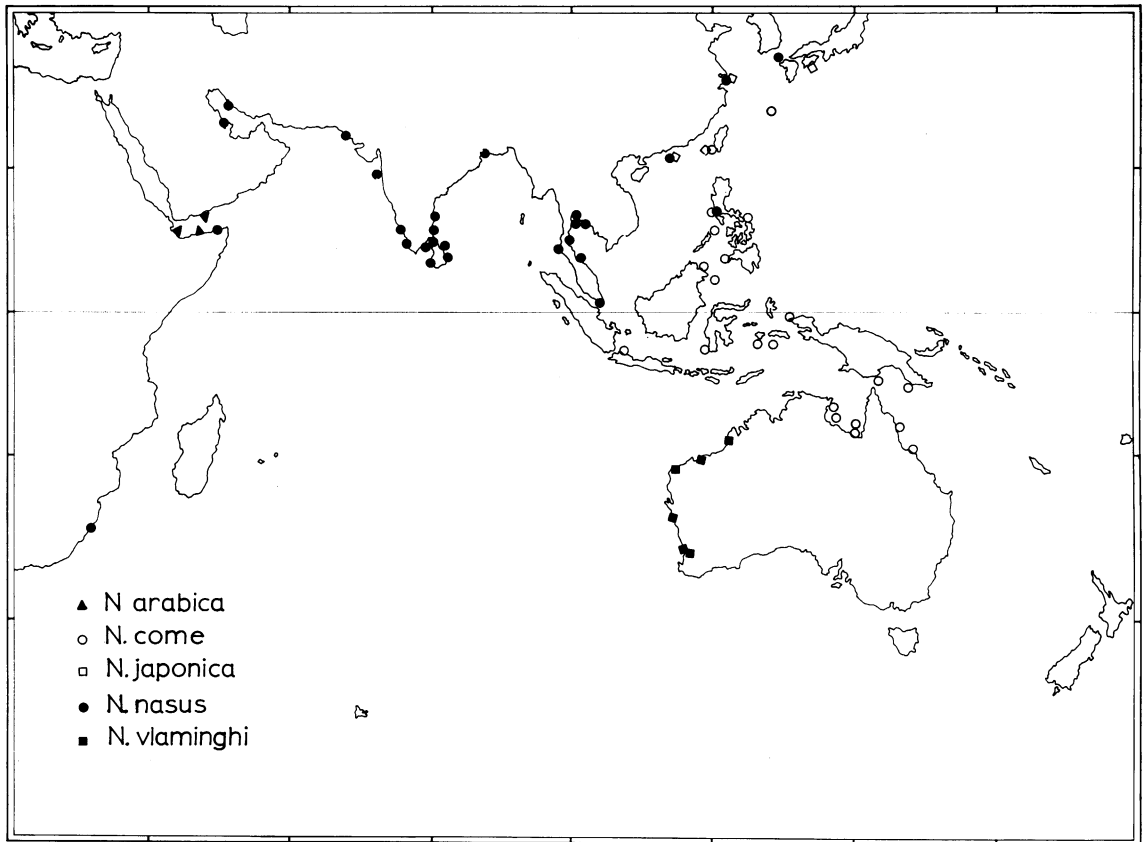
Nematalosa arabica Regan, 1917

Figures 5B, 13B

Nematalosa arabica REGAN, 1917, p. 313 (type specimen [Whitehead, 1962, p. 98]: BMNH 1887.11.11.312. Type locality: Muscat).

DIAGNOSIS: A *Nematalosa* with the third infraorbital little expanded, without a definite anterior edge, its lower border almost horizontal, extending posteriorly to contact preopercle at or above angle.

MERISTICS: Dorsal rays: iv or v unbranched, 13 or 14 branched, 17-19 total. Anal rays: ii or iii unbranched, 16-18 branched, 18-20 total. Vertebrae: 14-16 abdominal, 29-31 caudal, 45 or 46 total. Ventral scutes; 18 or 19 prepelvic, 1 subpelvic, 12-14 postpelvic, 32-34 total. Predorsal bones 8 or 9. Pectoral rays 16 or 17. Pelvic rays 8. Scale rows: 19 trunk, 7 caudal peduncle. Lateral scales 45-47.



MAP 2. *Nematalosa arabica*, *N. come*, *N. japonica*, *N. nasus*, and *N. vlaminghi*, collection localities of specimens examined.

DISTRIBUTION: (marine): Arabia, Somalia.

SPECIMENS EXAMINED: (8) BMNH 1945.12.31.14, 1 specimen, 151 mm., Gulf of Aden (Aden Protectorate, Hadhramaut, Mukalla), J. Goepel; 1962.3.13.1-6, 4, 93-100 mm. (Somalia, Djibouti), A. Fraser-Brunner; 1962.3.13.7-8, 2, 51-52 mm., Gulf of Aden (Somaliland Protectorate, Elayu), A. Fraser-Brunner.

FMNH 3982, 1, 165 mm. (Arabia), F. Steindachner.

REFERENCES: *Chatoessus nasus*: Boulenger, 1887, p. 666 (name).

Nematalosa arabica: Fowler, 1941, p. 554, 1956, p. 60 (compiled). Tortonese, 1957, p. 123 (Somalia). Whitehead, 1965, p. 261 (Red Sea).

Nematalosa come (Richardson, 1846)

Regan, 1917

Figure 5C

Chatoessus come RICHARDSON, 1846a, p. 62, pl. 38, figs.

7-10 (type specimen [Regan, 1917, p. 314; Whitehead, personal commun.]: BMNH 1971.4.26.1 [radiograph examined]. Type locality: Western Australia, Indian Ocean).

DIAGNOSIS: A *Nematalosa* with the third infra-orbital moderately expanded, its anterior edge extending obliquely posteroventrally to contact preopercle anterior to angle (as in *N. erebi*, *N. japonica*, and *N. vlaminghi*); nuchal scales without anastomosing canals (as in *Nematalosa* except *N. erebi*); pectoral axillary process large, approximately one-third length of fin (as in *Nematalosa* except *N. erebi* and *N. vlaminghi*); vertebrae few (usually 44 or 45); ventral scutes few (usually 29 or 30); trunk scale rows few (16-19); caudal peduncle scale rows few (usually 7); lateral scales few (usually 46 or 47).

MERISTICS: Dorsal rays: iv or v unbranched, 11-14 (12 or 13) branched, 15-19 (17 or 18) total. Anal rays: ii-iv (ii or iii) unbranched,

17–22 (18–21) branched, 20–25 (21–24) total. Vertebrae: 13–15 (13 or 14) abdominal, 29–32 (30–32) caudal, 43–46 (44 or 45) total. Ventral scutes: 15–19 (17 or 18) prepelvic, 1 subpelvic, 9–12 (10–12) postpelvic, 27–31 (29–31) total. Predorsal bones 7–9 (8 or 9). Pectoral rays 14–17 (15 or 16). * Pelvic rays 8. * Scale rows: 16–19* trunk, 6 or 7 (7)* caudal peduncle. Lateral scales 45–49 (46 or 47).*

DISTRIBUTION: (marine): Indonesia, Australia (Northern Territory, Queensland), New Guinea, Philippine Islands, Taiwan, Ryukyu Islands.

SPECIMENS EXAMINED: (65) AM B9760, 1 specimen, 140 mm., Hood's Lagoon (New Guinea, Papua), 1885; I.14502, 1, 69 mm., Walker's Bay (Australia, Queensland, Cooktown), 1918; I.15557–025–6, 6, 82–118 mm., Gulf of Carpentaria (Australia, Queensland), 1963.

AMNH 14018, 3, 72–74 mm. (New Guinea, Papua, Daru), R. Archbold and A. L. Rand, 1934; 28138, 2, 35–76 mm. (Australia, Queensland, Cooktown), C. L. Smith and J. C. Tyler, 1969.

ANSP 95522, 2, 136–139 mm., Coral Sea (Australia, Queensland, Townsville).

BMNH 1844.2.21.69, 1, 128 mm. (Java), A. W. Franks; 1858.4.21.470, 1, 72 mm., A. W. Franks; 1867.11.28.65, 1, 156 mm., P. Bleeker; uncat. a, 3, 45–46 mm. (Moluccas, Ambon), A. W. Franks; uncat. b, 1, 130 mm. (Philippines), Cuming.

FMNH 52107, 2, 165–166 mm. (Taiwan, Kaohsiung Mkt.), H. Sauter, 1907.

MCZ 30467, 1, 70 mm. (Celebes, Makasar), T. Barbour, 1906.

MSNG 17512, 1, 71 mm. (New Guinea, Salawati Island), L. M. D'Albergis, 1872.

RMNH 3313, 1, 144 mm. (New Guinea), S. Müller; 7081, 4, 48–158 mm. (East Indies), P. Bleeker, 1879; uncat. a, 1, 120 mm. (Celebes, Makasar), D. M. Piller; uncat. b, 1, 37 mm. (Java), P. Bleeker, 1879.

SU 28532, 3, 152–161 mm. (Philippines, Culion), A. W. Herre, 1931; 28534, 1, 87 mm. (Philippines, Sulu, Si Tangkay), A. W. Herre, 1931; 38387, 6, 64–109 mm. (Philippines, Luzon, Malabon), A. W. Herre, 1940.

UMMZ 100211, 1, 135 mm. (Philippines, Culion), A. W. Herre, 1931.

USNM 6455, 2, 110–134 mm. (Ryukyu, Okinawa), W. Stimpson; 56105, 1, 153 mm. (Philippines), Philippine Government; 58043,

3, 102–115 mm. (Philippines, Mindanao, Zamboanga), E. A. Mearns; 99640, 1, 134 mm. (Philippines, Luzon, Sorsogon Mkt.), U.S.S. *Albatross*, 1909; 99641–4, 99646, 5, 121–153 mm. Panabutan Bay (Philippines, Mindanao), U.S.S. *Albatross*, 1908; 99648, 1, 75 mm. (North Borneo, Sandakan Mkt.), U.S.S. *Albatross*, 1908; 150226, 190091, 4, 56–208 mm., Tifu Bay (Moluccas, Boeroe Island), U.S.S. *Albatross*, 1909; 173585, 2, 61–73 mm., Gulf of Carpentaria (Australia, Northern Territory, Groote Eylandt), R. R. Miller, 1948; 173586, 1, 116 mm., Gulf of Carpentaria (Australia, Northern Territory, Port Bradshaw), R. R. Miller, 1948; uncat., 1, 70 mm., Sandakan Bay (North Borneo), U.S.S. *Albatross*, 1908.

REFERENCES: *Anodontostoma chacunda*: Fowler, 1941, p. 549 (in part: USNM 190091).

Nematalosa coma: Lindberg and Legeza, 1965, p. 63, fig. 84; 1969, p. 60, fig. 84 (Australia).

Dorosoma come: Cockerell, 1915, p. 35 (scales. Australia). Ogilby, 1915, p. 133 (synonymy). Waite, 1921, p. 38, fig. 54 (after Richardson, 1846a, pl. 38, fig. 7) (reference).

Nematalosa come: Fowler, 1941, p. 552 (in part). McCulloch, 1921, p. 27, pl. 5, fig. 56a, 1922, p. 17, pl. 5, fig. 56a, 1927, p. 17, pl. 5, fig. 56a, 1929, p. 41, 1934, p. 17, pl. 5, fig. 56a (after Bleeker, 1872, pl. 260, fig. 4) (reference). McCulloch and Whitley, 1925, p. 132 (compiled). Marshall, 1964, p. 61, color pl. 4, fig. 68, 1965, p. 61, color pl. 4, fig. 68, 1966, p. 68, color pl. 4, fig. 68 (Australia). Munro, 1956, p. 25, fig. 176, 1967, p. 43, pl. 3, fig. 30 (after Bleeker, 1872, pl. 260, fig. 4), (description); 1958, p. 118 (New Guinea). Paradise and Whitley, 1927, p. 79 (Australia). Regan, 1917, p. 314 (Indo-Australian Archipelago). Roughley, 1951, p. 7 (in part) (popular account). Taylor, 1964, p. 64 (Australia). Whitehead, 1962, pp. 89–101, figs. 1a, 3a, 4a (identification); 1967, p. 96 (synonymy); 1969b, p. 273, fig. 1a (infraorbitals). Whitley, 1948b, p. 4, 1956, p. 39 (name).

Chatoessus erebi: Macleay, 1881, p. 194, 1882, p. 258 (reference).

Nematalosa erebi: Waite, 1923, p. 59, fig. (after Richardson, 1846a, pl. 38, fig. 7) (description).

Chatoessus nasus: Bleeker, 1851b, pp. 210 ff., 1854d, pp. 227, 237 (Celebes); 1852c, p. 51 (description); 1852d, pp. 690, 693 (Seram); 1852e, pp. 717, 723 (Bangka); 1852f, p. 747, 1853a, p. 161, 1853b, p. 182, 1853c, p. 238, 1855e, p. 194, 1855f, p. 299, 1855h, p. 497,

1858a, p. 12, 1859b, p. 373, 1862, p. 112, 1863c, p. 261, 1865b, p. 192 (name); 1854b, p. 476 (Ambon); 1854f, p. 362 (Batjan); 1854–1857a, pp. 34–35, 1855a, p. 15, 1854–1857b, p. 18, 1856b, p. 26, 1857a, p. 19, 1859a, p. 170, 1860e, p. 48, 1861a, p. 236 (compiled); 1863b, pp. 240, 243 (Obi). Elera, 1895, p. 581 (compiled). Gogorza y Gonzales, 1887, p. 300 (name). Günther, 1868, p. 407 (at least in part: BMNH 1844.2.21.69, 1858.4.21.470, uncat. a, uncat. b). Klunzinger, 1880, p. 417 (Australia). Saville-Kent, 1893, p. 370 (name).

Dorosoma nasus: Bleeker, 1872, p. 142, pl. 260, fig. 4 (compiled. Java). Delsman, 1926b, pp. 393–394, figs. 6–9, 1933, pp. 247–249 (Java). Stead, 1908, p. 24, pl. 3 (popular account). Weber and de Beaufort, 1913, p. 24 (compiled).

Konosirus nasus: Seale and Bean, 1907, p. 239 (USNM 58043).

Nematalosa nasus: Domantay, 1940, p. 98 (Philippines, Mindanao). Herre, 1934b, p. 15 (SU 28532, UMMZ 100211); 1953, p. 63 (compiled); 1959, p. 70 (name). Munro, 1955, pl. 6, fig. 78 (after Bleeker, 1872, pl. 260, fig. 4). Nichols, 1958, p. 1 (in part: AMNH 14018). Roxas, 1934, pp. 233, 254, pl. 1, fig. 1, pl. 3, fig. 2 (Philippines: Luzon, Mindanao, Palawan, Panay). Roxas and Martin, 1937, p. 23 (compiled). Tortonese, 1964–1965, p. 21 (MSNG 17512). Umali, 1934, p. 370 (Philippines, Samar); 1937, p. 235 (Philippines, Luzon); 1950, p. 4 (name). Villadolid, 1937, p. 216 (Philippines, Luzon).

Chatoessus punctatus: Elera, 1895, p. 581 (compiled).

Clupanodon thrissa: Fowler, 1941, p. 557 (in part: USNM 56105, 58043, 99640–4, 99646, 99648). Herre, 1953, p. 64 (compiled).

Konosirus thrissa: Evermann and Seale, 1907, p. 54 (USNM 56105). Herre, 1934b, p. 15 (SU 28534). Jordan and Richardson, 1910, p. 7 (compiled). Jordan and Seale, 1906, p. 187 (name).

Nematalosa erebi (Günther, 1868) Regan, 1917

Figures 1B, 6A–C, 7A–C, 8A, 13C

Chatoessus erebi GÜNTHER, 1868, p. 407 (type specimen [Whitehead, personal commun.]: BMNH 1866.6.19.6. Type locality: Mary River [Queensland]).

Chatoessus richardsoni CASTELNAU, 1873b, p. 144 (type specimen: status unknown. Type locality: Murray River [Victoria]).

Chatoessus elongatus MACLEAY, 1883c, p. 209 (type

specimen [Whitley, 1943b, p. 130]: AM IA.6018 [radiograph examined]. Type locality: Mary River [Queensland]).

Chatoessus horni ZERTZ, 1896, p. 180, pl. 16, fig. 6 (type specimens [Regan, 1917, p. 315]: BMNH 1897.1.20.59–63 [four specimens]. Type locality: Finke River [Northern Territory]).

Fluviolosa bulleri WHITLEY, 1948a, p. 267 (type specimen [original designation]: WAM P.2945. Type locality: Ord River [Western Australia]).

Fluviolosa paracome WHITLEY, 1948a, p. 267 (type specimen [original designation]: WAM P.2619. Type locality: Fitzroy River [Western Australia]).

Fluviolosa papuensis MUNRO, 1964, p. 152, fig. 3 (type specimen [original designation]: AM B.9953. Type locality: Strickland River [New Guinea]).

DIAGNOSIS: A *Nematalosa* with the third infra-orbital moderately expanded, its anterior edge extending obliquely posteroventrally to contact preopercle anterior to angle (as in *N. come*, *N. japonica*, and *N. vlaminghi*); nuchal scales with anastomosing canals; pectoral axillary process rudimentary or absent (less than one-third length of fin; as in *N. vlaminghi*).

MERISTICS: Dorsal rays: iii–v (iv)* unbranched, 10–16 (11 or 12)* branched, 14–19 (15 or 16)* total. Anal rays: i–iv (iii)* unbranched, 14–24* branched, 17–27* total. Vertebrae: 11–19* abdominal, 24–33* caudal, 41–45 (42–44)* total. Predorsal bones 6–10 (8 or 9)*. Pectoral rays 14–18.* Pelvic rays 8.* Scale rows: 16–19* trunk, 6 or 7* caudal peduncle. Lateral scales 40–46.* Predorsal scales 14–19* pairs (nuchal scales omitted from counts).

DISTRIBUTION: (freshwater): Australia and New Guinea.

NOTES: Seven species have been described from the freshwaters of Australia and New Guinea, and the genus *Fluviolosa* Whitley, 1943 (here considered a synonym of *Nematalosa* Regan, 1917) has been erected to accommodate them. As they are presently defined, most if not all of the species are not recognizably distinct, especially when one takes into consideration the degree of variation in the counts and measurements of other dorosomatines (*Fluviolosa papuensis* may prove to be exceptional in this respect). That there is more than one species involved has never been convincingly demonstrated, and we have been unable to do so, even with extensive material from Western Australia and Northern Territory, supplemented with material from other localities. Preliminary analysis shows that



FIG. 6. *Nematalosa erebi*. A. AMNH 28083, Western Australia (Fortesque River), 162 mm. B. AMNH 28093, Western Australia (Hann River), 126 mm. C. AMNH 28087, Western Australia (Fitzroy River), 154 mm.

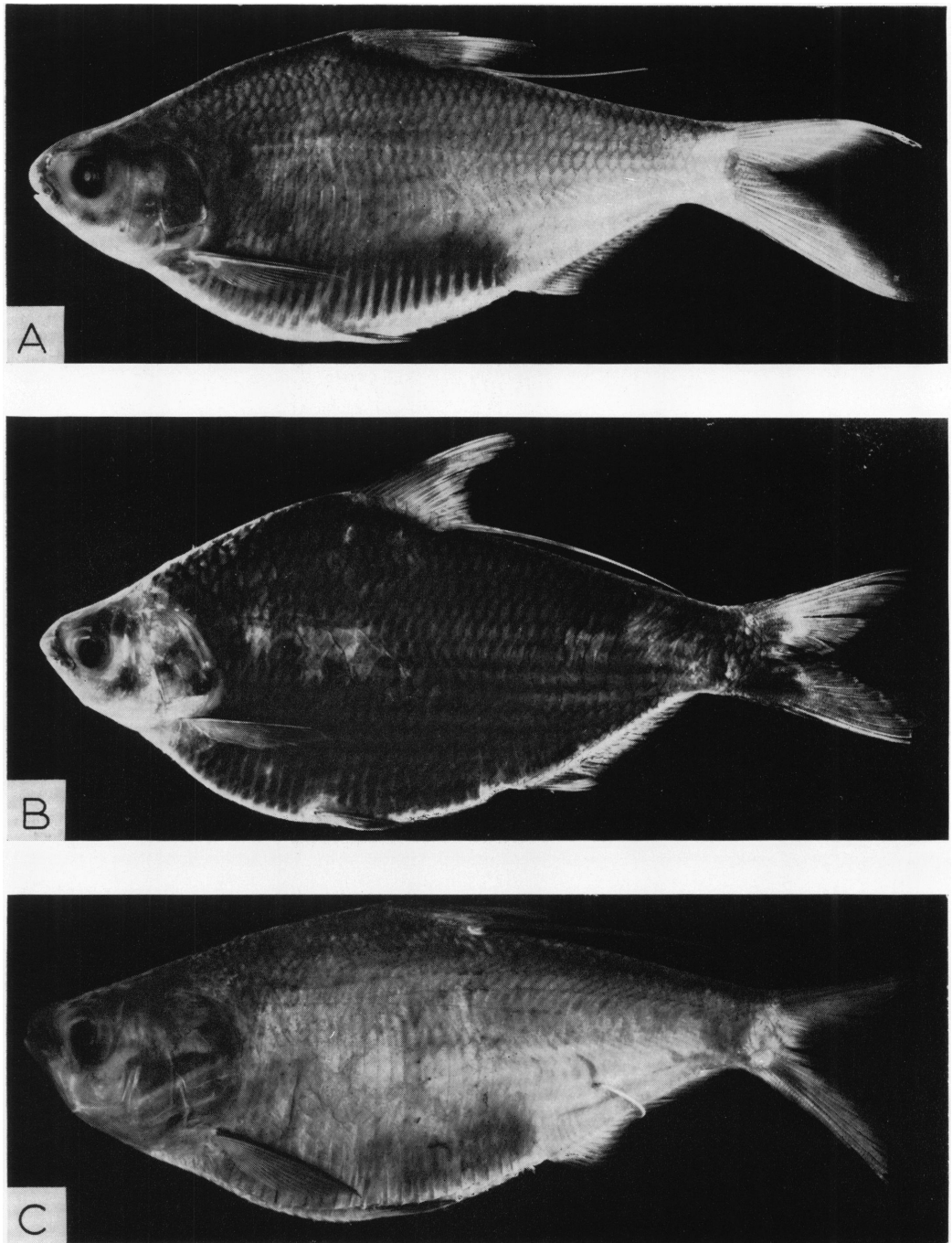


FIG. 7. *Nematalosa erebi*. A. AMNH 28108, Northern Territory (South Alligator River), 180 mm. B. USNM 173588, Northern Territory (Oenpelli billabong), 210 mm. C. AM IB.7039, New Guinea, 170 mm.

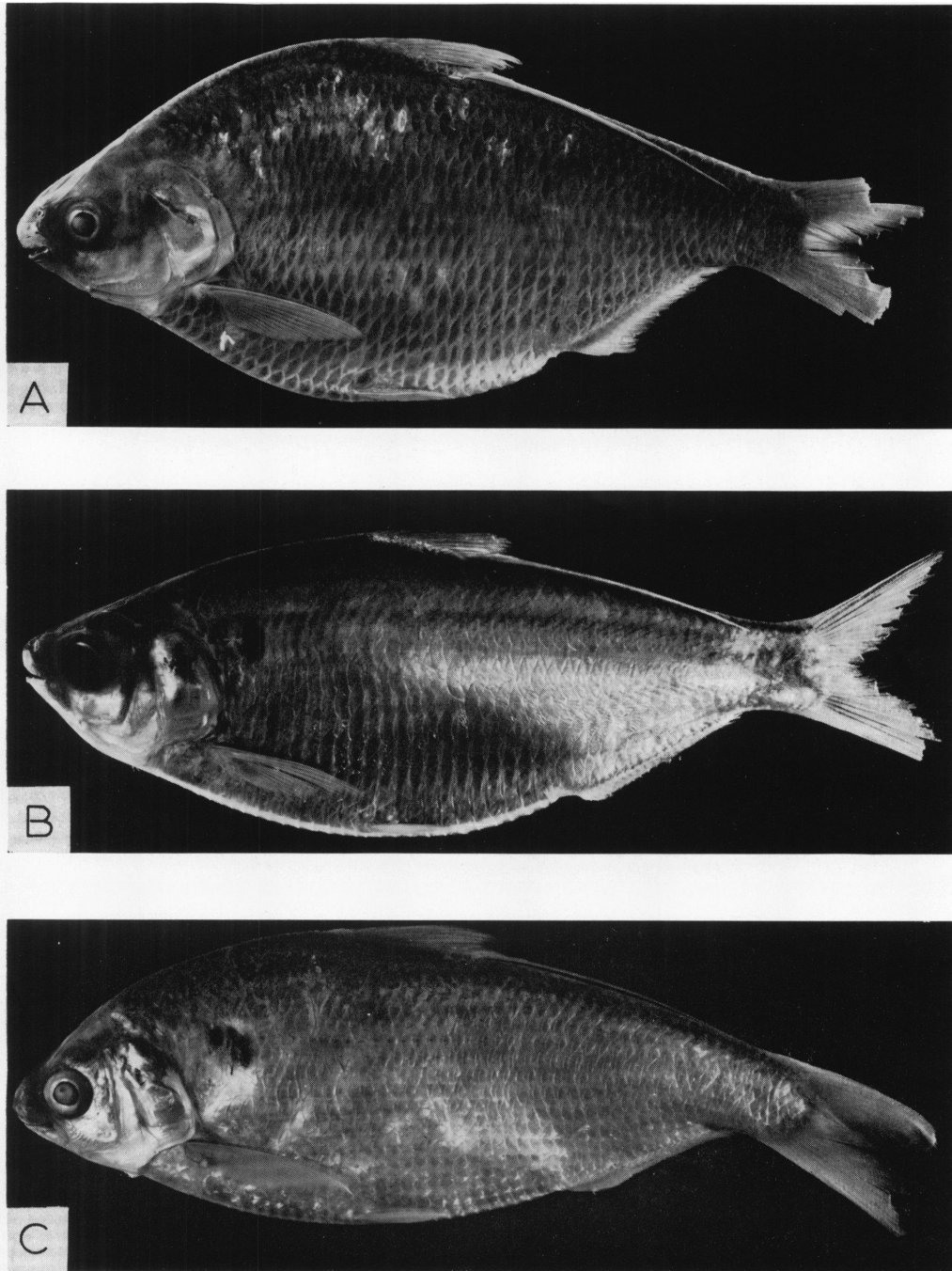
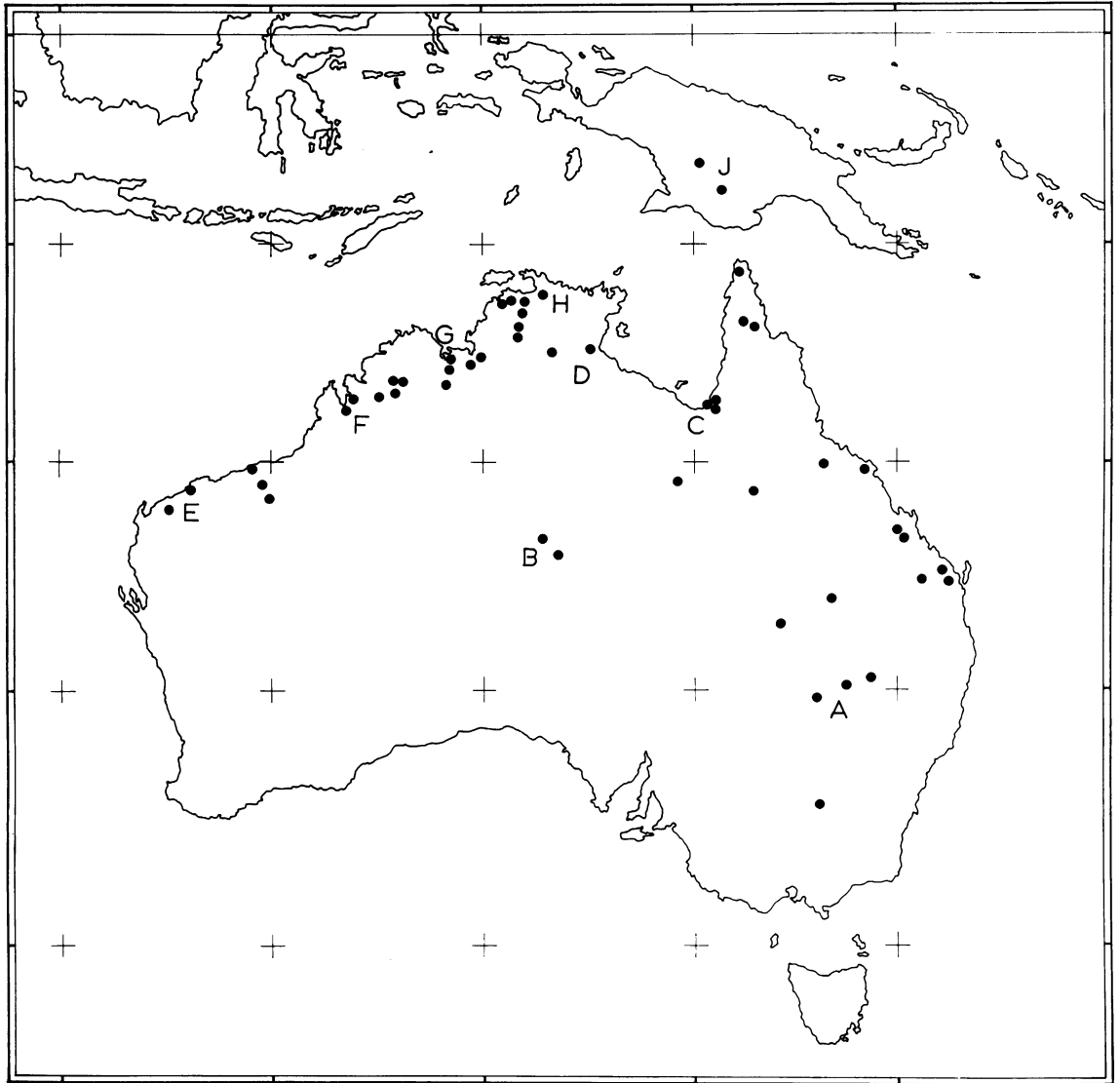


FIG. 8. A. *Nematalosa erebi*, FMNH 5773, Queensland (Mary River), 209 mm. B. *Nematalosa galathea*, new species, CAS 17815, 131 mm. (holotype). C. *Nematalosa japonica*, USNM 130701, 133 mm.

some characters may vary clinally (table 5). It is possible, however, that further collecting in Australia and New Guinea would reveal degrees

of geographic variation and differentiation similar to those shown by the North American populations of *Dorosoma* (figs. 11-12), currently



MAP 3. *Nematalosa erebi*, collection localities of specimens examined. A-J, localities listed in tables 1-5.

considered to comprise five species (see below; these however involve some allopatric populations whose specific status is questionable). Pending further collecting in Australia, and a thorough study of the Australian populations, we here can do no more than tentatively refer all the freshwater dorosomatines of Australia and New Guinea to *Nematalosa erebi* (Günther).

Juveniles and adults of *Nematalosa erebi* may be distinguished from other species by the anastomosing canals (secondary tubes of the cephalic lateralis system) in the skin overlying

the nuchal scales (the anteriormost pair of predorsal scales). In *Nematalosa erebi* the canals of the left and right sides anastomose in the midline (a character most easily observed in slightly dry specimens).

SPECIMENS EXAMINED: (4252) AM A18069, 18083, 4 specimens, 102-118 mm., Burdekin R. (Qld.), 1882-1889; I.1850, 1, 192 mm., Murrumbidgee R. (N.S.W.), 1888; I.4659, 1, 184 mm., Fitzroy R. (Qld.), 1900; I.12784, 2, 83-90 mm., Burnett R. (Qld.); I.13060-5, 6, 122-147 mm., Flinders R. (Qld.); I.15552-002, 1,

66 mm., Norman R. (Qld.), 1963-5; IB.2348-9, 2, 80-84 mm., Coen R. (Qld.), 1949; IB.3159/2935, 1, 141 mm., Norman R. (Qld.), 1954; IB.4586, 7, 84-115 mm., Lake Narran (N.S.W.), 1960; IB.5308-11, 4, 86-111 mm. (Qld., Mt. Isa), 1961; IB. 7039, 1, 170 mm., Lake Murray (Papua), 1963.

AMNH 15416, 1, 145 mm., Ward R. (Qld.), L. Macmillan, 1940; 17724, 2, 67-74 mm. (Qld.), O. Barton; 18538, 4, 104-115 mm., Coen R. (Qld.), Archbold Exp., 1948; 28082, 817, 15-76 mm., Ashburton R.; 28083, 110, 72-216 mm., Fortesque R.; 28084, 138, 16-31 mm., Nullagine R.; 28085, 591, 13-99 mm., Coongan R.; 28086, 240, 39-113 mm., DeGrey R.; 28087, 582, 26-216 mm., Yeeda Creek; 28088, 281, 17-63 mm., Fitzroy R.; 28089, 238, 30-88 mm., Meda R.; 28090, 49, 69-122 mm., Grave Creek; 28091, 28093, 14, 57-146 mm., Hann R.; 28092, 3, 115-175 mm., Manning Creek; 28094-5, 76, 57-88 mm., Bow R.; 28096, 12, 111-171 mm., Dunham R.; 28097, 154, 24-134 mm., King R.; 28098, 3, 66-114 mm., Parry Creek (AMNH 28082-98 collected in Western Australia, G. J. Nelson, W. H. Butler, and D. E. Rosen, 1969); 28099, 66, 43-94 mm., West Baines R.; 28100, 153, 27-120 mm., Victoria R.; 28101, 2, 160-175 mm., Katherine R.; 28102, 25, 61-98 mm., Furgeson R.; 28103, 1, 71 mm., Mary R.; 28104, 28108, 74, 25-203 mm., South Alligator R.; 28105, 28107, 21, 43-118 mm., Barramundie Creek; 28106, 148, 30-140 mm., Jim Jim Creek; 28109, 51, 53-87 mm., Wildman R.; 28110-1, 38, 33-125 mm., East Mary R.; 28112, 8, 36-48 mm., Daly R.; 28113, 27, 72-96 mm., Red Lily Lagoon (Daly R. Police Sta.); 28114, 13, 53-176 mm., pool (15 miles east of Daly R. Police Sta.); 28115, 5, 72-97 mm., Manton R. (AMNH 28099-28115 collected in Northern Territory, G. J. Nelson, W. H. Butler, and D. E. Rosen, 1969); 28117-9, 19, 52-260 mm., Finke R.; 28120, 18, 16-193 mm., Red Lily Lagoon (9 miles northeast of Elsey Homestead), (AMNH 28117-20 collected in Northern Territory, W. H. Butler, 1969).

ANSP 87733, 2, 111-120 mm. (Qld., Mt. Morgan).

BMNH 1867.5.6.4, 1, 200 mm. (Australia), W. Higgins; 1867.5.13.6, 1, 242 mm. (Qld., Cape York), Daniel; 1871.9.25.1, 1, 158 mm., Burnett R. (Qld.), G. Bennell; 1879.5.14.623-30, 1912.11.28.43-52, 8, 56-95 mm. (Qld.), H.M.S. *Challenger*; 1912.11.28.38-42, 3, 84-

142 mm., Mary R. (Qld.), H.M.S. *Challenger*; 1914.8.20.22-7, 3, 64-113 mm., Barwon R. (N.S.W.), D. G. Stead; 1927.2.11.1-3, 2, 140-205 mm. (Qld.), G. H. Wilkins.

CAS 23514, 7, 35-85 mm., Cullens Lake (Vict.), R. H. Parrish, 1963.

FMNH 5773, 2, 164-209 mm., Mary R. (Qld.); 63913, 3, 93-106 mm., Walker R. (Qld.), Brisbane Dept. Harbours, 1963.

MCZ 33079-80, 5, 158-183 mm., Burnett R. (Qld.), W. E. Sheville, 1932.

RMNH 11449, 1, 152 mm. (Qld.), 1887; 25078, 4, 235-267 mm., Digoel R. (Netherlands New Guinea), 1955.

USNM 47866, 1, 203 mm., Mary R. (Qld.); 47867, 1, 189 mm., Burdekin R. (Qld.); 173587-8, 112, 14-327 mm., billabong (N.T., Oenpelli), R. R. Miller, 1948; 173589, 4, 147-170 mm., Red Lily Lagoon (7 miles southwest of Oenpelli), R. R. Miller, 1948; 173590, 15, 70-101 mm., Roper R. (N.T.), Blitner, 1948.

WAM P5136, 2, 103-115 mm., Darling R. (N.S.W.), Narrandera Inland Fish. Res. Sta., 1959.

REFERENCES: *Fluvialosa bulleri*: Munro, 1956, p. 26, fig. 180 (after Whitley, 1956, fig. 2), (description). Whitley, 1947, p. 53 (name [species B]); 1948b, p. 11 (name); 1956, p. 39, fig. 2 (W.A.).

Chatoessus come: Klunzinger, 1872, p. 43, Murray R. (S.A.).

Dorosoma come: Ogilby, 1915, p. 133, Norman R. (Qld.). Waite, 1921, p. 38 (reference).

Nematalosa come: Fowler, 1941, p. 552 (USNM 47866-7). Williams, 1971, Brisbane R. (Qld.).

Fluvialosa elongata: Whitley, 1943a, p. 170, 1943b, p. 130, fig. 9 (type); 1956, p. 39 (name).

Nematalosa elongata: Fowler, 1941, p. 554 (compiled). Johnston, 1942, p. 187, Burnett R. (parasites. Qld.). Johnston and Bancroft, 1919, p. 527, 1921, p. 177, Thomson R. (parasites, mass mortality. Qld.). McCulloch, 1929, p. 41 (reference).

Chatoessus elongatus: Saville-Kent, 1893, p. 370 (name).

Nematalosa elongatus: McCulloch and Whitley, 1925, p. 132 (compiled).

Chatoessus erebi: Anon., 1873, p. 686 (exhibition). Bertin, 1958, fig. 467D (after Regan, 1910, fig. 1), (caudal skeleton). Castelnau, 1872, p. 184, Murray R.; 1873a, p. 38, Australian freshwater; 1878a, p. 240, Brisbane R. (Qld.); 1878b, p. 51, Norman R. (Qld.). Günther, 1880, p. 33

(BMNH 1879.5.14.623-30; 1912.11.28.38-42). Harder, 1964, fig. 31D (after Regan, 1910, fig. 1), (caudal skeleton). Heim, 1935, pp. 87-93 (epibranchial organ). Klunzinger, 1880, p. 418, Murray R. Macleay, 1880, p. 368, 1881, p. 194, 1882, p. 258 (reference); 1883a, p. 71, Palmer R. (Qld.); 1883c, p. 209, Burdekin R. (Qld.); 1887, p. 1020 (W.A., Derby). Ogilby, 1886, p. 55 (reference). Regan, 1910, pp. 531-533, fig. 1 (caudal skeleton). Ridewood, 1904, pp. 55 ff., 1905, pp. 463 ff., figs. 126-129 (osteology). Saville-Kent, 1893, p. 370 (name). Weber, 1895, p. 274, Burnett R. (Qld.). Woods, 1882, p. 106 (popular account). Zeitz, 1902, p. 266, Lake Alexandrina (S.A.).

Dorosoma erebi: Monod, 1968, p. 272 (reference). Stead, 1906, pp. 27, 31, 1908, p. 24 (popular account). Waite, 1904, p. 12 (name).

Fluviolosa erebi: Munro, 1956, p. 26, fig. 179 (after Whitley, 1943b, fig. 9), (description). Whitley, 1957, p. 57, fig. 1, Paluma Shoals (Qld.); 1962, p. 21, fig. (after Whitley, 1943b, fig. 9), (popular account).

Nematalosa erebi: McCulloch, 1921, p. 27, 1922, p. 17, 1927, p. 17, 1929, p. 41, 1934, p. 17 (reference). McCulloch and Whitley, 1925, p. 132 (compiled). Nichols, 1949, p. 1 (AMNH 18538). Regan, 1917, p. 314 (Australia). Taylor, 1964, p. 63 (N.T., Arnhem Land). Whitehead, 1962, pp. 89 ff., (description). Whitley, 1956, p. 39 (name).

Chatoessus horni: McCulloch and Whitley, 1925, p. 132 (reference).

Fluviolosa horni: Whitley, 1956, p. 39 (name).

Nematalosa horni: McCulloch, 1921, p. 27, 1922, p. 17, 1927, p. 17, 1929, p. 41, 1934, p. 17 (reference). McCulloch and Whitley, 1925, p. 132 (compiled). G. J. Nelson, 1970a, p. 12 (branchiostegals). Regan, 1917, p. 314 (types). Whitehead, 1962, pp. 89 ff., fig. 2a (description).

Chatoessus nasus: Ramsay and Ogilby, 1886, p. 8 (New Guinea). Weber, 1895, p. 274, Burnett R. (Qld.).

Nematalosa nasus: Nichols, 1958, p. 1 (in part: AMNH 17724).

Fluviolosa papuensis: Munro, 1967, p. 43, pl. 3, fig. 33 (after Munro, 1964, fig. 3), (New Guinea).

Fluviolosa paracome: Munro, 1956, p. 26, fig. 181 (after Whitley, 1956, fig. 1), (description). Whitley, 1947, p. 53 (name [species A]); 1948b, p. 4 (name); 1956, p. 39, fig. 1 (W.A.).

Chatoessus richardsoni: Castelnau, 1878a, p. 241

(identification). Lucas, 1890, p. 37 (reference). Macleay, 1880, p. 369, 1881, p. 194, 1882, p. 258 (reference). Ogilby, 1886, p. 55 (reference); 1893, p. 178, Murray R. (N.S.W.). Woods, 1882, p. 106 (popular account).

Fluviolosa richardsoni: Lake, 1967, p. 10, fig. (after Waite, 1927, pl. 13), Murray-Darling R. Munro, 1956, p. 26, fig. 178 (after Waite, 1927, pl. 13), (description). T. D. Scott, 1962, p. 62, fig. (after Waite, 1927, pl. 13), (reference). Whitley, 1956, p. 39 (name).

Nematalosa richardsoni: McCulloch, 1929, p. 41 (reference). Waite, 1927, p. 225, pl. 13 (identification); 1928, p. 4 (name).

Clupanodon thrissa: Fowler, 1934b, p. 387 (New Guinea). Munro, 1958, p. 118 (compiled).

Nematalosa galathea, new species

Figures 1A, 8B, 9, 13D

DIAGNOSIS: A *Nematalosa* with the level of mouth above lower level of eye in adults; third infraorbital fully expanded, its anterior edge vertical (as in *N. nasus*); in skin of top of head, a pair of longitudinal grooves between supra-orbital canals.

ETYMOLOGY: This species is named after the Danish *Galathea* Expedition which collected the first known specimens.

MERISTICS: Dorsal rays iv or v (iv) unbranched, 11-13 (12 or 13) branched, 15-17 (16 or 17) total. Anal rays ii or iii (iii) unbranched, 19-22 branched, 22-25 total. Vertebrae: 11-14 (11-13) abdominal, 29-33 (31-33) caudal, 43-45 (43 or 44) total. Ventral scutes: 16 or 17 prepelvic, 1 subpelvic, 8-11 (10 or 11) postpelvic, 25-29 (27-29) total. Predorsal bones 8 or 9. Pectoral rays 14 or 15 (15). Pelvic rays 7 or 8 (8). Scale rows: 15-17 (16) trunk, 6 or 7 (6) caudal peduncle. Lateral scales 42-47 (43-46).

MEASUREMENTS: (all percent standard length): Head length 26-32. Snout length 5.8-7.5. Eye diameter 6.3-8.7. Lower jaw length 9.7-13. Pectoral fin length 21-24. Pelvic fin length 10-12. Dorsal fin length 19-23. Dorsal filament length 36-46. Dorsal base 13-15. Anal base 22-26. Prepectoral distance 24-29. Predorsal distance 68-75.

DISTRIBUTION: (marine): India, Malaya, Thailand, Vietnam.

NOTES: *Nematalosa galathea*, new species, may prove to be a close relative of those species placed by Regan (1917) in the genus *Gonialosa*, for it is



FIG. 9. *Nematalosa galathea*, new species, CAS 17815, 131 mm. (holotype). Left side of head, dorsolateral view, showing supra-orbital grooves.

similar to them in the position of the mouth and in the meristic characters studied.

TYPE SPECIMENS: Holotype: CAS 17815, 131 mm. Paratypes: AMNH 28928, 3 specimens, 110–126 mm.; BMNH 1971.10.4.1, 1 specimen, 120 mm.; CAS 17816, 3 specimens, 104–137 mm.; USNM 206329, 1 specimen, 106 mm.; ZMUC P18516, 1 specimen, 107 mm. Type specimens were collected with rotenone in 6 feet of water in the Andaman Sea off Ranong Province, Thailand, at the mouth of the Pakchan River by H. A. Fehlman and party, May 31, 1960.

OTHER SPECIMENS EXAMINED: (18) ANSP 76824, 4 specimens, 130–136 mm. (Thailand), R. M. de Schauensee, 1936.

BMNH 1889.2.1.1877, 1, 122 mm. (India, Canara), F. Day.

CAS 24838, 1, 109 mm., Gulf of Thailand (Thailand, Chanthaburi), R. R. Rofen, 1957; 24839, 3, 108–119 mm., Gulf of Thailand (Thailand, Chumphon), H. A. Fehlman et al. 1960.

FMNH 2369, 1, 90 mm. (India, Canara), F. Day.

MHNL 3699, 2, 145–163 mm. (Vietnam), G. Tirant, 1881; 3700, 2, 128–152 mm. (Vietnam), G. Tirant, 1879.

SU 30694, 1, 90 mm. (Singapore), A. W. Herre, 1934.

ZMUC 101, 1, 136 mm. (Singapore), *Galathea* Exp., 1846; 102–103, 2, 98–120 mm. (Malaya, Penang), *Galathea* Exp., 1846.

REFERENCES: *Chatoessus nasus*: Tirant, 1886 (MHNL 3699, 3700).

Nematalosa nasus: Herre and Myers, 1937, p. 13 (SU 30694). Regan, 1917, p. 313 (in part: BMNH 1889.2.1.1877).

Nematalosa japonica Regan, 1917

Figure 8C

Nematalosa japonica REGAN, 1917, p. 313 (type specimen [Whitehead, personal commun.]: BMNH 1905.6.7.2–4 [3 specimens]. Type locality: Inland Sea of Japan).

DIAGNOSIS: A *Nematalosa* with the third infra-orbital moderately expanded, its anterior edge extending obliquely posteroventrally to contact preopercle anterior to angle (as in *N. come*, *N. erebi*, *N. vlaminghi*); nuchal scales without anastomosing canals (as in *Nematalosa* except *N. erebi*); vertebrae numerous (usually 47 or 48); ventral scutes numerous (usually 32 or 33); trunk scale rows numerous (usually 20–22); caudal peduncle scale rows numerous (8); lateral scales numerous (usually 49 or 50).

MERISTICS: Dorsal rays: iv or v unbranched, 12–14 (13 or 14) branched, 16–19 (17 or 18) total. Anal rays: ii or iii unbranched, 14–21 (18–20) branched, 17–24 (20–23) total. Vertebrae: 14–16 (14 or 15) abdominal, 31–34 (32 or 33) caudal, 47 or 48 total. Ventral scutes: 17–19 (17 or 18) prepelvic, 1 subpelvic, 13 or 14 post-

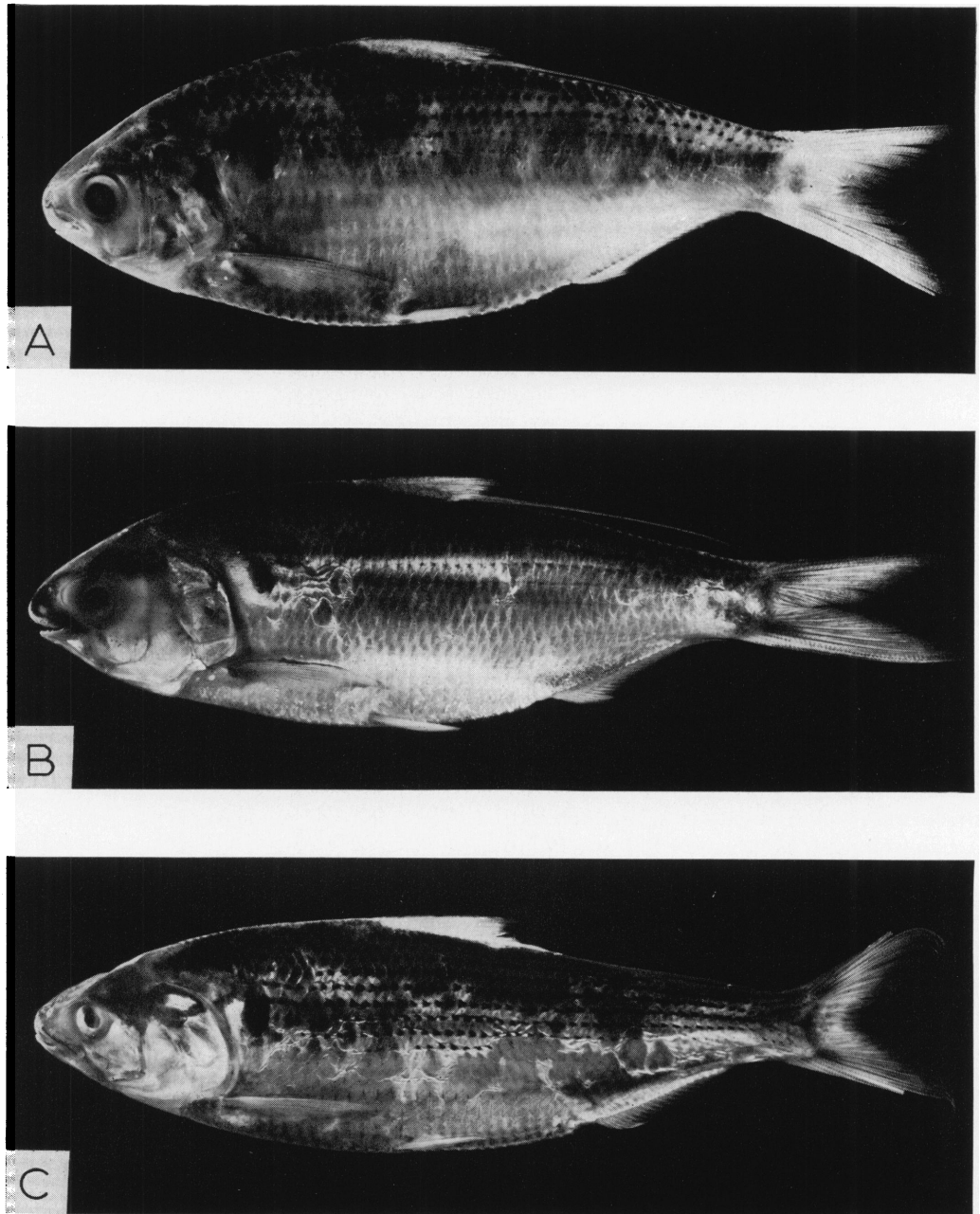


FIG. 10. A. *Nematalosa nasus*, CAS 24841, 139 mm. B. *Nematalosa vlaminghi*, WAM P.14523-26, 140 mm.
C. *Clupanodon punctatus*, AMNH 23969, 212 mm.

pelvic, 31-33 (32 or 33) total. Predorsal bones 8-10 (9 or 10). Pectoral rays 15-17. Pelvic rays 8. Scale rows: 19-23 (20-22) trunk, 8 caudal peduncle. Lateral scales 49 or 50.

DISTRIBUTION: (marine): China, Taiwan,

Japan, "Thailand," "Java."

SPECIMENS EXAMINED: (22) AMNH 28124, 2 specimens, 120-121 mm. (Taiwan, Kaohsiung), S. C. Shen, 1962.

BMNH 1965.7.5.35-44, 4, 63-74 mm. (Hong

Kong, Tap Min Chav), W. L. Chan.

MCZ uncat., 1, 177 mm. (Hong Kong), Putnam.

NMW 2921, 1, 149 mm. ("Thailand"), Salmin, 1870; 2922, 1, 90 mm. ("Java"), *Novara* Exp., 1857-1859; 4335, 1, 70 mm. (Taiwan), H. Sauter, 1908.

SU 7284, 2, 108-114 mm. (Taiwan, Giran), T. Tada; 18163, 24308, 27952, 4, 116-158 mm. (Hong Kong), A. W. Herre, 1929-1941.

USNM 57625, 1, 137 mm. (Japan), P. L. Jouy; 59802, 3, 94-140 mm. (Japan, Shikoku, Urado), H. M. Smith, 1903; 130701, 1, 133 mm. (East Asia); 148397, 1, 136 mm. (China, Shanghai), D. C. Jansen, 1882.

REFERENCES: *Nematalosa japonica*: Fowler, 1941, p. 555 (compiled). Herre, 1945, p. 110 (China, Chekiang). Herre and Myers, 1931, p. 237 (SU 7284, 24308). Hiyama and Yasuda, 1961, p. 14 (name). Kamohara, 1958a, p. 9, 1964, p. 12 (name); 1958b, p. 3 (Japan, Shikoku). Lindberg and Legeza, 1965, p. 63, 1969, p. 60 (compiled). Matsubara, 1955, p. 188, 1963, p. 188 (reference). G. J. Nelson, 1970b, p. 133 (meristics). Whitehead, 1962, pp. 89 ff. (description); 1966, p. 49 (compiled).

Clupanodon nasus: Jordan and Evermann, 1902, p. 328 (SU 7284).

Dorosoma nasus: Kamohara, 1950, p. 24 (Japan). Tanaka, 1928a, p. 836, pl. 175, fig. 482 (Japan, Shikoku); 1936, p. 61, 1951, p. 23, fig. 44 (Japan).

Konosirus nasus: Jordan and Herre, 1906, p. 625 (USNM 59802). H. M. Smith and Pope, 1906, p. 462 (USNM 59802).

Chatoessus selangkat: Kner, 1867, p. 337 (NMW 2922).

Clupanodon thrissa: Fowler, 1941, p. 557 (in part: USNM 57625, 59802).

Konosirus thrissa: Jordan and Richardson, 1909, p. 167 (Taiwan).

Nematalosa nasus (Bloch, 1795) Regan, 1917

Figure 10A

Clupea nasus BLOCH, 1795, p. 116, pl. 429 (type specimen [Whitehead, 1969b, p. 272]: ZMB 3898 [specimen examined]). Type locality: Tranquebar).

Clupanodon nasica LACEPÈDE, 1803, p. 468 (description based on Bloch, 1795).

Chatoessus altus GRAY, 1833-1834, p. 4, pl. 91, fig. 2 (type specimen: status unknown. Type locality: India).

?*Chatoessus chrysopterus* RICHARDSON, 1846b, p. 308

(type specimen [Whitehead, 1966, p. 36]: status unknown. Type locality: Chinese sea).

DIAGNOSIS: A *Nematalosa* with the level of mouth below level of eye in adults (as in *Nematalosa* except *N. galathea*, new species); third infraorbital fully expanded, its anterior edge vertical (as in *N. galathea*, new species); no supraorbital grooves (as in *Nematalosa* except *N. galathea*, new species).

MERISTICS: Dorsal rays: iii-v (iv or v) unbranched, 11-14 (12 or 13) branched, 15-18 (16-18) total. Anal rays: ii-iv (ii or iii) unbranched, 16-23 (18-21) branched, 18-26 (21-24) total. Vertebrae: 13-16 (13-15) abdominal, 29-33 (31-33) caudal, 44-48 (45 or 46) total. Ventral scutes: 17-20 (17 or 18) prepelvic, 1 subpelvic, 7-13 (11 or 12) postpelvic, 26-32 (29-31) total. Predorsal bones 8-10 (8 or 9). Pectoral rays 15-17.* Pelvic rays 8.* Scale rows: 16-19 (18 or 19)* trunk, 6-8 (7)* caudal peduncle. Lateral scales 45-49 (46-48).*

DISTRIBUTION: (marine): ? South Africa (Natal), Arabia, India, Ceylon, Thailand, China, Japan, Philippine Islands.

SPECIMENS EXAMINED: (180) ANSP 60447-50, 4 specimens, 126-130 mm. (Thailand, Bangkok), R. M. de Schauensee, 1934; 76979, 77341-2, 4, 64-143 mm. (Hong Kong), G. A. C. Herklots, 1930; 77104, 77165, 2, 63-75 mm. (India, Bombay), F. Hallberg, 1924.

AMNH 30106, 1, 77 mm. (India, Bombay), F. Hallberg, 1924; 30110, 3, 132-136 mm. (Singapore), 1971.

BMNH 1881.2.1.1880, 1, 133 mm. (India, Kerala, Kozhikode), F. Day; 1889.2.1.1865-70, 3, 48-57 mm. (India, Assam), F. Day; 1889.2.1.1871, 1, 139 mm. (West Pakistan, Sind), F. Day; 1889.2.1.1872.4, 3, 95-144 mm. (India, Maharashtra, Bombay), F. Day; 1889.2.1.1875-7, 2, 152-159 mm. (India, Canara), F. Day; 1889.2.1.1878, 1, 113 mm. (India, Madras), F. Day; 1939.3.23.8, 1, 142 mm. (Hong Kong), G. A. C. Herklots; 1962.3.13.9, 1, 52 mm. (Somalia), A. Fraser-Brunner; 1965.7.5.29-34, 4, 90-98 mm. (Hong Kong), W. L. Chan; 1970.4.24.42-3, 2, 200-202 mm. Palk Bay (Ceylon, Jaffna), P. C. Heemstra.

CAS 24836, 1, 153 mm. Manila Bay (Philippines, Luzon), I. Ronquillo and R. R. Rofen, 1953; 24837, 2, 99-101 mm. (Thailand, Chon Buri Mkt.), R. R. Rofen, 1957; 24840-2, 33, 115-142 mm. (Thailand, Bangkok Mkt.), 1960-1961; 24843, 1, 97 mm., Gulf of Thailand

(Thailand, Rayong, Ban Paknam Prasae), R. R. Rofen, 1957; 24844, 1, 166 mm. Gulf of Thailand (Thailand, Rayong), 1957; uncat. a. (GVF 2207), 1, 103 mm., Andaman Sea (Thailand, Ranong, Goh Kol Thee), H. A. Fehlmann et al, 1960; uncat. b. (GVF 2507), 24, 119–136 mm. (Thailand, Bangkok Mkt.), 1961.

FMNH 58898, 1, 178 mm. (Ceylon), D. S. Jordan, 1914.

MCZ 17930, 1, 148 mm. (Hong Kong), Putnam.

NMW 2925, 1, 78 mm. ("Tahiti"), *Novara* Exp., 1857–1859; 2926, 59658, 2, 125–149 mm. (India, Madras), *Novara* Exp., 1857–1859.

RMNH 8614, 1, 106 mm. (India, Bombay), F. Day.

RUSI 1009, 1, 60 mm. (Natal).

SOSC RN 334, 5, 94–118 mm. (India, Maharashtra, Bombay), F. H. Berry (field numbers 66–3, 66–6), 1966; 1, 74 mm., Ennore Creek (India, Madras), F. H. Berry (66–12), 1966; 19, 120–146 mm., Palk Strait (India, Madras, Mandapam Camp), F. H. Berry (66–36, 66–37), 1966; 3, 122–199 mm. (India, Kerala, Cochin and Ernakulam), F. H. Berry (66–53), 1966; 2, 75–85 mm. (India, Madras, Ennore), F. H. Berry (66–62), 1966. RN 381, 9, 39–143 mm. (India, Madras, Porto Novo), F. H. Berry, 1966. RN 553, 1, 158 mm. (Ceylon, Payagala), C. C. Koeing (69–33), 1969; 6, 164–197 mm. (Ceylon, Mannar Mkt.), C. C. Koeing (69–97), 1969; 6, 132–172 mm. (Ceylon, Colombo Mkt.), T. R. Roberts (70–6), 1970. RN 577, 2, 88–192 mm. (Ceylon, Colombo Mkt.), T. Iwamoto (70–304, 70–310), 1970.

SU 9717, 3, 119–122 mm. (Philippines, Luzon, Cavite), G. A. Lung; 27954, 1, 140 mm. (Hong Kong), A. W. Herre, 1931; 35712, 6, 100–121 mm. (India, Bengal, Calcutta), A. W. Herre, 1937; 29611, 1, 139 mm. (Hong Kong), A. W. Herre, 1941; 41033, 1, 44 mm. (India, Madras, Pamban), A. W. Herre, 1941; 67158, 1, 137 mm. (Hong Kong), A. W. Herre, 1931.

USNM 147936–7, 6, 107–122 mm., Persian Gulf (Saudi Arabia, Zaal Island), D. S. Erdman, 1948; 148397, 1, 150 mm. (China, Kiangsu, Shanghai), D. C. Jansen, 1882; uncat., 1, 155 mm. (Japan), P. L. Jouy.

ZMB 3898, 1, 110 mm. (India, Madras, Tranquebar).

ZMUC C4–5, 2, 98–149 mm., Persian Gulf (Iran, Būshehr), H. Blegvad, 1938.

REFERENCES: *Chatoessus altus*: Day, 1865a,

p. 313 (India, Malabar); 1865b, p. 243 (description). Jerdon, 1851, p. 146 (name).

Chatoessus chrysopterus: Valenciennes, 1848, p. 110 (reference).

Dorosoma chrysopterus: Bleeker, 1873, p. 148 (name).

Clupanodon nasica: Sonnini, 1803–1804, pp. 61, 64 (compiled).

Anodontostoma nasus: Suvatti, 1936, p. 14 (Thailand).

Chatoessus nasus: Bleeker, 1853e, p. 18, 1861c, p. 62 (name); 1853f, pp. 8, 16, 76, 1854–1857a, pp. 34–35, 1854–1857b, p. 18, 1859a, p. 170, 1860b, p. 61 (compiled); 1859–1860a, p. 217, 1859–1860b, p. 450 (Singapore). Day, 1878, p. 634, pl. 160, fig. 4, 1889, p. 387, fig. 120 (description). Elera, 1895, p. 581 (compiled). Jenkins, 1910, p. 131 (India, Orissa; Pakistan); 1912, p. 60 (name). Károli, 1882, p. 183 (China, Kwangtung). Kishinouye, 1907, p. 101 (reference). R. S. N. Pillay, 1929, p. 355 (India, Kerala). Swainson, 1839, p. 293 (reference). Valenciennes, 1848, p. 104 (India). Willey, 1910, p. 99 (Ceylon).

Clupanodon nasus: Chung, 1961, p. 129 (Korea). Kuronuma, 1961, p. 3 (name). Mori, 1928, p. 3 (Korea); 1952, p. 30 (name). Mori and Uchida, 1934, p. 14 (name). Okada, 1938, p. 127 (name). Reeves, 1927, p. 4 (name); 1933, p. 76 (identification).

Clupea nasus: Bloch, 1797, p. 117, pl. 429, fig. 1, 1801, p. 326, pl. facing p. 318, fig. 3 (translation). Cuvier, 1817, p. 174 (reference). Russell, 1803, p. 77, pl. 197 (India, Andhra Pradesh). J. G. Schneider, 1801, p. 426 (description after Bloch).

Dorosoma nasus: Bleeker, 1879, p. 25 (name). Blegvad and Løppenthin, 1944, p. 58, fig. 26 (after Day, 1878, pl. 160, fig. 4), (ZMUC C4, C5). Bourret, 1927, p. 301 (name). Chabanaud, 1926, p. 7 (name). Chaudhuri, 1916, p. 417 (India, Orissa). Chevey, 1932b, p. 19, pl. 2 (Indochina); 1934, pp. 111, 208 (synonymy). Deraniyagala, 1929, p. 45, pl. 18, fig. 1 (Ceylon). Durand, 1945, p. 6, fig. 3 (Indochina). Jordan and Gilbert, 1882, p. 574 (synonymy). Marcelet, 1929 (oil). C. N. Maxwell, 1921, pp. 18, 78, 86, pl. 4 (Malaya). Oshima, 1926, p. 2 (China, Hainan). Pearson and Malpas, 1926, pp. 66, 161 (Ceylon). Steindachner, 1907, pp. 156, 167 (Arabia). Tanaka, 1928a, p. 836 (compiled; not pl. 175, fig. 482). Weber and de Beaufort, 1913, p. 24 (compiled).

Konosirus nasus: Jordan and Snyder, 1901b, p. 53 (reference). Sowerby, 1930, p. 147 (reference).

Nematalosa nasus: Annigeri, 1967, p. 25 (spawning. India, Mysore). Bal et al. 1959, pp. 8, 15, fig. 11 (air bladder, labyrinth). Banasopit and Wongratana, 1967, p. 4 (name). Bapat and Bal, 1950, pp. 42, 44, 54 (food of young. India, Maharashtra). Bensam, 1967 (epibranchial organ). Chacko, 1949, p. 87 (food. India, Madras). Chen, 1951, p. 190 (compiled). Chopra, 1951, p. 49 (fishery. India). Deraniyagala, 1952, p. 21 (Ceylon). Fowler, 1931a, p. 78, fig. 6 (reference); 1935, p. 90 (ANSP 60447-50); 1938b, p. 25, 1941, p. 555, 1956, p. 61 (compiled). Halstead, 1967, pp. 66, 608, pl. 3, fig. 4 (after Day, 1878, pl. 160, fig. 4) (toxins). Herre, 1934a, p. 26 (SU 27954); 1953, p. 63 (compiled). Jones, 1951, p. 125 (references). Jones and Bensam, 1968, p. 116 (references). Jones and Sujansingani, 1954, pp. 262 ff. (biology. India, Orissa). Khalaf, 1961, p. 20 (Iraq). Kuronuma, 1961, p. 3 (name). Liu and Shen, 1957, p. 25 (fishery. Taiwan). Mahdi, 1962, p. 13, fig. (Iraq). M. A. S. Menon, 1960, p. 141 (Iraq); 1963, pp. 43, 52 (India, Orissa). Misra, 1947a, p. 116 (Iraq); 1947b, p. 397, 1953, p. 383, fig. 7a, 1959, p. 125, fig. 49 (after Day, 1878, pl. 160, fig. 4), (reference). Misra and Menon, 1966, pp. 407, 416 (distribution). Moona, 1962, p. 268, 1963 (osteology. India, Bengal). Munro, 1955, p. 29 (Ceylon, not pl. 6, fig. 78 [after Bleeker, 1872, pl. 260, fig. 4]). Murty, 1969, p. 5 (India). G. J. Nelson, 1970a, p. 12 (branchial structure); 1970b, p. 133 (meristics). T. V. R. Pillay, 1967, p. 649 (name). Regan, 1917, p. 313 (India; Burma). Rofen, 1963, p. 217 (Thailand). H. M. Smith, 1945, p. 50 (Thailand). J. L. B. Smith, 1961, p. 93, pl. 5, fig. 117 (Natal). Suvatti, 1950, p. 196 (Thailand). Tchang, 1957, pp. 341, 344 (distribution). Tripathi, 1959, p. 62 (parasites. India). Whitehead, 1962, pp. 89 ff., fig. 4b (description); 1965, p. 262 (Iraq); 1966, pp. 36, 49, 1967, p. 97 (synonymy); 1969a, p. 244, fig. 22 (compiled); 1969b, p. 273, fig. 1b (infra-orbitals). Wongratana, 1968, p. 12 (Thailand).

Chatoessus punctatus: Kner, 1867 (NMW 2925-6, 59658).

Clupanodon thrissa: Deraniyagala, 1933, p. 82 (name). Fowler, 1929, p. 103 (ANSP 77104, 77165); 1941, p. 557 (in part: ANSP 77104, 77165, USNM uncat.). Jordan and Starks, 1917,

p. 432 (FMNH 58898). G. J. Nelson, 1967b, p. 83 (epibranchial organ); 1970a, pp. 12, 15 (branchial structure).

Clupea thrissa: Russell, 1803, p. 76, pl. 195 (India, Andhra Pradesh).

Konosirus thrissa: Jordan and Seale, 1905b, p. 2 (Hong Kong); 1906, p. 187 (name).

Nematalosa vlaminghi (Munro, 1956),
new combination

Figure 10B

Fluvialosa vlaminghi MUNRO, 1956, p. 25, fig. 177 (type specimen [original designation]: AM IB.1835 [radiograph examined]. Type locality: Swan River [Western Australia]).

DIAGNOSIS: A *Nematalosa* with the third infra-orbital moderately expanded, its anterior edge extending obliquely posteroventrally to contact preopercle anterior to angle (as in *N. come*, *N. erebi*, *N. japonica*); nuchal scales without anastomosing canals (as in *Nematalosa* except *N. erebi*); pectoral axillary process rudimentary to absent (less than one-third length of fin; as in *N. erebi*).

MERISTICS: Dorsal rays iii-v (iv or v) unbranched, 12-14 (12 or 13) branched, 15-18 (16-18) total. Anal rays ii or iii unbranched, 19-23 (19-22) branched, 21-26 (22-25) total. Vertebrae: 14-18 (14-17) abdominal, 27-32 (28-32) caudal, 45-47 (45 or 46) total. Ventral scutes: 16-19 (17 or 18) prepelvic, 1 subpelvic, 10-12 (11 or 12) postpelvic, 28-31 (30 or 31) total. Predorsal bones 7-9 (8 or 9). Pectoral rays 14-16 (15 or 16). * Pelvic rays 8. * Scale rows: 16-19 (18 or 19) * trunk, 6-8 (6 or 7) * caudal peduncle. Lateral scales 45-49. *

NOTES: *Nematalosa vlaminghi* (Munro) was described as one of the freshwater dorosomatines of Australia, and placed by him in the genus *Fluvialosa* Whitley. *N. vlaminghi* was not taken in collections made by W. H. Butler, D. E. Rosen, G. J. Nelson, in freshwaters of Western Australia and apparently does not occur there. *N. vlaminghi* probably is a marine species, similar to *N. come* in meristic characters but differing in the lack of a scaly process in the pectoral axilla (in this respect resembling *Nematalosa erebi*).

DISTRIBUTION: (marine): Western Australia.

SPECIMENS EXAMINED: (37) WAM P184, 1 specimen, 168 mm. (W.A., Port Hedland), W. B. Alexander, 1914; P2776, 1, 172 mm., Exmouth Gulf (W.A.), R. J. McKay, 1964; P8988-9006, 20, 68-82 mm., Canning River (W.A., Rossmoyne), R. J. McKay, 1964;

P12831-2, P14523-6, 6, 137-191 mm., Swan River (W.A.), W. Hines, 1965; P19198-9, 2, 149 mm. (W.A., Broome), T. Kalnins, 1954; P19200-8, 7, 82-156 mm., Murchison River (W.A., Tutula Well), R. J. McKay, 1969.

REFERENCES: *Nematalosa come*: Roughley, 1951, p. 7 (in part), (popular account).

Chatoessus erebi: Castelnau, 1873b, p. 143 (identification); 1878a, p. 241 (in part). Woods, 1882, p. 107 (reference).

Dorosoma erebi: Waite, 1900, p. 210, Swan River (Western Australia).

TRIBE CLUPANODONTINI WHITLEY, 1943

Clupanodontidae WHITLEY, 1943a, p. 170 (type genus: *Clupanodon* Lacepède, 1803).

DIAGNOSIS: One supramaxillary; dentary not flared outward in front of maxillary; paired predorsal scales not overlapping, not covering midline; dorsal scutes in one of two species; third infraorbital unexpanded, lacking a definite anterior edge, the lower border almost horizontal, extending posteriorly to preopercle at or above preopercular angle; third intestinal flexure forming a coiled loop.

NOTES: At one time or another, the two species of clupanodontins have been relegated to monotypic genera, most recently by Whitehead (1962, p. 90): "the criteria used by Herre and Myers (1931) to separate *Konosirus* are valid and should be re-emphasized." Jordan (in Jordan and Evermann, 1917, p. 68; Jordan, 1920, p. 490; see also Jordan and Snyder, 1901a, p. 743; Jordan and Starks, 1917, p. 432; Jordan and Hubbs, 1925, p. 120) himself, however, finally considered the generic name *Konosirus* a synonym of *Clupanodon*, an opinion with which Regan (1917, p. 308; see also Norman, 1966, p. 81) concurred. In our opinion, no real advance nor finality in classification is achieved by the adoption of monotypic genera in order to express degrees of difference—a process tending to result in gradual inflation of rank for all species as new differences are found. In the absence of evidence that the two species concerned are not each other's closest relatives, i.e., "sister species" in the sense of Hennig (1966), the name *Konosirus* Jordan and Snyder is here considered a synonym of *Clupanodon* Lacepède.

GENUS *CLUPANODON* LACEPÈDE, 1803

Clupanodon LACEPÈDE, 1803, p. 465 (type species

[Bleeker, 1872, p. 112; Regan, 1917, p. 308]: *Clupea thrissa* Linnaeus, 1758. Subsequent designations [invalid]: *Clupeonia jussieui* Valenciennes, 1847 [by Jordan and Gilbert, 1882, p. 574]; *Clupea pilchardus* Walbaum, 1792 [by Jordan and Evermann, 1896, p. 422]; *Megalops oglina* Lesueur, 1818 [by Jordan and Seale, 1905a, p. 771; Jordan and Herre, 1906, p. 626].

Thrissa RAFINESQUE, 1815, p. 88 (type species [Fowler, 1941, p. 557]: *Clupea thrissa* Linnaeus, 1758).

Konosirus JORDAN AND SNYDER, 1900, p. 349 (type species [original designation]: *Chatoessus punctatus* Temminck and Schlegel, 1846. Subsequent designation [invalid]: *Chatoessus nasus* Bloch, 1795 [by Jordan, 1920, p. 490]).

Nealosa HERRE AND MYERS, 1931, p. 236 (type species [original designation]: *Chatoessus punctatus* Temminck and Schlegel, 1846).

DIAGNOSIS: Same as that of the tribe (monotypic).

Clupanodon punctatus (Temminck and Schlegel, 1846) Regan, 1917

Figures 2A, 10C, 13A

Chatoessus punctatus TEMMINCK AND SCHLEGEL, 1846, p. 240, pl. 109, fig. 1 (type specimen [Boeseman, 1947, p. 176]: RMNH 3315 [specimen examined]. Type locality: Japan).

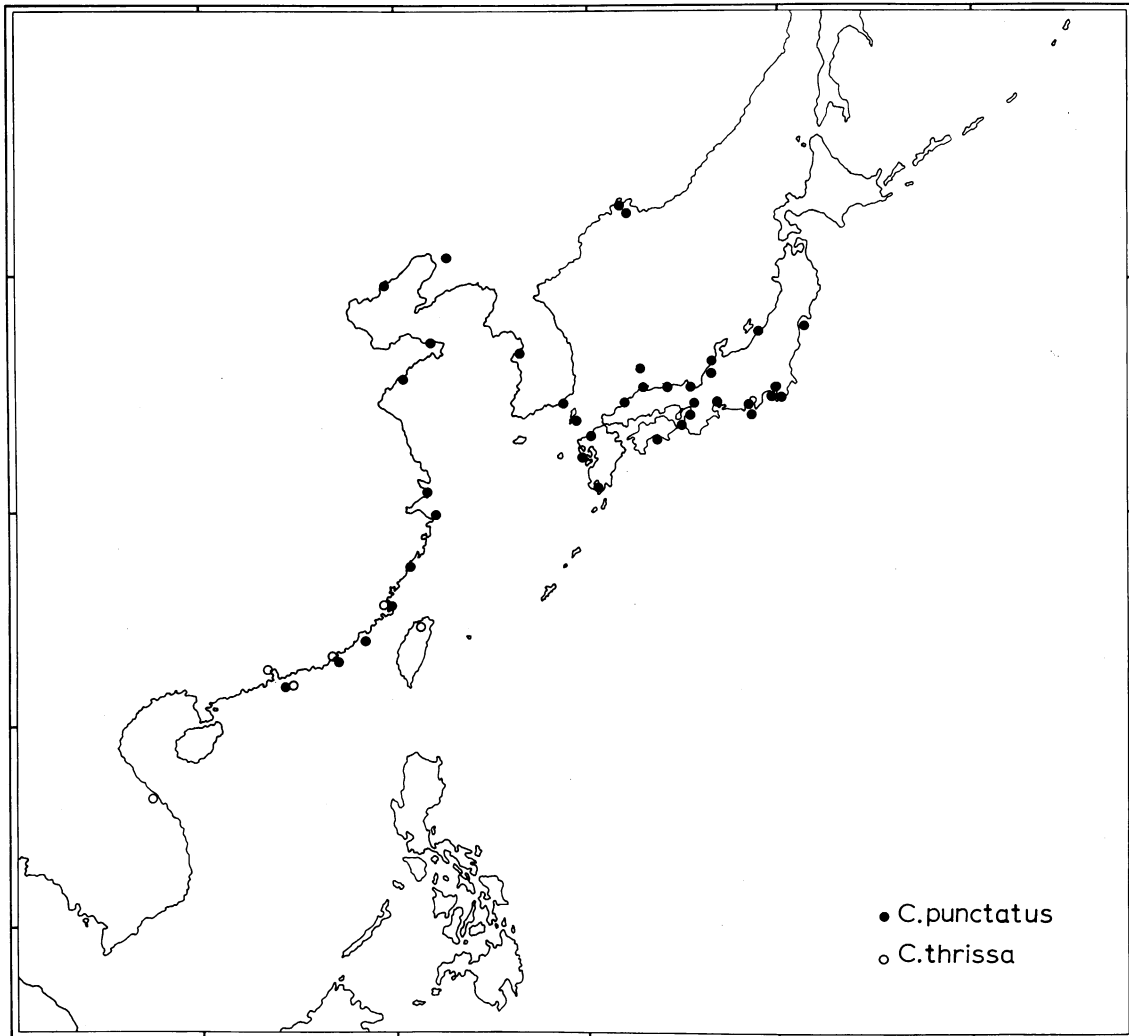
Nomen oblitum (Whitehead, 1966, p. 34): *Chatoessus aquosus* Richardson, 1846b, p. 307 (type specimen [Whitehead, 1966, p. 33]: BMNH 1964.11.6.5. Type locality: Chinese sea).

DIAGNOSIS: A clupanodontin without dorsal scutes; ventral scutes numerous (32-37).

MERISTICS: Dorsal rays: iii-vi (iv or v) unbranched, 12-15 (13 or 14) branched, 16-20 (17-19) total. Anal rays: i-iv (ii or iii) unbranched, 16-25 (18-22) branched, 19-27 (20-24) total. Vertebrae: 12-17 (14-16) abdominal, 31-36 (33-35) caudal, 46-51 (48-50) total. Ventral scutes: 17-21 (19 or 20) prepelvic, 1 subpelvic, 12-16 (13-15) postpelvic, 32-37 (33-36) total. Predorsal bones 8-11 (9 or 10). Pectoral rays 15-18 (16 or 17). * Pelvic rays 8. * Scale rows: 21-23* trunk; 8-10 (9 or 10)* caudal peduncle. Lateral scales 52-57.*

DISTRIBUTION: (marine): China, Korea, U.S.S.R., Japan.

SPECIMENS EXAMINED: (287) AMNH 4544, 2 specimens, 141-149 mm. (Japan), R. C. Andrews, 1912; 13047, 2, 187-191 mm. Kago-shima Bay (Japan, Kyushu), D. S. Jordan, 1922;



MAP 4. *Clupanodon punctatus*, *C. thrissa*, collection localities of specimens examined.

23969, 3, 201–232 mm. Japan Sea (Japan, Honshu, Maizuru), K. Matsubara, 1968; 26699, 3, 131–142 mm. (Japan, Honshu, Kyoto Mkt.), D. S. Jordan, 1922; 27731, 2, 94–97 mm. (South Korea), T. Abe, 1968; 27732, 5, 149–199 mm. (Japan, Honshu, Tokyo), T. Abe, 1967.

ANSP 52657, 1, 129 mm. (Hong Kong), H. W. Fowler, 1929.

BMNH 1860.7.20.61, 1, 166 mm. (China, Fukien, Amoy), Stevens; 1874.1.16.48, 4, 129–181 mm. (China, Shantung, Yentai), R. Swinhoe; 1878.4.5.48–9, 2, 176–182 mm. (Japan), H. Balson Joyner; 1893.4.21.38, 1, 120 mm. (China), W. P. Basset-Smith; 1898.2.28.19, 1,

175 mm. Liao Ho River (China, Liaoning), W. Morrison; 1924.10.9.1, 1, 93 mm. (China, Chekiang, Wenchow), Sci. Soc. China; 1927.3.26.1, 1, 88 mm. (China), C. Ping; 1971.2.8.161–163, 3, 31–59 mm. (Japan), T. Ozawa, 1969; uncat., 1, 171 mm., P. Bleeker.

CAS 24834, uncat., 23, 60–174 mm. (Japan, Honshu, Chiba), K. Terazaki, 1945; 24835, 1, 158 mm., Tokyo Bay (Japan, Honshu), R. S. Croker et al. 1946.

FMNH 55488, 1, 155 mm. (Korea, Chinnampo), D. S. Jordan, 1911; 55769, 9, 81–218 mm. (Korea), D. S. Jordan, 1911; 57478, 3, 104–112 mm. (Japan, Honshu, Misaki), D. S.

Jordan, 1911; 57506, 1, 126 mm. (Japan, Honshu, Nagoya), D. S. Jordan, 1911; 58676, 2, 173-182 mm. (Japan, Honshu, Fukui), D. S. Jordan.

MCZ 1174, 4, 172-189 mm. (Japan, Honshu, Kanagawa), J. T. Gulick, 1863; 17932, 1, 193 mm. (China, Kiangsu, Shanghai), A. V. Chamberlin, 1862; 32346, 4, 47-54 mm., Peter-the-Great Bay (U.S.S.R., Marit. Terr., Patrokl), Vladivostok Fish. Inst.; 34389, 4, 175-208 mm. (Japan, Honshu, Tokyo), S. Tanaka.

NMW 2927, 1, 161 mm. (Japan, Honshu, Osaka), Ranson, 1870; 4344, 1, 124 mm. (China, Shantung, Yentai), Frundsberg, 1899.

RMNH 3314, 4, 162-169 mm. (China, Fukien, Amoy), G. Schlegel, 1862; 3315, 2, 179-185 mm. (Japan), P. F. de Siebold, *ca.* 1830; 7105, 2, 167-180 mm. (Japan), P. Bleeker, 1879.

SU 2019, 1, 117 mm. (China, Kwangtung, Swatow), A. M. Fiedle; 4611, 3, 123-199 mm., Tokyo Bay (Japan, Honshu), K. Otaki, 1895-1896; 18186, 2, 148-161 mm. (Hong Kong), A. W. Herre, 1941; 18189, 18196, 12, 176-209 mm. (Japan, Kyushu, Nagasaki Mkt.), O. Kibezaki, 1952; 18193, 33, 122-144 mm. (Japan, Honshu, Tokyo Mkt.), G. W. Mead, 1952; 20149, 5, 111-159 mm. (Japan, Kyushu, Nagasaki), D. S. Jordan and J. O. Snyder; 24309, 3, 160-163 mm. (Hong Kong), A. W. Herre, 1929; 26553, 3, 98-213 mm. (Korea, Pusan); 29438, 3, 85-88 mm. (Japan, Honshu, Tokyo); 29439, 2, 124-129 mm. (Japan, Honshu, Nagoya); 30631, 1, 85 mm. (Japan, Honshu, Yokohama), D. S. Jordan, 1911; 30634, 1, 121 mm. (Japan, Honshu, Nagoya), D. S. Jordan, 1911; 33974, 2, 85-88 mm., Peter-the-Great Bay (U.S.S.R.), 1925; 34034, 2, 106-155 mm. (China, Chekiang, Chu Shan Island), 1937; 39610, 1, 146 mm. (Hong Kong), A. W. Herre, 1941.

UMMZ 142854, 2, 183-184 mm., Kagoshima Bay (Japan, Kyushu), Y. Wakiya, *ca.* 1922; 142859, 3, 129-143 mm. (Japan, Honshu, Tokyo), D. S. Jordan, 1922; 142860, 4, 75-160 mm. (Japan, Honshu, Misaki), K. Aoki, *ca.* 1922; 167429, 1, 101 mm. (China, Shantung, Tsingtao), T. J. Tu, 1932; 178916, 1, 140 mm., Tokyo Bay (Japan, Honshu, Yokohama), C. L. Hubbs, 1929; 178917, 5, 135-145 mm., Tokyo Bay (Japan, Honshu, Nagishi), C. L. Hubbs, 1929; 178919, 3, 96-191 mm., Suruga Bay (Japan, Honshu), C. L. Hubbs, 1929; 178921, 1, 151 mm. (Japan, Honshu, Osaka Mkt.),

C. L. Hubbs, 1929; 178922, 1, 166 mm., Hakata Bay (Japan, Kyushu), C. L. Hubbs and H. Oshima, 1929; 178923, 1, 148 mm., Sea of Japan (Japan, Honshu, Miyazu), C. L. Hubbs, and K. Sakamoto, 1929; 178927, 2, 70-151 mm. (Japan, Honshu, Niigata Mkt.), C. L. Hubbs and K. Sakamoto, 1929; 178930, 5, 40-114 mm. (Japan, Honshu, Sendai and Shiogama Mkts.), C. L. Hubbs et al, 1929; 178932, 1, 142 mm., Sagami Bay (Japan, Honshu), Imp. Fish. Inst., 1925; 178933, 1, 122 mm. (Japan, Honshu), Fukui-Ken Fish. Sta., 1911; 189656, 1, 165 mm. (China, Shanghai), Y. T. Chu; 189657, 2, 214-215 mm. (Japan, Honshu, Tottori Mkt.), C. L. Hubbs, 1929; 189658, 1, 214 mm. (Japan, Honshu, Hamada and Matsue Mkts.), C. L. Hubbs and K. Sakamoto, 1929; 189659, 1, 179 mm. (Japan, Honshu, Kanazawa Mkt.), C. L. Hubbs and K. Sakamoto, 1929; 189660, 1, 174 mm. (Japan, Oki Island), Shimane Fish. Sta., 1927; 189661, 2, 202-204 mm. (Japan, Honshu, Yokohama Mkt.), C. L. Hubbs, 1929; 189662, 1, 207 mm., Suruga Bay (Japan, Honshu), Ogawa, 1929.

USNM 6495, 2, 149-156 mm. (Hong Kong); 22538, 6, 74-176 mm. (Japan, Honshu, Tokyo), Japanese Government, 1878; 26245, 10, 105-125 mm. (Japan), E. E. Morse, 1878; 37759, 1, 90 mm. (Korea), J. B. Bernadon; 38837, 1, 196 mm. (Japan, Honshu, Tokyo Mkt.), Education Dept., Tokyo; 44891, 4, 166-178 mm. (Japan), Japanese Government; 49506, 2, 127-169 mm. (Japan, Honshu, Tokyo), U.S.S. *Albatross*, 1896; 57624, 1, 166 mm. (Japan), P. L. Jouy; 59803, 1, 120 mm., Urado Bay (Japan, Shikoku), H. M. Smith, 1903; 71048, 3, 147-153 mm. (Japan, Honshu, Tokyo Mkt.), U.S.S. *Albatross*, 1906; 71050, 1, 184 mm. (Japan, Kyushu, Satsuma), U.S.S. *Albatross*, 1906; 71212, 1, 79 mm., Sagami Sea (Japan, Honshu, Misaki), U.S.S. *Albatross*, 1906; 82607, 2, 73-79 mm., Wakanoura Bay (Japan), D. S. Jordan and J. O. Snyder; 85855, 12, 72-97 mm., Gulf of Chihli (China, Hopeh, Pei-tai-ho), A. de C. Sowerby, 1921; 86993, 130556, 130605, uncat., 5, 46-174 mm. (China, Fukien, Foochow), A. de C. Sowerby, 1923-1926; 87116, 87120, 2, 112-168 mm. (China, Chekiang, Wenchow), C. Ping; 105245, 1, 125 mm., Peter-the-Great Bay (U.S.S.R., Marit. Terr.), 1925; 120859, 1, 75 mm. (Japan), P. L. Jouy; 130463, 19, 42-146 mm., Yellow Sea (China, Shantung, Tsingtao), A. de C. Sowerby, 1926; 143400, 1,

206 mm. (Korea, Pusan), P. L. Jouy, ca. 1885; 151675, 1, 140 mm., Kagoshima Bay (Japan, Kyushu), M. Ishikawa, 1922.

REFERENCES: *Chatoessus aquosus*: Valenciennes, 1848, p. 109 (reference).

Konosirus nasus: Jordan and Metz, 1913, p. 8 (FMNH 55488).

Clupanodon punctata: Tchang, 1957, p. 344 (distribution).

Nealosa punctata: Herre and Myers, 1931, p. 236 (SU 24309). Tchang, 1938, p. 331, figs. 1a, 2 (China: Chekiang, Hopeh, Kwangtung, Liaoning, Shantung).

Dorosoma punctatum: Bleeker, 1873, p. 148, 1879, p. 25 (name). Rutter, 1897, p. 62 (SU 2019).

Chatoessus punctatus: Bleeker, 1853e, pp. 5, 18, 50, 1854–1857a, pp. 6 ff., 1858b, p. 6 (Japan, Honshu); 1854–1857b, p. 18, 1860b, p. 61 (compiled); 1865a, p. 57 (China, Fukien). Brevoort, 1856, p. 278 (Japan [from figure]). Elera, 1895, p. 582 (compiled). Günther, 1868, p. 408 (BMNH 1860.7.20.61, uncat.); 1874, p. 158 (BMNH 1874.1.16.48); 1898, p. 263 (BMNH 1898.2.28.19). Ishikawa and Matsuura, 1897, p. 9 (name). Károli, 1882, p. 183 (Japan, Honshu). Kishinouye, 1907, p. 101 (reference). Martens, 1876, pp. 126, 404 (Japan, Honshu). Valenciennes, 1848, p. 107 (reference).

Clupanodon punctatus: Berg, 1932, p. 92, fig. 97, 1948, p. 146, fig. 101, 1962, p. 151, fig. 101 (U.S.S.R.). Chang, 1957, p. 50, fig. 34 (China). Chung, 1961, p. 127, pl. 28, fig. 110, pl. 29, fig. 111–117, color pl. 10, fig. 44 (Korea). Fowler, 1928, p. 32, 1931a, p. 77, fig. 5 (compiled); 1938a, p. 264 (name); 1941, p. 559 (Japan; Korea). Herre, 1932a, p. 2 (name). Honma, 1952, p. 141 (Japan, Honshu). Jordan and Hubbs, 1925, p. 120 (AMNH 13047, 26699; FMNH 57478, 58676; UMMZ 142854, 142859–60; USNM 151675). Kamohara, 1958a, p. 9, 1964, p. 12 (name); 1958b, p. 3 (Japan, Shikoku); 1967a, p. 12, pl. 6, fig. 4, 1967b, p. 6, pl. 6, fig. 4 (after Kamohara, 1955, pl. 6, fig. 4), (identification). Kobayashi, 1952, p. 185 (name); 1954, pp. 83–84, 203–204, figs. 12, 15 (scales. Japan). Koo, 1933, pp. 37, 153, pl. 14, fig. 1 (China, Shantung). Lindberg and Legeza, 1965, p. 61, figs. 82, 83, 1969, p. 58, figs. 82, 83 (U.S.S.R.; Korea; Japan). Misra, 1947b, p. 397, 1953, p. 382 (reference). Misra and Menon, 1966, p. 416 (distribution). Mori, 1928, p. 3, 1952, p. 29 (Korea). Mori and Uchida, 1934,

p. 14 (name). G. J. Nelson, 1970b, p. 133 (meristics). Okada, 1938, p. 127 (name). Reeves, 1927, p. 4 (name); 1933, p. 76 (identification). Regan, 1917, p. 309 (China; Japan). Roxas, 1934, p. 225 (China, Fukien). Rumi-antsev, 1947, pp. 47–48 (distribution). Schmidt, 1931a, p. 103 (Japan, Honshu); 1931b, p. 18 (Japan, Kyushu). Schmidt and Lindberg, 1930, p. 1137 (Japan, Honshu). Soldatov, 1929, p. 4 (name). Suyehiro, 1942, p. 39, figs. 10, 11 (gut. Japan). Svetovidov, 1952, p. 319, pl. 26, fig. 1, 1963, p. 359, pl. 26, fig. 1 (compiled). Tchang, 1957, p. 341 (distribution). Uchida and Tsukahara, 1955, p. 294 (Japan). Wang, 1933, p. 6 (China, Shantung); 1935, p. 1 (China, Chekiang).

Konosirus punctatus: Anon., 1931, pl. 10, fig. 5 (description). Bertmar et al. 1969, p. 7 (epibranchial organ). Franz, 1910, p. 5 (Japan, Honshu). Hiyama and Yasuda, 1961, p. 14, pl. 25 (description). Honma, 1956, p. 80 (Japan, Sado). Iwai, 1956, pp. 9–11 (epibranchial organ. Japan). Izuka and Matsuura, 1920, p. 184 (Japan). Jordan and Herre, 1906, p. 624 (SU 20149). Jordan and Metz, 1913, p. 8 (FMNH 55769, SU 26553). Jordan and Snyder, 1900, p. 349 (SU 4611); 1901b, p. 53 (SU 4611). Jordan and Thompson, 1914, p. 208, (FMNH 57478, 57506). Jordan, Tanaka, and Snyder, 1913, p. 36 (reference). Kawanabe et al. 1968, p. 53 (ecology. Japan). Liu and Shen, 1957, p. 25 (fishery. Taiwan). Matsubara, 1955, p. 188, 1963, p. 188 (reference). Mori, 1956, p. 5 (name). Myers, 1932, p. 30 (generic name). M. Nakamura, 1963, p. 89, illus. (identification). G. J. Nelson, 1967a, fig. 5 (gill arches); 1970a, pp. 12, 15, fig. 9C (branchial structure). Okada, 1955, p. 43, fig. 42 (after Tanaka, 1928b, pl. 179, fig. 490), (description). Schmidt, 1903, p. 21 (name); 1904, p. 264 (Japan). H. M. Smith and Pope, 1906, p. 462 (USNM 59803). Snyder, 1912, p. 402 (USNM 71048, 71050, 71212). Soldatov and Lindberg, 1930, p. 35 (U.S.S.R.). Sowerby, 1930, p. 147 (reference). Takahasi, 1957, pp. 72–75, pl. 1 (epibranchial organ. Japan). Tominaga, 1965, p. 78, pl. 35, figs. 1–7 (structure). Tuge et al. 1968, p. 28, figs. 1–11 on p. 29 (brain). Whitehead, 1962, pp. 89–101 (description); 1966, pp. 33, 49 (synonymy). Wu, 1929, p. 18, fig. 14 (China, Fukien); 1931, p. 166 (China, Chekiang). Yoshida, 1967 (epibranchial organ).

Clupanodon thrissa: Fowler, 1941, p. 557 (in

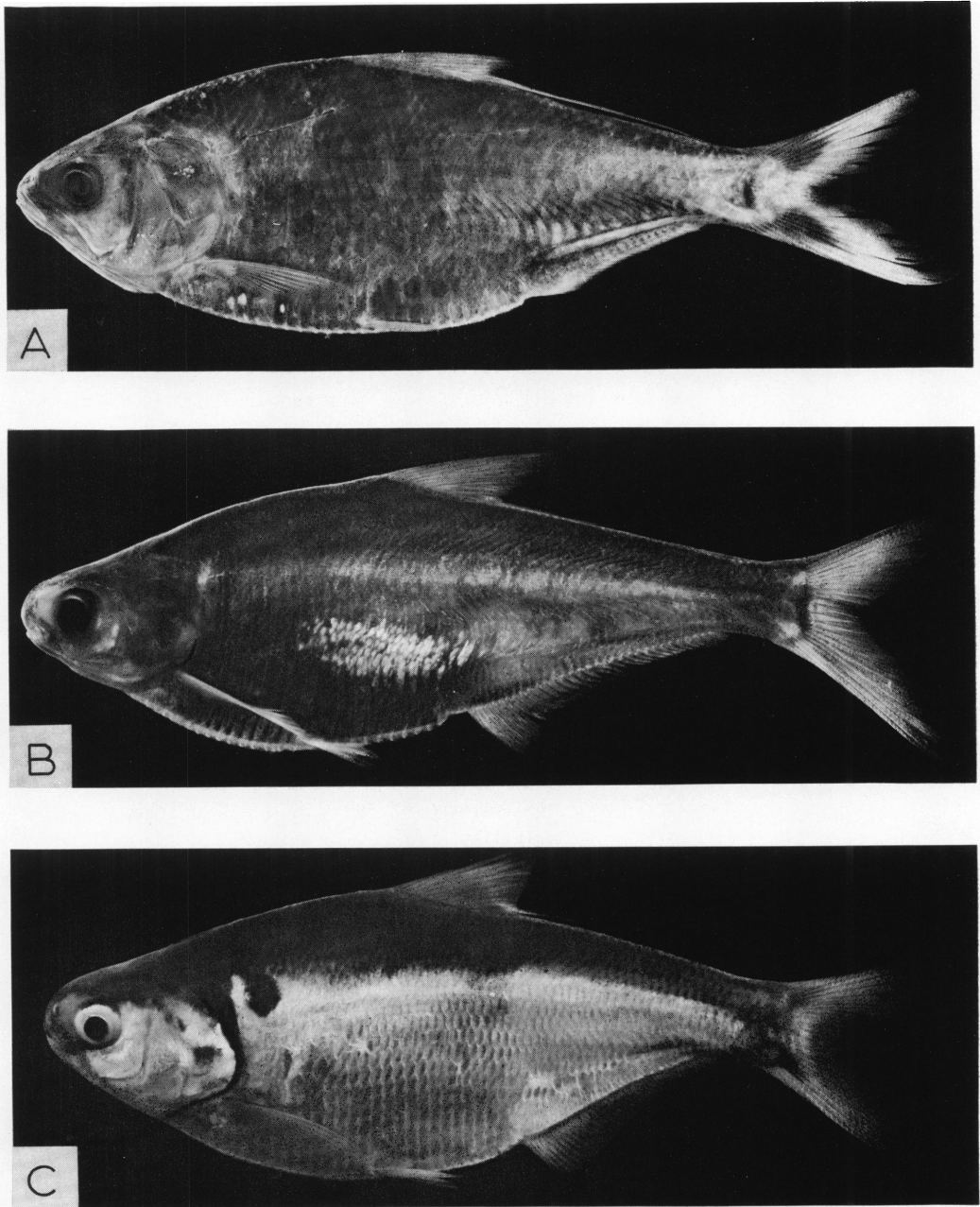


FIG. 11. A. *Clupanodon thrissa*, USNM 191244, 169 mm. B. *Dorosoma anale*, AMNH 25234, Guatemala, 151 mm. C. *Dorosoma cepedianum*, AMNH 20980, Ohio, 114 mm.

part: USNM 6495). Fumiyama et al. 1966, p. 284, fig. (Japan). Halstead, 1967, pp. 65, 606, pl. 1, fig. 4 (toxins). Jordan and Snyder, 1901a, p. 743 (USNM 38837). Kamohara, 1955, p. 6, pl. 6, fig. 4 (Japan). Kuroda, 1951, p. 317

(compiled). Tortonese, 1939, p. 45 (Japan, Honshu).

Clupea thrissa: Houttyn, 1782, p. 341 (Japan).

Dorosoma thrissa: Kamohara, 1950, p. 23, fig. 21 (Japan). Love, 1970, p. 323 (reference).

Shimma and Taguchi, 1964, pp. 180, 184 (fatty acids). Tanaka, 1928b, p. 866, pl. 179, fig. 490 (Japan, Shikoku); 1936, p. 61, 1951, p. 23, fig. 43 (Japan).

Clupanodon thrissa (Linnaeus, 1758)
Lacepède, 1803

Figure 11A

Clupea thrissa LINNAEUS, 1758, p. 318 (type specimen [Lönnberg, 1896, p. 31]: LCUU 107 [radiograph examined]. Type locality: China).

Clupea triza LINNAEUS, 1759, p. 251 (type specimen [Lönnberg, 1896, p. 31]: LCUU 107 [radiograph examined]. Type locality: China).

Chatoessus maculatus RICHARDSON, 1846b, p. 308 (type specimen [Whitehead, 1966, p. 37]: status unknown. Type locality: Canton).

Chatoessus osbeckii VALENCIENNES, 1848, p. 106 (type specimen [Bertin, 1940, p. 227; Whitehead, 1967, p. 98]: MNHN 3675. Type locality: China).

Clupanodon haihoensis OSHIMA, 1926, p. 3 (type specimen: status unknown. Type locality: Hainan).

DIAGNOSIS: A clupanodontin with dorsal scutes; ventral scutes few (27–31).

MERISTICS: Dorsal rays: iv or v (iv) unbranched, 11–13 (12 or 13) branched, 15–17 (16 or 17) total. Anal rays: i–iii (ii or iii) unbranched, 19–26 (20–24) branched, 22–28 (23–27) total. Vertebrae: 10–12 (11 or 12) abdominal, 32–35 (33 or 34) caudal, 43–46 (44 or 45) total. Ventral scutes: 16–19 (17 or 18) prepelvic, 1 subpelvic, 9–12 (10 or 11) postpelvic, 27–31 (28–31) total. Dorsal scutes 17–26 (20–25). Predorsal bones 7–9 (8). Pectoral rays 13–15.* Pelvic rays 7 or 8.* Scale rows: 21–23* trunk, 8* caudal peduncle. Lateral scales 49–52.*

DISTRIBUTION: (perhaps marine but entering rivers): Vietnam, China, Taiwan, "Korea."

SPECIMENS EXAMINED: (58) AMNH 15617, 15626, 2 specimens, 73–75 mm. (China, Kwangtung, Canton), S. Y. Lin, 1934; 17738, 4, 62–126 mm. (China, Kwangtung, Canton), W. E. Hoffman; 20328, 3, 60–62 mm., Tanshui River (Taiwan), M. Walsh, 1956; 28121, 8, 106–237 mm. (China, Fukien, Foochow), C. H. Pope, 1926; 28122–3, 6, 53–88 mm. (Taiwan, Taipei, Tanshui), S. C. Shen, 1957–1963.

ANSP 52655–6, 2, 122–133 mm. (Hong Kong), H. W. Fowler, 1929.

BMNH 1851.12.27.200–201, 2, 50–69 mm. (China); 1862.12.6.14–15, 3, 124–169 mm. (Taiwan), R. Swinhoe.

MHNL 3701, 2, 106–109 mm. (Vietnam, Hué), G. Tirant, 1882.

SU 1571, 4, 63–103 mm. (China, Kwangtung, Swatow), A. M. Felde; 25757, 28203, 2, 66–172 mm. (China, Kwangtung, Canton), A. W. Herre, 1931; 39609, 2, 152–155 mm. (Hong Kong), A. W. Herre, 1941.

USNM 86349, 87046, 130606, 8, 57–257 mm. (China, Fukien, Foochow), A. de C. Sowerby, 1923–1926; 94872, 3, 73–77 mm. (China, Kwangtung, Canton), S. Y. Lin, 1934; 191244, 7, 73–189 mm. (Taiwan, Taipei), 1959.

REFERENCES: *Mystus altus*: Linnaeus, 1754 (in Whitehead, 1966, p. 34), p. 26 (China).

Clupea libertatis: Bleeker, 1873, pp. 118, 147 (Chinese painting).

Dorosoma maculatum: Bleeker, 1873, p. 148 (name).

Chatoessus maculatus: Anon., 1929, p. 174 (MHNL 3701). Chevey, 1932a, p. 8 (name). Günther, 1868, p. 409 (BMNH 1862.12.6.14–15). Tirant, 1883 (MHNL 3701). Valenciennes, 1848, p. 108 (reference).

Clupanodon maculatus: Jordan and Evermann, 1902, p. 327 (Taiwan).

Dorosoma maculatus: Bourret, 1927, p. 301 (name).

Chatoessus osbeckii: Bertin, 1940, p. 277 (types). Günther, 1868, p. 406 (reference).

Clupanodon osbeckii: Chung, 1961, p. 130 (reference). Mori, 1928, p. 3, 1952, p. 30 ("Korea"). Mori and Uchida, 1934, p. 14 (name).

Dorosoma osbeckii: Bleeker, 1873, p. 148 (name).

Clupanodon thrissa: Bertmar et al., 1969, p. 6 (epibranchial organ). Chen, 1951, p. 190 (compiled). Chin, 1935, p. 5 (fishery. China). Fowler, 1928, p. 32 (compiled); 1930, p. 599 (ANSP 52655–6); 1931a, p. 76 (ANSP 52655–6); 1941, p. 557 (only ANSP 52655–6 ["6318, 9959 . . . China" and "1 example . . . Japan" not available for reexamination]). Halstead, 1967, pp. 65, 606 (toxins, in part?). Herre, 1932b, p. 425 (SU 28203); 1934a, p. 26 (Hong Kong); 1953, p. 64 (compiled). Herre and Myers, 1931, p. 236 (reference). Lacepède, 1803, pp. 468, 470 (compiled). Lin, 1934, p. 673 (China, Fukien). Lindberg and Legeza, 1965, p. 62, 1969, p. 59 (Hainan; Vietnam). Liu and Shen, 1957, p. 25 (fishery. Taiwan). Matsubara, 1955, p. 188, 1963, p. 188 (reference). Misra, 1947b, p. 397, 1953, p. 381 (reference). Misra and Menon, 1966, pp. 407, 416 (distribution). G. J. Nelson, 1970b, pp. 131–133, fig. 1 (dorsal scutes).

Reeves, 1927, p. 4 (name); 1933, p. 76 (identification). Regan, 1917, p. 309 (China; Taiwan). Shen, 1964, p. 194 (Hong Kong). Sonnini, 1803–1804, pp. 61, 63 (compiled). Tchang, 1957, pp. 341, 344 (distribution). Teng and Chen, 1960, p. 16 (Taiwan). Whitehead, 1962, pp. 89 ff., figs. 2C, 3B (description); 1966, pp. 22 ff., pl. 4, fig. 2, pl. 5, fig. 1 (Reeves drawings); 1967, pp. 75, 96, 98 (synonymy); 1969b, p. 266 (identification).

Clupea thrissa: Bleeker, 1873, p. 148 (compiled). Bloch, 1795, p. 35 (not pl. 404), 1797, p. 27 (not pl. 404), 1801, p. 303 (not pl. opposite) (reference). Bonnaterre, 1788, p. 186 (not pl. 76, fig. 315 [after Broussonet, 1782, pl. 10]) (reference). Broussonet, 1782, p. 35 (not pl. 10), 1802, p. 4 (not pl. 7) (reference). Cuvier, 1817, p. 174 (reference). Gmelin, 1788, p. 1406, 1789, p. 1406 (compiled). Günther, 1868, p. 432 (reference). Heim, 1935, pp. 93, 101 (epibranchial organ). Hiyama, 1943, p. 6 (name). Osbeck, 1757, p. 257, 1765, p. 336, 1771, p. 26 (description). Pennant, 1792, p. 97 (reference). J. G. Schneider, 1801, p. 424 (description after Bloch).

Dorosoma thrissa: Rutter, 1897, p. 63 (SU 1571). Tanaka, 1928b, p. 866 (compiled).

Konosirus thrissa: Jordan and Herre, 1906, p. 626 (synonymy). Jordan and Seale, 1905a, p. 771 (identification). Jordan, Tanaka, and Snyder, 1913, p. 36 (reference). Nichols, 1958, p. 1 (AMNH 15617, 15626, 20328). Sowerby, 1930, p. 147 (USNM 86349, 87046, 130606).

Chatoessus triza: Richardson, 1846b, p. 307 (China). Whitehead, 1966, p. 34, pl. 4, fig. 2 (Reeves drawing).

Dorosoma triza: Bleeker, 1873, p. 148 (name).

Meletta thryssa: Hyrtl, 1855, pp. 48, 51, pl. 1, figs. 1–2, 4 (epibranchial organ, gut).

TRIBE DOROSOMATINI GILL, 1862

DIAGNOSIS: Two supramaxillaries; dentary not flared outward in front of maxillary; pre-dorsal scales paired, not overlapping, not covering midline; dorsal scutes absent; third infraorbital unexpanded, lacking a definite anterior edge, the lower border almost horizontal, extending posteriorly to preopercle at or above preopercular angle; third intestinal flexure forming a complex and variable pattern.

GENUS DOROSOMA RAFINESQUE, 1820

Dorosoma RAFINESQUE, 1820, p. 171 (type species

[monotypy]: *Dorosoma notata* Rafinesque, 1820 = *Dorosoma cepedianum*).

SUBGENUS DOROSOMA RAFINESQUE, 1820

Dorosoma anale Meek, 1904

Figures 2B, 3F, 11B

Dorosoma anale MEEK, 1904, p. 93, fig. 26 (type specimen [original designation]: FMNH 4637. Type locality [R. R. Miller, 1950, p. 395]: Río Papaloapán).

REFERENCES: Alvarez del Villar, 1970, p. 41 (key). Bertmar et al. 1969, p. 6 (epibranchial organ). Granados and Sevilla, 1963, p. 355 (name). R. R. Miller, 1960, p. 373 (key); 1966, pp. 777, 794 (distribution). R. V. Miller, 1969, p. 311, fig. 4 (epibranchial organ).

Dorosoma cepedianum (Lesueur, 1818) Gill, 1862

Figure 11C

Megalops cepediana LESUEUR, 1818, p. 361 (type specimen: status unknown [see also Bertin, 1940, p. 277]. Type locality [R. R. Miller, 1964, p. 447]: Chesapeake and Delaware Bays).

REFERENCES: Ager, 1971, p. 55 (Fla.). Allison and Kelly, 1963 (mass mortality. Ala.). Alvarez del Villar, 1970, p. 40 (key). Anderson, 1968 (transport). Baglin and Kilambi, 1968 (biology. Ark.). Bailey and Allum, 1962, p. 30 (S. Dak.). Bailey et al. 1970, p. 15 (name). Baxter and Simon, 1970, p. 24 (Wyo.). Becker, 1966, p. 94 (Wis.). Beckman, 1963, p. 15 (Col.). Benda and Gammon, 1968, pp. 196 ff. (ecology, Ind.). Benson, 1968, pp. 28 ff., Missouri R. Benson et al. 1961, p. 221 (rotenone control). Benton and Douglas, 1965, p. 94 (La.). Bertmar et al. 1969, p. 6 ff. (epibranchial organ). Bodola, 1966, L. Erie (biology). Bonn and Holbert, 1961, p. 292 (rotenone control. Tex.). Boschung, 1961, p. 267 (Ala.). Branson, 1967, pp. 130, 151 (Okla.). Breder and Rosen, 1966, p. 89 (reproduction). Brungs and Mount, 1967 (endrin uptake). Burton and Douglas, 1965, p. 94 (La.). Calhoun, 1966 (forage, rotenone sensitivity). Carlander, 1969, pp. 82–89 (biology). Carter and Eley, 1968 (vertical distribution. Okla.). Carufel, 1960 (fishery. N. Dak.). Carufel and Witt, 1963 (range extension. N. Dak.). Charles, 1967 (population control. Ky.). Christenson and Smith, 1965, p. 9, Mississippi R.

- Clay, 1962, p. 37 (Ky.). Clemens and Johnson, 1964, pp. 390 ff. (pituitary extract). Cramer and Marzolf, 1970 (plankton feeding, Kan.). Cross, 1967, p. 53, fig. (Kan.). Cuerrier, 1962, p. 212 (Quebec). Dahlberg and Scott, 1971, pp. 12, 58 (Ga.). Davis, 1960, pp. 19, 36 (La.). Davis and Posey, 1960 (netting, trapping, La.). Deacon, 1961, pp. 374 ff. (biology, Kan.). Deacon and Metcalf, 1961, p. 315 (Kan.). Dickinson, 1960, p. 14, fig. 15 (key). Echeele and Mense, 1968 (Okla.). Fisher, 1962, p. 427, Missouri R. Fitz, 1968 (Tenn.). Fry and Hanson, 1968, p. 140 (Mo.). Gammon, 1965, pp. 355, 359 (Ind.). Gasaway and Lambou, 1968 (trawling). Geagan and Allen, 1961, pp. 74-81 (La.). Granados and Sevilla, 1963, p. 355 (name). Greeson, 1963, p. 24 (Ky.). Grinstead, 1969 (harvesting, Ala.). Grzenda et al. 1970, p. 392 (DDT uptake). Gunter, 1967, p. 634, Gulf of Mexico. Gunter and Hall, 1963, pp. 225 ff. (Fla.). Hadley and Carter, 1961, p. 129 (Okla.). Hall, 1971 (biology in reservoirs). Hanek and Fernando, 1971 (parasites, Ontario). Hanson and Campbell, 1963, p. 139 (beaver influence, Mo.). Harlan and Speaker, 1969, pp. 48 ff. (Iowa). Hellier, 1967, p. 35 (Fla.). Hergenrader and Bliss, 1971, pp. 735, 738 (Nebr.). Hoese, 1963 (salinity tolerance). Hoffman, 1970, p. 346 (parasites). Holmes and Donaldson, 1969, p. 53 (blood chemistry). Hopkins, 1966 (parasites, Okla.). Horel and Huish, 1960 (population sampling, Fla.). Hoyt et al. 1970, p. 56 (Ky.). Hunn and Robinson, 1966, p. 173 (blood chemistry, Md.). Isom, 1960 (mass mortality, Tenn.). Jester and Jensen, 1972 (biology, N. Mex.). D. W. Johnson, 1968, p. 400 (pesticides). M. Johnson and Becker, 1970, p. 270 (Wis.). Kilambi and Baglin, 1969a (fecundity, Ark.). King, 1969 (rotenone control). Krumholz and Minckley, 1964, pp. 2-3, Ohio R. (pollution abatement). Lambou, 1960, pp. 57 ff., 1961, 1962, p. 77, 1963, pp. 80-81 (forage, population sampling, La.). Lambou and Geagan, 1961 (population sampling, La.). Lane et al. 1968, pp. 173 ff. (biology). Larimore and Smith, 1963, p. 321 (Ill.). Lantz, 1970, pp. 43 ff. (La.). Lennon, 1962, p. 6 (Tenn.). Lewis and Helms, 1964, pp. 316-317 (forage). Louder, 1962, pp. 69-70 (N.C.). Love, 1970, pp. 322, 421 (references). Lyles, 1965-1968 (fishery). McAllister, 1968a, p. 41, pl. 8 (branchiostegals); 1968b, p. 64 (mandibular pores). McHugh, 1967, p. 609, Chesapeake Bay, McMahan, 1963, p. 159, Chesapeake Bay (parasites). Mansueti, 1962a, p. 138, 1962b, pp. 191 ff., Chesapeake Bay (egg, larva). Mansueti and Hardy, 1967, p. 75, figs. 37-38 (development). Metcalf, 1966, p. 96 (Kan.). Meyer, 1965 (selective eradication). R. R. Miller, 1960, 1964, p. 444 (biology, systematics). R. V. Miller, 1969, p. 311, fig. 4 (epibranchial organ). Minckley and Krumholz, 1960 (hybrids, Ky., Ill.). Moody, 1961 (exploitation, Fla.). Moser and Hicks, 1970 (Okla.). Mount, 1964, p. 180 (zinc uptake, Ohio, Tenn.). Mullan and Applegate, 1969, p. 5 (echolocation). Murphy, 1964, p. 71 (Ky.). G. J. Nelson, 1967a, pp. 394-395, figs. 6-7 (gill arches). W. R. Nelson, 1968, p. 164, 1969, p. 10, Missouri R. (forage). Netsch et al. 1971, p. 178 (larvae sampling). Norden, 1965, p. 102, 1966, p. 126 (La.). Patrick, 1961, p. 255 (eastern U.S.). Patrick et al. 1967, pp. 173 ff., Savannah R. (ecology). Pflieger, 1971, p. 322 (Mo.). Posey, 1962, pp. 95 ff. (population dynamics, La.). Power, 1960-1963 (fishery). Power and Lyles, 1964 (fishery). Priegel, 1971, pp. 21-23 (Wis.). Renfro, 1960, p. 86 (salinity, Tex.). Rock and Nelson, 1965 (mass mortality, Ill.). Schmitz and Baker, 1970 (gut). R. W. Schneider, 1968 (life history, Va.). W. B. Scott and Crossman, 1969, pp. 9 ff. (Canada). Sisk, 1969, p. 56 (Ky.). C. L. Smith and Powell, 1971, pp. 7 ff. (Okla.). P. L., Smith and Sisk, 1969, p. 64 (Ky.). P. W. Smith, 1963, pp. 253-255, 1968, p. 45 (Ill.). P. W. Smith and Page, 1969, p. 650 (forage, Ill.). S. L. Smith et al. 1969, p. 72 (Ill.). W. L. Smith, 1963 (algal digestion). Smith-Vaniz, 1968, p. 23, fig. 7 (Ala.). Southern, 1963, p. 46, 1964, p. 122, 1966 (food of eagles, Ill.). Springer, 1961 (Fla.). Starrett and Fritz, 1965 (Ill.). Sulya et al. 1960, p. 1178, Gulf of Mexico (blood chemistry). Summerfelt, 1967, pp. 116 ff. (Kan.). Swingle and Shell, 1971, p. 30 (relative condition). Tagatz, 1968, p. 34 (Fla.). Trent and Hassler, 1966, p. 190 (forage, N.C.). Turnage, 1964, p. 9 (La.). Van Meter and Trautman, 1970, p. 68, L. Erie. Vanicek, 1964, pp. 481 ff. (forage, Iowa). Vladykov and McAllister, 1961, p. 60 (Quebec). Walburg, 1964, pp. 4 ff., 1969, p. 9, Missouri R. (winter mortality). B. T. Walker, 1965, p. 107 (La.). J. M. Walker, 1962, p. 36, 1963, p. 46 (La.). Welker, 1967, pp. 232-234 (Mo.). Wells, 1968, pp. 3, 13, L. Michigan. Whitaker, 1969, p. 16 (key). Wolfert, 1966, pp. 490-494, L. Erie (forage). Wright, 1970, pp. 40-41 (forage, Ill.). Yerger, 1961, p. 112 (Fla.).



FIG. 12. A. *Dorosoma chavesi*, AMNH 28125 (previously USNM 22138), Nicaragua, 145 mm. B. *Dorosoma smithi*, AMNH 28126 (previously USNM 129952), Mexico, 122 mm. C. *Dorosoma petenense*, AMNH 26361, Guatemala, 134 mm.

Dorosoma chavesi Meek, 1907

Figure 12A

Dorosoma chavesi MEEK, 1907, p. 112 (type specimen

[original designation]: FMNH 5928. Type locality: Lagoon Jenicero, Nicaragua).

REFERENCES: Astorqui, 1971, p. 29 (Nicaragua). Bertmar et al. 1969, p. 6 (epibranchial

organ). R. R. Miller, 1960, p. 373 (key); 1966, pp. 782, 794 (distribution). R. V. Miller, 1969, p. 311, fig. 4 (epibranchial organ).

Dorosoma smithi Hubbs and Miller, 1941

Figure 12B

Dorosoma smithi HUBBS AND MILLER, 1941, p. 232, fig. 1 (type specimen [original designation]: USNM 133749-50. Type locality: Rio Piaxtla, Mexico).

REFERENCES: Alvarez del Villar, 1970, p. 41 (key). Bertmar et al. 1969, p. 6 (epibranchial organ). Branson et al. 1960, p. 218 (Mexico). Granados and Sevilla, 1963, p. 355 (name). R. R. Miller, 1960, p. 373 (key). R. V. Miller, 1969, p. 311, fig. 4 (epibranchial organ).

SUBGENUS *SIGNALOSA* EVERMANN AND KENDALL, 1898

Signalosa EVERMANN AND KENDALL, 1898, p. 127 (type species [original designation]: *Signalosa atchafalaya* Evermann and Kendall, 1898 = *Dorosoma petenense*).

Dorosoma petenense (Günther, 1866) Jordan and Evermann, 1896

Figures 2C, 3E, 12C

Meletta petenensis GÜNTHER, 1866, p. 603 (type specimens: BMNH 1864.1.26.372 [four specimens]. Type locality: Lake Petén, Guatemala).

REFERENCES: *Signalosa mexicana*: Gunter, 1967, p. 634, Gulf of Mexico.

Dorosoma mexicanum: Gery, 1971, p. 48.

Dorosoma petenense: Ager, 1971, p. 56 (Fla.). Allison and Kelly, 1963 (mass mortality. Ala.). Alvarez del Villar, 1970, p. 40 (key). Applegate and Mullan (food. Ark.). Bailey et al. 1970, p. 15 (name). Beers and McConnell, 1966 (forage. Ariz.). Benton and Douglas, 1965, p. 94 (La.). Bertmar et al. 1969, pp. 6 ff. (epibranchial organ). Bonn and Holbert, 1961, p. 292 (rotenone control. Tex.). Boschung, 1961, p. 267 (Ala.). Branson, 1967, pp. 130, 151 (Okla.). Breder and Rosen, 1966, p. 89 (reproduction). Bryan and Sopher, 1969 (range extension. Cal.). Burton and Douglas, 1965, p. 94 (La.). Calhoun, 1966 (forage, biology). Carlander, 1969, pp. 89-92 (biology). Clay, 1962, p. 39 (Ky.). Collins and Hulsey, 1963 (transporation. Ark.). Cook and Moore, 1966 (mosquito control. Cal.). Dahlberg and Scott, 1971, pp. 12, 58 (Ga.).

Davis, 1960, p. 19 (La.). Davis and Posey, 1960 (netting, trapping. La.). Erdman, 1967 (Puerto Rico). Finucane, 1965 (Fla.). Fitz, 1966, 1968 (forage. Tenn.). Fox and Mock, 1968, pp. 46, 52 (La.). Franks, 1970, p. 36 (Miss.). Geagan and Allen, 1961, pp. 74 ff. (La.). Geldern, 1971, p. 240 (forage. Cal.). Goodson, 1964, 1965 (forage. Cal.). Gunter and Hall, 1963, pp. 225 ff. 1965, pp. 20 ff. (Fla.). Haley et al. 1967 (mass mortality. Cal.). Hall, 1971 (biology in reservoirs). Hellier, 1967, p. 35 (Fla.). Hida and Thomson, 1962 (Hawaii). Hoffman, 1970, p. 346 (parasites). Holmes and Donaldson, 1969, p. 53 (blood chemistry). Hopkins, 1966 (parasites. Okla.). Houser and Dunn, 1967 (population estimate). Hunsaker and Crawford, 1964, p. 240 (forage. Cal.). Isaacson and Poole, 1965 (range extension. Cal.). Iversen, 1971 (tuna bait. Hawaii). Jester and Jensen, 1972, p. 12 (N. Mex.). D. W. Johnson and Lew, 1970 (pesticides. Ariz.). J. E. Johnson, 1968, p. 209, 1970, 1971 (biology, Ariz.). J. E. Johnson et al. 1970 (fishing efficiency. Ariz.). Kilambi and Baglin, 1969b (fecundity. Ark.). Kilgen, 1970 (unintentional stocking. Ga.). Kimsey and Fisk, 1960, p. 464 (key). King, 1969 (rotenone control). La Faunce et al. 1964 (forage. Cal.). Lambou, 1961, 1962, p. 77, 1963, pp. 80-81, 1965 (biology. La.). Lambou and Geagan, 1961 (population sampling. La.). Lane et al. 1968, pp. 231 ff. (biology). La Rivers, 1962, pp. 186 ff., fig. 128 (Nev.). Lantz, 1970, pp. 43 ff. (La.). Love, 1970, p. 323 (reference). McConnell and Gerdes, 1964 (forage. Cal.). Maloy, 1967, p. 133 (hatchery). R. Maxwell and Essbach, 1971 (egg transport). L. W. Miller, 1967 (parasites. Cal.). R. R. Miller, 1960, p. 373, 1964, p. 448, 1966, p. 794 (biology, systematics). R. V. Miller, 1964, 1969, p. 311, fig. 4 (epibranchial organ); 1967 (food. Ark.). Minckley et al. 1970, p. 338 (egg predation. Ariz.). Mount, 1964, p. 180 (zinc uptake. Ga., Tenn.). Mullan and Applegate, 1969, p. 5 (echolocation). Nahhas and Short, 1965, p. 49 (Fla.). E. L. Nakamura, 1962, p. 502 (behavior. Hawaii). Netsch et al. 1971, p. 178 (larvae sampling). Norden, 1965, p. 100, 1966, p. 126 (La.). Patrick, 1961, p. 255 (eastern U.S.). Patrick et al. 1967, pp. 173 ff., Savannah R. Posey, 1962, pp. 105 ff. (La.). Rawstron, 1964 (low temperature spawning. Cal.). Renfro, 1960, p. 86 (salinity. Tex.). Richmond, 1968, p. 238 (Miss.). Schmitz and Baker, 1970 (gut). Shelton, 1963 (ovaries. Okla.). Shomura, 1964,

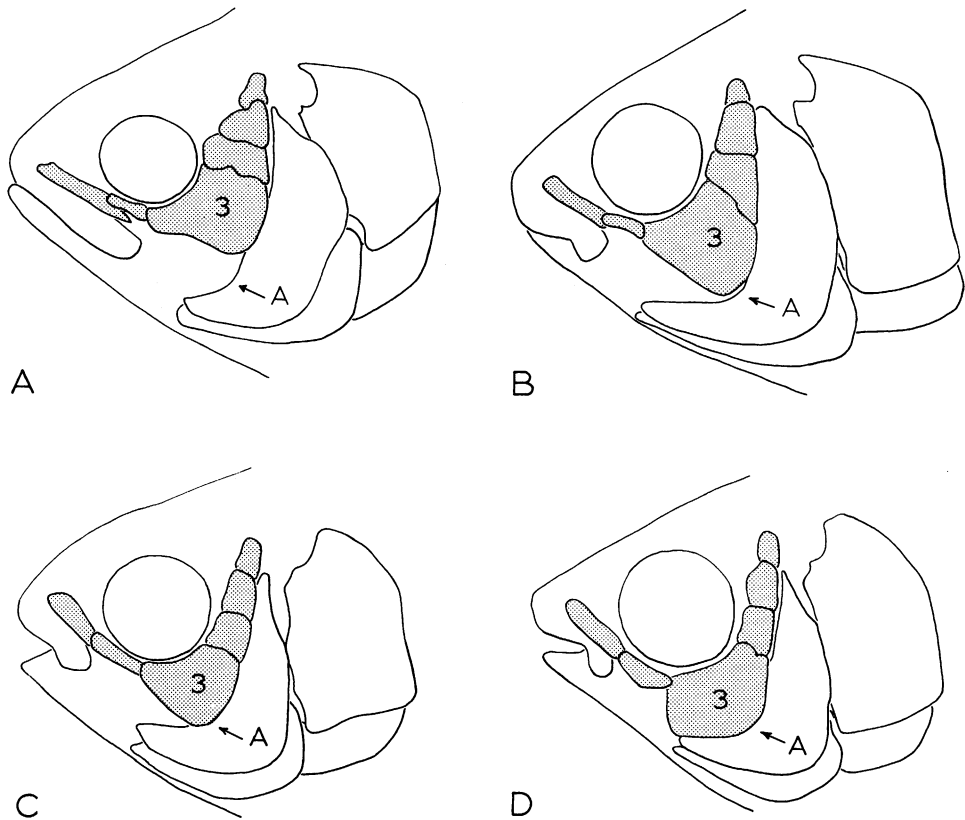


FIG. 13. Diagram of left side of head showing infraorbital bones (stippled) in relation to opercular bones (clear). A. *Clupanodon thrissa*, USNM 191244. B. *Nematalosa arabica*, FMNH 3982. C. *Nematalosa erebi*, AMNH 28087. D. *Nematalosa galathea*, new species, CAS 24839. Abbreviations: 3, infraorbital 3; A, angle of preopercular bone.

p. 291 (Hawaii). C. L. Smith and Powell, 1971, pp. 7 ff. (Okla.). Smith-Vaniz, 1968, p. 23, fig. 8 (Ala.). Stephens, 1968 (lateralis system). Sulya et al. 1960, p. 1178, Gulf of Mexico (blood chemistry). Thomas, 1962 (range extension. Cal.); 1967, pp. 50 ff., figs. 1, 4 (forage. Cal.). Turnage, 1964, p. 9 (La.). Turner, 1966 (distribution. Cal.). B. T. Walker, 1965, p. 107 (La.). B. W. Walker, 1961, pp. 79 ff., figs. 26, 77 (forage. Cal.). J. M. Walker, 1962, p. 36, 1963, p. 46 (La.). Whitaker, 1969, p. 18 (key).

Signalosa petenensis: Lambou, 1960, pp. 57 ff. (La.). Minckley and Krumholz, 1960 (hybrids. Ky., Ill.). Sisk, 1969, p. 56 (Ky.).

KEY TO THE SPECIES OF GIZZARD SHADS OF THE INDO-PACIFIC REGION

1a. Last dorsal ray not prolonged as a filament.

- 2a. Predorsal scales median *Anodontostoma chacunda* (Hamilton)
- 2b. Predorsal scales paired and overlapping in midline.
- 3a. Lateral scales numerous (50-60); body slender (30-40% standard length) *Gonialosa manmina* (Hamilton)
- 3b. Lateral scales few (40-50); body deep (40-50% standard length). *Gonialosa modesta* (Day)
- 1b. Last dorsal ray prolonged as a filament.
- 4a. Dorsal scutes present *Clupanodon thrissa* (Linnaeus)
- 4b. Dorsal scutes absent.
- 5a. Paired predorsal scales not overlapping in midline; third infraorbital unexpanded, without a definite anterior edge, its lower border nearly horizontal.
- 6a. One supramaxillary *Clupanodon punctatus* (Temminck and Schlegel)
- 6b. Two supramaxillaries Genus *Dorosoma* (North American species)

- 5b. Paired predorsal scales overlapping in midline.
- 7a. Third infraorbital little expanded, its lower border nearly horizontal, extending posteriorly to preopercle at or above preopercular angle *Nematalosa arabica* Regan
- 7b. Third infraorbital moderately or greatly expanded, its lower border with an oblique or vertical anterior edge, extending ventrally to preopercle anterior to preopercular angle.
- 8a. Third infraorbital greatly expanded, its anterior edge vertical.
- 9a. Supraorbital grooves present
 *Nematalosa galathea*, new species
- 9b. Supraorbital grooves absent
 *Nematalosa nasus* (Bloch)
- 8b. Third infraorbital moderately expanded, its anterior edge oblique.
- 10a. Pectoral axillary process rudimentary or absent.
- 11a. Nuchal scales with anastomosing canals .
 *Nematalosa erebi* (Günther)
- 11b. Nuchal scales without anastomosing canals *Nematalosa vlaminghi* (Munro)
- 10b. Pectoral axillary process developed, approximately one-third length of fin.
- 12a. Ventral scutes few (usually 29 or 30), trunk scale rows few (16-19), caudal peduncle scale rows few (7), lateral scales few (46 or 47)
 *Nematalosa come* (Richardson)
- 12b. Ventral scutes numerous (usually 32 or 33), trunk scale rows numerous (20-22), caudal peduncle scale rows numerous (8), lateral scales numerous (49 or 50)
 *Nematalosa japonica* Regan

TABLE 1
COUNTS OF DORSAL FINRAYS AND PREDORSAL BONES

	Unbranched rays						Branched Rays						Total Rays						Predorsal Bones														
	iii	iv	v	vi	10	11	12	13	14	15	16	14	15	16	17	18	19	20	21	6	7	8	9	10	11								
<i>C. thrisa</i>	—	50	7	—	—	8	35	14	—	—	—	—	—	—	4	36	18	—	—	—	—	—	—	—	1	53	4	—					
<i>C. punctatus</i>	1	105	149	4	—	—	21	148	87	3	—	—	—	—	—	6	66	153	44	1	—	—	—	—	—	7	195	69	3				
<i>A. chacunda</i>	9	297	80	1	—	—	—	7	100	256	24	—	—	—	—	—	5	102	315	95	1	—	—	—	—	9	518	25	—				
<i>G. mannina</i>	5	9	—	—	—	2	10	2	—	—	—	—	—	—	1	4	8	2	—	—	—	—	—	—	—	—	—	13	1	—			
<i>G. modesta</i>	1	7	—	—	—	1	4	3	—	—	—	—	—	—	—	1	4	3	—	—	—	—	—	—	—	—	—	1	6	1	—		
<i>N. galathea</i>	—	27	1	—	—	2	22	4	—	—	—	—	—	—	—	2	21	6	—	—	—	—	—	—	—	—	—	26	3	—	—		
<i>N. arabica</i>	—	6	2	—	—	—	—	4	4	—	—	—	—	—	—	—	3	4	1	—	—	—	—	—	—	—	—	7	1	—	—		
<i>N. nasus</i>	1	99	53	—	—	2	51	86	14	—	—	—	—	—	2	23	95	38	—	—	—	—	—	—	—	—	13	145	3	—	—		
<i>N. vlaminghi</i>	4	25	8	—	—	—	19	17	1	—	—	—	—	—	2	14	17	4	—	—	—	—	—	—	—	—	1	26	10	—	—		
<i>N. japonica</i>	—	13	9	—	—	—	1	15	6	—	—	—	—	—	—	1	7	13	1	—	—	—	—	—	—	—	1	19	2	—	—		
<i>N. come</i>	—	37	23	—	—	1	12	42	5	—	—	—	—	—	—	1	4	36	19	1	—	—	—	—	—	—	1	49	13	—	—		
<i>N. erebi</i> :																																	
A. Lake Narran	—	6	1	—	—	1	5	1	—	—	—	—	—	—	1	4	2	—	—	—	—	—	—	—	—	—	—	1	2	3	—	—	
B. Finke River	—	16	2	—	—	12	6	—	—	—	—	—	—	—	10	9	—	—	—	—	—	—	—	—	—	—	—	2	15	2	—	—	
C. Flinders River	—	6	—	—	—	—	5	1	—	—	—	—	—	—	5	1	—	—	—	—	—	—	—	—	—	—	—	4	2	—	—	—	
D. Roper River	1	11	3	—	—	—	5	9	1	—	—	—	—	—	4	9	2	—	—	—	—	—	—	—	—	—	2	12	1	—	—	—	
E. Fortesque River	17	66	9	—	—	7	59	25	—	—	1	—	—	—	14	66	26	—	1	—	—	—	—	—	—	—	1	13	68	27	1	—	—
F. Fitzroy River	8	61	5	—	—	1	44	28	1	—	—	—	—	—	7	52	40	2	—	—	—	—	—	—	—	—	4	84	12	1	—	—	
G. King River	7	38	1	—	—	3	28	15	—	—	—	—	—	—	5	40	11	—	—	—	—	—	—	—	—	—	3	35	22	—	—	—	
H. Oenpelli	1	19	6	—	—	1	18	7	—	—	—	—	—	—	2	19	18	—	—	—	—	—	—	—	—	—	—	—	34	11	—	—	
J. New Guinea	—	5	—	—	—	—	3	2	—	—	—	—	—	—	3	2	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—

TABLE 3
COUNTS OF VERTEBRAE

	Abdominal										Caudal										Total																																	
	10	11	12	13	14	15	16	17	18	19	24	25	26	27	28	29	30	31	32	33	34	35	36	39	40	41	42	43	44	45	46	47	48	49	50	51																		
<i>C. thrissa</i>	4	37	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	29	23	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	21	35	1	—	—	—												
<i>C. punctatus</i>	—	1	4	77	154	33	5	—	—	—	—	—	—	—	—	—	—	2	6	39	129	88	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	50	164	51	6								
<i>A. chacunda</i>	—	65	399	85	3	1	—	—	—	—	—	—	—	2	18	131	334	65	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—						
<i>G. manmina</i>	—	1	11	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	7	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
<i>G. modesta</i>	1	—	4	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	4	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
<i>N. galathea</i>	—	2	20	6	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	9	15	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
<i>N. arabica</i>	—	—	—	—	2	4	2	—	—	—	—	—	—	—	—	—	—	—	1	2	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
<i>N. nasus</i>	—	—	36	102	19	4	—	—	—	—	—	—	—	—	—	—	—	—	1	6	43	89	22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
<i>N. vlaminghi</i>	—	—	—	—	3	14	14	4	2	—	—	—	—	—	2	3	5	12	12	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
<i>N. japonica</i>	—	—	—	—	10	10	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
<i>N. come</i>	—	—	—	—	17	39	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
<i>N. erebi:</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
A. Lake Narran	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
B. Finke River	—	—	—	—	5	12	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
C. Flinders River	—	—	—	—	2	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
D. Roper River	—	—	—	—	2	8	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
E. Fortesque River	—	—	—	—	1	7	23	49	23	5	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
F. Fitzroy River	—	—	—	—	15	29	39	12	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
G. King River	—	—	—	—	7	22	18	8	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
H. Oenpelli	—	—	—	—	1	9	23	9	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
J. New Guinea	—	—	—	—	1	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

TABLE 4
COUNTS OF VENTRAL SCUTES

	Prepelvic										Postpelvic										Total															
	14	15	16	17	18	19	20	21	7	8	9	10	11	12	13	14	15	16	25	26	27	28	29	30	31	32	33	34	35	36	37					
<i>C. thirissa</i>	—	—	2	9	42	4	—	—	—	1	21	32	4	—	—	—	—	—	—	—	1	5	20	26	5	—	—	—	—	—	—					
<i>C. punctatus</i>	—	—	—	1	10	173	82	7	—	—	—	—	—	3	40	148	78	4	—	—	—	—	—	—	—	3	33	106	102	25	3					
<i>A. chacunda</i>	2	30	497	13	—	—	—	—	2	36	410	91	2	—	—	—	—	—	5	49	393	91	2	—	—	—	—	—	—	—	—					
<i>G. maninna</i>	—	—	1	7	6	1	—	—	—	—	—	5	7	3	—	—	—	—	—	—	1	3	5	3	2	1	—	—	—	—	—	—				
<i>G. modesta</i>	—	—	2	5	1	—	—	—	—	—	1	7	—	—	—	—	—	—	—	—	1	1	5	1	—	—	—	—	—	—	—	—				
<i>N. galathea</i>	—	—	4	25	—	—	—	—	—	1	1	20	7	—	—	—	—	—	1	—	3	19	6	—	—	—	—	—	—	—	—	—				
<i>N. arabica</i>	—	—	—	—	3	5	—	—	—	—	—	—	1	6	1	—	—	—	—	—	—	—	—	—	—	4	3	1	—	—	—	—				
<i>N. nasus</i>	—	—	—	28	124	7	1	—	1	—	1	13	112	33	1	—	—	—	—	1	—	4	27	97	27	5	—	—	—	—	—	—	—			
<i>N. ulaminghi</i>	—	—	1	7	27	2	—	—	—	—	—	1	15	21	—	—	—	—	—	—	—	2	2	14	19	—	—	—	—	—	—	—	—			
<i>N. japonica</i>	—	—	—	2	19	1	—	—	—	—	—	—	—	12	10	—	—	—	—	—	—	—	—	—	—	1	11	10	—	—	—	—				
<i>N. come</i>	—	1	3	6	51	2	—	—	—	1	9	45	8	—	—	—	—	—	—	—	3	2	11	37	10	—	—	—	—	—	—	—	—			
<i>N. erebi</i> :																																				
A. Lake Narran	1	1	2	2	—	—	—	—	—	—	—	—	3	3	—	—	—	—	—	—	1	—	2	2	1	—	—	—	—	—	—	—	—	—		
B. Finke River	—	—	14	5	—	—	—	—	—	—	3	10	4	2	—	—	—	—	—	—	3	8	5	1	2	—	—	—	—	—	—	—	—	—	—	
C. Flinders River	—	—	—	4	1	—	—	—	—	—	—	2	3	—	—	—	—	—	—	—	—	1	4	—	—	—	—	—	—	—	—	—	—	—	—	—
D. Roper River	—	—	1	5	8	1	—	—	—	—	—	7	8	—	—	—	—	—	—	—	—	4	5	6	—	—	—	—	—	—	—	—	—	—	—	—
E. Fortesque River	2	7	42	56	3	—	—	—	—	1	6	37	63	3	—	—	—	—	—	—	1	7	20	40	36	5	—	—	—	—	—	—	—	—	—	
F. Fitzroy River	—	10	68	22	1	—	—	—	—	1	1	17	61	20	1	—	—	—	—	2	1	18	45	29	6	—	—	—	—	—	—	—	—	—	—	—
G. King River	—	1	27	29	1	—	—	—	—	—	—	3	33	21	1	—	—	—	—	—	—	1	14	31	10	2	—	—	—	—	—	—	—	—	—	—
H. Oenpelli	—	—	6	37	2	—	—	—	—	—	1	4	30	9	1	—	—	—	—	—	—	1	—	7	26	11	—	—	—	—	—	—	—	—	—	—
J. New Guinea	—	—	1	4	—	—	—	—	—	—	1	2	2	—	—	—	—	—	—	—	—	2	1	2	—	—	—	—	—	—	—	—	—	—	—	—

TABLE 5
AVERAGE COUNTS OF ANAL FINRAYS AND VERTEBRAE FOR POPULATIONS OF *Nematalosa erebi*

	Anal Finrays	Abdominal Vertebrae	Caudal Vertebrae
A. Lake Narran (n=7)	20.86	16.57	27.86
B. Finke River (n=19)	21.16	14.89	28.05
C. Flinders River (n=6)	21.33	13.67	29.50
D. Roper River (n=15)	22.33	13.47	30.47
E. Fortesque River (n=109-110)	19.53	15.99	27.03
F. Fitzroy River (n=100-101)	20.77	14.63	27.83
G. King River (n=58-59)	21.65	13.68	29.56
H. Oenpelli (n=43-44)	24.39	13.00	30.77
J. New Guinea (n=5)	24.20	13.00	31.00

LITERATURE CITED

- AGER, L. A.
1971. The fishes of Lake Okeechobee, Florida. Quart. Jour. Florida Acad. Sci., vol. 34, pp. 53-62.
- ALLISON, R., AND H. D. KELLY
1963. An epizootic of *Ichthyophthirius multifiliis* in a river fish population. Prog. Fish-Cult., vol. 25, pp. 149-150.
- ALVAREZ DEL VILLAR, J.
1970. Peces mexicanos (claves). Inst. Nac. Invest. Biol. Pesqueras, Ser. Invest. Pesquera, Estud. no. 1, 166 pp., 62 figs.
- ANDERSON, R. O.
1968. Transport of gizzard shad. Prog. Fish-Cult., vol. 30, p. 184.
- ANNIGERI, G. G.
1967. Maturation of the intraovarian eggs and the spawning periodicities in few fishes of Mangalore area based on ova-diameter measurements. Indian Jour. Fish., vol. 10, pp. 23-32, 4 figs.
- ANON.
1873. [Exhibition of fishes.] Proc. Zool. Soc. London, p. 686.
1929. Oeuvre ichthyologique de G. Tirant. Reimpression. Saigon, 175 pp.
1931. Illustrations of Japanese aquatic plants and animals. Tokyo, vol. 1, 50 pls., + text.
1957-1967. Fisheries statistics of the Philippines, Quezon City and Manila, 11 vols.
- APPLEGATE, R. L., AND J. W. MULLAN
1969. Ecology of *Daphnia* in Bull Shoals Reservoir. Bur. Sport Fish. Wildlife Res. Rept., no. 74, 23 pp., 28 figs.
- ASTORQUI, I.
1971. Peces de la cuenca de los grandes lagos de Nicaragua. Rev. Biol. Trop., vol. 19, pp. 7-57, illus.
- BAGLIN, R. E., AND R. V. KILAMBI
1968. Maturity and spawning periodicity of the gizzard shad, *Dorosoma cepedianum* (Le Sueur), in Beaver Reservoir. Proc. Arkansas Acad. Sci., vol. 22, pp. 38-43, 2 figs.
- BAILEY, R. M., AND M. O. ALLUM
1962. Fishes of South Dakota. Misc. Publ. Mus. Zool. Univ. Michigan, no. 119, 131 pp., 7 figs., 1 pl.
- BAILEY, R. M., J. E. FITCH, E. S. HERALD, E. A. LACHNER, C. C. LINDSEY, C. R. ROBINS, AND W. B. SCOTT
1970. A list of common and scientific names of fishes from the United States and Canada. Special Publ. Amer. Fish. Soc., no. 6, 149 pp.
- BAL, D. V., P. D. NAYAK, AND M. R. VARDE
1959. A comparative account of the air-bladder and the membranous labyrinth in some marine fishes. Jour. Univ. Bombay, vol. 27, n.s., sec. B, Biol. Sci., pp. 1-21, 24 figs.
- BANASOPIT, T., AND T. WONGRATANA
1967. A check list of fishes in the reference collection maintained at the marine fisheries laboratory. Contrib. Marine Fish. Lab., Bangkok, no. 7, vii+73 pp.
- BAPAT, S. V.
1955. A preliminary study of the pelagic fish eggs and larvae of the Gulf of Mannar and the Palk Bay. Indian Jour. Fish., vol. 2, pp. 231-255, 40 figs.
- BAPAT, S. V., AND D. V. BAL
1950. The food of some young clupeids. Proc. Indian Acad. Sci., vol. 32B, pp. 39-58.

- BASHEERUDDIN, S., AND K. N. NAYAR
1961. A preliminary study of the juvenile fishes of the coastal waters off Madras City. *Indian Jour. Fish.*, vol. 8, pp. 169-188, 4 figs.
- BAXTER, G. T., AND J. R. SIMON
1970. Wyoming fishes. Cheyenne, 168 pp., illus.
- BEAN, B. A., AND A. C. WEED
1912. Notes on a collection of fishes from Java, made by Owen Bryant and William Palmer in 1909, with description of a new species. *Proc. U.S. Natl. Mus.*, vol. 42, pp. 587-611, pls. 73-75.
- BEAVAN, R.
1877. Handbook of the freshwater fishes of India. London, xii+247 pp., 12 pls.
- BECKER, G. C.
1966. Fishes of southwestern Wisconsin. *Trans. Wisconsin Acad. Sci., Arts Lett.*, vol. 55, pp. 87-117.
- BECKMAN, W. C.
1963. Guide to the fishes of Colorado. Boulder, 110 pp., illus.
- BEERS, G. D., AND W. J. MCCONNELL
1966. Some effects of threadfin shad introduction on black crappie diet and condition. *Jour. Arizona Acad. Sci.*, vol. 4, pp. 71-74, 3 figs.
- BENDA, R. S., AND J. R. GAMMON
1968. The fish populations of Big Walnut Creek. *Proc. Indiana Acad. Sci.*, vol. 77, pp. 193-205.
- BENNET, P. S.
1968. *Bomolochus varunae*, a new species of parasitic copepod from *Anodontostoma chacunda* (Hamilton Buchanan). *Jour. Marine Biol. Assoc. India*, vol. 8, pp. 295-301, 3 figs.
- BENSAM, P.
1967. The pharyngeal pockets in the Indian oil sardine, *Sardinella longiceps* Valenciennes and a few other Clupeiformes from Indian waters. *Indian Jour. Fish.*, sec. A, vol. 11, pp. 175-180, 25 figs.
- BENSON, N. G.
1968. Review of fishery studies on Missouri River main stem reservoirs. *Bur. Sport Fish. Wildlife Res. Rept.*, no. 71, 61 pp., 20 figs.
- BENSON, N. G., J. R. GREELEY, M. L. HUISSH, AND J. H. KUEHN
1961. Status of management of natural lakes. *Trans. Amer. Fish. Soc.*, vol. 90, pp. 218-224.
- BENTON, T. M., AND N. H. DOUGLAS
1965. A survey of the fishes of Bayou DeSiard: an impoundment in northeastern Louisiana. *Proc. Louisiana Acad. Sci.*, vol. 28, pp. 90-95.
- BERG, L. S.
1932. Ryby presnyx vod SSSR i sopredelnyx stran. Leningrad, vol. 1, 543 pp., 474 figs.
1948. Ryby presnyx vod SSSR i sopredelnyx stran. Leningrad, vol. 1, 466 pp., 281 figs.
1962. Freshwater fishes of the U.S.S.R. and adjacent countries. Jerusalem, vol. 1, viii+504 pp., 281 figs.
- BERTIN, L.
1940. Catalogue des types de poissons du Muséum National d'Histoire Naturelle. *Bull. Mus. Natl. Hist. Nat.*, ser. 2, vol. 12, pp. 244-322.
1958. Squelette appendiculaire. *In* Grassé, P. P. (ed.), *Traité de zoologie*. Paris, tome 13, fasc. 1, pp. 710-747, figs. 463-500.
- BERTMAR, G., B. G. KAPOOR, AND R. V. MILLER
1969. Epibranchial organs in lower teleostean fishes—an example of structural adaptation. *Internatl. Rev. Gen. Exp. Zool.*, vol. 4, pp. 1-48, 13 figs.
- BHATTACHARYA, D. R.
1920. On the aortic ligament in Indian fishes. *Proc. Zool. Soc. London*, pp. 61-75, 5 figs., pls. 1-2.
- BLANCO, G. J.
1938. Fisheries of northeastern Luzon and the Babuyan and Batanes Islands. *Philippine Jour. Sci.*, vol. 66, pp. 501-521, 5 pls.
- BLEEKER, P.
1849. Bijdrage tot de kennis der ichthyologische fauna van het island Madura, met beschrijving van eenige nieuwe soorten. *Verhandel. Bataviaasch Genootsch. Kunst. Westensch.*, vol. 22, no. 4, 16 pp.
- 1851a. Visschen van Banka. *Natuurk. Tijdschr. Nederlandsch Indië*, vol. 1, pp. 159-161.
- 1851b. Nieuwe bijdrage tot de kennis der ichthyologische fauna van Celebes. *Ibid.*, vol. 2, pp. 209-224.
- 1851c. Bijdrage tot de kennis der ichthyologische fauna van Riouw. *Ibid.*, vol. 2, pp. 469-497.
- 1852a. Bijdrage tot de kennis der ichthyologische fauna van de Moluksche Eilanden. Visschen van Amboina en Ceram. *Ibid.*, vol. 3, pp. 229-309.
- 1852b. Bijdrage tot de kennis der ichthyologische fauna van het eiland Banka. *Ibid.*, vol. 3, pp. 443-460.
- 1852c. Bijdrage tot de kennis der haringachtige visschen van den Soenda-Molukschen archipel. *Verhandel. Bataviaasch Genootsch. Kunst. Wetensch.*, vol. 24, no. 8, 52 pp.
- 1852d. Nieuwe bijdrage tot de kennis der ichthyologische fauna van Ceram. *Natuurk. Tijdschr. Nederlandsch Indië*, vol. 3, pp. 689-714.
- 1852e. Nieuwe bijdrage tot de kennis der ichthyologische fauna van het eiland Banka. *Ibid.*, vol. 3, pp. 715-738.

- 1852f. Derde bijdrage tot de kennis der ichthyologische fauna van Celebes. *Ibid.*, vol. 3, pp. 739–782.
- 1853a. Vierde bijdrage tot de kennis der ichthyologische fauna van Celebes. *Ibid.*, vol. 5, pp. 153–174.
- 1853b. Nalezingen op de ichthyologische fauna van het eiland Banka. *Ibid.*, vol. 5, pp. 175–194.
- 1853c. Derde bijdrage tot de kennis der ichthyologische fauna van Ceram. *Ibid.*, vol. 5, pp. 233–248.
- 1853d. Zevende bijdrage tot de kennis der ichthyologische fauna van Borneo. *Ibid.*, vol. 5, pp. 427–462.
- 1853e. Nalezingen op de ichthyologie van Japan. Verhandel. Bataviaasch Genootsch. Kunst. Wetensch., vol. 25, no. 7, 56 pp., 1 pl.
- 1853f. Nalezingen op de ichthyologische fauna van Bengalen en Hindostan. *Ibid.*, vol. 25, no. 8, 164 pp.
- 1854a. Bijdrage tot de kennis der ichthyologische fauna van Halmahera (Gilolo). Natuurk. Tijdsch. Nederlandsch Indië, vol. 6, pp. 49–62.
- 1854b. Vijfde bijdrage tot de kennis der ichthyologische fauna van Amboina. *Ibid.*, vol. 6, pp. 455–508.
- 1854c. Oversigt der ichthyologische fauna van Sumatra, met beschrijving van eenige nieuwe soorten. *Ibid.*, vol. 7, pp. 49–108.
- 1854d. Vijfde bijdrage tot de kennis der ichthyologische fauna van Celebes. *Ibid.*, vol. 7, pp. 225–260.
- 1854e. Ichthyologische waarnemingen gedaan op verschillende reizen in de residentie Banten. *Ibid.*, vol. 7, pp. 309–326.
- 1854f. Bijdrage tot de kennis der ichthyologische fauna van Batjan. *Ibid.*, vol. 7, pp. 359–378.
- 1854–1857a. Nieuwe nalezingen op de ichthyologie van Japan. Verhandel. Bataviaasch Genootsch. Kunst. Wetensch., vol. 26, no. 4, 32 pp., pls. 1–8.
- 1854–1857b. Index specierum piscium in vol. xxi–xxvi Actorum Societas Artium et Scient. Batav. descriptorum adjectis citationibus ubi descriptiones Bleekerianae recentiores emendataeque reperiuntur. *Ibid.*, vol. 26, no. 6, 24 pp.
- 1855a. Over eenige visschen van Van Diemensland. Verhandel. K. Akad. Wetensch., Amsterdam, vol. 2, pp. 1–30.
- 1855b. Achtste bijdrage tot de kennis der ichthyologische fauna van Borneo. Zoetwatervisschen van Bandjermasin. Natuurk Tijdschr. Nederlandsch Indië, vol. 8, pp. 151–168.
- 1855c. Zesde bijdrage tot de kennis der ichthyologische fauna van Amboina. *Ibid.*, vol. 8, pp. 391–434.
- 1855d. Tweede bijdrage tot de kennis der ichthyologische fauna van Halmaheira (Gilolo). *Ibid.*, vol. 9, pp. 105–112.
- 1855e. Tweede bijdrage tot de kennis der ichthyologische fauna van Batjan-Zoetwatervisschen. *Ibid.*, vol. 9, pp. 191–202.
- 1855f. Achtste bijdrage tot de kennis der ichthyologische fauna van Celebes. *Ibid.*, vol. 9, pp. 281–314.
- 1855g. Verslag van eenige verzamelingen van visschen van Oost-Java. *Ibid.*, vol. 9, pp. 391–414.
- 1855h. Derde bijdrage tot de kennis der ichthyologische fauna van Batjan. *Ibid.*, vol. 9, pp. 491–504.
- 1856a. Beschrijvingen van nieuwe en weinig bekende vischsoorten van Amboina, verzameld op eene reis door den Molukschen Archipel gedaan in het gevolg van den Gouverneur Generaal Duymaer Van Twist, in September en Oktober 1855. Acta Soc. Sci. Indo-Neerlandicae, vol. 1, no. 5, 76 pp.
- 1856b. Beschrijvingen van nieuwe en weinig bekende vischsoorten van Manado en Makassar, grotendeels verzameld op eene reis door den Molukschen Archipel, gedaan in het gevolg van den Gouverneur Generaal Duymaer Van Twist, in September en Oktober 1855. *Ibid.*, vol. 1, no. 6, 80 pp.
- 1856c. Verslag van eenige verzamelingen van zee- en zoetwatervisschen van het eiland Banka. Natuurk. Tijdschr. Nederlandsch Indië, vol. 11, pp. 415–420.
- 1857a. Conspectus specierum piscium moluccensium hucusque cognitatarum. Acta. Soc. Sci. Indo-Neerlandicae, vol. 2, no. 4, 23 pp.
- 1857b. Tiende bijdrage tot de kennis der ichthyologische fauna van Borneo. Visschen van de Rivieren Barito, Kahojan en Kapoeas. *Ibid.*, vol. 2, no. 6, 21 pp.
- 1857c. Achtste bijdrage tot de kennis der vischfauna van Amboina. *Ibid.*, vol. 2, no. 7, 102 pp.
- 1857d. Over eenige vischverzamelingen van verschillende gedeelten van Java. Natuurk. Tijdschr. Nederlandsch Indië, vol. 13, pp. 475–480.
- 1858a. Zesde bijdrage tot de kennis der vischfauna van Sumatra. Visschen van Padang, Troesan, Priaman, Sibogha en Palembang. Acta Soc. Sci. Indo-Neerlandicae, vol. 3, no. 9, 50 pp.
- 1858b. Vierde bijdrage tot de kennis der ichthyologische fauna van Japan. *Ibid.*, vol. 3, no. 10, 46 pp., 4 pls.
- 1858c. Elfde bijdrage tot de kennis der ichthyologische fauna van Borneo. *Ibid.*, vol. 3, no. 13, 4 pp.

- 1858d. Tweede bijdrage tot de kennis der vischfauna van Singapore. *Natuurk. Tijdschr. Nederlandsch Indië*, vol. 15, pp. 241–254.
- 1858e. Enumeratio specierum piscium javanensium hucusque cognitarum. *Ibid.*, vol. 15, pp. 359–456.
- 1858–1859a. Zevende bijdrage tot de kennis der vischfauna van Sumatra. *Visschen van Palembang. Acta Soc. Sci. Indo-Neerlandicae*, vol. 5, no. 6, 12 pp.
- 1858–1859b. Twaalfde bijdrage tot de kennis der vischfauna van Borneo. *Visschen van Singawang. Ibid.*, vol. 5, no. 7, 10 pp.
- 1858–1859c. Vischsoorten gevangen bij Japara, vermeld door S.A. Thurkow. *Natuurk. Tijdschr. Nederlandsch Indië*, vol. 16, pp. 406–409.
- 1859a. Enumeratio specierum piscium hucusque in Archipelago indico observatarum, adjectis habitationibus citationibusque, ubi descriptiones earum recentiores reperiuntur, nec non speciebus musei Bleekeriani Bengalensibus, Japonicis, Capensibus Tasmonicisque. *Acta Soc. Sci. Indo-Neerlandicae*, vol. 6, no. 3, xxxvi+276 pp.
- 1859b. Negende bijdrage tot de kennis der vischfauna van Banka. *Natuurk. Tijdschr. Nederlandsch Indië*, vol. 18, pp. 359–378.
- 1859–1860a. Vischsoorten van Singapore, verzameld door Fr. Graaf de Castelnau. *Ibid.*, vol. 20, pp. 216–217.
- 1859–1860b. Derde bijdrage tot de kennis der vischfauna van Singapoera. *Ibid.*, vol. 20, pp. 446–456.
- 1860a. Tiende bijdrage tot de kennis der vischfauna van Banka. *Ibid.*, vol. 21, pp. 135–142.
- 1860b. Zesde bijdrage tot de kennis der vischfauna van Japan. *Acta Soc. Sci. Indo-Neerlandicae*, vol. 8, no. 1, 104 pp., pls. 1–2.
- 1860c. Achtste bijdrage tot de kennis der vischfauna van Sumatra. (*Visschen van Benkoelen, Priaman, Tandjong, Palembang en Djambi*). *Ibid.*, vol. 8, no. 2, 88 pp.
- 1860d. Dertiende bijdrage tot de kennis der vischfauna van Borneo. *Ibid.*, vol. 8, no. 4, 64 pp.
- 1860e. Dertiende bijdrage tot de kennis der vischfauna van Celebes. *Ibid.*, vol. 8, no. 7, 60 pp.
- 1861a. Zesde bijdrage tot de kennis der vischfauna van Ceram. *Natuurk. Tijdschr. Nederlandsch Indië*, vol. 22, pp. 228–238.
- 1861b. Vierde bijdrage tot de kennis der vischfauna van Bali. *Ibid.*, vol. 22, pp. 239–242.
- 1861c. Mededeeling omtrent vischsoorten, nieuw voor de kennis der fauna van Singapoera. *Verslag. Meded. K. Akad. Wetensch., Amsterdam*, vol. 12, pp. 28–63.
1862. Sixième mémoire sur la faune ichthyologique de l'île de Batjan. *Ibid.*, vol. 14, pp. 99–112.
- 1863a. Troisième mémoire sur la faune ichthyologique de l'île de Halmahéra. *Nederlandsch Tijdschr. Dierk.*, vol. 1, pp. 153–159.
- 1863b. Deuxième notice sur la faune ichthyologique de l'île d'Obi. *Ibid.*, vol. 1, pp. 239–245.
- 1863c. Septième notice sur la faune ichthyologique de l'île de Céram. *Ibid.*, vol. 1, pp. 253–261.
- 1865a. Notice sur les poissons envoyés de Chine au Musée de Leide par M-G. Schlegel. *Ibid.*, vol. 2, pp. 55–62.
- 1865b. Enumération des espèces de poissons actuellement connues de l'île de Céram. *Ibid.*, vol. 2, pp. 182–193.
- 1865c. Enumération des espèces de poissons actuellement connues de l'île d'Amboine. *Ibid.*, vol. 2, pp. 270–293.
1868. Sixième notice sur la faune ichthyologique de l'île de Bintang. *Verslag. Meded. K. Akad. Wetensch., Amsterdam*, ser. 2, vol. 2, pp. 289–294.
1872. Les clupées. In Bleeker, P., *Atlas ichthyologique des Indes Orientales Néerlandaises*. Amsterdam, vol. 6, pp. 79–143, pls. 259–274.
1873. Mémoire sur la faune ichthyologique de Chine. *Nederlandsch Tijdschr. Dierk.*, vol. 4, pp. 113–154.
1879. Enumération des espèces de poissons actuellement connues du Japon et description de trois espèces inédites. *Verhandel. K. Akad. Wetensch., Amsterdam*, vol. 18, pp. 1–33.
- BLEGVAD, H., AND B. LØPPENTHIN
1944. Fishes of the Iranian Gulf. Copenhagen, 247 pp., 135 figs., 12 pls.
- BLOCH, M. E.
1795. *Naturgeschichte der ausländischen Fische*. Berlin, pt. 9, iv+192 pp., pls.
1797. *Ichthyologie, ou histoire naturelle, générale et particulière des poissons, avec des figures enluminées, dessinées d'après nature*. Berlin, pt. 12, ii+142 pp., pls. 397–432.
1801. *Histoire naturelle des poissons, avec les figures dessinés d'après nature par Bloch, ouvrage classé par ordres, genres et espèces, d'après le système de Linné*. Paris, vol. 6, 327 pp., pls.
- BODOLA, A.
1966. Life history of the gizzard shad, *Dorosoma cepedianum* (Le Sueur), in western Lake Erie. *Fish. Bull. U.S. Fish Wildlife Serv.*, vol. 65, pp. 391–425, 15 figs.
- BOESEMAN, M.
1947. Revision of the fishes collected by Burger and Von Siebold in Japan. *Zool. Meded.*, vol. 28, pp. 1–242, 5 pls.

- BONN, E. W., AND L. R. HOLBERT
1961. Some effects of rotenone products on municipal water supplies. *Trans. Amer. Fish. Soc.*, vol. 90, pp. 287-297, 2 figs.
- BONNATERRE
1788. *Tableau encyclopédique et méthodique des trois règnes de la nature. Ichthyologie.* Paris, lvi+215 pp., 100 pls.
- BORODIN, N. A.
1932. Scientific results of the yacht "Alva" world cruise, July 1931 to March, 1932, in command of William K. Vanderbilt. *Bull. Vanderbilt Mus.*, vol. 1, pp. 65-101, 2 pls.
- BOSCHUNG, H. T., JR.
1961. An annotated list of fishes from the Coosa River System of Alabama. *Amer. Midland Nat.*, vol. 66, pp. 257-285.
- BOULENGER, G. A.
1887. An account of the fishes obtained by Surgeon-Major A. S. G. Jayakar at Muscat, east coast of Arabia. *Proc. Zool. Soc. London*, pp. 653-667, pl. 54.
- BOURRET, R.
1927. *Inventaire générale de l'Indochine. La faune de l'Indochine. Vertébrés.* Hanoi, 453 pp., 9 pls.
- BRANSON, B. A.
1967. Fishes of the Neosho River System in Oklahoma. *Amer. Midland Nat.*, vol. 78, pp. 126-154, 1 fig.
- BRANSON, B. A., C. J. MCCOYE, JR., AND M. E. SISK
1960. Notes on the freshwater fishes of Sonora with an addition to the known fauna. *Copeia*, pp. 217-220.
- BREDER, C. M., JR., AND D. E. ROSEN
1966. Modes of reproduction in fishes. *Garden City*, xvi+941 pp.
- BREVOORT, J. C.
1856. Notes on some figures of Japanese fish, taken from recent specimens by the artists of the U.S. Japan expedition. *In Narrative of the expedition of an American squadron to the Chinaseas and Japan in 1852, '53 and '54, by Commodore M. C. Perry, U.S. Navy.* Washington, vol. 11, pp. 255-288, pls. 3-12.
- BROUSSONET, P. M. A.
1782. *Ichthyologia, sistens piscium descriptiones et icones.* London, iv+41 pp. (unnumbered), 11 pls. (unnumbered).
1802. *Icones piscium rariorum.* 4 pp. (unnumbered), 11 pls. (unnumbered).
- BRUNGS, W. A., AND D. I. MOUNT
1967. Lethal endrin concentration in the blood of gizzard shad. *Jour. Fish. Res. Bd. Canada*, vol. 24, pp. 429-432, 1 fig.
- BRYAN, C. F., AND T. R. SOPHER
1969. New northern record for the threadfin shad, *Dorosoma petenense* (Günther), in coastal waters of California. *California Fish Game*, vol. 55, pp. 155-156.
- BURTON, T. M., AND N. H. DOUGLAS
1965. A survey of the fishes of Bayou DeSiard: an impoundment in northeastern Louisiana. *Proc. Louisiana Acad. Sci.*, vol. 28, pp. 90-95.
- CALHOUN, A. (ED.)
1966. *Inland fisheries management.* Sacramento, vi+546 pp.
- CANTOR, T. E.
1849. *Catalogue of Malayan fishes.* *Jour. Asiatic Soc. Bengal*, vol. 18, pt. 2, pp. i-xii+983-1443, pls. 1-14 (reprint: 1966, Amsterdam).
1850. *Catalogue of Malayan fishes.* Calcutta, xii+461 pp., 14 pls.
- CARLANDER, K. D.
1969. *Handbook of freshwater fishery biology. Volume one. Life history data on freshwater fishes of the United States and Canada, exclusive of the Perciformes.* Ames, viii+752 pp.
- CARTER, N. E., AND R. L. ELEY
1968. Effects of a flood on fish distribution in Keystone Reservoir. *Proc. Oklahoma Acad. Sci.*, vol. 47, pp. 382-385, 2 figs.
- CARUFEL, L. H.
1960. Evaluation of commercial fishing by use of a questionnaire. *Prog. Fish-Cult.*, vol. 22, pp. 181-184.
- CARUFEL, L. H., AND A. WITT
1963. Range extension of the gizzard shad, *Dorosoma cepedianum*, into North Dakota. *Copeia*, p. 178.
- CASTELNAU, F. DE
1872. Contribution to the ichthyology of Australia. No. I—The Melbourne Fish Market. *Proc. Zool. Acclim. Soc. Victoria*, vol. 1, pp. 29-242.
1873a. Contribution to the ichthyology of Australia. No. III—Supplement to the fishes of Victoria. *Ibid.*, vol. 2, pp. 37-58.
1873b. Contribution to the ichthyology of Australia. No. VIII—Fishes of Western Australia. *Ibid.*, vol. 2, pp. 123-149.
1878a. Australian fishes. New or little known species. *Proc. Linnean Soc. New South Wales*, vol. 2, pp. 225-248, pls. 2-3.
1878b. Notes on the fishes of the Norman River. *Ibid.*, vol. 3, pp. 41-51.
- CAVENDER, T.
1966. The caudal skeleton of the Cretaceous teleosts *Xiphactinus*, *Ichthyodectes*, and *Gillicus*, and its bearing on their relationship with *Chirocentrus*. *Occas. Papers Mus. Zool. Univ. Michigan*, no. 650, 15 pp., 4 figs., 1 pl.
- CHABANAUD, P.
1926. *Inventaire de la faune ichthyologique de l'Indochine.* Saigon, 26 pp.

- CHACKO, P. I.
1949. Food and feeding habits of the fishes of the Gulf of Manaar. *Proc. Indian Acad. Sci.*, vol. 29B, pp. 83-97.
1950. Marine plankton from the waters around Krusadi Island. *Ibid.*, vol. 31B, pp. 162-174, 1 fig.
- CHANG, C. L. (ED.)
1957. (Report of investigation of the fishes of the Gulf of Po-Hai in the Yellow Sea). Peking, iv+16, i+360 pp., 206 figs.
- CHARLES, J. J.
1967. The Dewey Lake (Reservoir) fishery during the first seventeen years of impoundment. *Fish. Bull. Kentucky Dept. Fish Wildlife Resources*, no. 47, 63 pp.
- CHAUDHURI, B. L.
1916. Fauna of the Chilka Lake. Part 1. *Mem. Indian Mus.*, vol. 5, pp. 403-439, 11 figs.
- CHEN, J. T. F.
1951. Check-list of the species of fishes known from Taiwan (Formosa). *Quart. Jour. Taiwan Mus.*, vol. 4, pp. 181-210.
- CHEVEY, P.
1932a. Inventaire de la faune ichthyologique de l'Indochine. Saigon, 31 pp.
1932b. Poissons des campagnes du "de Lanessan." Saigon, 155 pp., 50 pls.
1934. Revision synonymique de l'oeuvre ichthyologique de G. Tirant. Saigon, 291 pp.
- CHIN, T. Y.
1935. A survey of the fishery industries of Tinghai. *Bull. Chekiang Prov. Fish. Exp. Sta.*, vol. 1, no. 2, 30 pp.
- CHOPRA, B. N. (ED.)
1951. Indian fisheries. New Delhi, 129 pp.
- CHRISTENSON, L. M., AND L. L. SMITH
1965. Characteristics of fish populations in upper Mississippi River backwater areas. U.S. Dept. Int. Fish Wild. Service, Circ. no. 212, 53 pp., 3 figs.
- CHUNG, M.
1961. Illustrated encyclopedia. The fauna of Korea. (2). Fishes. Seoul, iv+861 pp., 240 figs., 72 (color)+239 (black and white) pls.
- CLAY, W. M.
1962. A field manual of Kentucky fishes. Frankfort, 147 pp., 94 figs.
- CLEMENS, H. P., AND W. W. JOHNSON
1964. Specificity of the gonadal hydration factors in the pituitary of some freshwater fishes. *Copeia*, pp. 389-398, 5 figs.
- COCKERELL, T. D. A.
1915. The scales of some Australian fishes. *Mem. Queensland Mus.*, vol. 3, pp. 35-46.
- COLLINS, J. L., AND A. H. HULSEY
1963. Hauling mortality of threadfin shad reduced with M.S. 222 and salt. *Prog. Fish-Cult.*, vol. 25, pp. 105-106.
- COOK, S. F., JR., AND R. L. MOORE
1966. Population fluctuations of threadfin shad, Clear Lake gnat larvae, and plankton in a Lake County farm pond 1961-1965. *Proc. California Mosquito Control Assoc.*, vol. 33, pp. 60-61.
- CRAMER, J. D., AND G. R. MARZOLF
1970. Selective predation of zooplankton by gizzard shad. *Trans. Amer. Fish. Soc.*, vol. 99, pp. 320-332, 3 figs.
- CROSS, F. B.
1967. Handbook of fishes of Kansas. Topeka, 357 pp., illus.
- CUERRIER, J.-P.
1962. Inventaire biologique des poissons et des pêcheries de la région du Lac Saint-Pierre. *Nat. Canadien*, vol. 89, pp. 193-214, 7 figs.
- CUVIER, G. L. C. F. G.
1817. Le règne animal, distribué d'appès son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée. Tome II. Les reptiles, les poissons, les mollusques et les annélides. Paris, 532 pp.
- DAHLBERG, M. D., AND D. C. SCOTT
1971. The freshwater fishes of Georgia. *Bull. Georgia Acad. Sci.*, vol. 29, pp. 1-64.
- DAVID, A.
1954. A preliminary survey of the fish and fisheries of a five-mile stretch of the Hooghly River near Barrackpore. *Indian Jour. Fish.*, vol. 1, pp. 231-255.
- DAVIS, J. T.
1960. Fish populations and aquatic conditions in polluted waters in Louisiana. *Bull. Louisiana Wild Life Fish. Comm.*, no. 1, 121 pp., 21 figs.
- DAVIS, J. T., AND L. POSEY, JR.
1960. Relative selectivity of freshwater commercial fishing devices used in Louisiana. *Bull. Louisiana Wild Life and Fish. Comm.*, no. 3, 27 pp., 9 figs. and supplement.
- DAY, F.
1865a. On the fishes of Cochin, on the Malabar coast of India. *Proc. Zool. Soc. London*, pp. 286-318.
1865b. The fishes of Malabar. London, xxxii+293 pp., 20 pls.
1869a. On the fishes of Orissa—Part II. *Proc. Zool. Soc. London*, pp. 369-387.
1869b. On the freshwater fishes of Burma. *Ibid.*, pp. 614-623.
1870. On the fishes of the Andaman Islands. *Ibid.*, pp. 677-705.
1873. Report on the freshwater fish and fisheries

- of India and Burma. Calcutta, x+118 pp., and appendix.
1878. The fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma, and Ceylon. London, xx+778 pp., 195 pls. (reprint: 1958, London).
1889. The fauna of British India, including Ceylon and Burma. Fishes. London, Calcutta, Bombay, and Berlin, vol. 1, xviii+548 pp., 164 figs.
- DEACON, J. E.
1961. Fish populations, following a drought, in the Neosho and Marais des Cygnes Rivers of Kansas. Univ. Kansas Publ., Mus. Nat. Hist., vol. 13, pp. 359-427, 3 figs., pls. 26-30.
- DEACON, J. E., AND A. L. METCALF
1961. Fishes of the Wakarusa River in Kansas. Univ. Kansas Publ., Mus. Nat. Hist., vol. 13, pp. 309-322.
- DELSMAN, H. C.
1923. Fish eggs and larvae from the Java Sea. Treubia, vol. 3, pp. 38-46, 9 figs.
1926a. Fish eggs and larvae from the Java Sea. 7. The genus *Clupea*. *Ibid.*, vol. 8, pp. 218-239, 35 figs.
1926b. Fish eggs and larvae from the Java Sea. 8. *Dorosoma chacunda*. *Ibid.*, vol. 8, pp. 389-394, 9 figs.
1933. Fish eggs and larvae from the Java Sea. 22. *Clupeoides lile* (C.V.). *Ibid.*, vol. 14, pp. 247-249.
- DELSMAN, H. C., AND J. D. F. HARDENBERG
1934. De indische zeevisschen en zeevisscherij. Djakarta, viii+388 pp., 273 figs.
- DERANIYAGALA, P. E. P.
1929. Ceylon sardines. Spolia Zeylanica, vol. 15, pp. 31-47, pls. 13-18.
1933. Names of some fishes from Ceylon. Ceylon Jour. Sci., sec. C, Fisheries, vol. 5, pp. 79-111.
1952. A colored atlas of some vertebrates from Ceylon. Colombo, xiv+149 pp., 60 figs., 34 pls.
- DEVANESAN, D. W., AND K. CHIDAMBARAM
1941. On two kinds of fish eggs hatched out in the laboratory of West Hill Biological Station, Calicut. Curr. Sci., vol. 10, pp. 259-261.
1942. On two kinds of fish eggs hatched out in the laboratory of West Hill Biological Station, Department of Fisheries, Calicut. Proc. Indian Sci. Congr., vol. 28, pt. 3, p. 180.
1953. The common food-fishes of the Madras State. Madras, x+79 pp., illus.
- DICKINSON, W. E.
1960. Handbook of Wisconsin fishes. Milwaukee, 83 pp., 167 figs.
- DOMANTAY, J. S.
1940. The fishery industries of Zamboanga. Philippine Jour. Sci., vol. 71, pp. 81-112, 7 figs., 6 pls.
1958. The aquatic products of Zamboanga, Basilan and the Sulu Archipelago. Philippine Jour. Fish., vol. 6, pp. 17-40.
- DUNCKER, G.
1904. Die Fische der malayischen Halbinsel. Mitt. Naturhist. Mus. Hamburg, vol. 21, pp. 133-207, 2 pls.
- DURAND, J.
1945. Principaux poissons comestibles d'Indochine. Saigon, 71 pp., 63 figs.
- ECHEELE, A. A., AND J. B. MENSE
1968. Forage value of Mississippi silversides in Lake Texoma. Proc. Oklahoma Acad. Sci., vol. 47, pp. 394-396.
- ELERA, C. DE
1895. Catálogo sistemático de toda la fauna de Filipinas conocida hasta el presente, y a la vez el de la colección zoológica del museo de PP. Dominicos del Colegio-Universidad de Sto. Tomás de Manila. I. Vertebrados. Manila, x+701 pp.
- ERDMAN, D. S.
1967. Inland game fishes of Puerto Rico. San Juan, no pagination, illus.
- EVERMANN, B. W., AND W. C. KENDALL
1898. Descriptions of new or little known genera and species of fishes from the United States. Bull. U.S. Fish Comm., for 1897, vol. 17, pp. 125-133, pls. 6-9.
- EVERMANN, B. W., AND A. SEALE
1907. Fishes of the Philippine islands. Bull. Bur. Fish., vol. 26, pp. 49-110, 22 figs.
- FINUCANE, J. H.
1965. Threadfin shad in Tampa Bay, Florida. Quart. Jour. Florida Acad. Sci., vol. 28, pp. 267-270.
- FISHER, H. J.
1962. Some fishes of the lower Missouri River. Amer. Midland Nat., vol. 68, pp. 424-429, 1 fig.
- FITZ, R. B.
1966. Unusual food of a paddle fish (*Polyodon spathula*) in Tennessee. Copeia, p. 356.
1968. Fish habitat and population changes resulting from impoundment of Clinch River by Melton Hill Dam. Jour. Tennessee Acad. Sci., vol. 43, pp. 7-15, 1 fig.
- FOWLER, H. W.
1918. A list of Philippine fishes. Copeia, no. 58, pp. 62-65.
1924. Notes and descriptions of Indian fishes. Jour. Bombay Nat. Hist. Soc., vol. 30, pp. 36-41.
1927. Notes on the Philippine fishes in the collection of the academy. Proc. Acad. Nat. Sci. Philadelphia, vol. 79, pp. 255-297.

1928. The fishes of Oceania. Mem. Bernice P. Bishop Mus., vol. 10, pp. i-iii, 1-540, pls. 1-49.
1929. Further notes and descriptions of Bombay shore fishes. Jour. Bombay Nat. Hist. Soc., vol. 33, pp. 100-119, 2 pls.
1930. Notes on Japanese and Chinese fishes. Proc. Acad. Nat. Sci. Philadelphia, vol. 81, pp. 589-616.
- 1931a. A synopsis of the fishes of China. Part II. The herrings and related fishes. Hong Kong Nat., vol. 2, pp. 69-79, 7 figs.
- 1931b. A small collection of fishes from Singapore. Proc. Acad. Nat. Sci. Philadelphia, vol. 83, pp. 443-448.
- 1934a. Zoological results of the third de Schauensee Siamese expedition, part I.—Fishes. *Ibid.*, vol. 86, pp. 67-163, 129 figs., pl. 12.
- 1934b. The fishes of Oceania—Supplement 2. Mem. Bishop Mus., vol. 11, pp. 385-466, 4 figs.
1935. Zoological results of the third de Schauensee Siamese Expedition, part VI.—Fishes obtained in 1934. Proc. Acad. Nat. Sci. Philadelphia, vol. 87, pp. 89-163, 132 figs.
- 1938a. The fishes of the George Vanderbilt South Pacific Expedition 1937. Monogr. Acad. Nat. Sci. Philadelphia, no. 2, viii+349 pp., 12 pls.
- 1938b. A list of the fishes known from Malaya. Fisheries Bull., Singapore, no. 1, pp. 1-268.
1940. Zoological results of the George Vanderbilt Sumatran Expedition, 1936-1939. Part II.—The fishes. Proc. Acad. Nat. Sci. Philadelphia, vol. 91, pp. 369-398.
1941. Contributions to the biology of the Philippine Archipelago and adjacent regions. Bull. U.S. Natl. Mus., no. 100, vol. 13, x+879 pp., 30 figs.
1956. Fishes of the Red Sea and southern Arabia. Vol. 1. Branchiostomida to Polynemida. Jerusalem, iv+240 pp., 117 figs.
- FOX, L. S., AND W. R. MOCK, JR.
1968. Seasonal occurrence of fishes in two shore habitats in Barataria Bay, Louisiana. Proc. Louisiana Acad. Sci., vol. 31, pp. 43-53, 1 fig.
- FRANKS, J. S.
1970. An investigation of the fish population within the inland waters of Horn Island, Mississippi, a barrier island in the northern Gulf of Mexico. Gulf Res. Rept., vol. 3, pp. 3-104, 8 figs.
- FRANZ, V.
1910. Die japanischen Knochenfische der Sammlungen Haberer und Doflein. Abhandl. Bayerischen Akad. Wiss., Suppl., vol. 4, no. 1, 135 pp., 7 figs., 11 pls.
- FRY, J. P., AND W. D. HANSON
1968. Lake Taneycomo, a cold-water reservoir in Missouri. Trans. Amer. Fish. Soc., vol. 97, pp. 138-145, 3 figs.
- FUMIYAMA, I., T. ABE, AND O. R. DOKI
1966. Encyclopaedia zoologica illustrated in colours. Tokyo, vol. 2, 392+86 pp., illus.
- GAMMON, J. R.
1965. The distribution of fishes in Putnam County, Indiana, and vicinity. Proc. Indiana Acad. Sci., vol. 74, pp. 353-359.
- GASAWAY, C. R., AND V. W. LAMBOU
1968. A simple surface midwater trawl. Prog. Fish-Cult., vol. 30, pp. 178-180, 4 figs.
- GEAGAN, D. W., AND T. D. ALLEN, JR.
1961. An ecological survey of factors affecting fish production in Louisiana waters. Bull. Louisiana Wildlife and Fish. Comm., no. 2, 100 pp., 53 figs.
- GELDERN, C. E. VON, JR.
1971. Abundance and distribution of fingerling largemouth bass, *Micropterus salmoides*, as determined by electrofishing, at Lake Nacimiento, California. California Fish Game, vol. 57, pp. 228-245, 3 figs.
- GERY, J.
1971. On certain fresh-water fishes from British Honduras. The Aquarium, vol. 148, pp. 48-52, 2 figs.
- GILL, T.
1862. Catalogue of the fishes of the eastern coast of North America from Greenland to Georgia. Proc. Acad. Nat. Sci. Philadelphia, for 1861, suppl., 63 pp.
- GMELIN, J. F.
1788. Caroli a Linné. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species; cum characteribus, differentiis, synonymis, locis. Leipzig, vol. 1, pt. 3, pp. 1033-1516.
1789. Caroli a Linné. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species; cum characteribus, differentiis, synonymis, locis. Lugduni, vol. 1, pt. 3, pp. 1033-1516.
- GOGORZA Y GONZALES, J.
1887. Datos para la fauna Filipina. Ann. Soc. Española Hist. Nat., vol. 17, pp. 247-303.
- GOODSON, L. F., JR.
1964. Diet of striped bass at Millerton Lake, California. California Fish Game, vol. 50, p. 307.
1965. Diets of four warm water game fishes in a fluctuating, steep-sided California reservoir. California Fish Game, vol. 51, pp. 259-269.
- GOSLINE, W. A.
1960. Contributions toward a classification of modern isospondylous fishes. Bull. Brit.

- Mus. (Nat. Hist.), Zool., vol. 6, pp. 325-365, 15 figs.
- GRANADOS, R. R., AND M. L. SEVILLA
1963. Lista preliminar de recursos pesqueros de Mexico marinos y de agua dulce. Publ. Inst. Nac. Inves. Biol. Pesqueros, no. 3, pp. 323-361.
- GRAY, J. E.
1833-1834. Illustrations of Indian zoology chiefly selected from the collection of Major-General Hardwicke, F.R.S., L.S., M.R.A.S., M.R.I.A., &c., &c. London, 4 pp. (un-numbered), 102 pls.
- GREESON, P. E.
1963. An annotated checklist of fishes from Dix River and tributaries (exclusive of Herrington Reservoir). Trans. Kentucky Acad. Sci., vol. 24, pp. 23-27.
- GRINSTEAD, B. G.
1969. A fish pump as a means of harvesting gizzard shad from tail waters of TVA reservoirs. Prog. Fish-Cult., vol. 31, pp. 236-238, 3 figs.
- GRZENDA, A. R., D. F. PARIS, AND W. J. TAYLOR
1970. The uptake, metabolism and elimination of chlorinated residues by goldfish (*Carassius auratus*) fed a ¹⁴C-DDT contaminated diet. Trans. Amer. Fish. Soc., vol. 99, pp. 385-396.
- GÜNTHER, A.
1861. List of cold-blooded Vertebrata collected by B. H. Hodgson, Esq., in Nepal. Proc. Zool. Soc. London, pp. 213-227.
1866. Fishes of the states of Central America collected by Messrs. Salvin and Godman and Capt. Dow. *Ibid.*, pp. 600-604.
1868. Catalogue of the Physostomi, containing the families Heteropygii, Cyprinidae, Gonorrhynchidae, Hyodontidae, Osteoglossidae, Clupeidae, Chirocentridae, Alepocephalidae, Notopteridae, Halosauridae, in the collection of the British Museum. London, xx+512 pp.
1874. Third notice of a collection of fishes made by Mr. Swinhoe in China. Ann. Mag. Nat. Hist., ser. 4, vol. 13, pp. 154-159.
1880. Report on the shore fishes procured during the voyage of H.M.S. Challenger in the years 1873-1876. In Thomson, C. W. (ed.), Zoology of the voyage of H.M.S. Challenger. Edinburgh, vol. 1, pt. 6, pp. 1-82, 32 pls. (reprint: 1963, Lehre, Codicote, and New York).
1898. Report on a collection of fishes from Newchwang, North China. Ann. Mag. Nat. Hist., ser. 7, vol. 1, pp. 257-263.
1909-1910. Andrew Garrett's Fische der Sudsee. Band III. Jour. Mus. Godeffroy, vol. 6, pp. 261-388, 17 figs., pls. 141-180 (reprint: 1966, Lehre, Codicote, and New York).
- GUNTER, G.
1967. Some relationships of estuaries to the fisheries of the Gulf of Mexico. In Lauff, G. H. (ed.), Estuaries. Washington, pp. 621-638, 2 figs.
- GUNTER, G., AND G. E. HALL
1963. Biological investigations of the St. Lucie Estuary (Florida) in connection with Lake Okeechobee discharges through the St. Lucie Canal. Gulf Res. Rept., vol. 1, pp. 189-307, illus.
1965. A biological investigation of the Calloosahatchee Estuary of Florida. *Ibid.*, vol. 2, pp. 1-71, 3 pls.
- HADLEY, W. F., AND W. A. CARTER
1961. Fishes known from Salt Creek, Osage County, Oklahoma. Proc. Oklahoma Acad. Sci., vol. 42, pp. 128-132.
- HALEY, R., S. P. DAVIS, AND J. M. HYDE
1967. Environmental stress and *Aeromonas liquefaciens* in American and threadfin shad mortalities. Prog. Fish-Cult., vol. 29, p. 193.
- HALL, G. E., (ED.)
1971. Reservoir fisheries and limnology. Special Pub. Amer. Fish. Soc., no. 8, x+511 pp.
- HALSTEAD, B. W.
1967. Poisonous and venomous marine animals of the world, vol. 2—Vertebrates. xxxii+1070 pp., figs. and pls.
- HAMILTON, F.
1822. An account of the fishes found in the River Ganges and its branches. Edinburgh, viii+405 pp., 39 pls.
- HANEK, G., AND C. H. FERNANDO
1971. *Pseudomazocraeoides ontariensis* n. sp. (Monogenoidea: Mazocraeidae) from *Dorosoma cepedianum* (LeSueur) in Bay of Quinte, Ontario. Canadian Jour. Zool., vol. 49, pp. 573-575.
- HANSON, W. D., AND R. S. CAMPBELL
1963. The effects of pool size and beaver activity on distribution and abundance of warm-water fishes in a north Missouri stream. Amer. Midland Nat., vol. 69, pp. 136-149, 5 figs.
- HARDENBERG, J. D. F.
1931. The fish fauna of the Rokan mouth. Treubia, vol. 13, pp. 81-168.
1934. Additional notes to my paper "the fish-fauna of the Rokan mouth." *Ibid.*, vol. 14, pp. 299-312, 4 figs.
1936. On a collection of fishes from the estuary and the lower and middle course of the River Kapuas (W. Borneo). *Ibid.*, vol. 15, pp. 225-254.

1937. Hydrological and ichthyological observations in the mouth of the Kumai-River (S.W. Borneo). *Ibid.*, vol. 16, pp. 1-14.
- HARDER, W.
1958a. Vergleichende Untersuchungen zur Morphologie des Darmes bei Clupeoidea. *Zeitschr. Wiss. Zool.*, vol. 163, pp. 65-167, 31 figs.
1958b. Zur Anatomie des Darmtraktes einiger Familien du Clupeoidea: Clupeidae, Dorosomatidae, Dussumieriidae und Engraulidae (Clupeiformes, Pisces). *Kurze Mitt. Inst. Fish. Univ. Hamburg*, no. 8, pp. 11-61, 103 figs.
1964. Anatomie der Fische. In Wundsch, H. H. (ed.), *Handbuch der Binnenfischerei Mitteleuropas*. Stuttgart, vol. 2A, 308 pp., 266 figs., 19 pls.
- HARLAN, J. R., AND E. B. SPEAKER (EDS.)
1969. Iowa fish and fishing. Iowa, x+365 pp., illus.
- HEIM, W.
1935. Über die Rachensäcke der Characiniden und über verwandte akzessorische Organe bei andern Teleosteen. *Zool. Jahrb., Anat.*, vol. 60, pp. 61-132, 23 figs., 2 pls.
- HELLIER, T. R., JR.
1967. The fishes of the Santa Fe River System. *Bull. Florida State Mus.*, vol. 11, pp. 1-46, 9 figs.
- HENNIG, W.
1966. Phylogenetic systematics. Urbana, 263 pp., 69 figs.
- HERGENRADER, G. L., AND Q. P. BLISS
1971. The white perch in Nebraska. *Trans. Amer. Fish. Soc.*, vol. 100, pp. 734-738, 1 fig.
- HERRE, A. W.
1932a. A check list of fishes recorded from Tahiti. *Jour. Pan-Pacific Res. Inst.*, vol. 7, no. 1, pp. 2-6.
1932b. Fishes from Kwangtung Province and Hainan Island, China. *Lingnan Sci. Jour.*, vol. 11, pp. 423-443.
1933a. A check list of fishes from Sandakan, British North Borneo. *Jour. Pan-Pacific Res. Inst.*, vol. 8, no. 4, pp. 2-5.
1933b. A check list of fishes from Dumaguete, Oriental Negros, P.I., and its immediate vicinity. *Ibid.*, vol. 8, no. 4, pp. 6-11.
1934a. Hong Kong fishes collected in October-December, 1931. *Hong Kong Nat., Suppl.*, no. 3, pp. 26-36.
1934b. The fishes of the Herre 1931 Philippine expedition with descriptions of 17 new species. *Hong Kong*, 106 pp.
1940a. On a collection of littoral and freshwater fishes from the Andaman Islands. *Rec. Indian Mus.*, vol. 42, pp. 1-8.
1940b. On a small collection of fish from the Mergui Archipelago. *Ibid.*, vol. 42, pp. 9-14.
1941. A list of the fishes known from the Andaman Islands. *Mem. Indian Mus.*, vol. 13, pp. 331-403.
1945. Marine fishes from Chusan Archipelago and the Chinese coast. *Lingnan Sci. Jour.*, vol. 21, pp. 107-122.
1953. Check list of Philippine fishes. *U.S. Fish Wildlife Res. Rep.*, no. 20, 977 pp.
1959. Marine fishes in Philippine rivers and lakes. *Philippine Jour. Sci.*, vol. 87, pp. 65-88.
- HERRE, A. W., AND G. S. MYERS
1931. Fishes from southeastern China and Hainan. *Lingnan Sci. Jour.*, vol. 10, pp. 233-254.
1937. A contribution to the ichthyology of the Malay Peninsula. *Bull. Raffles Mus.*, no. 13, pp. 5-75, 7 pls.
- HIDA, T. S., AND D. A. THOMSON
1962. Introduction of the threadfin shad to Hawaii. *Prog. Fish-Cult.*, vol. 24, pp. 159-163.
- HILDEBRAND, S. F.
1964. Family Clupeidae. *Mem. Sears Found. Marine Res.*, no. 1, pt. 3, pp. 257-385, 397-442, figs. 62-94, 98-115.
- HIYAMA, Y.
1941. Illustrations of edible aquatic products in southern waters. Japan, 7+v pp., 149 pls.
1943. Poisonous fish of the mandated islands. Japan, 136+iii pp., 29 pls.
- HIYAMA, Y., AND F. YASUDA
1961. Japanese fishes. Tokyo, 12+155+xxxix pp., 210 pls.
- HOESE, H. D.
1963. Salt tolerance of the eastern mudminnow, *Umbra pygmaea*. *Copeia*, pp. 165-166.
- HOFFMAN, G. L.
1970. Parasites of North American freshwater fishes. Berkeley and Los Angeles, x+486 pp., 252 figs.
- HOLMES, W. N., AND E. M. DONALDSON
1969. The body compartments and the distribution of electrolytes. In Hoar, W. S., and D. J. Randall (eds.), *Fish Physiology*. New York and London, vol. 1, pp. 1-89, 4 figs.
- HONMA, Y.
1952. A list of the fishes collected in the province of Echigo, including Sado Island. *Japanese Jour. Ichthyol.*, vol. 2, pp. 138-146.
1956. A list of the fishes found in the vicinity of Sado Marine Biological Station. II. *Jour. Fac. Sci. Niigata Univ.*, ser. II, vol. 2, pp. 79-87.
- HOPKINS, S. H.
1966. A comparison of the parasites of two freshwater shads, *Dorosoma (Dorosoma) cepedianum* and *Dorosoma (Signalosa) petenense*, in Lake Texoma. *Jour. Parasitol.*, vol. 52, p. 843.

- HORA, S. L.
1924. Zoological results of a tour in the Far East. Fish of the Tale Sap, peninsular Siam (Part 1). Mem. Asiatic Soc. Bengal, vol. 6, pp. 461-530, 10 figs.
- HOREL, G., AND M. T. HUISSH
1960. The effects of fish removal and other factors upon remaining fish populations at Lake Trafford, Florida. Prog. Fish-Cult., vol. 22, pp. 73-76.
- HORNELL, J.
1918. A statistical analysis of the fishing industry of Tuticorin (South India). Bull. Madras Fish. Dept., no. 11, pp. 67-117, 7 figs.
- HOUSER, A., AND J. E. DUNN
1967. Estimating the size of the threadfin shad population in Bull Shoals Reservoir from midwater trawl catches. Trans. Amer. Fish. Soc., vol. 96, pp. 176-184.
- HOUTTUYN, M.
1782. Beschryving van eenige japanse visschen, en andere zeeschepzelen, Verhandel. Hollandsche Maatsch. Weetensch. Harlem, vol. 20, no. 2, pp. 311-350.
- HOYT, R. D., S. E. NEFF, AND L. A. KRUMHOLZ
1970. An annotated list of fishes from the upper Salt River, Kentucky. Trans. Kentucky Acad. Sci., vol. 31, pp. 51-60, 3 figs.
- HUBBS, C. L., AND R. R. MILLER
1941. *Dorosoma smithi*, the first known gizzard shad from the Pacific drainage of Middle America. Copeia, pp. 232-238, 1 fig.
- HUNN, J. B., AND P. F. ROBINSON
1966. Some blood chemistry values for five Chesapeake Bay area fishes. Chesapeake Sci., vol. 7, pp. 173-175.
- HUNSAKER, D., JR., AND R. W. CRAWFORD
1964. Preferential spawning behavior of the largemouth bass, *Micropterus salmoides*. Copeia, pp. 240-241.
- HYRTL, J.
1855. Über die accessorischen Kiemenorgane der Clupeaceen, nebst Bemerkungen über den Darmcanal derselben. Denkschr. Akad. Wiss. Wien, vol. 10, pp. 47-57, 3 pls.
- INGER, R. F.
1955. Ecological notes on the fish fauna of a coastal drainage of North Borneo. Fieldiana, Zool., vol. 37, pp. 47-90, figs. 10-13.
- INTENGAN, C. L., L. G. ALEJO, I. CONCEPCIÓN, V. A. CORPUS, R. D. SALUD, I. DEL ROSARIO, R. GOMEZ, AND J. HENSON
1956. Composition of Philippine foods. Philippine Jour. Sci., vol. 85, pp. 203-213.
- ISAACSON, P. A., AND R. L. POOLE
1965. The thread fin shad, *Dorosoma petenense*, in northern California ocean water. California Fish Game, vol. 51, pp. 56-57.
- ISHIKAWA, C., AND K. MATSUÛRA
1897. Preliminary catalogue of fishes including Dipnoi, Cyclostomi and Cephalochordata in the collection of the Natural History Department, Imperial Museum. Tokyo, ii+65 pp.
- ISOM, B. G.
1960. Outbreaks of columnaris in Center Hill and Old Hickory Reservoirs, Tennessee. Prog. Fish-Cult., vol. 22, pp. 43-45.
- IVERSON, R. T. B.
1971. Use of threadfin shad, *Dorosoma petenense*, as live bait during experimental pole-and-line fishing for skipjack tuna, *Katsuwonus pelamis*, in Hawaii. Natl. Oceanic Atmos. Admin. Tech. Rept., Natl. Marine Fish. Serv., Special Sci. Rept. Fish., no. 641, 10 pp., 3 figs.
- IWAI, T.
1956. Anatomy of the pharyngeal pockets of the Japanese gizzard shad, *Konosirus punctatus* (Temminck et Schlegel). Bull. Japanese Soc. Sci. Fish., vol. 22, pp. 9-11, 4 figs.
- IZUKA, A., AND K. MATSUÛRA
1920. Catalogue of the zoological specimens exhibited in the Natural History Department, Tokyo Imperial Museum (Vertebrata). Tokyo, 10+192 pp., illus.
- JACOB, P. K.
1948. Natural history of the gizzard-shad *Anodontostoma chacunda* (Ham. Buch.) and its fishery on the west coast of Madras Province. Jour. Bombay Nat. Hist. Soc., vol. 48, pp. 159-160.
- JAMES, P. S. B. R., AND C. ADOLPH
1971. Observations on trawl fishing in the Palk Bay and Gulf of Manaar in the vicinity of Mandapam. Indian Jour. Fish., vol. 12, pp. 530-545.
- JENKINS, J. T.
1910. Notes on fish from India and Persia, with descriptions of new species. Rec. Indian Mus., vol. 5, pp. 123-139, pl. 6.
1912. Observations on the shallow-water fauna of the Bay of Bengal made on the Bengal fisheries steam-trawler "Golden Crown," 1908-1909. *Ibid.*, vol. 7, pp. 51-64, pl. 4.
- JERDON, T. C.
1851. Ichthyological gleanings in Madras. Madras Jour. Lit. Sci., vol. 17, pp. 128-151.
- JESTER, D. B., AND B. L. JENSEN
1972. Life history and ecology of the gizzard shad, *Dorosoma cepedianum* (Le Sueur) with reference to Elephant Butte Lake. New Mexico State Univ., Agric. Exp. Sta. Res. Rept., no. 218, 56 pp., 26 figs.
- JOB, T. J., A. DAVID, AND K. N. DAS
1955. Fish and fisheries of the Mahanadi in

- relation to the Hirakud Dam. *Indian Jour. Fish.*, vol. 2, pp. 1-36.
- JOHNSON, D. W.
1968. Pesticides and fishes—A review of selected literature. *Trans. Amer. Fish. Soc.*, vol. 97, pp. 398-424.
1970. Chlorinated hydrocarbon pesticides in representative fishes of southern Arizona. *Pest. Monitor. Jour.*, vol. 4, pp. 57-61.
- JOHNSON, J. E.
1968. Albinistic carp, *Cyprinus carpio*, from Roosevelt Lake, Arizona. *Trans. Amer. Fish. Soc.*, vol. 97, pp. 209-210.
1970. Age, growth, and population dynamics of threadfin shad, *Dorosoma petenense* (Günther), in central Arizona reservoirs. *Ibid.*, vol. 99, pp. 739-753.
1971. Maturity and fecundity of threadfin shad, *Dorosoma petenense* (Günther), in central Arizona reservoirs. *Ibid.*, vol. 100, pp. 74-85, 7 figs.
- JOHNSON, J. E., J. N. RENNE, AND W. L. MINCKLEY
1970. Selectivity and efficiency of some commercial fishing devices in central Arizona reservoirs. *Jour. Arizona Acad. Sci.*, vol. 6, pp. 46-50.
- JOHNSON, M., AND G. C. BECKER
1970. Annotated list of the fishes of Wisconsin. *Wisconsin Academy of Sci., Arts, Lett.*, vol. 58, pp. 265-300.
- JOHNSTON, T. H.
1942. The metacercaria stage of Australian species of *Clinostomum*. *Rec. South Australian Mus.*, vol. 7, pp. 187-191, figs. 1-2.
- JOHNSTON, T. H., AND M. J. BANCROFT
1919. Some new sporozoan parasites of Queensland freshwater fish. *Proc. Roy. Soc. New South Wales*, vol. 52, pp. 520-528, pls. 43-47.
1921. The freshwater fish epidemics in Queensland rivers. *Proc. Roy. Soc. Queensland*, vol. 33, pp. 174-210.
- JONES, S.
1951. Bibliography of breeding habits and development of estuarine and marine fishes of India. *Jour. Zool. Soc. India*, vol. 3, pp. 121-139.
- JONES, S., AND P. BENSAM
1968. An annotated bibliography on the breeding habits and development of fishes of the Indian region. *Bull. Cent. Marine Fish. Res. Institute*, no. 3, 154 pp.
- JONES, S., AND K. H. SUJANSINGANI
1954. Fish and fisheries of the Chilka Lake with statistics. *Indian Jour. Fish.*, vol. 1, pp. 256-344, 4 figs., pls. 6-8.
- JORDAN, D. S.
1920. The genera of fishes. Part IV. From 1881 to 1920, thirty-nine years, with the accepted type of each. *Stanford*, pp. 411-576, and index.
- JORDAN, D. S., AND B. W. EVERMANN
1896. The fishes of North and Middle America. Part 1. *Bull. U.S. Natl. Mus.*, no. 47, lx+1240 pp.
1902. Notes on a collection of fishes from the island of Formosa. *Proc. U.S. Natl. Mus.*, vol. 25, pp. 315-368.
1917. The genera of fishes from Linnaeus to Cuvier, 1758-1833, seventy-five years, with the accepted type of each. *Stanford*, pp. 1-160.
- JORDAN, D. S., AND C. H. GILBERT
1882. On certain neglected generic names of *La Cépède*. *Proc. U.S. Natl. Mus.*, vol. 5, pp. 570-576.
- JORDAN, D. S., AND A. C. HERRE
1906. A review of the herring-like fishes of Japan. *Proc. U.S. Natl. Mus.*, vol. 31, pp. 613-645.
- JORDAN, D. S., AND C. L. HUBBS
1925. Record of fishes obtained by David Starr Jordan in Japan, 1922. *Mem. Carnegie Mus.*, vol. 10, pp. 93-346, pls. 5-12.
- JORDAN, D. S., AND C. W. METZ
1913. A catalog of the fishes known from the waters of Korea. *Mem. Carnegie Mus.*, vol. 6, pp. 1-65, 67 figs., pls. 1-10.
- JORDAN, D. S., AND R. E. RICHARDSON
1908. Fishes from islands of the Philippine Archipelago. *Bull. Bur. Fish.*, vol. 27, pp. 233-287, 12 figs.
1909. A catalog of the fishes of the island of Formosa, or Taiwan, based on the collections of Dr. Hans Sauter. *Mem. Carnegie Mus.*, vol. 4, pp. 159-204, 29 figs., pls. 63-74.
1910. Check-list of the species of fishes known from the Philippine Archipelago. *Manila Sci. Bur.*, pub. no. 1, 78 pp.
- JORDAN, D. S., AND A. SEALE
1905a. List of fishes collected by Dr. Bashford Dean on the Island of Negros, Philippines. *Proc. U.S. Natl. Mus.*, vol. 28, pp. 769-803.
1905b. List of fishes collected at Hong Kong by Captain William Finch, with description of five new species. *Proc. Davenport Acad. Sci.*, vol. 10, pp. 1-17, pls. 1-13.
1906. The fishes of Samoa. Description of the species found in the archipelago, with a provisional check-list of the fishes of Oceania. *Bull. Bur. Fish.*, vol. 25, pp. 173-455, 111 figs. pls. 33-53.
1907. Fishes of the islands of Luzon and Panay. *Ibid.*, vol. 26, pp. 1-48, 20 figs.
- JORDAN, D. S., AND J. O. SNYDER
1900. A list of fishes collected in Japan by

- Keinosuke Otaki, and by the United States Steamer Albatross, with descriptions of fourteen new species. Proc. U.S. Natl. Mus., vol. 23, pp. 335-380, pls. 9-20.
- 1901a. List of fishes collected in 1883 and 1885 by Pierre Louis Jouy and preserved in the United States National Museum, with descriptions of six new species. *Ibid.*, vol. 23, pp. 739-769, pls. 31-38.
- 1901b. A preliminary check list of the fishes of Japan. Annot. Zool. Japonenses, vol. 3, pp. 27-159.
- JORDAN, D. S., AND E. C. STARKS
1917. Notes on a collection of fishes from Ceylon with descriptions of new species. Ann. Carnegie Mus., vol. 11, pp. 430-460, pls. 43-65.
- JORDAN, D. S., AND W. F. THOMPSON
1914. Records of the fishes obtained in Japan in 1911. Mem. Carnegie Mus., vol. 6, pp. 205-313, 87 figs., pls. 24-42.
- JORDAN, D. S., S. TANAKA, AND J. O. SNYDER
1913. A catalogue of the fishes of Japan. Jour. Coll. Sci., Tokyo Imp. Univ., vol. 33, art. 1, 497 pp., 396 figs.
- KAMOYARA, T.
1950. Description of the fishes from the provinces of Tosa and Kishu, Japan. Japan, 288 pp., 220 figs.
1955. Coloured illustrations of the fishes of Japan. Osaka, xi+136 pp., 76 figs., 64 pls.
- 1958a. A catalogue of fishes of Kochi Prefecture (Province Tosa), Japan. Rep. USA Marine Biol. Sta., Japan, vol. 5, no. 1, 76 pp.
- 1958b. The fishes of Urado Bay, Kochi Prefecture. Res. Rept. Kôchi Univ., vol. 7, no. 13, 11 pp.
1964. Revised catalogue of fishes of Kochi Prefecture, Japan. Rept. USA Marine Biol. Sta., vol. 11, no. 1, 99 pp., 63 figs.
- 1967a. Fishes of Japan in color. Osaka, xvi+135 pp., 64 pls.
- 1967b. Coloured illustrations of the fishes of Japan (1). Osaka, xvii+158 pp., 93 figs., 64 pls.
- KÁROLI, J.
1882. Prodrömus piscium Asiae orientalis a domine Joanne Xantus annis 1868-70 collectorum. Természetráji Füzetek, vol. 5, pp. 147-187.
- KAWANABE, H., Y. T. SAITO, T. SUNAGA, I. MAKI, AND M. AZUMA
1968. Ecology and biological production of Lake Naka-umi and adjacent regions. 4. Distribution of fishes and their foods. Special Pub. Seto Marine Biol. Lab., ser. 2, part 2, pp. 45-73, 6 figs.
- KHALAF, K. T.
1961. The marine and fresh water fishes of Iraq. Baghdad, vi+164 pp.
- KILAMBI, R. V., AND R. E. BAGLIN, JR.
1969a. Fecundity of the gizzard shad, *Dorosoma cepedianum* (Le Sueur) in Beaver and Bull Shoals Reservoir. Amer. Midland Nat., vol. 82, pp. 444-449, 4 figs.
- 1969b. Fecundity of the threadfin shad *Dorosoma petenense* in Beaver and Bull Shoals Reservoirs. Trans. Amer. Fish. Soc., vol. 98, pp. 320-322, 3 figs.
- KILGEN, R. H.
1970. Unintentional stocking of ponds with fish eggs attached to aquatic plants. Prog. Fish-Cult., vol. 32, p. 157.
- KIMSEY, J. B., AND L. O. FISK
1960. Keys to the freshwater and anadromous fishes of California. California Fish Game, vol. 46, pp. 453-479, 34 figs.
- KING, W.
1969. Management of fresh water fish populations. An. Acad. Brasileira Cien., vol. 41, suppl., pp. 111-138, 11 figs.
- KISHINOUE, K.
1907. Notes on the natural history of the sardine. Jour. Imp. Fish. Bur., vol. 14, pp. 71-105, pls. 13-21.
- KLUNZINGER, C. B.
1872. Zur Fischfauna von Süd-Australien. Arch. Naturgesch., vol. 38, pp. 17-47.
1880. Die v. Müller'sche Sammlung australischer Fische in Stuttgart. Sitzber. Akad. Wiss. Wien., Math-Naturwiss. Cl., vol. 80, pp. 325-430.
- KNER, R.
1867. Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. Zoologischen Theil Fische. Vienna, vol. 1, pt. 3, pp. 275-433, pls. 12-16.
- KOBAYASHI, H.
1952. Comparative studies of the scales in Japanese freshwater fishes, with special reference to phylogeny and evolution. Japanese Jour. Ichthyol., vol. 2, pp. 183-191.
1954. Comparative studies of the scales in Japanese freshwater fishes, with special reference to phylogeny and evolution. IV. Particular lepidology of freshwater fishes. I. Suborder Isospondyli. *Ibid.*, vol. 3, pp. 83-86, 203-208, figs. 12-18.
- Koo, K.-C.
1933. The fishes of Chefoo. (Part I). Contrib. Inst. Zool. Natl. Acad. Peiping, vol. 1, no. 3, 236 pp., 35 pls.

- KRUMHOLZ, L. A., AND W. L. MINCKLEY
1964. Changes in the fish population in the upper Ohio River following temporary pollution abatement. *Trans. Amer. Fish. Soc.*, vol. 93, pp. 1-5.
- KURODA, N.
1951. A nominal list with distribution of the fishes of Suruga Bay, inclusive of the freshwater species found near the coast. *Japanese Jour. Ichthyol.*, vol. 1, pp. 314-338, 1 fig.
- KURONUMA, K.
1961. A check list of fishes of Vietnam. Vietnam, x+66 pp.
- LACEPÈDE, B. G. E.
1803. *Histoire naturelle des poissons*. Paris, vol. 5, 803 pp.
- LA FAUNCE, D. A., J. B. KIMSEY, AND H. K. CHADWICK
1964. The fishery at Sutherland Reservoir, San Diego County, California. *California Fish Game*, vol. 50, pp. 271-291, 4 figs.
- LAKE, J. S.
1967. Freshwater fish of the Murray-Darling River system. *New South Wales State Fish. Res. Bull.*, no. 7, 48 pp., illus.
- LAMBOU, V. W.
1960. Fish populations of Mississippi River oxbow lakes in Louisiana. *Proc. Louisiana Acad. Sci.*, vol. 23, pp. 52-64, 1 fig.
1961. Utilization of macrocrustaceans for food by freshwater fishes in Louisiana and its effects on the determination of predator-prey relations. *Prog. Fish-Cult.*, vol. 23, pp. 18-25.
1962. Fishes occurring in Lake Bistineau, Louisiana. *Proc. Louisiana Acad. Sci.*, vol. 25, pp. 75-79.
1963. Application of distribution patterns of fishes in Lake Bistineau to design of sampling programs. *Prog. Fish-Cult.*, vol. 25, pp. 79-87.
1965. Observations on size distribution and spawning behavior of the threadfin shad. *Trans. Amer. Fish. Soc.*, vol. 94, pp. 385-386.
- LAMBOU, V. W., AND S. W. GEAGAN
1961. Fish populations of alluvial flood plain lakes in Louisiana. *Proc. Louisiana Acad. Sci.*, vol. 24, pp. 95-115, 1 fig.
- LANE, C. E., JR., ET AL.
1968. Reservoir fishery resources. Athens, viii+569 pp., illus.
- LANTZ, K. E.
1970. An ecological survey of factors affecting fish production in a Louisiana backwater area and river. Baton Rouge, 60 pp., 13 figs.
- LARIMORE, R. W., AND P. W. SMITH
1963. The fishes of Champaign County, Illinois. *Bull. Illinois Nat. Hist. Surv.*, vol. 28, pp. 295-382, 70 figs.
- LA RIVERS, I.
1962. Fishes and fisheries of Nevada. Carson City, 782 pp., 270 figs.
- LENNON, R. E.
1962. An annotated list of the fishes of Great Smoky Mountains National Park. *Jour. Tennessee Acad. Sci.*, vol. 37, pp. 5-7.
- LESUEUR, C. A.
1818. Descriptions of several new species of North American fishes (continued). *Jour. Acad. Nat. Sci. Philadelphia*, vol. 1, pp. 359-368, pl. 14.
- LEWIS, W. M., AND D. R. HELMS
1964. Vulnerability of forage organisms to largemouth bass. *Trans. Amer. Fish. Soc.*, vol. 93, pp. 315-318.
- LIN, S. Y.
1934. A study of Foochow fishes. *Lingnan Sci. Jour.*, vol. 13, pp. 671-691.
- LINDBERG, G. V., AND M. I. LEGEZA
1965. Ryby yaponskogo morya i sopredelnyx časte oxotskogo i želtogo more. Čast 2. Teleostomi. XII. Acipenseriformes-XXVIII. Polynemiformes. Moscow, ii+391 pp., 324 figs.
1969. Fishes of the Sea of Japan and the adjacent areas of the Sea of Okhotsk and the Yellow Sea. Part 2. Teleostomi XII, Acipenseriformes-XXVIII. Polynemiformes. Jerusalem, viii+389 pp., 324 figs.
- LINNAEUS, C.
1754. *Chinensia Lagerströmiana*. Upsala, 36 pp. (not seen).
1758. *Systema naturae*. Holmiae, vol. 1, 823 pp.
1759. *Chinensia Lagerströmiana*. *Amoenitates Acad.*, vol. 4, pp. 230-260, pl. 3.
- LIU, F. H., AND S. C. SHEN
1957. A preliminary report on the activity of wenfishes (herring-like fishes) along the coast of Taiwan. *Rept. Inst. Fish. Biol. Taipei*, vol. 1, pp. 24-32.
- LÖNNBERG, E.
1896. Linnean type-specimens of birds, reptiles, batrachians and fishes in the zoological museum of the R. University in Upsala. *Bihang K. Svenska Vetenskapsakad. Handl.* vol. 22, pt. 4, no. 1, 45 pp.
- LOUDER, D. E.
1962. An annotated check-list of the North Carolina Bay lakes fishes. *Jour. Elisha Mitchell Soc.*, vol. 98, pp. 68-73.
- LOVE, R. M.
1970. The chemical biology of fishes. London and New York, xvi+547 pp., 103 figs.
- LUCAS, A. H. S.
1890. A systematic census of indigenous fish,

- hitherto recorded from Victorian Waters. Proc. Roy. Soc. Victoria, vol. 2, pp. 15-47.
- LYLES, C. H.
1965-1968. Fishery statistics of the United States. U.S. Bur. Comm. Fish. Statist. Dig., nos. 57-60.
- MCALLISTER, D. E.
1968a. The evolution of branchiostegals and associated opercular, gular, and hyoid bones and the classification of teleostome fishes, living and fossil. Bull. Natl. Mus. Canada, no. 221, xiv+239 pp., 21 pls.
1968b. Mandibular pore pattern in the sculpin family Cottidae. *Ibid.*, no. 223, pp. 58-69, 1 fig.
- MCCONNELL, W. J., AND J. H. GERDES
1964. Threadfin shad, *Dorosoma petenense*, as food of yearling centrarchids. California Fish Game, vol. 50, pp. 170-175, 2 figs.
- MCCULLOCH, A. R.
1921. Check-list of the fish and fish-like animals of New South Wales. Part ii. Australian Zool., vol. 2, pp. 24-68, pls. 4-24.
1922. The fishes and fish-like animals of New South Wales. Sydney, xxiv+104 pp., 43 pls.
1927. The fishes and fish-like animals of New South Wales with additions by Gilbert P. Whitley. Sydney, iv+xxiv+104 pp., 43 pls.
1929. A check-list of the fishes recorded from Australia. Australian Mus. Mem., no. 5, x+534 pp.
1934. The fishes and fish-like animals of New South Wales. Third edition with supplement by Gilbert P. Whitley, F.R.Z.S. Sydney, suppl.+xxiv+104 pp., 43 pls.
- MCCULLOCH, A. R., AND G. P. WHITLEY
1925. A list of the fishes recorded from Queensland waters. Mem. Queensland Mus., vol. 8, pt. 2, pp. 125-182.
- McHUGH, J. L.
1967. Estuarine nekton. In Lauff, G. H. (ed.) Estuaries. Washington, pp. 581-620, 23 figs.
- MACLEAY, W.
1880. On the Clupeidae of Australia. Proc. Linnean Soc. New South Wales, vol. 4, pp. 363-385.
1881. Descriptive catalogue of Australian fishes. Sydney, vol. 2, vi+323 pp.
1882. Descriptive catalogue of the fishes of Australia. Part IV. Order IV. Physostomi. Proc. Linnean Soc. New South Wales, vol. 6, pp. 202-387.
1883a. The fishes of the Palmer River. *Ibid.*, vol. 7, pp. 69-71.
1883b. Contribution to a knowledge of the fishes of New Guinea.—No. III. *Ibid.*, vol. 7, pp. 585-598.
1883c. Notes on a collection of fishes from the Burdekin and Mary Rivers, Queensland. *Ibid.*, vol. 8, pp. 199-213.
1887. Notes on Mr. Froggatt's collections made during the year 1887, in the vicinity of Derby, King's Sound, N.W. Australia. *Ibid.*, ser. 2, vol. 2, pp. 1017-1020.
- McMAHON, J. W.
1963. Monogenetic trematodes from some Chesapeake Bay fishes. Part 1: The superfamilies, Capsaloidea Price, 1936 and Diclidophoridae Price, 1936. Chesapeake Sci., vol. 4, pp. 151-160, 14 figs.
- MAHDI, N.
1962. Fishes of Iraq. Baghdad, pp. A-F, 1-82 illus.
- MALOY, C. R.
1967. Status of fish culture in the North American Region. FAO Fish. Rept., no. 44, vol. 2, pp. 123-134.
- MANSUETI, A. J., AND J. D. HARDY, JR.
1967. Development of fishes of the Chesapeake Bay region. An atlas of egg, larval, and juvenile stages. Baltimore, vi+202 pp., 90 figs.
- MANSUETI, R. J.
1962a. Distribution of small, newly metamorphosed sea lampreys, *Petromyzon marinus*, and their parasitism on menhaden, *Brevoortia tyrannus*, in mid-Chesapeake Bay during winter months. Chesapeake Sci., vol. 3, pp. 137-139.
1962b. Eggs, larvae, and young of the hickory shad, *Alosa mediocris*, with comments on its ecology in the estuary. Chesapeake Sci., vol. 3, pp. 173-205, 12 figs.
- MARCELET, H.
1929. L'huile de Cá Mòi (*Dorosoma nasus*). Etude physico-chimique. Saigon, 57 pp.
- MARSHALL, T. C.
1964. Fishes of the Great Barrier Reef and coastal waters of Queensland. Sydney, London, and Melbourne, xvi+566 pp., pls. 72 (color)+64 (black-and-white).
1965. Fishes of the Great Barrier Reef and coastal waters of Queensland. Narberth, xvi+566 pp., pls. 72 (color)+64 (black-and-white).
1966. Tropical fishes of the Great Barrier Reef. Sydney, Melbourne, London, and New York, 239 pp., pls. 72 (color)+64 (black-and-white).
- MARTENS, E.
1876. Die Preussische Expedition nach Ost-Asian. Zool. Theil. Berlin, vol. 1, xii+412 pp., 15 pls.
- MATSUBARA, K.
1955. Fish morphology and hierarchy. Part 1. Tokyo, xii+789 pp., 289 figs.
1963. Fish morphology and hierarchy. Part 1. Tokyo, xii+789 pp., 289 figs.

- MAXWELL, C. N.
1921. Malayan fishes. Singapore, 104 pp., 72 pls.
- MAXWELL, R., AND A. R. ESSBACH
1971. Eggs of threadfin shad successfully transported and hatched after spawning on excelsior mats. *Prog. Fish-Cult.*, vol. 33, p. 140.
- MEEK, S. E.
1904. The fresh-water fishes of Mexico north of the Isthmus of Tehuantepec. *Pub. Field Columbian Mus., Zool. Ser.*, vol. 5, lxiv+252 pp., 72 figs., 17 pls.
1907. Synopsis of the fishes of the great lakes of Nicaragua. *Ibid.*, vol. 7, pp. 97-132, 2 figs.
- MENON, A. G. K.
1966. On a collection of fish from the Coromandel coast of India including Pondicherry and Karaikkal areas. *Rec. Indian Mus.*, vol. 59, pp. 369-404, pl. 33.
- MENON, A. G. K., AND G. M. YAZDANI
1968. Catalogue of type-specimens in the zoological survey of India. Part 2.—Fishes. *Rec. Zool. Surv. India*, vol. 61, pp. 91-190.
- MENON, M. A. S.
1960. On a third collection of fish from Iraq. *Rec. Indian Mus.*, vol. 54, pp. 139-157, 2 figs., 1 pl.
1963. On a collection of fish from Lake Chilka, Orissa. *Ibid.*, vol. 59, pp. 41-69, 1 fig.
- METCALF, A. L.
1966. Fishes of the Kansas River system in relation to zoogeography of the great plains. *Univ. Kansas Publ. Nat. Hist.*, vol. 17, pp. 23-189, 4 figs.
- MEYER, F. P.
1965. The experimental use of Guthion as a selective fish eradicator. *Trans. Amer. Fish. Soc.*, vol. 94, pp. 203-209.
- MILLER, L. W.
1967. A heavy infestation of the threadfin shad, *Dorosoma petenense*, by the yellow grub, *Clinostomum marginatum*, in El Capitan Reservoir, San Diego County, California. *California Fish Game*, vol. 53, pp. 293-295.
- MILLER, R. R.
1950. A review of the American clupeid fishes of the genus *Dorosoma*. *Proc. U.S. Natl. Mus.*, vol. 100, pp. 387-410.
1960. Systematics and biology of the gizzard shad (*Dorosoma cepedianum*) and related fishes. *Fish. Bull. U.S. Fish Wildlife Serv.*, vol. 60, pp. 371-392, 4 figs.
1964. Genus *Dorosoma* Rafinesque 1820. *Mem. Sears Found. Marine Res.*, no. 1, pt. 3, pp. 443-451, figs. 116-117.
1966. Geographical distribution of Central American freshwater fishes. *Copeia*, pp. 773-802, 5 figs.
- MILLER, R. V.
1964. The morphology and function of the pharyngeal organs in the clupeid *Dorosoma petenense* (Gunther). *Chesapeake Sci.*, vol. 5, pp. 194-199, 4 figs.
1967. Food of the threadfin shad, *Dorosoma petenense*, in Lake Chicot, Arkansas. *Trans. Amer. Fish. Soc.*, vol. 96, pp. 243-246.
1969. Constancy of epibranchial organs and fourth epibranchial bones within species groups of clupeid fishes. *Copeia*, pp. 308-312, 4 figs.
- MINCKLEY, W. L., J. E. JOHNSON, J. N. RINNE, AND S. E. WILLOUGHBY
1970. Foods of buffalo fishes, genus *Ictiobus* in central Arizona reservoirs. *Trans. Amer. Fish. Soc.*, vol. 99, pp. 333-342, 7 figs.
- MINCKLEY, W. L., AND L. A. KRUMHOLZ
1960. Natural hybridization between the clupeid genera *Dorosoma* and *Signalosa*, with a report on the distribution of *S. petenensis*. *Zoologica*, New York, vol. 44, pp. 171-180, 2 pls.
- MISRA, K. S.
1947a. On a second collection of fish from Iraq. *Rec. Indian Mus.*, vol. 45, pp. 115-127, pls. 1-2.
1947b. A check-list of the fishes of India, Burma and Ceylon. Part II. Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes, and Ateleopiformes. *Ibid.*, vol. 45, pp. 377-431.
1953. An aid to the identification of the fishes of India, Burma, and Ceylon. II. Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes, and Ateleopiformes. *Ibid.*, vol. 50, pp. 367-422, 30 figs.
1959. An aid to the identification of the common commercial fishes of India and Pakistan. *Ibid.*, vol. 57, pp. 1-320, 198 figs.
- MISRA, K. S., AND M. A. S. MENON
1966. On the distribution of the fishes (Orders Clupeiformes, Bathyclupeiformes, Galaxiiformes, Scopeliformes, and Ateleopiformes) of the Indian region in relation to the mean annual isotherms. *Rec. Indian Mus.*, vol. 59, pp. 405-433, pl. 34.
- MONOD, T.
1967. Le complexe urophore des téléostéens: typologie et évolution. *Colloques Internat. Centre Natl. Rech. Sci.*, no. 163, pp. 111-131, 16 figs.
1968. Le complexe urophore des poissons téléostéens. *Mém. Inst. Français Afrique Noire*, no. 81, 705 pp., 989 figs.
- MOODY, H. L.
1961. Exploited fish populations of the St. Johns River, Florida. *Quart. Jour. Florida Acad. Sci.*, vol. 24, pp. 1-18, 3 figs.

- MOONA, J. C.
 1962. Cranial osteology of the Indian clupeoid fishes. *Agra Univ. Jour. Res., Sci.*, vol. 11, pp. 267-271.
 1963. Studies on the cranial osteology of the Indian clupeoid fishes. IV. The skull of *Nematolosa nasus* (Bloch). *Jour. Morph.*, vol. 113, pp. 345-358, 14 figs.
- MORI, T.
 1928. A catalogue of the fishes of Korea. *Jour. Pan-Pacific Res. Inst.*, vol. 3, no. 3, pp. 3-8.
 1952. Check list of the fishes of Korea. *Mem. Hyogo Univ. Agric.*, vol. 1, no. 3, 228 pp.
 1956. Fishes of San-in district including Oki Islands and its adjacent waters (southern Japan Sea). *Ibid.*, vol. 2, no. 3, 62 pp.
- MORI, T., AND K. UCHIDA
 1934. A revised catalogue of the fishes of Korea. *Jour. Chosen Nat. Hist. Soc.*, vol. 19, pp. 12-33.
- MOSER, B. B., AND D. HICKS
 1970. Fish population of the Stilling Basin below Canton Reservoir. *Proc. Oklahoma Acad. Sci.*, vol. 50, pp. 69-74.
- MOUNT, D. I.
 1964. An autopsy technique for zinc-caused fish mortality. *Trans. Amer. Fish. Soc.*, vol. 93, pp. 174-182, 6 figs.
- MULLAN, J. W., AND R. L. APPLGATE
 1969. Use of an echosounder in measuring distribution of reservoir fishes. *Tech. Papers Bur. Sport Fish. Wildlife*, no. 19, 16 pp., 9 figs.
- MUNRO, I. S. R.
 1955. The marine and fresh water fishes of Ceylon. Canberra, xvi+351 pp., 19 figs., 56 pls.
 1956. Handbook of Australian fishes. No. 6. *Fish. Newsletter*, vol. 25, no. 12, pp. 25-28, figs. 171-198.
 1958. The fishes of the New Guinea Region. *Papua New Guinea Fish. Bull.*, no. 1, pp. 97-369.
 1964. Additions to the fish fauna of New Guinea. *Papua New Guinea Agric. Jour.*, vol. 16 pp. 141-186, 22 figs.
 1967. The fishes of New Guinea. Port Moresby, xviii+650 pp., 23 figs., 6 (color)+78 (black-and-white) pls.
- MURPHY, G. W.
 1964. Fishes of the Green River Basin in Case and Lincoln Counties, Kentucky. *Trans. Kentucky Acad. Sci.*, vol. 25, pp. 65-73.
- MURTY, V. S.
 1969. Catalogue of fishes (excluding from the Laccadives) in the reference collections of the Central Marine Fisheries Research Institute. Mandapam Camp, 36 pp.
- MYERS, G. S.
 1932. *Nealosa* Herre and Myers equals *Konosirus* Jordan and Snyder (Clupeidae). *Copeia*, 1932, p. 30.
- NAHHAS, F. M., AND R. B. SHORT
 1965. Digenetic trematodes of marine fishes from Apalachee Bay, Gulf of Mexico. *Tulane Stud. Zool.*, vol. 12, pp. 39-50.
- NAKAMURA, E. L.
 1962. Observations on the behavior of skipjack tuna, *Euthynnus pelomis*, in captivity. *Copeia*, pp. 499-505, 3 figs.
- NAKAMURA, M.
 1963. Keys to the freshwater fishes of Japan fully illustrated in colors. Japan, iv+258 pp., illus.
- NELSON, G. J.
 1967a. Gill arches of teleostean fishes of the family Clupeidae. *Copeia*, pp. 389-399, 9 figs.
 1967b. Epibranchial organs in lower teleostean fishes. *Jour. Zool., London*, vol. 153, pp. 71-89, 3 figs., 1 pl.
 1970a. The hyobranchial apparatus of teleostean fishes of the families Engraulidae and Chirocentridae. *Amer. Mus. Novitates*, no. 2410, 30 pp., 11 figs.
 1970b. Dorsal scutes in the Chinese gizzard shad *Clupanodon thrissa* (Linnaeus). *Japanese Jour. Ichthyol.*, vol. 17, pp. 131-134, 1 fig.
- NELSON, W. R.
 1968. Reproduction and early life history of sauger, *Stizostedion canadense*, in Lewis and Clark Lake. *Trans. Amer. Fish. Soc.*, vol. 97, pp. 159-166, 3 figs.
 1969. Biological characteristics of the sauger population in Lewis and Clark Lake. *Tech. Papers Bur. Sport Fish. Wildlife*, no. 21, 11 pp., 2 figs.
- NETSCH, N. F., A. HOUSER, AND L. E. VOGELE
 1971. Sampling gear for larval reservoir fishes. *Prog. Fish-Cult.*, vol. 33, pp. 175-179, 4 figs.
- NICHOLS, J. T.
 1949. Results of the Archbold expeditions. No. 62. Fresh-water fishes from Cape York, Australia. *Amer. Mus. Novitates*, no. 1433, 8 pp.
 1958. A new goby and other fishes from Formosa. *Ibid.*, no. 1876, 7 pp.
- NORDEN, C. R.
 1965. Fishes of the Little River Drainage in Louisiana. *Proc. Louisiana Acad. Sci.*, vol. 28, pp. 96-104.
 1966. The seasonal distribution of fishes in Vermilion Bay, Louisiana. *Trans. Wisconsin Acad. Sci., Arts Lett.*, vol. 55, pp. 119-137, 3 figs.
- NORMAN, J. R.
 1966. A draft synopsis of the orders, families and

- genera of recent fishes and fish-like vertebrates. London, 649 pp.
- NYBELIN, O.
1963. Zur Morphologie und Terminologie des Schwanzskelettes der Actinopterygier. *Achiv. Zool.*, ser. 2, vol. 15, pp. 485-516, 22 figs.
- OGILBY, J. D.
1886. Catalogue of the fishes of New South Wales with their principal synonyms. Sydney, 67 pp.
1893. Edible fishes and crustaceans of New South Wales. Sydney, ii+212 pp., 51 pls.
1915. Ichthyological notes (No. 2). *Mem. Queensland Mus.*, vol. 3, pp. 130-136.
- OKADA, Y.
1938. A catalogue of vertebrates of Japan. Tokyo, iv+412 pp.
1955. Fishes of Japan. Tokyo, 434 pp., 391 figs.
- OSBECK, P.
1757. *Dagbok öfver en ostindisk resa aren 1750-52*. Stockholm, 376 pp.
1765. *Reise nach Ostindien und China*. Rostock, xxvi+552 pp., 13 pls.
1771. *A voyage to China and the East Indies*. London, vol. 2, 125 pp.
- OSHIMA, M.
1926. Notes on a collection of fishes from Hainan, obtained by Prof. S. F. Light. *Annot. Zool. Japanenses*, vol. 11, pp. 1-25.
- PARADICE, W. E. J., AND G. P. WHITLEY
1927. Northern territory fishes. An annotated list of fishes collected from the waters of the Northern Territory of Australia during the cruise of H.M.A.S. "Geranium," 1923-1952. *Mem. Queensland Mus.*, vol. 9, pp. 76-106, pls. 11-15.
- PATRICK, R.
1961. A study of the numbers and kinds of species found in rivers in eastern United States. *Proc. Acad. Nat. Sci. Philadelphia*, vol. 113, pp. 215-258, 1 fig.
- PATRICK, R., J. CAIRNS, JR., AND S. S. ROBOCK
1967. An ecosystematic study of the fauna and flora of the Savannah River. *Proc. Acad. Nat. Sci. Philadelphia*, vol. 118, pp. 109-407, 18 figs.
- PATTERSON, C.
1967. Are the teleosts a polyphyletic group? *Colloques Internat. Centre Natl. Rech. Sci.*, no. 163, pp. 93-109, 11 figs.
- PEARSON, J., AND A. H. MALPAS
1926. A preliminary report on the possibilities of commercial trawling in the sea around Ceylon. *Ceylon Jour. Sci.*, Sec. C-Fisheries, vol. 2, pp. 1-165, pl. 2.
- PENNANT, T.
1792. *Indian Zoology*. viii+161 pp., 16 pls.
- PETERS, W.
1877. Übersicht der während der von 1874 bis 1876 unter dem Commando des Hrn. Capitän Z. S. Freiherrn von Schleinitz ausgeführten Reise S.M.S. Gazelle gesammelten und von der Kaiserlichen Admiralität der Königlichen Akademie der Wissenschaften übersandten Fische. *Monatsber. K. Preussischen Akad. Wissen.*, for 1876, pp. 831-854.
- PFLIEGER, W.
1971. A distributional study of Missouri fishes. *Univ. Kansas Publ., Mus. Nat. Hist.*, vol. 20, pp. 225-570, 15 figs.
- PILLAY, R. S. N.
1929. A list of fishes taken in Travancore from 1901-1915. *Jour. Bombay Nat. Hist. Soc.*, vol. 33, pp. 347-379.
- PILLAY, T. V. R.
1967. Estuarine fisheries of the Indian Ocean coastal zone. In Lauff, G. H. (ed.), *Estuaries*. Washington, pp. 647-657, 5 figs.
- POSEY, L. E., JR.
1962. Changes occurring in the fish population of Black Bayou Lake following an increase in water level. *Proc. Louisiana Acad. Sci.*, vol. 25, pp. 93-108.
- POWER, E. A.
1960-1963. Fishery statistics of the United States. *U.S. Bur. Comm. Fish. Stat. Dig.*, nos. 52-55.
- POWER, E. A., AND C. H. LYLES
1964. Fishery statistics of the United States. *U.S. Bur. Comm. Fish. Stat. Dig.*, no. 56.
- PRIEGEL, G. R.
1971. Evaluation of intensive fresh water drum removal in Lake Winnebago, Wisconsin. *Wisconsin Dept. Nat. Resources Tech. Bull.* no. 47, 28 pp., 6 figs.
- RAFINESQUE, C. S.
1815. *Analyse de la nature*. Palerme, 224 pp.
1820. Fishes of the River Ohio (continued). *Western Rev. Misc. Mag.*, vol. 2, pp. 169-177.
- RAJAN, S., S. PATNAINK, AND N. C. BASU
1968. New records of fishes from the Chilka Lake. *Jour. Zool. Soc. India*, vol. 20, pp. 80-93, 1 fig.
- RAMSAY, E. P., AND J. D. OGILBY
1886. A contribution to the knowledge of the fish-fauna of New Guinea. *Proc. Linnean Soc. New South Wales*, ser. 2, vol. 1, pp. 8-20.
- RAO, M. B.
1965. Biological studies on the gizzard shad, *Anodontostoma chacunda* Hamilton (fam: Clupeidae). *Jour. Mar. Biol. Assoc. India*, vol. 7, pp. 89-101, 7 figs.

- RASALAN, S. B.
1957. Marine fisheries of the central Visayas. *Philippine Jour. Fish.*, vol. 5, pp. 53-88, 2 pls.
- RAWSTRON, R. R.
1964. Spawning of threadfin shad, *Dorosoma petenense*, at low water temperature. *California Fish Game*, vol. 50, p. 58.
- REEVES, C. D.
1927. A catalogue of the fishes of north-eastern China and Korea. *Jour. Pan-Pacific Res. Inst.*, vol. 2, no. 3, pp. 3-16.
1933. Manual of the vertebrate animals of north-eastern and central China exclusive of birds. Shanghai, xxxii+806 pp.
- REGAN, C. T.
1910. On the caudal fin of the Clupeidae, and on the teleostean urostyle. *Ann. Mag. Nat. Hist.*, ser. 8, vol. 5, pp. 531-533, 2 figs.
1917. A revision of the clupeoid fishes of the genera *Pomolobus*, *Brevoortia* and *Dorosoma*, and their allies. *Ibid.*, ser. 8, vol. 19, pp. 297-316.
- RENFRO, W. C.
1960. Salinity relations of some fishes in the Arkansas River, Texas. *Tulane Stud. Zool.*, vol. 8, pp. 83-91, 2 figs.
- RICHARDSON, J.
1846a. Fishes. In Richardson, J., and J. E. Gray (eds.), *The zoology of the voyage of H.M.S. "Erebus and Terror."* London, vol. 2, 139+viii pp., 60 pls.
1846b. Report on the ichthyology of the seas of China and Japan. *Rept. Brit. Assoc. Adv. Sci.*, for 1845, pp. 187-320.
- RICHMOND, E. A.
1968. A supplement to the fauna and flora of Horn Island, Mississippi. *Gulf Res. Rept.*, vol. 2, pp. 213-254, 12 figs.
- RIDEWOOD, W. G.
1904. On the cranial osteology of the fishes of the families Elopidae and Albulidae, with remarks on the morphology of the skull in the lower teleostean fishes generally. *Proc. Zool. Soc. London*, vol. 2, pp. 35-81, figs. 8-18.
1905. On the cranial osteology of the clupeoid fishes. *Ibid.*, vol. 2, pp. 448-493, figs. 118-143.
- ROCK, L. F., AND H. M. NELSON
1965. Channel catfish and gizzard shad mortality caused by *Aeromonas liquefaciens*. *Prog. Fish-Cult.*, vol. 27, pp. 138-141, 4 figs.
- ROFEN, R. R.
1963. Handbook of the food fishes of the Gulf of Thailand. La Jolla, 237 pp., illus.
- ROUGHLEY, T. C.
1951. Fish and fisheries of Australia. Sydney and London, xvi+343 pp.
- ROXAS, H. A.
1934. A review of Philippine isospondylous fishes. *Philippine Jour. Sci.*, vol. 55, pp. 231-295, pls. 1-3.
- ROXAS, H. A., AND C. MARTIN
1937. A check list of Philippine fishes. *Tech. Bull. Dept. Agr. Commerce, Manila*, no. 6, 314 pp.
- RUMIANTZEV, A. I.
1947. On changes in the composition of the warm-water ichthyofauna of the coast waters of the Japanese Sea. *Zool. Zhur.*, vol. 26, pp. 47-52.
- RUSSELL, P.
1803. Descriptions and figures of two hundred fishes collected at Vizagapatam on the coast of Coromandel. London, 85 pp., 208 pls.
- RUTTER, C.
1897. A collection of fishes obtained in Swatow, China, by Miss Adele M. Fielde. *Proc. Acad. Nat. Sci. Philadelphia*, pp. 56-90.
- SAVILLE-KENT, W.
1893. The great barrier reef of Australia; its products and potentialities. London, xx+387 pp., 48 (black-and-white) + 16 color pls.
- SCHMIDT, P. J.
1903. Sur les conditions physico-géographiques et la faune de la mer du Japon et de la mer d'Okhotsk. *Izv. Imp. Russkago Geogr., Obshch.*, vol. 38, pp. 503-532.
1904. Pisces marium orientarium imperii rossici. Saint Petersburg, xv+466 pp., 6 pls.
1931a. A list of fishes, collected in Japan and China by Dr. A. Bunge and N. Grebnitzky. *Bull. Acad. Sci. URSS, Cl. Sci. Math. Nat.*, pp. 101-123, 5 figs.
1931b. Fishes of Japan, collected in 1901. *Trans. Pacific Comm. Acad. Sci. U.S.S.R.*, vol. 2, pp. 1-176, 30 figs.
- SCHMIDT, P., AND G. LINDBERG
1930. A list of fishes collected in Tsuruga (Japan) by W. Roszkowski. *Bull. Acad. Sci. URSS, Cl. Sci. Phys.-Math.*, pp. 1135-1150, 1 fig.
- SCHMITZ, E. H., AND C. D. BAKER
1970. Digestive anatomy of the gizzard shad *Dorosoma cepedianum* and the threadfin shad, *D. petenense*. *Trans. Amer. Micros. Soc.*, vol. 88, pp. 525-546, 25 figs.
- SCHNEIDER, J. G.
1801. M. E. Blochii. *Systema ichthyologiae iconibus ex illustratum*. Berolini, lx+584 pp., 110 pls.
- SCHNEIDER, R. W.
1968. The gizzard shad *Dorosoma cepedianum* of Smith Mountain Lake, Virginia. *Virginia Jour. Sci.*, vol. 19, no 3, p. 182.

- SCOTT, T. D.
1962. The marine and fresh-water fishes of South Australia. Adelaide, 338 pp., illus.
- SCOTT, W. B., AND E. J. CROSSMAN
1969. Checklist of Canadian freshwater fishes with keys for identification. Toronto, 104 pp., illus.
- SEALE, A.
1908. The fishery resources of the Philippine Islands. Part 1, Commercial fishes. Philippine Jour. Sci., ser. A., Gen. Sci., vol. 3, pp. 513-529, 5 figs., 10 pls.
1910. Philippine fishes which are poisonous. Bull. Manila Med. Soc., vol. 2, pp. 96-98.
- SEALE, A., AND B. A. BEAN
1907. On a collection of fishes from the Philippine Islands, made by Maj. Edgar A. Mearns, surgeon, U.S. Army, with descriptions of seven new species. Proc. U.S. Natl. Mus., vol. 33, pp. 229-248, 7 figs.
- SHAW, G. E., AND E. O. SHEBBEARE
1937. The fishes of northern Bengal. Jour. Roy. Asiatic Soc. Bengal, vol. 3, 137 pp., 130 figs., 6 pls.
- SHELTON, W. L.
1963. Ovarian morphology of the threadfin shad, *Dorosoma petenense* (Günther). Proc. Oklahoma Acad. Sci., vol. 43, pp. 145-148, 2 figs.
- SHEN, S.-C.
1964. A list of fishes from Hong Kong (Part 1). Quart. Jour. Taiwan Mus., vol. 18, pp. 193-208.
- SHIMMA, Y., AND H. TAGUCHI
1964. A comparative study on fatty acid composition of fish. Bull. Japanese Soc. Sci. Fish., vol. 30, pp. 179-188.
- SHOMURA, R. S.
1964. Effectiveness of *Tilapia* as live bait for skipjack tuna fishing. Trans. Amer. Fish. Soc., vol. 93, pp. 291-294.
- SISK, M. E.
1969. The fishes of west Kentucky. I. The fishes of Clark's River. Trans. Kentucky Acad. Sci., vol. 30, pp. 54-59.
- SMITH, C. L., AND C. R. POWELL
1971. The summer fish communities of Brier Creek, Marshall County, Oklahoma. Amer. Mus. Novitates, no. 2458, 30 pp., 6 figs.
- SMITH, H. M.
1945. The fresh-water fishes of Siam, or Thailand. Bull. U.S. Natl. Mus., vol. 188, xii+622 pp., 107 figs.
- SMITH, H. M., AND T. E. B. POPE
1906. List of fishes collected in Japan in 1903, with descriptions of new genera and species. Proc. U.S. Natl. Mus., vol. 31, pp. 459-499.
- SMITH, H. M., AND A. SEALE
1906. Notes on a collection of fishes from the Island of Mindanao, Philippine Archipelago, with descriptions of new genera and species. Proc. Biol. Soc. Washington, vol. 19, pp. 73-82, illus.
- SMITH, J. L. B.
1961. The sea fishes of southern Africa. South Africa, viii+1580 pp., 111 pls.
- SMITH, P. L., AND M. E. SISK
1969. The fishes of west Kentucky. II. The fishes of Obion Creek. Trans. Kentucky Acad. Sci., vol. 30, pp. 60-68.
- SMITH, P. W.
1963. A study of seasonal distribution of fishes in the Kaskaskia River Ditch, a highly modified stream in eastern Illinois. Copeia, pp. 251-259, 1 fig.
1968. An assessment of changes in the fish fauna of two Illinois rivers and its bearing on their future. Trans. Illinois State Acad. Sci., vol. 61, pp. 31-45, 15 figs.
- SMITH, P. W., AND L. M. PAGE
1969. The food of spotted bass in streams of the Wabash River Drainage. Trans. Amer. Fish. Soc., vol. 98, pp. 647-651, 1 fig.
- SMITH, S. L., R. E. TWILLMAN, AND J. E. THOMERSON
1969. The fishes of Piasa Creek, west central Illinois. Trans. Illinois State Acad. Sci., vol. 62, pp. 70-79, 1 fig.
- SMITH, W. L.
1963. Viable algal cells from the gut of the gizzard shad *Dorosoma cepedianum* (Le Sueur). Proc. Oklahoma Acad. Sci., vol. 43, pp. 148-149.
- SMITH-VANIZ, W. F.
1968. Freshwater fishes of Alabama. Auburn, x+211 pp., 159 figs.
- SNYDER, J. O.
1912. Japanese shore fishes collected by the United States Bureau of Fisheries Steamer "Albatross" expedition of 1906. Proc. U.S. Natl. Mus., vol. 42, pp. 399-450, pls. 51-61.
- SOLDATOV, V. K.
1929. A check list of fishes recorded from Russian Pacific Waters. Jour. Pan-Pacific Res. Inst., vol. 4, no. 1, pp. 3-7.
- SOLDATOV, V. K., AND G. J. LINDBERG
1930. A review of the fishes of the seas of the far east. Bull. Pacific Sci. Fish. Inst., vol. 5, xxi+576 pp., 76 figs.
- SONNINI, C. S.
1803-1804. Histoire naturelle, générale et particulière des poissons. Paris, vol. 13, 364 pp.
- SORLEY, H. T.
1933. The marine fishes of the Bombay Presidency. Bombay, vi+174 pp., illus.
- SOUTHERN, W. E.
1963. Winter populations, behavior, and seasonal dispersal of bald eagles in northwestern

- Illinois. Wilson Bull., vol. 75, pp. 42-55, 2 figs.
1964. Additional observations on winter bald eagle populations including remarks on biotelemetry techniques and immature plumages. *Ibid.*, vol. 76, pp. 121-137, 3 figs.
1966. Utilization of shad as winter food by birds. *Auk*, vol. 83, pp. 309-311.
- SOWERBY, A. DE C.
1930. The naturalist in Manchuria. Tientsin, vol. 4, 8+321 pp., illus.
- SPRINGER, V. G.
1961. Notes and additions to the fish fauna of the Tampa Bay area in Florida. *Copeia*, pp. 480-482.
- SRIVASTAVA, G. J.
1968. Fishes of eastern Uttar Pradesh. Varanasi, xxii+163 pp., 89 figs.
- STARRETT, W. C., AND A. W. FRITZ
1965. A biological investigation of the fishes of Lake Cautauqua, Illinois. *Bull. Illinois Nat. Hist. Surv.*, vol. 29, pp. 1-104, 40 figs.
- STEAD, D. G.
1906. Fishes of Australia: a popular and systematic guide to the study of the wealth within our waters. Sydney, xii+278 pp., 88 figs.
1908. The edible fishes of New South Wales: their present importance and their potentialities. Sydney, 119 pp., 81 pls.
- STEINDACHNER, F.
1907. Fische aus Südarabien und Sokótra. *Denkschr. Akad. Wiss. Wien*, vol. 71, pp. 123-168, pl. 1.
- STEPHENS, R. R.
1968. The development of the lateral-line system of *Dorosoma petenense* (Günther). *Diss. Abstr.*, vol. 28B, pp. 5254-5255.
- STOLL, N. R. (ED.)
1961. International code of zoological nomenclature. London, xviii+176 pp.
- SULYA, L. L., B. E. BOX, AND G. GUNTER
1960. Distribution of some blood constituents in fishes from the Gulf of Mexico. *Amer. Jour. Physiol.*, vol. 199, pp. 1177-1180.
- SUMMERFELT, R. C.
1967. Fishes of the Smoky Hill River, Kansas. *Trans. Kansas Acad. Sci.*, vol. 70, pp. 102-139, 7 figs.
- SUVATTI, C.
1936. Index to fishes of Siam. Bangkok, 226 pp.
1950. Fauna of Thailand. Bangkok, v+1100 pp.
- SUYEHIRO, Y.
1942. A study on the digestive system and feeding habits of fish. *Japanese Jour. Zool.*, vol. 10, pp. 1-303, 190 figs., 15 pls.
- SVETOVIDOV, A. N.
1952. Fauna SSSR. Ryby. Vol. II, no. 1. Seld-
evye. Moscow, 331 pp., 54 figs., 53 pls.
1963. Fauna of USSR. Fishes. Vol. II, no. 1. Clupeidae. Jerusalem, iv+428 pp., 54 figs., 53 pls.
- SVETOVIDOV, A. N., AND A. N. SKVORZOWA
1968. The structure and functional significance of pharyngeal organs in clupeoid fishes. *Trud. Zool. Inst. Akad. Nauk SSSR, Leningrad*, vol. 46, pp. 169-189, 16 figs.
- SWAINSON, W.
1839. The natural history of fishes, amphibians, and reptiles, or monocardian animals. London, vol. 2, vi+452 pp., 135 figs.
- SWINGLE, W. E., AND E. W. SHELL
1971. Tables for computing relative conditions of some common freshwater fishes. *Agr. Exp. Sta. Auburn Univ. Circ. no. 183*, 55 pp.
- TAGATZ, M. E.
1968. Fishes of the St. John River, Florida. *Quart. Jour. Florida Acad. Sci.*, vol. 30, pp. 25-50.
- TAKAHASI, N.
1957. On the so-called accessory respiratory organ "gill-helix" found in some clupeiform fishes, with special reference to its function and its geneology. *Japanese Jour. Ichthyol.*, vol. 5, pp. 71-77, 1 pl.
- TALWAR, P. K., AND P. J. P. WHITEHEAD
1971. The clupeoid fishes described by Francis Day. *Bull. Brit. Mus., (Nat. Hist.), Zool.*, vol. 22, pp. 57-85, 3 figs., 2 pls.
- TANAKA, S.
1928a. Figures and descriptions of the fishes of Japan. Tokyo, vol. 43, pp. 831-846, pls. 175-177.
1928b. Figures and descriptions of the fishes of Japan. Tokyo, vol. 44, pp. 847-870, pls. 178-180.
1936. The fishes of Japan. Tokyo, 334 pp.
1951. Dr. Tanaka's Japanese fishes in life colours. Tokyo, lx+203 pp., 355 figs.
- TAYLOR, W. R.
1964. Fishes of Arnhem Land. In Specht, R. L. (ed.), *Records of the American-Australian scientific expedition to Arnhem Land*. 4. Zoology. Melbourne, London and New York, pp. 45-307, pls. 1-68.
- TCHANG, T.-L.
1938. Some Chinese clupoid [sic] fishes. *Bull. Fan Mem. Inst. Biol., Zool. Ser.*, vol. 8, pp. 311-337, 11 figs.
1957. The distribution of chinese clupeoid fishes. *Acta Zool. Sinica*, vol. 9, pp. 339-344.
- TEMMINCK, C. J., AND H. SCHLEGEL
1846. Pisces. In Siebold, P. F. de (ed.), *Fauna Japonica*. Leiden, pt. 5, pp. 173-269, pls. 88-115.
- TENG, H. T., AND T.-R. CHEN
1960. Contributions to the studies of fishes from

- I-Lan and Lo-Tong Districts. Taiwan Fish. Res. Inst., Lab. Fish. Biol., rept. no. 11, 28 pp.
- THOMAS, J. L.
1962. The occurrence and distribution of threadfin shad in southern California waters. California Fish Game, vol. 48, pp. 282-283.
1967. The diet of juvenile and adult striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin River System. *Ibid.*, vol. 53, pp. 49-62, 4 figs.
- TIRANT, G.
1883. Mémoire sur les poissons de la rivière de Hué. Bull. Soc. Etudes Indochinoises, pp. 80-101. (Not seen. Reprint: Anon., 1929).
1886. Note sur les poissons de la Basse-Cochinchine et du Cambodge. Excursions et Reconnaissances, vol. 10, pp. 91-198. (Not seen. Reprint: Anon., 1929).
- TOMINAGA, M.
1965. Anatomical sketches of 500 fishes. Tokyo, vol. 1, 274 pp., 216 pls.
- TORTONESE, E.
1939. Risultati ittologici del viaggio di circumnavigazione del globodella R.N. "Magenta" (1865-68). Boll. Mus. Zool. Anat. Comp., Torino, vol. 47, ser. 3, pp. 1-245, 9 pls.
1957. Su alcuni pesci eritrei e Somali del Museo Civico di Storia Naturale de Venezia. Boll. Mus. Civ. Stor. Nat. Venezia, vol. 10, pp. 121-128, 3 pls.
1964-1965. Contributo allo studio sistematico e biogeographico dei pesci della Nuova Guinea. Ann. Mus. Civ. Stor. Nat. "Giacomino Doria," vol. 75, pp. 13-98, 9 figs.
- TRENT, L., AND W. W. HASSLER
1966. Feeding behavior of adult striped bass, *Roccus saxatilis*, in relation to stages of sexual maturity. Chesapeake Sci., vol. 7, pp. 189-192.
- TRIPATHI, Y. R.
1959. Studies on parasites of Indian fishes. V. Acanthocephala. Rec. Indian Mus., vol. 54, pp. 61-99, 10 figs.
- TUGE, H., K. UCHIHASHI, AND H. SHIMAMURA
1968. An atlas of the brains of fishes of Japan. Tokyo, 240 pp.
- TURNAGE, D.
1964. A survey of fishes in Lake Palourde, Louisiana. Proc. Louisiana Acad. Sci., vol. 27, pp. 8-11.
- TURNER, J. T.
1966. Distribution of threadfin shad, *Dorosoma petenense*; tule perch, *Hysterocarpus traskii*; sculpin spp. and crayfish spp., in the Sacramento-San Joaquin Delta. Fish. Bull. California, vol. 136, pp. 160-168, 5 figs.
- UCHIDA, K., AND H. TSUKAHARA
1955. The fish-fauna of Ariake Sound. Bull. Bio-geog. Soc. Japan, vols. 16-19, pp. 292-302.
- UMALI, A. F.
1934. The fishery industries of southwestern Samar. Philippine Jour. Sci., vol. 54, pp. 365-392, 8 figs., 7 pls.
1936. Edible fishes of Manila. Pop. Bull. Philippine Dept. Agr. Comm., no. 6, 192 pp., 145 figs., 8 pls.
1937. The fishery industry of San Miguel Bay. Philippine Jour. Sci., vol. 63, pp. 227-258, 9 figs., 7 pls.
1950. Key to the families of common commercial fishes in the Philippines. U.S. Fish Wildlife Serv. Res. Rept. no. 21, 47 pp.
- VALENCIENNES, M. A.
1847. Histoire naturelle des poissons. Paris, vol. 20, xviii+472 pp., pls. 591-606.
1848. Histoire naturelle des poissons. Paris, vol. 21, xvi+536 pp., pls. 607-633.
- VANICEK, C. D.
1964. Age and growth of sauger, *Stizostedion canadense* (Smith), in Lewis and Clark Lake. Iowa State Jour. Sci., vol. 38, pp. 481-502, 4 figs.
- VAN METER, H. D., AND M. B. TRAUTMAN
1970. An annotated list of the fishes of Lake Erie and its tributary waters exclusive of the Detroit River. Ohio Jour. Sci., vol. 70, pp. 65-78, 1 fig.
- VIALI, M.
1926. L'organo epibranchiale dei Clupeidi. Monit. Zool. Italiano, vol. 37, pp. 174-185, 4 figs.
- VILLADOLID, D. V.
1937. The fisheries of Lake Taal, Pansipit River, and Balayan Bay, Batangas Province, Luzon. Philippine Jour. Sci., vol. 63, pp. 191-244, 2 figs., 4 pls.
- VINCIGUERRA, D.
1926. Catalogo dei pesci raccolti a Borneo dai Sigg. Marchese G. Doria et Dott. O. Beccari negli anni 1865-67. Ann. Mus. Civ. Stor. Nat. Genova, ser. 3, vol. 10, pp. 532-628, 1 pl.
- VLADYKOV, U., AND D. E. McALLISTER
1961. Preliminary list of marine fishes of Quebec. Nat. Canadien, vol. 88, pp. 53-78.
- WAITE, E. R.
1900. Notes on fishes from Western Australia, and description of a new species. Rec. Australian Mus., vol. 3, pp. 210-216, pl. 37.
1904. A synopsis of the fishes of New South Wales. Mem. New South Wales Nat. Club, no. 2, 59 pp.
1921. Catalogue of the fishes of South Australia. Rec. South Australian Mus., vol. 2, pp. 1-208.

1923. The fishes of South Australia. Adelaide, 243 pp., illus.
1927. Supplement to the catalogue of the fishes of South Australia. Rec. South Australian Mus., vol. 3, pp. 223-234, pl. 13.
1928. Check list of the marine fishes of South Australia. Jour. Pan-Pacific Res. Inst., vol. 3, no. 1, pp. 3-10.
- WALBAUM, J. J.
1792. Petri Artedi sueci genera piscium. Ichthyologiae pars III. Grypeswaldiae, 723 pp., 3 pls. (reprint: 1966, Lehre, Codicote and New York).
- WALBURG, C. H.
1964. Fish population studies, Lewis and Clark Lake, Missouri River, 1956 to 1962. U.S. Fish Wildlife Serv., Special Sci. Rept. Fish., no. 482, 27 pp., 5 figs.
1969. Fish sampling and estimation of relative abundance in Lewis and Clark Lake. Tech. Papers Bur. Sport Fish. Wildlife, no. 18, 15 pp., 5 figs.
- WALKER, B. T.
1965. A taxonomic survey of the fish fauna of Bayou d'Arbonne Drainage System prior to impoundment. Proc. Louisiana Acad. Sci., vol. 28, pp. 105-110.
- WALKER, B. W. (ED.)
1961. The ecology of the Salton Sea, California, in relation to the sport fishery. California Dept. Fish Game Fish Bull., no. 13, 204 pp., 80 figs.
- WALKER, J. M.
1962. Fishes in north Louisiana. Proc. Louisiana Acad. Sci., vol. 25, pp. 35-41.
1963. Fishes in Choudrant Bayou. *Ibid.*, vol. 26, pp. 45-48.
- WANG, K. F.
1933. Study of the teleost fishes of coastal region of Shantung. Contrib. Biol. Lab. Sci. Soc. China, Zool. Ser., vol. 9, pp. 1-76, 39 figs.
1935. Preliminary notes on the fishes of Chekiang (Isospondyli, Apodes and Plectospondyli). *Ibid.*, vol. 11, pp. 1-65, 9 figs.
- WEBER, M.
1894. Die Süsswasser-Fische des Indischen Archipels, nebst Bemerkungen über den Ursprung der Fauna von Celebes. In Weber, M. (ed.), Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien. Leiden, vol. 3, pp. 405-476.
1895. Fische von Ambon, Java, Thursday Island, dem Burnett-Fluss und von der Südküste von Neu-Guinea. In Semon, R. (ed.), Zoologische Forschungsreisen in Australien und dem malayischen Archipel. Jena, vol. 5, pp. 257-276, 1 fig.
- WEBER, M., AND L. F. DE BEAUFORT
1913. The fishes of the Indo-Pacific Archipelago. II. Malacopterygii, Myctophoidea, Ostariophysii: I. Siluroidea. Leiden, xx+404 pp., 151 figs.
- WELKER, B. D.
1967. Fish population in five Missouri River ox-bow lakes. Proc. Iowa Acad. Sci., vol. 72, pp., 230-237.
- WELLS, L.
1968. Seasonal depth distribution of fish in southeastern Lake Michigan. U.S. Dept. Int. Fish. Bull., vol. 67, pp. 1-15.
- WHITAKER, J. O., JR.
1969. Keys to the vertebrates of the eastern United States excluding birds. Minneapolis, vi+256 pp.
- WHITEHEAD, P. J. P.
1962. A review of the Indo-Pacific gizzard shad genera *Nematalosa*, *Clupanodon*, and *Konosirus* (Pisces: Dorosomatidae). Bull. Brit. Mus. (Nat. Hist.), Zool., vol. 9, pp. 87-102, 4 figs.
1965. A review of the elopoid and clupeoid fishes of the Red Sea and adjacent regions. *Ibid.*, vol. 12, pp. 225-281, 4 figs.
1966. The elopoid and clupeoid fishes in Richardson's "Ichthyology of the seas of China and Japan" 1846. *Ibid.*, vol. 14, pp. 15-54, 7 pls.
1967. The clupeoid fishes described by Lacepède, Cuvier and Valenciennes. *Ibid.*, Suppl., no. 2, 180 pp., 11 pls.
1968. Indian Ocean anchovies collected by the Anton Bruun and Te Vega, 1963-1964. Jour. Mar. Biol. Assoc. India, vol. 9, pp. 13-37, 4 figs.
- 1969a. The clupeoid fishes of Malaya. *Ibid.*, vol. 9, pp. 223-280, 58 figs.
- 1969b. The clupeoid fishes described by Bloch and Schneider. Bull. Brit. Mus. (Nat. Hist.), Zool., vol. 17, pp. 261-279, 2 figs., 3 pls.
- [MS.] A synopsis of the clupeoid fishes of the Indian Ocean.
- WHITEHEAD, P. J. P., M. BOESEMAN, AND A. C. WHEELER
1966. The types of Bleeker's Indo-Pacific elopoid and clupeoid fishes. Zool. Verhandl., no. 84, 159 pp., 19 pls.
- WHITLEY, G. P.
1943a. Ichthyological notes and illustrations. (part 2). Australian Zool., vol. 10, pp. 167-187, 10 figs.
- 1943b. Ichthyological descriptions and notes. Proc. Linnean Soc. New South Wales, vol. 68, pp. 114-144, 12 figs.
1947. The fluvifaunulae of Australia with particular reference to freshwater fishes in

- Western Australia. *Western Australia Nat.*, vol. 1, pp. 49–53, 2 figs.
- 1948a. New sharks and fishes from Western Australia. Part 4. *Australian Zool.*, vol. 11, pp. 259–276, pls. 24–25.
- 1948b. A list of the fishes of Western Australia. *Western Australia Fish. Dept. Fish. Bull.*, no. 2, 35 pp.
1956. List of the native freshwater fishes of Australia. *Proc. Roy. Zool. Soc. New South Wales*, for 1954–1955, pp. 39–47, 16 figs.
1957. Ichthyological illustrations. *Ibid.*, for 1955–1956, pp. 56–71, 12 figs.
1962. Native freshwater fishes of Australia. *Brisbane*, 127 pp.
- WILLEY, A.
1910. Notes on the freshwater fisheries of Ceylon. *Spolia Zeylanica*, vol. 7, pt. 26, pp. 88–105, 1 pl.
- WILLIAMS, K. A. W.
1971. The fishes found in the freshwaters of the Brisbane River and the associated systems of the Bremer and Stanley Rivers. *Queensland Nat.*, vol. 20, pp. 51–53.
- WOLFERT, D. R.
1966. Food of young-of-the-year walleyes in Lake Erie. *U.S. Fish. Bull.*, vol. 65, pp. 489–494, 1 fig.
- WONGRATANA, T.
1968. A check list of fishes caught during the trawl surveys in the Gulf of Thailand and off the east coast of the Malay Peninsula. *Marine Fish. Lab., Bangkok*, contrib. no. 13, 96 pp.
- WOODS, J. E. T.
1882. Fish and fisheries of New South Wales. Sydney, xvi+213 pp., 45 pls.
- WRIGHT, L. D.
1970. Forage size preference of the largemouth bass. *Prog. Fish-Cult.*, vol. 32, pp. 39–42.
- WU, H. W.
1929. Study of the fishes of Amoy. Part 1. *Contrib. Biol. Lab. Sci. Soc. China*, vol. 5, no. 4, 90 pp., 70 figs.
1931. Note sur les poissons marins recueillis par M. Y. Chen sur la côte du Tchékiang, avec synopsis des espèces du genre *Tridentiger*. *Sinensia*, vol. 1, pp. 165–174.
- YERGER, R. W.
1961. Additional records of marine fishes from Alligator Harbor, Florida, and vicinity. *Quart. Jour. Florida Acad. Sci.*, vol. 24, pp. 111–116.
- YOSHIDA, Y.
1967. On the feeding mechanisms of plankton feeders. *Inform. Bull. Planktonology Japan*, 1967, pp. 271–278 (Fishery Research Board of Canada, translation series, no. 1784).
- ZEITZ, A.
1896. Pisces. In Spencer, M. A. (ed.), Report on the work of the Horn Scientific Expedition to central Australia. Part II—Zoology. London and Melbourne, pp. 176–180, pl. 16.
1902. List of the edible fish of the lower Murray. *Trans. Roy. Soc. South Australia*, vol. 26, pp. 265–267.

INDEX OF SCIENTIFIC NAMES

Page numbers in boldface type refer to descriptions of the taxa.

- altus, *Chatoessus*, **161**, 162
Mystus, 169
Anadontostomidae, **139**
 anale, *Dorosoma*, 140–141, 168, **170**
Anodontostoma, 138–139, **141**
 breviceps, 145
 chacunda, 139, **141**, 142, 143, 145, 151, 174, 176–179
 chanpole, 147
 hasseltii, 141, **142**
 nasus, 162
Anodontostomatini, 135, **139**, 141
 aquosus, *Chatoessus*, **164**, 167
 arabica, *Nematalosa*, 148, **149**, 150, 174–179
 atchafalayae, *Signalosa*, 173
- breviceps*, *Anodontostoma*, 145
 Chatoessus, **143**, 145
Brevoortia, 138
bulleri, *Fluvialosa*, **152**, 157
- cepediana*, *Megalops*, **170**
cepedianum, *Dorosoma*, 168, **170**
chacunda, *Anodontostoma*, 139, **141**, 142, 143, 145, 151, 174, 176–179
 Chatoessus, 146
 Clupanodon, **141**
 Dorosoma, 147
chanpole, *Anodontostoma*, 147
 Chatoessus, 147
 Clupanodon, **142**
Chatoessus altus, **161**, 162
 aquosus, **164**, 167
 breviceps, **143**, 145
 chacunda, 146
 chanpole, 147
 chrysopterus, **161**, 162
 come, 157
 cortius, 148
 elongatus, 149, **152**, 157
 erebi, 151, **152**, 164
 horni, **152**, 158
 maculatus, **169**
 manmina, 149
 manminna, 149
 modestus, 147, **149**
 nasus, 150–151, 158–159, 162, 164
 osbeckii, **169**
 punctatus, 152, 163, **164**, 167
 richardsoni, **152**, 158
 selangkat, **143**, 147, 161
 triza, 170
Chatoesus come, **150**
chavesi, *Dorosoma*, **172**
chrysopterus, *Chatoessus*, **161**, 162
 Dorosoma, 162
Clupanodon, 138, **164**
- chacunda*, **141**
chanpole, **142**
cortius, **147**
haihoensis, **169**
maculatus, 169
manmina, **147**
nasica, **161**, 162
nasus, 161–162
osbeckii, 169
punctata, 167
punctatus, 138, 140, 160, **164**, 165, 167, 174, 176–179
thrissa, 138, 152, 158, 161, 163, 165, 167–168, **169**, 174, 176–179
- Clupanodontidae*, **164**
Clupanodontini, 135, 139, 141, **164**
Clupea libertatis, 169
 nasus, 149, **161**, 162
 pilchardus, 164
 thrissa, 163–164, 168, **169**, 170
 triza, **169**
Clupeonia jussieui, 164
coma, *Nematalosa*, 151
come, *Chatoessus*, 157
 Chatoesus, **150**
 Dorosoma, 151, 157
 Nematalosa, 148, **150**, 151–152, 157, 159, 163–164, 175–179
cortius, *Chatoessus*, 148
 Clupanodon, **147**
- Dorosoma*, 135, 138, 156, **170**, 174
 anale, 140–141, 168, **170**
 cepedianum, 168, **170**
 chacunda, 147
 chavesi, **172**
 chrysopterus, 162
 come, 151, 157
 erebi, 158, 164
 indicus, 147
 maculatum, 169
 maculatus, 169
 mexicanum, 173
 nasus, 152, 161–162
 notata, 170
 osbeckii, 169
 petenense, 138, 140–141, 172, **173**
 punctatum, 167
 smithi, 172, **173**
 thrissa, 168, 170
 triza, 170
Dorosomatinae, 137, **138**
Dorosomatini, 135, 139, 141, **170**
- elongata*, *Fluvialosa*, 157
 Nematalosa, 157

- elongatus, Chatoessus, 149, **152**, 157
 Nematalosa, 157
 erebi, Chatoessus, 151, **152**, 164
 Dorosoma, 158, 164
 Fluvialosa, 158
 Nematalosa, 139, 150–151, **152**, 153–156, 158–159,
 163, 174–180
 Ethmalosa, 135, 138
 Ethmidium, 138

 Fluvialosa, **149**, 152, 163
 bulleri, **152**, 157
 elongata, 157
 erebi, 158
 horni, 158
 papuensis, **152**, 158
 paracome, **152**, 158
 richardsoni, 158
 vlaminghi, **163**

 galathea, Nematalosa, 139, 155, **158**, 159, 161,
 174–179
 Gonialosa, 138, **147**, 158
 manmina, 142, **147**, 149, 174, 176–179
 manminna, 149
 modesta, 148, **149**, 174, 176–179
 modestus, 149
 Gonostoma javanicum, 147
 Gudusia, 135, 138

 haihoensis, Clupanodon, **169**
 hasseltii, Anodontostoma, 141, **142**
 Hilsa, 135, 138
 horni, Chatoessus, **152**, 158
 Fluvialosa, 158
 Nematalosa, 158

 Indialosa, **147**
 indicus, Dorosoma, 147

 japonica, Nematalosa, 150, 152, 155, **159**, 161, 163,
 175–179
 javanicum, Gonostoma, 147
 jussieui, Clupeonia, 164

 Konosirus, **164**
 nasus, 152, 161, 163, 167
 punctatus, 167
 thrissa, 152, 161, 163, 170

 libertatis, Clupea, 169

 maculatum, Dorosoma, 169
 maculatus, Chatoessus, **169**
 Clupanodon, 169
 Dorosoma, 169
 manmina, Chatoessus, 149
 Clupanodon, **147**
 Gonialosa, 142, **147**, 149, 174, 176–179
 manminna, Chatoessus, 149
 Gonialosa, 149
 Megalops cepediana, **170**
 oglina, 164
 Meletta petenensis, **173**
 thyssa, 170
 mexicana, Signalosa, 173
 mexicanum, Dorosoma, 173
 modesta, Gonialosa, 148, **149**, 174, 176–179
 modestus, Chatoessus, 147, **149**
 Gonialosa, 149
 Mystus altus, 169

 nasica, Clupanodon, **161**, 162
 nasus, Anodontostoma, 162
 Chatoessus, 150–151, 158–159, 162, 164
 Clupanodon, 161–162
 Clupea, 149, **161**, 162
 Dorosoma, 152, 161–162
 Konosirus, 152, 161, 163, 167
 Nematalosa, 150, 152, 158, 160, **161**, 163, 175–179
 Nealosa, **164**
 punctata, 167
 Nematalosa, 138, 140, **149**
 arabica, 148, **149**, 150, 174, 175–179
 coma, 151
 come, 148, **150**, 151–152, 157, 159, 163–164, 175–
 179
 elongata, 157
 elongatus, 157
 erebi, 139, 150–151, **152**, 153–156, 158–159, 163,
 174–180
 galathea, 139, 155, **158**, 159, 161, 174, 175–179
 horni, 158
 japonica, 150, 152, 155, **159**, 161, 163, 175–179
 nasus, 150, 152, 158, 160, **161**, 163, 175–179
 richardsoni, 158
 vlaminghi, 150, 152, 159–160, **163**, 175–179
 Nematalosidae, **139**
 notata, Dorosoma, 170

 oglina, Megalops, 164
 Opisthonema, 138
 osbeckii, Chatoessus, **169**
 Clupanodon, 169
 Dorosoma, 169

 papuensis, Fluvialosa, **152**, 158
 paracome, Fluvialosa, **152**, 158
 petenense, Dorosoma, 138, 140–141, 172, **173**
 petenensis, Meletta, **173**
 Signalosa, 174
 pilchardus, Clupea, 164
 punctata, Clupanodon, 167
 Nealosa, 167
 punctatum, Dorosoma, 167
 punctatus, Chatoessus, 152, 163, **164**, 167

- Clupanodon, 138, 140, 160, **164**, 165, 167, 174,
176–179
Konosirus, 167
- richardsoni, Chatoessus, **152**, 158
Fluviolosa, 158
Nematalosa, 158
- selangkat, Chatoessus, **143**, 147, 161
Signalosa, **173**
 atchafalayae, 173
 mexicana, 173
 petenensis, 174
smithi, Dorosoma, 172, **173**
- Thrissa, **164**
thrissa, Clupanodon, 138, 152, 158, 161, 163, 165,
167–168, **169**, 174, 176–179
 Clupea, 163–164, 168, **169**, 170
 Dorosoma, 168, 170
 Konosirus, 152, 161, 163, 170
thryssa, Meletta, 170
triza, Chatoessus, 170
 Clupea, **169**
 Dorosoma, 170
- vlaminghi, Fluviolosa, **163**
Nematalosa, 150, 152, 159–160, **163**, 175–179

