Report on Gerreidae specimens (Teleostei: Perciformes) deposited in the Department of Zoology, The University Museum, The University of Tokyo, with notes on *Gerres* cf. *chrysops* from Sarawak, Borneo

Hidetoshi Wada[1*)], Keita Koeda[2)], Masahiro Aizawa[2)], Kazuo Sakamoto[2,3)], Rei Ueshima[2,4)]

[1)]Kanagawa Prefectural Museum of Natural History, 499 Iryuda, Odawara, Kanagawa 250-0031, Japan
[2)]The University Museum, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan
[3)]Fish Information Center and Museum, 6-6 Toyosu, Koto-ku, Tokyo 135-0061, Japan
[4)]Department of Biological Sciences, Graduate School of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

*Corresponding author: h-wada@nh.kanagawa-museum.jp

Abstract

The collection of Gerreidae (Teleostei: Perciformes) held in the Department of Zoology, The University Museum, The University of Tokyo (ZUMT) includes 156 specimens representing two genera and eight species, most of which were collected in the early 20th century, but does not include type specimens of nominal species in the family. A single specimen from Sarawak, Borneo (88.4 mm standard length; SL) agreed well with the morphological characters of *Gerres chrysops* Iwatsuki, Kimura & Yoshino, 1999, previously recorded only from northeastern Gulf of Thailand, in having the following characters: IX, 10 dorsal-fin rays; 12 gill rakers on the first gill arch; body depths at the pelvic fin and anal fin origins 47.0 % of SL and 39.4 % of SL, respectively; interorbital width 12.1% of SL; caudal-peduncle depth 13.6% of SL; and 2 supraneurals. However, the specimen differed slightly from the type specimens of *G. chrysops* in having 17 pectoral-fin rays (vs. 16 in the latter), and 10.5 scale rows below the lateral line (vs. 8.5–9.5). Although the former may yet prove to be an undescribed species, any judgment must be based on additional specimens and comparative materials. A single specimen of *Gerres equulus* Temminck & Schlegel, 1844 from Fukushima Prefecture represents the first record of this species from the Tohoku region.

Introduction

The silverbiddy family Gerreidae (Teleostei: Perciformes), currently represented by seven valid genera and 54 valid species in tropical to temperate waters in the Indo-Pacific and Atlantic (Fricke et al. 2021), is characterized by the following characters: body laterally compressed, oblong, oval, or with markedly elevated back; mouth terminal, strongly protractile, pointing downward when extended; bands of acute minute teeth in both jaws; incisors, canines and molars absent; dorsal fin long, single, with 9 (occasionally 10) spines, the first very short (except in *Parequula*), and a similar number of soft rays (9–11 in *Deckertichthys*, *Diapterus*, *Eucinostomus*, *Eugerres* and *Gerres*) or greater (12–15 in *Pentaprion* and 16–18 in *Parequula*); base of dorsal fin sheathed in a row of deciduous scales; anal fin usually with III spines (very

rarely II), but V or VI in *Pentaprion*, the first spine very short in all species, except *Parequula*; 6–8 anal-fin rays (but 12–14 in *Pentaprion* and 14–18 in *Parequula*); pectoral fins long and pointed; caudal fin markedly to very deeply forked; scales large, deciduous, cycloid or finely ctenoid, extending over sides of head (Roux 1986; Deckert and Greenfield 1987; Woodland 2001; Gilmore and Greenfield 2003; Iwatsuki et al. 2012; Vergara-Solana et al. 2014). Most species, except deepwater species in the genus *Parequula*, inhibit shallow sandy or muddy bottoms in coastal waters, feeding on small bottom invertebrates by taking up mouthfuls of substrate, and expelling sand and debris (Woodland 2001; Iwatsuki et al. 2012).

The family has long been confused taxonomically due to the similar overall appearance, coloration, and meristics of species (Woodland 1986; Iwatsuki et al. 1999a). However, recent studies have resolved many of the issues, with the recognition of some Indo-Pacific species complexes (Iwatsuki et al. 1996, 1998, 1999a, b, 2001a, b, c, 2002, 2007, 2012; Iwatsuki and Kimura 1998; Iwatsuki and Heemstra 2001, 2007).

During the management of the fish collection in the Department of Zoology, The University Museum, The University of Tokyo (ZUMT), 156 specimens were identified by the first author as belonging to the family Gerreidae. They are listed below with morphological and distributional notes.

Materials and Methods

Identifications of the gerreid specimens in ZUMT were confirmed by the first author, with reference to Iwatsuki et al. (1996, 1998, 1999a, b, 2001a, b, c, 2002, 2007, 2012), Iwatsuki and Kimura (1998), Iwatsuki and Heemstra (2001, 2007), and Woodland (2001). Standard lengths (SL) were measured for all specimens, which are arranged herein in alphabetical order by species. Although, some of the ZUMT specimens collected by Tokiharu Abe (阿部宗明) had not been formally cataloged into the ZUMT collection (and the data of some specimens not retained), such specimens are listed herein with the number ZUMT ABE-XXXX (number written on the accompanying label), due to the possibility of future discovery of Dr. Abe's remaining catalog books with collection data. Local name, and collector's name and affiliation are given where known (from ZUMT specimen catalog or tag), with Japanese language equivalents in parentheses. The following list includes ZUMT number, SL, number of specimens in parentheses when two or more, type (abbreviated when non-type), collection locality, collection date, collector or donator and affiliation, collection method, and remarks when applicable.

Collection of Gerreidae in ZUMT

Two genera and eight species of the family Gerreidae are represented by 156 specimens held in ZUMT, there being no type specimens of any nominal species. Specimens were collected from 1909 to 1960, many representing subtropical or tropical species from the Ryukyu Archipelago, and the tropical Indo-West Pacific. Most specimens from waters off Kyushu and Honshu were identified as *Gerres equulus* Temminck & Schlegel, 1844, the most commonly caught species (by set net, seine net, and line-fishing) in temperate Japanese coastal areas (Iwatsuki et al. 1999a; Shimose 2018; Hata 2020). Other common species inhabiting temperate Japanese waters, *Gerres japonicus* Bleeker, 1854 and *Gerres akazakii* Iwatsuki,

Kimura & Yoshino, 2007 were not found in the collection, due to their preferred estuarine habitat (Iwatsuki et al. 2007). Consequently, they are rarely collected by set nets and/or gill nets on rocky reefs, the most common methods of collecting coastal fish specimens in Japan.

Gerreidae クロサギ科

Gerres Quoy & Gaimard, 1824 クロサギ属

Gerres* cf. *chrysops Iwatsuki, Kimura & Yoshino, 1999

(Fig. 1)

ZUMT 62506 (paper tag P. 611): 88.4 mm SL, probably around Sarawak, donated in 1960 by Tom Harrisson (Sarawak Museum) to I. Tomiyama (冨山一郎).

Remarks: The specimen from Sarawak belongs to the *Gerres setifer* complex sensu Iwatsuki et al. (2001a), in having a deep body (depth at pelvic fin origin 47.0% of SL) and two supraneural bones (Fig. 1). Moreover, it agreed well with the morphological characters of *Gerres chrysops*, previously recorded only from northeastern Gulf of Thailand, having the following features: IX, 10 dorsal-fin rays; 12 gill rakers on first gill arch; body depth at anal fin origin 39.4 % of SL; interorbital width 12.1% of SL; and caudal-peduncle depth 13.6% of SL (Fig. 1; Iwatsuki et al. 1999b). However, the specimen differed slightly from the type specimens of *G. chrysops* in having 17 pectoral-fin rays (vs. 16 in the latter) and 10.5 scale rows below the lateral line (vs. 8.5–9.5), and is likely to represent an undescribed species, due to the currently recognized species in the *G. setifer* complex having a limited distribution (Iwatsuki et al. 1999b, 2001a). However, additional specimens and comparative materials are required before any taxonomic conclusions are made (currently under study by H.W.).

Since the *G. setifer* complex is currently known only Bengal and Thailand bays, Malay Peninsula, Xisha Archipelago, the southwestern Eurasian coast from Amoy to Guanghai, and Taiwan, the present specimen probably represents the first record of the complex from Borneo.

Gerres equulus Temminck & Schlegel, 1844 クロサギ

ZUMT 2320: 144.9 mm SL, Nagasaki, Japan, 11 July 1909.

ZUMT 2658: 107.2 mm SL, Nagasaki, Japan, Feb. 1910, Nagasaki Prefecture Normal School (長崎師範学校), local name “Inoko (イノコ)”.

ZUMT 3654 (cloth tag Hamamatsu "濱松"): 57.0 mm SL, Hamamatsu (浜松), Shizuoka, Japan, T. Saito (斎藤智治)

ZUMT 3880: 77.5 mm SL, Kajiki (加治木), Kagoshima, Japan, Y. Tashiro, Kajiki Junior High School (加治木中学校　田代善太郎).

ZUMT 6402: 157.3 mm SL, Nagasaki, Japan, K. Kaneko (金子一狼).

ZUMT 7741: 57.4 mm SL, Ise-yokkaichi (currently probably "Yokkaichi (四日市市)"), Mie, Japan, M. Kobayashi, Ise-yokkaichi Elementary School (伊勢四日市第一小学校　小林万作).

ZUMT 7915: 181.1 mm SL, Shimanokuni-Momotori (志摩国桃取), currently Toba (鳥羽市), Mie, Japan, O. Taniguchi (谷口織平).
ZUMT 18402: 165.0 mm SL, Misaki (三崎), Miura, Kanagawa, Japan, K. Aoki (青木熊吉).
ZUMT 20209: 167.1 mm SL, Kisyu-tanabe (紀州田辺), Wakayama, Japan, Jan. 1920, N. Ui (宇井縫蔵).
ZUMT 21698: 182.3 mm SL, Tokyo Market.
ZUMT 22586: 32.0 mm SL, Kisyu-tanabe, Wakayama, Japan, Jan. 1920, N. Ui.
ZUMT 23778: 84.7 mm SL; **ZUMT 23779**: 98.7 mm SL; **ZUMT 23780**: 87.3 mm SL; **ZUMT 23781**: 60.7 mm SL; **ZUMT 23782**: 94.4 mm SL; **ZUMT 24095**: 69.3 mm SL, Taniyama (谷山), Kagoshima, Japan, 20 July 1930, local name “Amenoiwo (アメノイヲ)”.
ZUMT 23960: 105.4 mm SL; **ZUMT 24143**: 75.8 mm SL, Naya (納屋) [currently Nakamachi and Kinsei-cho (中町・金生町)], Kagoshima City, Kagoshima, Japan, local name “Amenoiwo (アメノイヲ)”.
Remarks: Naya Street (facing the sea) was established in 1615 (early Edo era) by Iehisa Shimazu (島津家久), at that time Lord of Satsuma Province, to serve as a fish market. It was considered as a major fish market in Kagoshima City until 1935, when the market was moved to Jonan, Kagoshima City (Naya Street Shopping Street Promotion Association 2021; Ixrea 2021). The area is currently inland due to land reclamation.
ZUMT 26879: 125.2 mm SL; **ZUMT 40487**: 87.7 mm SL; **ZUMT 40493**: 72.1 mm SL; **ZUMT 40494**: 78.8 mm SL, Kagoshima, Japan.
ZUMT 30081: 209.2 mm SL, Hayama (葉山), Miura, Kanagawa, Japan, Aug. 1934.
ZUMT 34101: 16.5 mm SL, Onahama, Iwaki, Fukushima, Japan, H. Kakuta (角田春彦).
ZUMT 43580: 37.2 mm SL, Nagasaki, Japan, Feb. 1912.
ZUMT 49205: 127.9 mm SL, Misaki (三崎), Miura, Kanagawa, Japan, 6 Feb. 1958, I. Tomiyama.
ZUMT 49964: 155.7 mm SL, Fukue-jima I. (福江島), Goto Is. (五島列島), Nagasaki, Japan, 10 June 1953, I. Tomiyama (Fukue-cho Fish. Corp.) (福江町漁業共同組合).
ZUMT 50037: 190.9 mm SL, Mitsuiraku (三井楽), Fukue-jima I., Goto Is., Nagasaki, Japan, 13 Oct. 1953, I. Tomiyama (Mitsuiraku-cho Fish. Corp.) (三井楽町漁業共同組合), Local name “Guchi (グチ)” or "Shindobari (シンドバリ)".
ZUMT 50190: 118.9 mm SL; **ZUMT 50191**: 135.5 mm SL; **ZUMT 50192**: 131.2 mm SL; **ZUMT 50193**: 131.3 mm SL, Arikawa (有川), Nakadori-jima I. (中通島), Goto Is., Nagasaki, Japan, 18 Oct. 1953, I. Tomiyama (Arikawa-cho Fish. Corp.) (有川町漁業共同組合).
ZUMT 52144: 127.1 mm SL, Totoro (土々呂), Nobeoka (延岡), Miyazaki, Japan, Aug. 1960.
ZUMT 62403 (cloth tag "Feb. 28. '68 福魚市"): catalog number newly given during this study, 204.0 mm SL, probably Fukuoka Fish Market, 28 Feb. 1968.
ZUMT 62405: 123.4 mm SL **ZUMT 62405**: 123.4 mm SL; **ZUMT 62406**: 123.4 mm SL; **ZUMT 62407**: 120.5 mm SL; **ZUMT 62412**: 78.6 mm SL; **ZUMT 62413**: 84.6 mm SL; **ZUMT 62414**: 60.3 mm SL; **ZUMT 62415**: 54.4 mm SL; **ZUMT 62416**: 46.7 mm SL; **ZUMT 62417**: 40.3 mm SL; **ZUMT 62421**: 50.9 mm SL, catalog numbers newly given during this study, localities and dates unknown.

ZUMT 62429 (cloth tag "332 アマギ VIII'32 MMB.S アベ". MMB.S probably refers to Misaki Marine Biological Station : School of Science, The University of Tokyo): catalog number newly given during this study, 79.3 mm SL, locality unknown, Aug. 1932, T. Abe (阿部宗明).

ZUMT ABE 11002: 125.9 mm SL; **ZUMT ABE '60-1026**: 111.2 mm SL; **ZUMT ABE '60-1027**: 110.3 mm SL; **ZUMT ABE '60-1028**: 106.5 mm SL; **ZUMT ABE '60-1029**: 96.7 mm SL, locality and date unknown, T. Abe.

Remarks: The distribution of *G. equulus* in Japan in the early to mid-20th century, as judged from these specimens, was not significantly different from the current distribution (Iwatsuki et al. 1999a; Hatooka 2013). In Japanese waters, *G. equulus* has been recorded from Chiba to Kagoshima prefectures on the Pacific coast, Niigata to Yamaguchi prefectures on the Sea of Japan coast, Nagasaki to Kagoshima prefectures on the East China Sea coast, Tokyo, Osaka and Kagoshima bays, the Seto Inland Sea, and Tsushima, Sadogashima, Tanegashima and Yaku-shima islands (Seto Inland Sea Fishery Development Council 1997; Iwatsuki et al. 1999a; Omi et al. 2003; Hatooka 2013; Takeuchi et al. 2015; Kaburagi 2016; Matsunuma et al. 2016; Motomura and Harazaki 2017; Arao et al. 2020; Hata 2020).

A single juvenile specimen from Fukushima Prefecture (ZUMT 34101, 16.5 mm SL) represents the first record of the species from Pacific Coast of the Tohoku region. Since warm water fishes are sometimes accidently transported northward to the southern Tohoku region by Kuroshio Follow-on (黒潮続流), the usually eastward-flowing branch from east of Boso Peninsula occasionally flows northward along the east coast of the peninsula (Kume et al. 2017), this individual was probably an example of such, possibly transported from south of Chiba Prefecture during the egg or larval stage.

Gerres erythrourus (Bloch, 1791)　セダカクロサギ

ZUMT 14756: 123.2 mm SL, Yaeyama Is. (八重山諸島), Ryukyu Archipelago (琉球列島), Okinawa, Japan, H. Yashiro (沖縄県産業課　屋代弘孝).

ZUMT 40898: 120.9 mm SL; **ZUMT 40908**: 86.1 mm SL, Jolo I., Sulu Archipelago, Philippines, Feb. 1909, I. Iijima (飯島　魁) and K. Aoki.

ZUMT 41993: 100.3 mm SL; **ZUMT 41994**: 89.1 mm SL; **ZUMT 41995**: 106.1 mm SL; **ZUMT 41996**: 86.2 mm SL; **ZUMT 41997**: 117.3 mm SL; **ZUMT 41998**: 88.7 mm SL; **ZUMT 41999**: 80.8 mm SL, Philippines, Jan. 1938, U. Yamamura (山村楳次郎).

ZUMT 42277: 80.6 mm SL, Philippines, 1926, U. Yamamura.

Gerres filamentosus Cuvier, 1829　イトヒキサギ

ZUMT 14899: 99.3 mm SL; **ZUMT 14900**: 97.4 mm SL; **ZUMT 14901**: 99.4 mm SL, Taiwan, T. Aoki (青木赳雄).

ZUMT 62402 (cloth tag Palao 49): catalog number newly given during this study, 87.4 mm SL, Palau.

ZUMT 62403 (cloth tag "169 ヒイラギ 3 月 31 日’31 年　淡水市場"): 142.8 mm SL, Tansui (淡水), New Taipei City (台北), Taiwan, 31 Mar. 1931, purchased at Tansui Market.

ZUMT ABE 3374: 93.4 mm SL; **ZUMT ABE 3376**: 103.5 mm SL; **ZUMT ABE 3453**: 97.0 mm SL; **ZUMT ABE 3697**: 86.4 mm SL, Palau, T. Abe.

ZUMT 62401: 60.0 mm SL; **ZUMT 62418**: 142.2 mm SL; **ZUMT 62419**: 120.4 mm SL; **ZUMT 62420**: 94.5 mm SL; **ZUMT 63059**: 93.7 mm SL; **ZUMT 63288**: 39.4 mm SL; **ZUMT 63289**: 40.3 mm SL, catalog numbers newly given during this study, localities and dates unknown.

Gerres longirostris (Lacepède, 1801)　ツッパリサギ

ZUMT 55304: 72.7 mm SL, Palau, Aug. 1935, Y. Haneda, Yokosuka City Museum (横須賀市立博物館　羽根田弥太).

ZUMT 63358 (cloth tag Palao 44): catalog number newly given during this study, 67.3 mm SL, Palau.

ZUMT ABE 3456: 79.9 mm SL; **ZUMT ABE 3456**: 79.9 mm SL; **ZUMT ABE 3465**: 86.0 mm SL; **ZUMT ABE 3454**: 94.8 mm SL; **ZUMT ABE 3455**: 86.4 mm SL; **ZUMT ABE 3457**: 93.9 mm SL; **ZUMT ABE 3458**: 99.2 mm SL; **ZUMT ABE 3459**: 98.3 mm SL; **ZUMT ABE 3460**: 89.9 mm SL; **ZUMT ABE 3461**: 100.0 mm SL, Palau, 1936, T. Abe.

Gerres oyena (Forsskål, 1775)　ミナミクロサギ

ZUMT 14067: 151.9 mm SL; **ZUMT 14068**: 139.0 mm SL; **ZUMT 14069**: 145.9 mm SL; **ZUMT 14070**: 140.8 mm SL, Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, H. Yashiro.

ZUMT 16775: 80.1 mm SL; **ZUMT 16776**: 119.0 mm SL; **ZUMT 16777**: 73.1 mm SL, Onna (恩納), west of Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, S. Tanabe (水産学校漁労科　田辺貞夫).

ZUMT 16832: 68.1 mm SL; **ZUMT 16833** (cloth tag 13 "十三"): 139.7 mm SL, Unten (運天), Nakijin (今帰仁), northwest of Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, S. Tanabe.

ZUMT 16954: 92.1 mm SL; **ZUMT 16962**: 97.5 mm SL; **ZUMT 16963**: 82.8 mm SL; **ZUMT 16964** (cloth tag "イせ"): 89.2 mm SL; **ZUMT 16965**: 116.0 mm SL; **ZUMT 17107**: 122.3 mm SL; **ZUMT 17108**: 135.0 mm SL; **ZUMT 17110**: 133.8 mm SL, Itoman (糸満), south of Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, S. Tanabe.

ZUMT 17308: 93.6 mm SL, Yaeyama Is., Ryukyu Archipelago, Okinawa, Japan, S. Tanabe.

ZUMT 17390: 76.1 mm SL, Naha (那覇), southwest of Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, S. Tanabe and Hiyane (比屋根).

ZUMT 25482: 125.7 mm SL, Philippines, before 12 May 1933, A.W. Herre (Stanford University).

ZUMT 42000: 128.1 mm SL, Philippines, Jan. 1938, U. Yamamura.

ZUMT 53004: 77.3 mm SL; **ZUMT 53006**: 73.3 mm SL; **ZUMT 53009**: 61.7 mm SL; **ZUMT 53010**: 53.4 mm SL; **ZUMT 53011**: 73.9 mm SL, probably east coast of African Continent (catalog entry, "Taki-Africa 4"), probably Taki.

ZUMT 53506: 71.5 mm SL, Ishigaki-jima I.? (石垣島), Yaeyama Is., Ryukyu Archipelago, Okinawa, Japan, probably T. Sato (佐藤寅夫).

Remarks: The specimen supposedly collected from Ishigaki-jima Island (based on the ZUMT specimen ledger) was included in a series with specimens of *Sardinops melanostictus* (Temminck & Schlegel, 1846) (Clupeidae) (ZUMT 53211) and *Pempheris japonica* Döderlein, 1883 (Pempheridae) (ZUMT 53349). Therefore the locality is doubtful.

ZUMT 62426 (cloth tag, No. 4): catalog number newly given during this study, 90.6 mm SL, locality and date unknown.

ZUMT ABE 2325: 118.6 mm SL; **ZUMT ABE 2713**: 169.3 mm SL; **ZUMT ABE 2739**: 123.04 mm SL; **ZUMT ABE 2740**: 125.7 mm SL; **ZUMT ABE 2776**: 152.2 mm SL; **ZUMT ABE 2823**: 146.1 mm SL; **ZUMT ABE 3184**: 77.7 mm SL; **ZUMT ABE 3451**: 171.0 mm SL; **ZUMT ABE 3452**: 111.6 mm SL; **ZUMT ABE 3462**: 91.7 mm SL; **ZUMT ABE 3463**: 86.6 mm SL; **ZUMT ABE 3464**: 61.5 mm SL; **ZUMT ABE 3466**: 92.2 mm SL; **ZUMT ABE 3696**: 67.7 mm SL; **ZUMT ABE 4259**: 167.6 mm SL; **ZUMT ABE 4260**: 160.6 mm SL, Palau, 1936, T. Abe.

ZUMT ABE '60-1319: 131.4 mm SL, **ZUMT ABE '60-1320**: 114.4 mm SL; **ZUMT ABE '61-1035**: 106.0 mm SL, T. Abe, locality and date unknown.

Gerres shima Iwatsuki, Kimura & Yoshino, 2007　シマクロサギ

ZUMT 62408: 83.6 mm SL; **ZUMT 62409**: 113.1 mm SL; **ZUMT 62410**: 85.2 mm SL; **ZUMT 62411**: 82.0 mm SL, catalog numbers newly given during this study, localities and dates unknown.

Pentaprion Bleeker, 1850　タイワンサギ属

Pentaprion longimanus (Cantor, 1849)　タイワンサギ

ZUMT 11244: 67.0 mm SL; **ZUMT 11245**: 113.0 mm SL, probably Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, S. Sakaguhi, Okinawa Daiichi Junior High School (沖縄県立第一中学校　坂口総一郎).

ZUMT 39749: 122.3 mm SL; **ZUMT 39812**: 121.0 mm SL; **ZUMT 39913**: 111.7 mm SL, probably Okinawa-jima I., Ryukyu Archipelago, Okinawa, Japan, before Mar. 1925, S. Sakaguhi.

ZUMT 40778: 64.6 mm SL, **ZUMT 40802**: 57.0 mm SL, **ZUMT 40822**: 51.5 mm SL, **ZUMT 40823**: 57.5 mm SL, **ZUMT 40879**: 68.6 mm SL, Manila, Philippines, 11 Feb. 1909, I. Iijima and K. Aoki.

ZUMT 51048: 107.4 mm SL, East China Sea, Dec. 1959, bottom trawl.

ZUMT 51216: 100.5 mm SL, Norin Area 554, East China Sea, 20 Jan. 1960, F/V *Ten-yo-maru* (天洋丸).

ZUMT 51406: 102.6 mm SL, East China Sea or Fukuoka Fish Market, Oct. 1959.

ZUMT 54090: 134.9 mm SL, Kuji (久慈), southwest of Amami-oshima I. (奄美大島), Amami Is., Kagoshima, Japan, 20 May 1966, line fishing, donated by local fisherman to Y. Tominaga (富永義昭).

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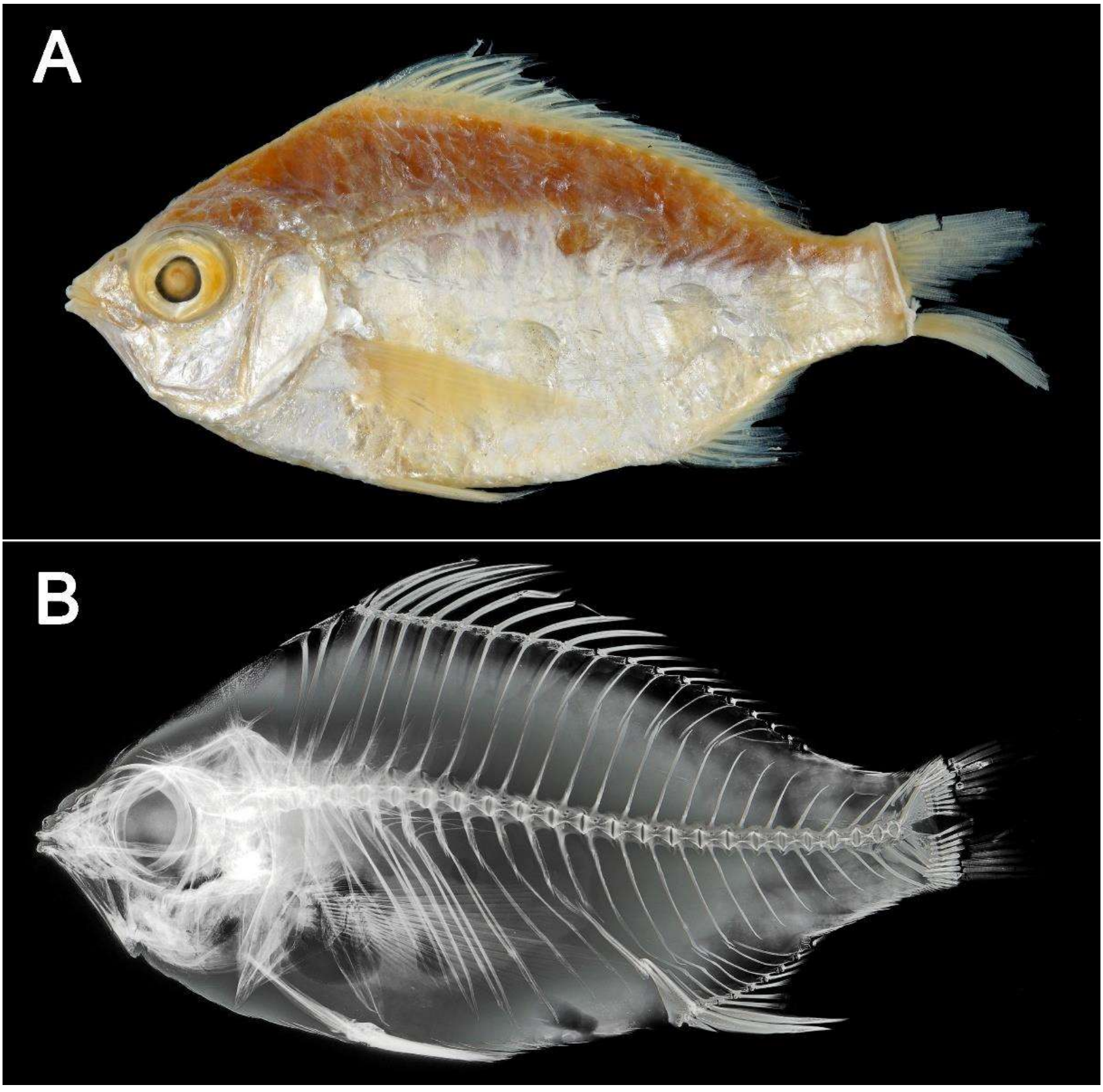

Figure 1. *Gerres* cf. *chrysops* from Sarawak, Borneo (ZUMT 62506, 88.4 mm SL). A: Photograph of preserved specimen (image reversed); B: radiograph.