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# Notes on shark and ray types at the South China Sea Fisheries Research Institute (SCSFRI) in Guangzhou, China

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## Abstract

Most of the shark and ray type material at the South China Sea Fisheries Research Institute (SCSFRI) in Guangzhou, China was examined during a museum visit by the senior author in 2009. The status of the shark and ray species described from the South China Sea in the 1980s and deposited in this collection is discussed. *Squalus acutirostris* is considered a junior synonym of *Squalus mitsukurii* from the western North Pacific. *Centrophorus ferrugineus* is considered a junior synonym of *Centrophorus squamosus*. *Centroscymnus macrops* is confirmed as a junior synonym of *Centroscymnus coelolepis*. *Scymnodon niger* is confirmed as a junior synonym of *Zameus squamulosus*. *Isistius labialis* is considered a synonym of *Isistius brasiliensis*. *Halaelurus immaculatus* is confirmed as a valid species of the genus *Bythaelurus*. *Urolophus marmoratus* is considered a junior synonym of the widespread *Plesiobatis daviesi*. *Springeria nanhaiensis* is a questionable synonym of *Sinobatis borneensis*, following previous researchers. *Springeria stenosoma* is considered as questionably valid but with further investigation into generic placement required. The validity of species with SCSFRI type specimens not examined in this study are also briefly discussed.

**Key words:** biological collections, China, resolution, chondrichthyans, synonym

## Introduction

Biological collections are extremely important assets for all the life sciences, in particular type material which needs to be accessible to taxonomists well into the future to resolve taxonomic issues. Many very old specimens from centuries past are in very poor condition which can create an impediment to taxonomic research. It is thus extremely important that such material remains well maintained and stored in adequate containers to ensure specimens remain in good condition. While the world's largest collections, particularly those in Europe and the USA, are commonly accessed by taxonomists for their various research activities, other smaller and less frequented collections can be a gold mine of information, particularly where type material exists. The South China Seas Fisheries Research Institute (SCSFRI) in Guangzhou, China, is a good example of a biological collection with a large number of important type specimens. The vast majority of the 20 shark and ray type specimens with SCSFRI registration numbers were collected during deepwater trawls of the South China Sea in 1980 (e.g. Chu *et al.*, 1981, 1982, 1984; Meng *et al.*, 1985a, b). Most of the taxonomic literature that considers the validity of these species has only used the information and illustrations in the original descriptions, without examining type specimens. Several of the species have been considered as invalid but their synonymy remains undetermined. This paper provides important taxonomic information on the shark and ray type specimens registered in the SCSFRI ichthyological collection in Guangzhou, China.

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## Methods

The ichthyological collection at the SSCFRI in Guangzhou, China was visited on the 7th September 2009. Most of the type specimens present were examined and photographed. The holotype of *Squalus acutirostris* was measured in full following the methodology presented in Last *et al.* (2007), who provide a detailed account of the morphological methodology for squaloid sharks and illustrations of these measurements. It should be noted that due to time and space constraints, the images obtained are not of very high quality but, nonetheless, are still important for making comparisons with related species.

Comparative specimens are deposited in the Australian National Fish Collection, Hobart (CSIRO); Hokkaido University Museum, Hakodate, Japan (HUMZ); and Stanford University (SU, collection housed at the California Academy of Sciences, San Francisco).

### ***Squalus acutirostris*** **Chu, Meng & Li, 1984**

(= *Squalus mitsukurii* Jordan & Snyder *in* Jordan & Fowler, 1903)
(Figure 1)

*Squalus acutirostris* Chu, Meng & Li, 1984: 283, fig. 1 (South China Sea)—Muñoz-Chápuli & Ramos, 1989: 6 (misidentification).

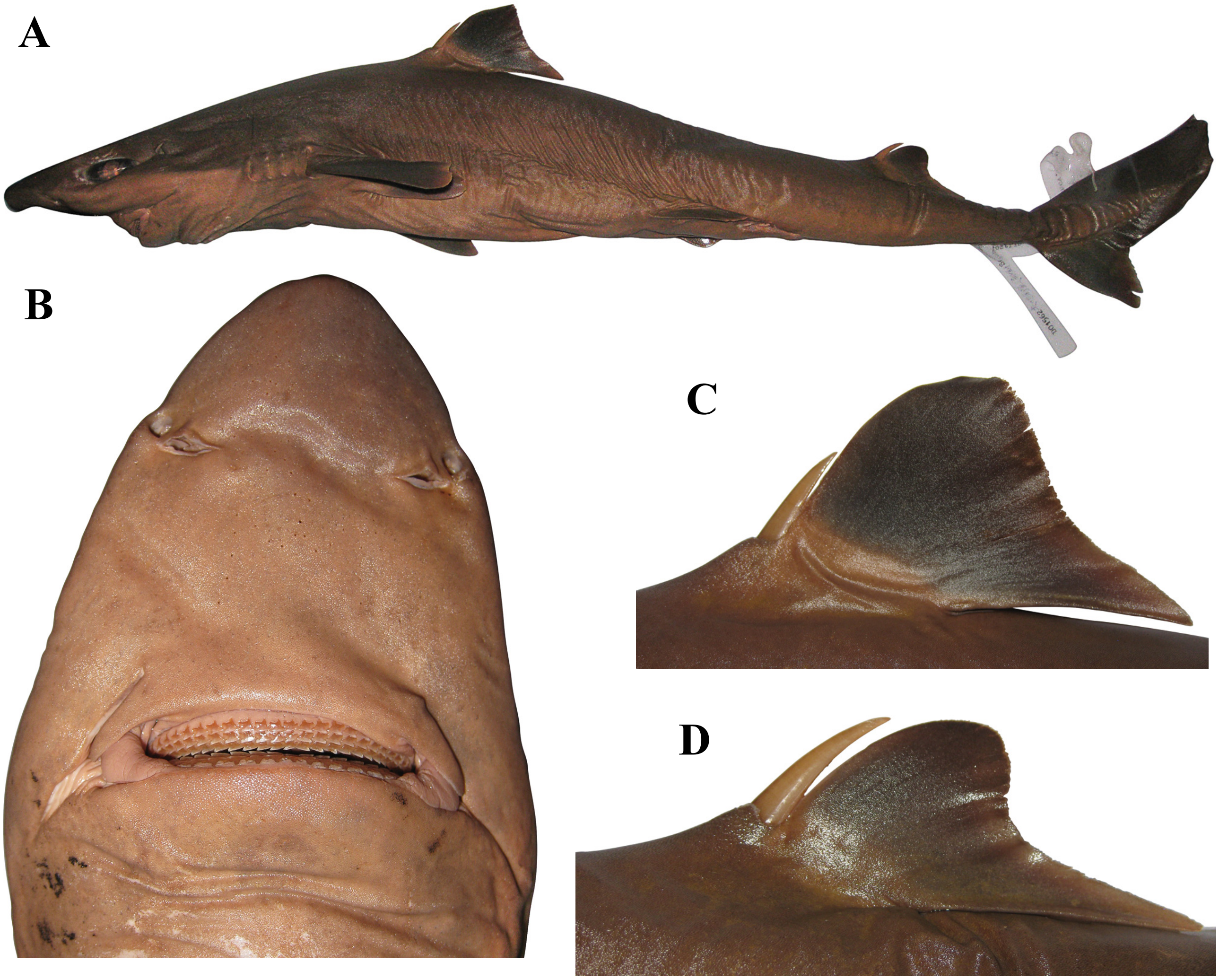


**FIGURE 1.** Holotype of *Squalus acutirostris* SCSFRI D 01562 (adult male 648 mm TL): A. lateral view; B. ventral head view; C. first dorsal fin; D. second dorsal fin.

**Material examined.** SCSFRI D 01562 (holotype), adult male 648 mm TL, South China Sea, 18°51'–18°47' N, 112°41'–112°33' E, depth 394 m, 21 Apr 1982.

**Remarks.** Described by Chu *et al.* (1984) based on four specimens collected from the South China Sea. This species has been considered valid by some authors (e.g. Muñoz-Chápuli & Ramos, 1989), but Compagno *et al.* (2005a) did not treat this as a valid species of *Squalus*. Muñoz-Chápuli & Ramos (1989) based their recognition of *S. acutirostris* as a valid species on a specimen from New South Wales, Australia, which matched the description of this species. However, examination of the morphological and meristic data presented by these authors for the Australian specimen indicates that it's a then undescribed species of *Squalus*, which has since been described as *Squalus grahami* White, Last & Stevens, 2007. The main characters confirming this identification are: low monospondylous centra (40) and longer snout (preoral length 10.5–11.3% TL vs. 9.3% TL in holotype of *S. acutirostris*). *Squalus grahami* is a common species in the upper continental slope waters off New South Wales and is endemic to eastern Australia.

The *S. acutirostris* holotype (Figure 1) is very similar morphologically to *S. mitsukurii* Jordan & Snyder *in* Jordan & Fowler, 1903, a common squalid species in the western North Pacific, particularly off Taiwan and Japan. Comparison of morphometric data taken from the holotype of *S. acutirostris* and the holotype and five other specimens of *S. mitsukurii* revealed very few differences (Table 1). The only characters which differed between these two nominal taxa (in bold in Table 1) were precaudal length (PCL), interdorsal space (IDS), second dorsal-fin length (D2L), second dorsal-fin anterior margin (D2A), second dorsal-fin base length (D2B), and dorsal caudal margin (DCM). However, the differences in IDS, D2L, D2A and D2B are likely the result of difficulty in determining the origin of the second dorsal fin, which affects all of these measurements. Furthermore, the lateral images of *S. acutirostris* and *S. mitsukurii* (Figs 1 and 2) do not suggest any difference in interdorsal space ratios. The differences in DCM and PCL are likely the result of the slightly damaged caudal fin tip in the *S. acutirostris* holotype. Although the total length could be determine relatively accurately due to the ceratotrichia of the caudal fin, the DCM was not as easy to accurately measure.

There appears to be no useful characters to distinguish *S. acutirostris* from *S. mitsukurii*. *Squalus acutirostris* should be considered a junior synonym of *Squalus mitsukurii* Jordan & Snyder *in* Jordan & Fowler (1903).

**FIGURE 2.** Lateral view of *Squalus mitsukurii* (CSIRO H 7403–02, female 632 mm TL) from Taiwan.

### *Centrophorus ferrugineus* Meng, Hu & Li, 1982

[=*Centrophorus squamosus* (Bonnaterre, 1788)]
(Figures 3–4)

*Centrophorus ferrugineus* Meng, Hu & Li *in* Chu, Meng, Hu & Li, 1982: 302, fig. 2 (South China Sea).
*Centrophorus lusitanicus* (a questionable synonym of ) – Compagno, 1984: 39, fig.

**Material examined.** SCSFRI O 0094 (holotype), adult male 1044 mm TL, South China Sea, 18°44' N, 112°46.3' E, depth 515 m, 21 Mar 1980.

**Remarks.** Described by Meng *et al. in* Chu *et al.* (1982) based on the single type specimen collected in the South China Sea. This species was considered a questionable synonym of *C. lusitanicus* Barbosa du Bocage & de Brito Capello, 1864 by Compagno (1984). The type specimen was not examined by this author and this decision would most likely have been based on the line illustrations in the original description. The features of the holotype of *C. ferrugineus* which are important for distinguishing it from other *Centrophorus* species are: large size (male >1 m TL), pectoral-fin free rear tip not produced, first dorsal fin moderately long and denticles on pedicels with leaf-shaped crowns. Based on these characters, *C. ferrugineus* appears conspecific with *Centrophorus squamosus* (Bonnaterre, 1788). This species is unique amongst its congeners in having its pectoral-fin free rear tip not produced at any size. Although the first dorsal-fin of *C. ferrugineus* is moderately long, that of *C. lusitanicus* is noticeably much longer. *Centrophorus lusitanicus* also possesses a moderately long pectoral-fin free rear tip. The morphology of the first dorsal fin closely resembles that of *Centrophorus granulosus* (Bloch & Schneider, 1801) (as defined by White *et al.*, 2013), but the pectoral-fin free rear tip and denticle morphology clearly separate the two species.

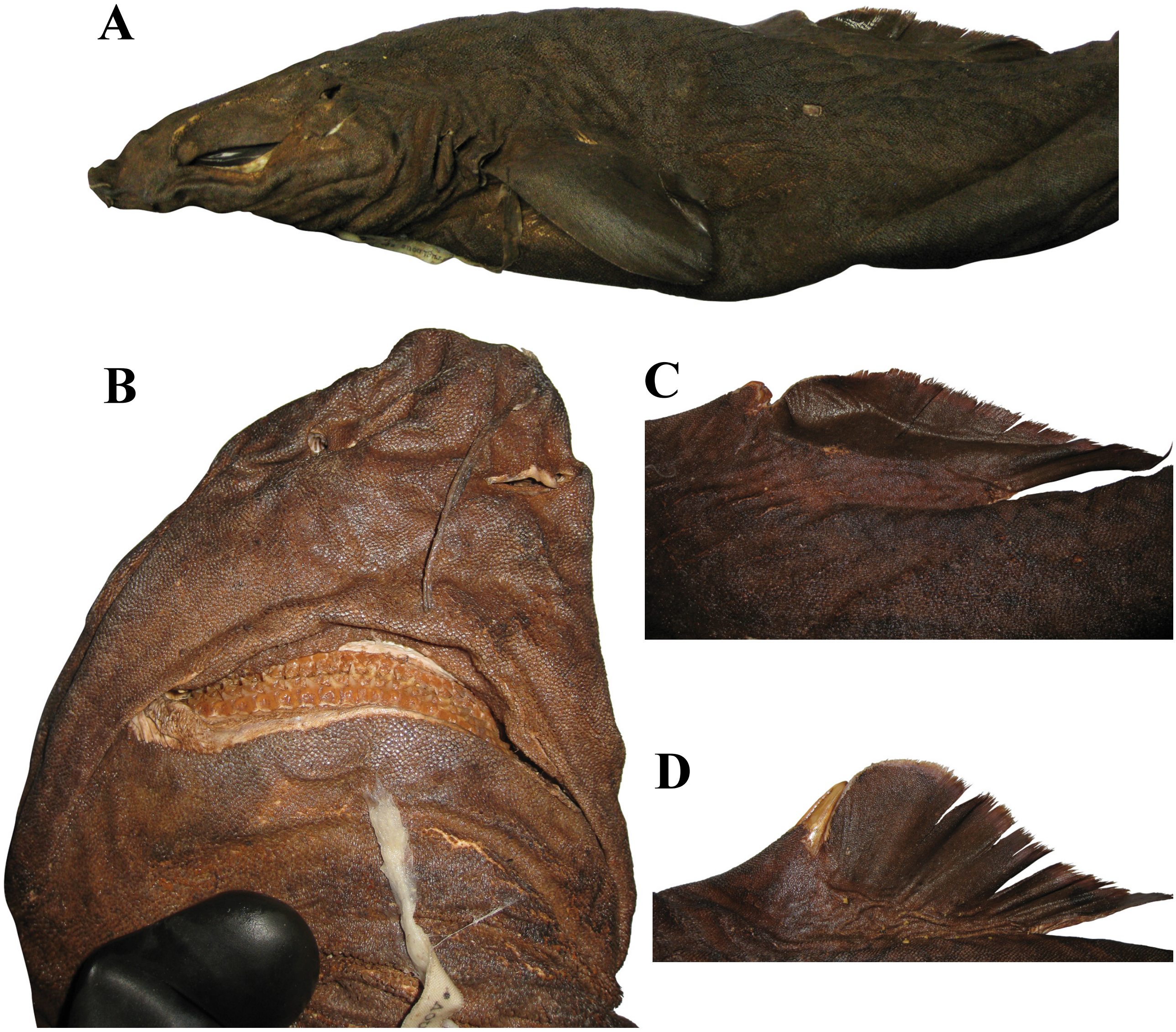


**FIGURE 3.** Holotype of *Centrophorus ferrugineus* SCSFRI O 0094 (adult male 1044 mm TL): A. anterior lateral view; B. ventral head view; C. first dorsal fin; D. second dorsal fin.

The denticles of the *C. ferrugineus* holotype are identical to those of adult *C. squamosus*, and very distinct from all other *Centrophorus* species. The crowns are raised on pedicels, leaf-shaped, overlapping, and ridged with a serrated posterior margin (Figure 4). As a result, the skin is very rough to the touch. Meng *et al. in* Chu *et al.* (1982) only made comparisons with *C. granulosus* and *C. atromarginatus* Garman, 1913 and did not compare their species with *C. squamosus*.

Based on examination of the holotype of *C. ferrugineus* in this study, this species should be considered a junior synonym of *C. squamosus* (Bonnaterre, 1788).

**FIGURE 4.** Lateral trunk denticles of the holotype of *Centrophorus ferrugineus* SCSFRI O 0094 (adult male 1044 mm TL).

***Centroscymnus macrops* Hu & Li, 1982**
[=*Centroscymnus coelolepis* Barbosa du Bocage & de Brito Capello, 1864]
(Figures 5–6)

*Centroscymnus macrops* Hu & Li *in* Chu, Meng, Hu & Li, 1982: 305, fig. 4 (South China Sea).
*Centroscymnus macros* (misspelling): Compagno, 1984: 56; possibly a synonym of *C. coelolepis*.

**Material examined.** SCSFRI O 0150 (holotype), female 792 mm TL, South China Sea, 19°24' N, 114°15.4' E, depth 964 m, 5 Oct 1980.

**Remarks.** Described by Hu & Li *in* Chu *et al.* (1982) based on a single specimen collected in the South China Sea. Compagno (1984) considered *C. macrops* to be a possible junior synonym of *Centroscymnus coelolepis* Barbosa du Bocage & de Brito Capello, 1864. Examination of the holotype of *C. macrops* supports the suggestion that it is a junior synonym of *C. coelolepis*. The smooth, uniform golden brown, leaf-shaped denticles which lack ridges are two of the key characters for distinguishing this species. Hu & Li *in* Chu *et al.* (1982) stated that *C. macrops* differs from *C. coelolepis* in a shorter snout (less than eye diameter) and shorter preoral distance (subequal to distance from eye to 1$^{st}$ gill slit. However, these characters do not take into account intraspecific variation and showed that there is no distinct difference in these snout and preoral length ratios when compared with some Australasian specimens (e.g. Figure 7). Thus, as previously suggested, *C. macrops* should be considered a junior synonym of *Centroscymnus coelolepis* Barbosa du Bocage & de Brito Capello, 1864.

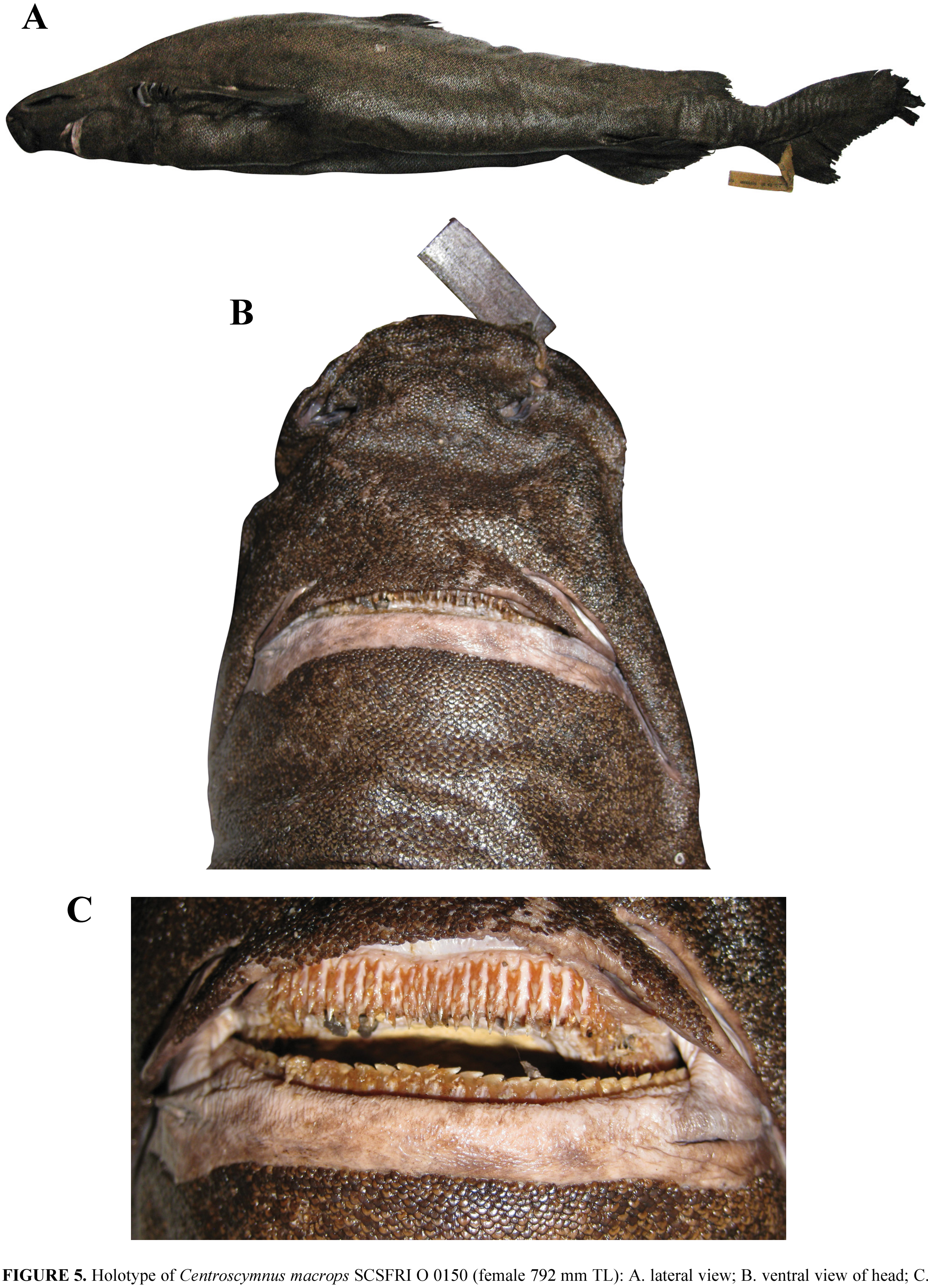


**FIGURE 5.** Holotype of *Centroscymnus macrops* SCSFRI O 0150 (female 792 mm TL): A. lateral view; B. ventral view of head; C. dentition.

**FIGURE 6.** Lateral trunk denticles of the holotype of *Centroscymnus macrops* SCSFRI O 0150 (female 792 mm TL).

**FIGURE 7.** Lateral view of *Centroscymnus coelolepis* (CSIRO H 493, adult male 925 mm TL) from off southeastern Australia.

### *Scymnodon niger* Chu & Meng, 1982
[=*Zameus squamulosus* (Bonnaterre, 1788)]
(Figures 8a, 9)

*Scymnodon niger* Chu & Meng *in* Chu, Meng, Hu & Li, 1982: 304, fig. 3 (South China Sea).
Possible junior synonym of *Scymnodon squamulosus* – Compagno, 1984: 101, fig.
Junior synonym of *Zameus squamulosus* – Taniuchi & Garrick, 1986: 119.

**Material examined.** SCSFRI S 07561 (holotype), female 482 mm TL, South China Sea, 19°27.6' N, 114°19.3' E, depth 964 m, 5 Oct 1980.

**Remarks.** Described by Chu & Meng *in* Chu *et al.* (1982) based on four specimens collected from the South China Sea. Compagno (1984) considered *Scymnodon niger* to be a possible junior synonym of *Scymnodon squamulosus* (Günther, 1877). *Scymnodon squamulosus* was subsequently assigned to the genus *Zameus* Jordan & Fowler, 1903 by Taniuchi & Garrick (1986). These authors also stated that using a variety of information sources, they could not distinguish between *S. niger* and *Z. squamulosus*. In the original description, *S. niger* was compared with *Scymnodon obscurus* (Vaillant, 1888) and considered to be distinguishable in having a snout subequal to eye diameter vs. longer than eye diameter. However, Taniuchi & Garrick (1986) highlighted that this was most likely due to the illustration by Vaillant (1888); this appears to be incorrect according to measurements of the holotype taken by Yano & Tanaka (1984). They also highlighted that the other cited differences are likely attributable to intraspecific variation. Chu & Meng *in* Chu *et al.* (1982) distinguished *S. niger* from *S. squamulosus* in having denticles with transverse ridges (vs. without), but this difference is invalid as *Z. squamulosus* does possess strongly ridge denticles (e.g. Yano & Tanaka, 1984). The other distinguishing character they presented was a first dorsal-fin base a third of the interdorsal space (vs. a fifth). However, comparison of the holotype with *Z. squamulosus* (Figure 8) showed that this difference is not valid and is possibly due to intraspecific variation or differences in interpretation of dorsal-fin origins which would affect these measurements. Thus, as previously suggested, *Scymnodon niger* should be considered a junior synonym *Zameus squamulosus* (Bonnaterre, 1788).


**FIGURE 8.** Lateral view of: A. holotype of *Scymnodon niger* SCSFRI S 07561 (female 482 mm TL); B. *Zameus squamulosus* (CSIRO H 2560–03, adult male ~500 mm TL) from Australia.

**FIGURE 9.** Ventral head view the holotype of *Scymnodon niger* SCSFRI S 07561 (female 482 mm TL).

***Isistius labialis* Meng, Zhu & Li, 1985b**
[= *Isistius brasiliensis* (Quoy & Gaimard, 1824)]
(Figures 10a, 11)

*Isistius labialis* Meng, Zhu & Li, 1985b: 442, fig. 1 (South China Sea) – Compagno, 1999: 475; Compagno *in* Randall & Lim, 2000: 580; Compagno *et al.*, 2005a: 128, fig., pl. 14.

**Material examined.** SCSFRI S 07257 (holotype), female 442 mm TL, South China Sea, 18°40'–19°32' N, 112°31'–113°57' E, depth 520 m, Oct 1980.


**FIGURE 10.** Lateral view of: A. holotype of *Isistius labialis* SCSFRI S 07257 (female 442 mm TL); B. *Isistius brasiliensis* (CSIRO H 5150–01, female 480 mm TL) from off Australia.

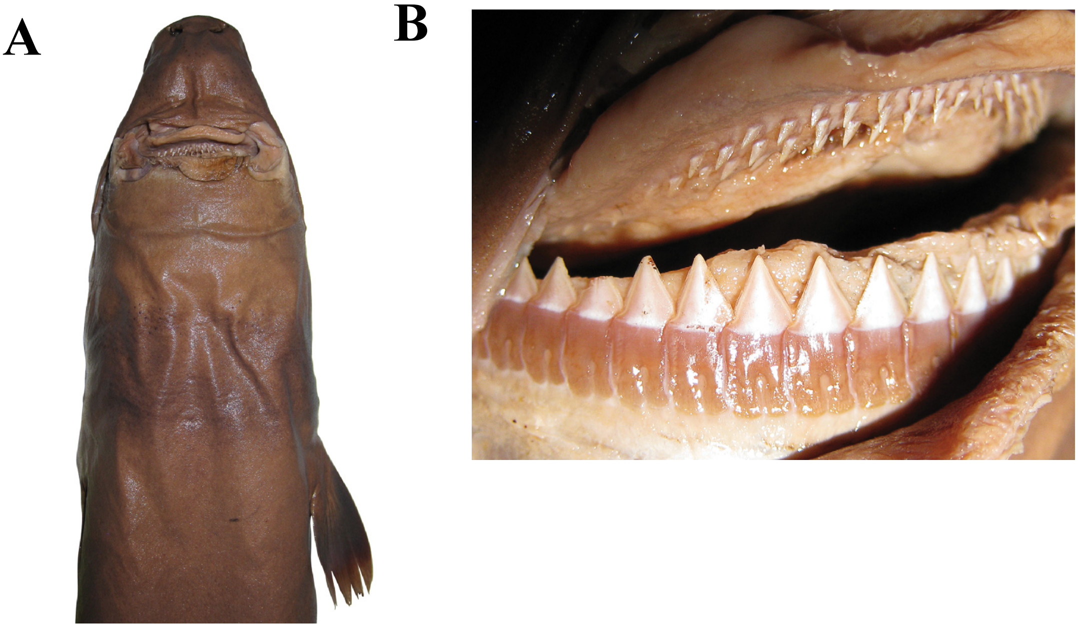


**FIGURE 11.** Holotype of *Isistius labialis* SCSFRI S 07257 (female 442 mm TL): A. anterior ventral view; B. dentition.

**Remarks.** Described by Meng *et al.* (1985b) based on a single specimens collected from the South China Sea. Tentatively considered as valid by Compagno (1999) and Compagno *in* Randall & Lim (2000) and treated as a nominal species in Compagno *et al.* (2005a). This species is very similar in appearance to *Isistius brasiliensis* (Quoy & Gaimard, 1824), with its brown colouration with a distinct, dark brown collar marking, fins with pale posterior margins, and dorsal fins set far back on body and relatively well separated (which separate it from *Isistius plutodus* Garrick & Springer, 1964). The main characters distinguishing this species from *I. brasiliensis* according to Compagno *et al.* (2005a) are: upper teeth more numerous (43 vs. 31–37 rows), eyes slightly further forward and caudal fin with a shorter ventral lobe. Following examination of the holotype, the latter two character states do not hold up in distinguishing this species from *I. brasiliensis* (see Figure 10b). In the original description, Meng *et al.* (1985b) distinguished *I. labialis* from *I. brasiliensis* in having: transverse, waved labial fold; snout shorter than eye diameter (vs. equal to); eye diameter two thirds (vs. half) of preoral length; height of pelvic fin equal to (vs. larger) the dorsal fins. However, when the holotype was compared with specimens of *I. brasiliensis*, the snout and eye proportions do not differ markedly and it is likely intraspecific variation was not considered. The statement about the pelvic fin being similar in size to the dorsal fins, which is also shown in the illustration in Compagno *et al.* (2005a, p. 128), is not reflected in the holotype of *I. labialis* which has pelvic fins clearly larger than the dorsal fins. Thus, the only characters remaining to separate the two species are the higher number of upper tooth rows and the presence of a large labial fold connecting lower labial furrows. However, the holotype was found to have a lower upper tooth row count of 35, or 17–1–17 (Flávia Petean, pers. comm.), compared to the 43 reported in Meng *et al.* (1985b); this falls within the upper tooth count range for *I. brasiliensis* of 31–37. Based on this information, *I. labialis* cannot be adequately distinguished from *I. brasiliensis* and we suggest that it should be considered a junior synonym of *Isistius brasiliensis* (Quoy & Gaimard, 1824).

### ***Halaleurus immaculatus*** **Chu & Meng, 1982**

[=*Bythaelurus immaculatus* (Chu & Meng, 1982)]
(Figures 12–13)

*Halaelurus immaculatus* Chu & Meng *in* Chu, Meng, Hu & Li, 1982: 301, fig. 1 (South China Sea) – Compagno, 1984: 326, figs.
*Halaelurus (Bythaelurus) immaculatus* – Compagno, 1988: 146.
*Bythaelurus immaculatus* – Compagno *et al.*, 2005a: 214, fig., pl. 35; Last & Stevens, 2008: 123.

**Material examined.** SCSFRI O 0094 (holotype), adult male ~708 mm TL, South China Sea, 19°24.8' N, 114°23.6' E, depth 1020 m, 6 Oct 1980.

**Remarks.** Originally described as *Halaelurus immaculatus* by Chu & Meng *in* Chu *et al.* (1982) based on three specimens collected in the South China Sea. Allocated to the genus *Bythaelurus* Compagno, 1988, which was previously a subgenus of *Halaelurus*. This genus is distinguishable from *Halaleurus* in the following combination of characters: snout bluntly rounded (vs. pointed); eyes not elevated on dorsal surface of head (vs. noticeably elevated on dorsal head); skin thin and body soft (vs. skin thick and body firm); and typically uniformly brownish, grey or blackish (vs. light grey or brown with a bold colour pattern of stripes, bands or spots) (Compagno, 1988). Specimens of *B. immaculatus* were not examined by Compagno (1984, 1988) but he did note that it is a close relative of the New Zealand endemic *Bythaelurus dawsoni* (Springer, 1971). Chu & Meng *in* Chu *et al.* (1982) did not discuss how *B. immaculatus* differs from *B. dawsoni*, but they differ in the following characters: anal-fin base about 1.4 times in interdorsal space (vs. subequal to interdorsal space in *B. dawsoni*), body uniformly dark yellowish brown (vs. light brown to grey on dorsal and lateral surfaces with a line of white spots on sides of small individuals, whitish ventrally), and caudal fin uniformly dark (vs. light brown to grey with dark bands).

The anal-fin base is subequal in length to the second dorsal-fin base, which as noted by Chu & Meng *in* Chu *et al.* (1982) clearly distinguishes this species from *B. hispidus* (Alcock, 1891) and *B. lutarius* (Springer & D'Aubrey, 1972) in which the anal-fin base is about twice the length of the second dorsal-fin base. Of the remaining *Bythaelurus* species, *B. immaculatus* is most similar in appearance to *B. canescens* (Günther, 1878) from the Eastern Pacific and *Bythaelurus incanus* Last & Stevens, 2008 from northwestern Australia. *Bythaelurus incanus* differs from *B. immaculatus* in having a shorter prevent length (more than 1.3 in tail length vs. exceeding tail length), shorter interdorsal space (about 1.7 times first dorsal-fin base vs. more than 2.2 times), and pectoral-pelvic space 1.7 times interdorsal space (vs. ~2.4 times) (Last & Stevens, 2008 vs. holotype of *B. immaculatus*). *Bythaelurus canescens* differs from *B. immaculatus* in being a more robust shark with a deeper and broader head and trunk, and a less broadly rounded snout (vs. broadly rounded). Chu & Meng *in* Chu *et al.* (1982) provided additional differences between these two species, including pectoral-pelvic space 2.4-2.5 times interdorsal space in *B. immaculatus* (vs. 1.5 times in *B. canescens*). However, estimates of this ratio by the author from images of *B. canescens* from off Chile were much higher, i.e. about 2 times. This is still likely to be a useful character but it possibly varies between specimens so caution should be taken.

Thus, *Bythaelurus immaculatus* clearly differs from all of its congeners and should be considered a valid species of *Bythaelurus*. This species has not been recorded since the 1982 description based on three specimens collected in 1980 in the South China Sea. More deepwater trawling may reveal this species has a broader distribution in this region, but alternatively it may be a narrow-ranging endemic.

**FIGURE 12.** Lateral view of the holotype of *Bythaelurus immaculatus* SCSFRI O 0094 (adult male ~708 mm TL).

**FIGURE 13.** Ventral head view of the holotype of *Bythaelurus immaculatus* SCSFRI O 0094 (adult male ~708 mm TL).

### *Urolophus marmoratus* Chu, Hu & Li, 1981
[=*Plesiobatis daviesi* (Wallace, 1967)]
(Figure 14)

*Urolophus marmoratus* Chu, Hu & Li in Chu, Meng, Hu & Li, 1981: 108, fig. (South China Sea).

**Material examined.** SCSFRI N 0428 (holotype), female 742 mm TL, South China Sea, depth 462 m, 5 Jun 1980.

**Remarks.** Described by Chu, Hu & Li *in* Chu *et al.* (1981) based on four specimens collected from the South China Sea. However, the name is objectively invalid, being preoccupied by *Urolophus marmoratus* Philippi, 1892 which is now recognised as *Urobatis marmoratus* (Philippi, 1892). Thus, *Urolophus marmoratus* Chu, Hu & Li, 1981 is a junior homonym. In most cases, the junior homonym must be replaced with a new name if considered to be a valid taxon. The exception to this is if the two names are now placed under two different families, as with these two names, in which case it might not be necessary to give a replacement name (Article 23.9.5 of the International Code for Zoological Nomenclature, ICZN). Examination of the holotype of *U. marmoratus* at the SCSFRI ichthyological collection revealed that this specimen refers to *Plesiobatis daviesi* (Wallace, 1967). This species belongs to the monotypic family Plesiobatidae, but originally was placed in the family Urolophidae.

Members of these two families are superficially similar in their possession of a distinct caudal fin, but *Plesiobatis daviesi* differs from urolophids (and urotrygonids) in having a very long snout (>6 times orbit diameter) and the dorsal surface covered with very small close-set denticles (vs. completely smooth) (Last & Stevens, 2009). The caudal fin is also far more elongate in *P. daviesi* than in urolophids, and it attains a far larger size (>2000 mm TL vs. <900 mm TL). Thus, *Urolophus marmoratus* of Chu, Hu & Li, 1981 is considered to be conspecific with *Plesiobatis daviesi* (Wallace, 1967) but the combination is objectively invalid.

**FIGURE 14.** Dorsal view of the holotype of *Urolophus marmoratus* SCSFRI N 0428 (female 742 mm TL).

### *Springeria nanhaiensis* Meng & Li, 1981

[=*Sinobatis borneensis* (Chan, 1965b)]
(Figures 15–16)

*Springeria nanhaiensis* Meng & Li *in* Chu, Meng, Hu & Li, 1981: 105, fig. 2 (South China Sea).
*Anacanthobatis nanhaiensis* – Séret, 1986: 323; McEachran & Dunn, 1998: 285; Compagno, 1999: 493; Compagno *in* Randall & Lim, 2000: 582; Last & Séret, 2008: 33; Ebert & Compagno, 2007: 122.
*Springeria naihaiensis* (misspelling) – Last & Séret, 2007: 36.
Questionable synonym of *Sinobatis borneensis* – Last & Séret, 2007: 36.

**Material examined.** SCSFRI S 04915 (holotype), subadult male 295 mm TL, South China Sea, depth 475 m, 2 Jul 1980.

**Remarks.** Described by Meng & Li *in* Chu *et al.* (1981) based on single male and female specimens collected in the South China Sea. Members of the family Anacanthobatidae show very strong ontogenetic and sexual differences making them very difficult to determine based on specimen quality (often damaged or shrunken) and low numbers of specimens in collections. Last & Séret (2008) suggested that *S. nanhaiensis*, based on the illustration in Chu *et al.* (1981), is probably a juvenile of *Sinobatis borneensis* (Chan, 1965b), also from the South

China Sea based on its small size. These authors also suggested that *Springeria melanosoma* Chan, 1965a is a valid species and, in the absence of a mature male, provisionally placed it within *Sinobatis*. Last & Séret (2008) did not discuss the validity of *A. donghaiensis* (Deng, Xiong & Zhan, 1983) or *A. stenosoma* Li & Hu *in Chu et al.*, 1982, other than to say the latter species is probably junior synonyms of one of the other described species. Thus, the generic placement of those two species is still unresolved. A thorough revision of the anacanthobatids of the western North Pacific using new material and molecular analysis is required so until that stage, *Springeria nanhaiensis* Meng & Li *in* Chu *et al.*, 1981 should be considered a questionable synonym of *Sinobatis borneensis* (Chan, 1965b) following Last & Séret (2008).

**FIGURE 15.** Dorsal view of the holotype of *Springeria nanhaiensis* SCSFRI S 04915 (subadult male 295 mm TL).

### *Springeria stenosoma* Li & Hu, 1982

[=*Sinobatis stenosoma*? (Li & Hu *in* Chu *et al.*, 1982)]
(Figures 17–18)

*Springeria stenosoma* Li & Hu *in* Chu, Meng, Hu & Li, 1982: 306, fig. 5 (South China Sea).
*Anacanthobatis stenosomus* – Séret, 1986: 323; McEachran & Dunn, 1998: 285; Ebert & Compagno, 2007: 122.
*Anacanthobatis stenosoma* – Compagno, 1999: 493; Compagno *in* Randall & Lim, 2000: 582; Last & Séret, 2008: 33.

**Material examined.** SCSFRI O 0065 (holotype), female 520 mm TL, South China Sea, 19°39.6' N, 114°02.2' E, depth 534 m, 4 Oct 1980.

**Remarks.** Described by Li & Hu *in* Chu *et al.* (1982) based on a single female specimen collected in the South China Sea. As discussed above for *S. nanhaiensis*, the generic placement and validity of this species is unknown. Last & Séret (2008) elevated the subgenus *Sinobatis* Hulley, 1973 to generic level, and also recommended the elevation of *Springeria* Bigelow & Schroeder, 1951 and *Schroederobatis* Hulley, 1973 to generic level. The characters separating the different genera relate primarily to clasper structure and since only a single female specimen of *S. stenosoma* is currently known, its generic placement remains unknown until additional material can be collected. It clearly differs from *Springeria melanosoma* in being brownish grey dorsally (vs. much darker) and pale ventrally (vs. dark). The female holotype is 520 mm in length suggesting it is possibly too large to be conspecific with *S. borneensis*. Based on the illustrations of *S. dongahaiensis*, *S. stenosoma* clearly has a much longer snout with a relatively narrow disc. It should be noted that the holotype of *S. dongahaiensis* was a much smaller female (325 mm TL) with the shape differences attributable to ontogenetic variability. Pending a thorough review of the western North Pacific anacanthobatids, this species should be considered as questionably valid as *Sinobatis stenosoma* (Li & Hu *in* Chu *et al.*, 1982).

**FIGURE 16.** Ventral view of snout of the holotype of *Springeria nanhaiensis* SCSFRI S 04915 (subadult male 295 mm TL).

**Other type specimens not examined.**

The holotype (SCSFRI 99) of *Apristurus sinensis* Chu & Hu *in* Chu, Meng, Hu & Li (1981) was observed in the collection but not examined as has previously been examined by Dr K. Nakaya, an expert on scyliorhinids. The specimen is in relatively poor condition but intact and is tied by monofilament line to a piece of glass. A number of other type specimens with SCSFRI registration numbers were not examined during this study. These may not be located at the Guangzhou SCSFRI building and may be located at a different SCSFRI collection but details of this were limited. These specimens are discussed briefly below based on the information available in the original description alone.

The types of the following species have also been previously examined and their validity discussed:

*Apristurus acanutus* Chu, Meng & Li *in* Meng, Chu & Li, 1985a: SCSFRI D 0172 (holotype); junior synonym of *Apristurus platyrhynchus* (Tanaka, 1909) – see Nakaya & Sato (2000).

*Apristurus brevicaudatus* Chu, Meng & Li, 1986: SCSFRI D 1125 (holotype); junior synonym of *Apristurus herklotsi* (Fowler, 1934) – see Nakaya (1991).

*Apristurus gibbosus* Meng, Chu & Li, 1985a: SCSFRI D 1121 (holotype); valid species (Nakaya & Sato, 1999).

**FIGURE 17.** Dorsal view of the holotype of *Springeria stenosoma* SCSFRI O 0065 (female 520 mm TL).

**FIGURE 18.** Ventral view of snout of the holotype of *Springeria stenosoma* SCSFRI O 0065 (female 520 mm TL).

*Apristurus longianalis* Chu, Meng & Li, 1986: SCSFRI S 6530 (holotype); junior synonym of *Apristurus herklotsi* (Fowler, 1934)—see Nakaya (1991).

*Apristurus macrostomus* Chu, Meng & Li *in* Meng, Chu & Li, 1985a: SCSFRI D 0807 (holotype); valid species (Nakaya & Sato, 1999).

*Apristurus micropterygeus* Meng, Chu & Li *in* Chu, Meng & Li, 1986: SCSFRI E 1128 (holotype); valid species (Nakaya & Sato, 2000).

*Apristurus xenolepis* Meng, Chu & Li, 1985a: SCSFRI D 0042 (holotype); junior synonym of *Apristurus herklotsi* (Fowler, 1934)—see Nakaya (1991).

*Figaro piceus* Chu, Meng & Liu, 1983: SCSFRI D 2436 (paratype); junior synonym of *Parmaturus melanobranchus* (Chan, 1966)—see Gledhill *et al.* (2008).

The holotype of *Hexatrematobatis longirostrum* Chu & Meng *in* Chu, Meng, Hu & Li, 1981 was not observed in this study. This species was considered a valid species, as *Hexatrygon longirostra* (Chu & Meng *in* Chu *et al.*, 1981), by a number of authors (e.g. Shen, 1986; Nishida, 1990). Other authors considered it a questionable synonym of *Hexatrygon bickelli* Heemstra & Smith, 1980 (e.g. Compagno, 1999) and more recently is considered a junior synonym of this species (e.g. Compagno *et al.*, 2005b). The holotype was not seen in a recent visit made by H.-C. Ho and was proved to be lost by the curator; the only paratype (Shanghai Fishery College 0306) was found in the collection of Shanghai Ocean University (Ho, H.-C., pers. comm.)

The holotype of *Carcharhinus macrops* Liu, 1983 was also not observed in this study. This species seems to have been neglected by most researchers and its validity has not been adequately investigated. Although the holotype was not examined, the description provides some important characters for comparison with other *Carcharhinus* species, in particular: second dorsal-fin small and its origin not posterior to anal-fin origin; first dorsal fin large and its origin about level with pectoral-fin insertion; no interdorsal ridge; snout relatively long; upper labial furrow very short; upper teeth slightly oblique with narrowly triangular cusps with serrated edges, more coarsely serrated on outer base; lower teeth with smooth, slender, erect cusps on broad bases; pectoral fin large and falcate. Liu (1983) provides a tooth count of 13–1–13 / 12–1–12 in the text, but the teeth drawings show 13 teeth lower teeth on the right side. The above characters agree mostly with *C. obscurus* (Lesueur, 1818) and *C. galapagensis* (Snodgrass & Heller, 1905). However, both of these species possess a well-developed interdorsal ridge. Examination of the holotype specimen is required to determine the validity of this species but it is highly likely to be a junior synonym of either *C. obscurus* or *C. galapagensis*.

**Comparative material**

*Centroscymnus coelolepis*: CSIRO H 493, adult male 925 mm TL, South Tasman Rise, Tasmania, Australia, 47°31' S, 148°15' E, 1100–1124 m, 17 Mar 1986.

*Isistius brasiliensis*: CSIRO CA 190, adult male 460 mm TL, east of Bermagui, New South Wales, Australia, 36°27' S, 151°39' E, 20 Jan 1978; CSIRO H 3722–01, male 300 mm TL, Coral Sea, Queensland, Australia, 16°38' S, 152°10' E, 26 Feb 1994; CSIRO H 5150–01, female 480 mm TL, 300 miles east of Coffs Harbour, New South Wales, Australia, Jan 1999.

*Squalus mitsukurii*: SU 7184 (paratype), immature male 266 mm TL, SU 12793 (holotype), 719 mm TL, Misaki, Honshu Island, Japan; HUMZ 79797, female 855 mm TL, HUMZ 79798, female 854 mm TL, Kyushu–Palau Ridge, Japan, 320–640 m; HUMZ 101719, adult male 657 mm TL, northwest of Okinawa, Japan; CSIRO H 7403–02, female 632 mm TL, off Kaohsiung, southern Taiwan, 22°32' N, 120°07' E, 320 m, 21 Mar 2012.

*Zameus squamulosus*: CSIRO H 2560–03, adult male ~500 mm TL, West of Cape Cuvier, Western Australia, 23°59.5' N, 111°54.1' E, 1061–1071 m, 27 Jan 1991.

**TABLE 1.** Proportional dimensions as percentages of total length for the holotypes of *Squalus acutirostris* (SCSFRI D01562) and *S. mitsukurii* (SU 12793) and ranges for additional material measured.

| | *S. acutirostris* | *S. mitsukurii* | | |
|---|---|---|---|---|
| | | | n = 5 | |
| | Holotype | Holotype | Min. | Max. |
| TL — Total length | 632 | 719 | 266 | 855 |
| PCL — Precaudal length | 80.6 | 76.6 | 77.1 | 79.0 |
| PD2 — Pre-second dorsal length | 64.7 | 59.8 | 58.6 | 61.2 |
| PD1 — Pre-first dorsal length | 30.9 | 30.9 | 28.0 | 32.3 |
| SVL — Pre-vent length | 51.4 | 51.5 | 47.6 | 52.2 |
| PP2 — Prepelvic length | 50.2 | 48.5 | 46.5 | 50.1 |
| PP1 — Prepectoral length | 23.8 | 23.3 | 19.9 | 23.9 |
| HDL — Head length | 23.8 | 23.4 | 20.9 | 23.5 |
| PG1 — Prebranchial length | 19.9 | 19.5 | 18.0 | 20.1 |
| PSP — Prespiracular length | 12.7 | 12.8 | 12.1 | 13.3 |
| POB — Preorbital length | 7.6 | 7.5 | 7.3 | 7.9 |
| PRN — Prenarial length | 4.8 | 5.5 | 5.0 | 5.4 |
| POR — Preoral length | 9.3 | 10.8 | 9.4 | 10.6 |
| INLF — Inner nostril-labial furrow space | 5.0 | 4.4 | 4.2 | 4.7 |
| MOW — Mouth width | 8.0 | 6.2 | 6.3 | 8.1 |
| ULA — Labial furrow length | 2.5 | 2.4 | 2.1 | 2.5 |
| INW — Internarial space | 3.9 | 4.8 | 4.0 | 4.9 |
| INO — Interorbital space | 8.3 | 8.1 | 7.9 | 8.7 |
| EYL — Eye length | 4.7 | 3.4 | 3.8 | 4.9 |
| EYH — Eye height | 1.6 | 1.3 | 1.8 | 2.5 |
| SPL — Spiracle length | 1.6 | 1.2 | 1.2 | 1.5 |
| GS1 — First gill-slit height | 2.1 | 1.9 | 1.6 | 2.2 |
| GS5 — Fifth gill-slit height | 2.2 | 2.1 | 1.8 | 2.4 |
| IDS — Interdorsal space | 27.7 | 21.3 | 18.7 | 25.2 |
| DCS — Dorsal-caudal space | 11.0 | 9.8 | 9.9 | 11.2 |
| PPS — Pectoral-pelvic space | 20.4 | 22.5 | 20.5 | 24.5 |
| PCA — Pelvic-caudal space | 26.0 | 22.7 | 22.3 | 27.4 |
| D1L — First dorsal length | 13.3 | 14.5 | 12.5 | 15.7 |
| D1A — First dorsal anterior margin | 9.7 | 12.0 | 10.5 | 11.7 |
| D1B — First dorsal base length | 7.8 | 8.3 | 7.8 | 8.9 |
| D1H — First dorsal height | 6.2 | 8.5 | 4.5 | 8.3 |
| D1I — First dorsal inner margin | 5.7 | 6.3 | 4.9 | 6.4 |
| D1P — First dorsal posterior margin | 7.9 | 9.7 | 4.6 | 7.9 |
| D1ES — First dorsal spine length | 3.0 | 3.3 | 2.8 | 4.8 |
| D1BS — First dorsal spine base width | 0.7 | 0.8 | 0.6 | 0.8 |
| D2L — Second dorsal length | 10.9 | 12.7 | 12.0 | 13.9 |
| D2A — Second dorsal anterior margin | 7.6 | 10.2 | 9.5 | 10.7 |
| D2B — Second dorsal base length | 5.9 | 7.2 | 8.0 | 9.2 |
| D2H — Second dorsal height | 3.5 | 4.5 | 3.0 | 4.6 |

...... *continued on the next page*

**TABLE 1** (continued)

| | *S. acutirostris* | *S. mitsukurii* | | |
|---|---|---|---|---|
| | | n = 5 | | |
| | Holotype | Holotype | Min. | Max. |
| D2I — Second dorsal inner margin | 4.9 | 5.1 | 4.2 | 5.4 |
| D2P — Second dorsal posterior margin | 5.0 | 5.2 | 4.1 | 5.4 |
| D2ES — Second dorsal spine length | 3.0 | 3.8 | 2.8 | 5.0 |
| D2BS — Second dorsal spine base width | 0.7 | 0.7 | 0.6 | 0.9 |
| P1A — Pectoral anterior margin | 12.6 | 15.0 | 11.7 | 16.1 |
| P1I — Pectoral inner margin | 7.5 | 8.2 | 7.0 | 8.3 |
| P1B — Pectoral base length | 4.9 | 6.8 | 5.0 | 6.1 |
| P1P — Pectoral posterior margin | 10.0 | 11.0 | 7.6 | 11.4 |
| P2L — Pelvic length | 9.6 | 10.8 | 9.6 | 10.3 |
| P2H — Pelvic height | 5.0 | 5.6 | 4.0 | 4.9 |
| P2I — Pelvic inner margin | 5.7 | 5.8 | 2.0 | 4.1 |
| CDM — Dorsal caudal margin | 18.8 | 22.6 | 21.2 | 22.5 |
| CPV — Preventral caudal margin | 10.7 | 12.3 | 10.2 | 12.2 |
| CPU — Upper postventral caudal margin | 13.3 | 16.4 | 13.2 | 16.2 |
| CPL — Lower postventral caudal margin | 5.0 | 4.8 | 3.4 | 5.6 |
| CFW — Caudal fork width | 6.7 | 6.7 | 5.9 | 7.3 |
| CFL — Caudal fork length | *7.2* | 9.2 | 9.3 | 10.3 |
| HANW — Head width at nostrils | 6.5 | 7.7 | 7.0 | 7.7 |
| HAMW — Head width at mouth | 11.2 | 11.5 | 10.1 | 10.8 |
| HDW — Head width | 11.4 | 14.8 | 11.5 | 13.8 |
| TRW — Trunk width | 9.5 | – | 8.2 | 10.7 |
| ABW — Abdomen width | 8.5 | – | 6.4 | 9.6 |
| TAW — Tail width | 6.9 | 6.3 | 4.7 | 6.7 |
| CPW — Caudal peduncle width | 3.7 | 2.5 | 2.4 | 3.8 |
| HDH — Head height | 11.2 | 8.5 | 7.5 | 11.7 |
| TRH — Trunk height | 12.6 | – | 7.9 | 12.2 |
| ABH — Abdomen height | 12.7 | – | 7.7 | 11.2 |
| TAH — Tail height | 6.4 | 7.2 | 5.3 | 7.4 |
| CPH — Caudal peduncle height | 2.5 | 2.6 | 2.3 | 3.0 |
| CLO — Clasper outer length | 4.5 | – | 1.7 | 2.6 |
| CLI — Clasper inner length | 10.1 | – | 5.2 | 6.0 |
| CLB — Clasper base width | 1.8 | – | 0.9 | 1.1 |

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