

***Scyliorhinus comoroensis* sp. n., a new catshark  
from the Comoro Islands, western Indian Ocean  
(Carcharhiniformes, Scyliorhinidae)**

by L. J. V. COMPAGNO

**Abstract.** — A new species of catshark (Scyliorhinidae, Carcharhiniformes), *Scyliorhinus comoroensis* sp. n., is described from an adult male 464 mm TL from 400 m depth off Moroni, Grande Comore Island. This is the first record of a scyliorhinid shark from the Comoro Islands. *S. comoroensis* can be grouped with other species of *Scyliorhinus* with light spots on a dark background, including *S. capensis*, *S. torrei*, *S. hesperius*, and *S. torazame*. The new species is closest to *S. hesperius* of the Atlantic coast of Central America but differs in coloration, nasal flap size, anal and second dorsal fin positions, and diplospondylous and total vertebral counts.

**Résumé.** — Une espèce nouvelle de roussette (Pisces, Chondrichthyes, Scyliorhinidae), *Scyliorhinus comoroensis* n. sp., est décrite à partir d'un mâle adulte de 464 mm LT, récolté au large de Moroni, Grande Comore, par 400 m de profondeur. Il s'agit de la première capture d'un scyliorhinidé pour les Comores. *S. comoroensis* peut être classée dans le groupe des espèces du genre *Scyliorhinus* présentant des taches claires sur une livrée sombre, et comprenant *S. capensis*, *S. torrei*, *S. hesperius*, et *S. torazame*. La nouvelle espèce est proche de *S. hesperius* des côtes atlantiques de l'Amérique Centrale, mais elle s'en distingue par la coloration, la taille des valvules nasales, la position de la nageoire anale et celle de la seconde nageoire dorsale, le nombre total de vertèbres et celui des vertèbres diplospondyles.

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INTRODUCTION

In 1982, 1983 and 1984, Dr. P. FOURMANOIR conducted a series of private ichthyological expeditions to the Comoro Islands and collected a few deepwater sharks with a deep-set longline off Grande Comore. These were identified by FOURMANOIR and stored in the fish collection of the Muséum national d'Histoire naturelle. The specimens were recently accessioned in the Museum collection and include the first records of the families Squalidae and Scyliorhinidae from the Comoro Islands. The sharks include the following species and specimens (B. SERET, *pers. comm.*):

Family Squalidae : *Centrophorus uyato*, MNHN 1986-719, 715 mm TL female, Grande Comore, 350 m, May 1982. *Squalus asper*, MNHN 1986-722, 763 mm TL female, Grande Comore, 320 m, May, 1982.

Family Scyliorhinidae : *Scyliorhinus capensis*, MNHN 1984-701, 464 mm TL adult male, Moroni, Grande Comore, 400 m, June 18, 1983.

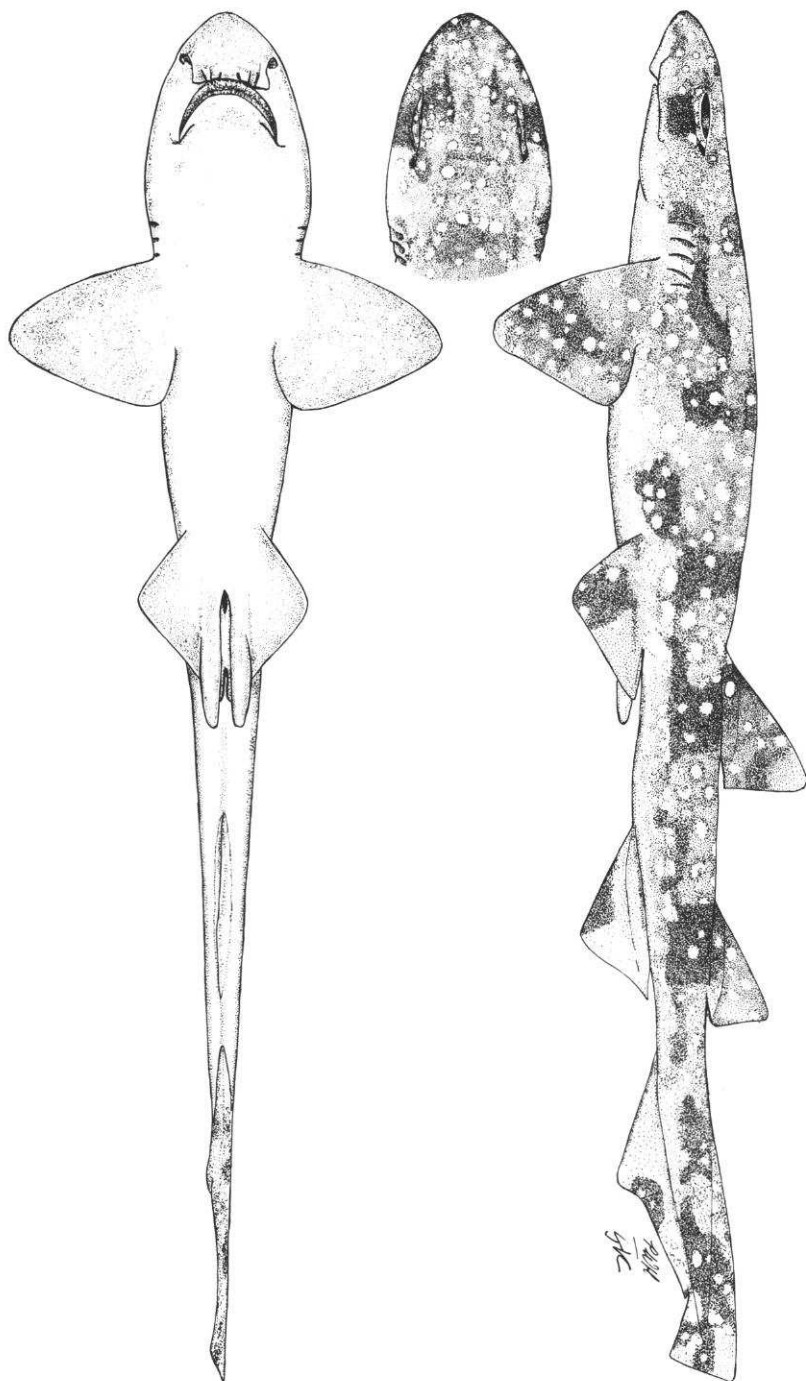


FIG. 1. — *Scyliorhinus comoroensis* n. sp., MNHN 1984-771, holotype, 465 mm adult male, lateral and ventral view, with dorsal view of head. Illustration by P. HAZELHURST and L. J. V. COMPAGNO.

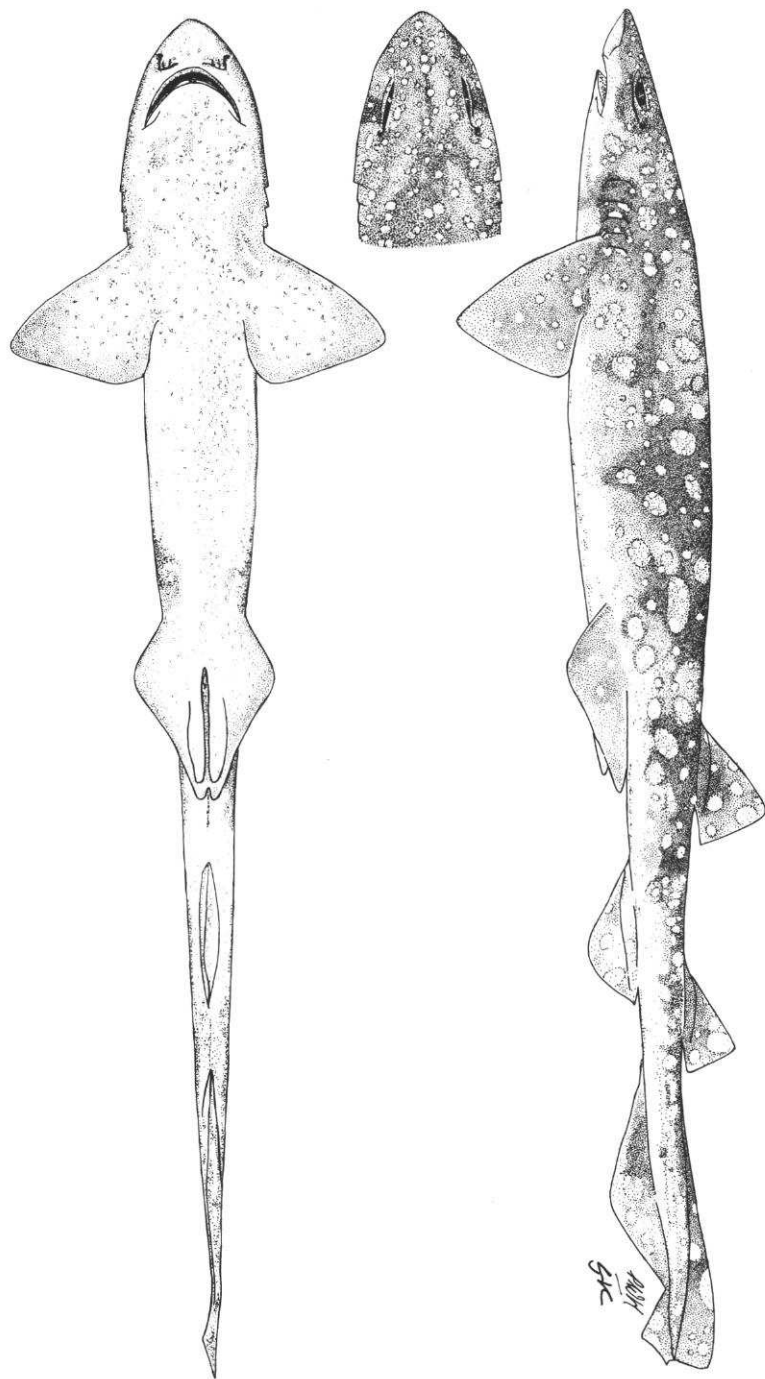


FIG. 2. — *Scyliorhinus capensis*, RV "Africana" A4750 048 029 3378, 945mm adult male, lateral and ventral view, with dorsal view of head. Illustration by P. HAZELHURST and L. J. V. COMPAGNO.

*Scyliorhinus capensis* (Smith, in Müller & Henle, 1838) was first named but not described by A. SMITH (1837, 1838) as *Scyllium capense* (nomen nudum). *Scyllium capense* was described by SMITH in MÜLLER & HENLE (1838 : 11), with a type locality "vom Cap" (from the Cape of Good Hope, South Africa). *Scyliorhinus capensis* was considered by BASS *et al.* (1975), SPRINGER (1979), and COMPAGNO (1984) as confined to South African waters, with outlying records from India and Pakistan (GÜNTHER, 1870; DAY, 1878; MISRA, 1949, 1969; QURESHI, 1971) being incorrect and possibly based on an undescribed species of *Scyliorhinus*. BASS *et al.* (1975) listed *S. capensis* as ranging from Natal, South Africa, where it is extremely rare, to the eastern Cape and southwestern Cape off Cape Town, where it commonly occurs in the catches of commercial hake trawlers.

In 1985, 1986, 1987 and 1988 the writer and colleagues Mr. D. A. EBERT, Mr. P. COWLEY, and Ms. A. MACRAS (Shark Research Center), and Dr. M. J. SMALE (Port Elizabeth Museum) participated in eight hake demersal and experimental cruises (039, 046, 048, 050, 054, 056, 059 and 060) of RV "Africana", a large (77.85 m, 2456 tonnes) and modern research vessel outfitted as a stern trawler and operated by the Sea Fisheries Research Institute, Cape Town. During these cruises we examined hundreds of *Scyliorhinus capensis* and deposited some of them in the fish collection of the J. L. B. Institute of Ichthyology along with *S. capensis* taken by four previous "Africana" cruises (015, 022, 028 and 033). The details of the chondrichthyan collections made on these cruises will be published elsewhere, but some data for *S. capensis* are noted in this account. We collected *S. capensis* off the Cape coast of South Africa from East London to the Orange River mouth and off southern Namibia. LLORIS (1986) reported five *S. capensis* from Namibian waters just north of the Orange River but did not collect it elsewhere off Namibia. Present information suggests that *S. capensis* is commonest in South African temperate waters from the Cape Peninsula to Algoa Bay in depths from 26 to 530 m, but apparently reaches the extreme limits of its range off Natal and southern Namibia where very few specimens have been collected.

With the known range of *S. capensis* off southern Africa in mind I examined FOURMANOIR's Grande Comore specimen and compared it with material of *S. capensis* from South Africa. This confirmed FOURMANOIR's placement of this shark in *Scyliorhinus*, but indicated that it is a new species, not referable to *S. capensis* or any other species and described below as *S. comoroensis*.

#### TERMINOLOGY AND ABBREVIATIONS

Terminology for external and anatomical structures (including vertebral count terminology) follows COMPAGNO (1970, 1979, 1988). Dentional terms are from a system developed by Dr. Bruce WELTON and myself (see COMPAGNO, 1988). The major difference as used here is the substitution of the orientation terms 'distal' for 'postlateral', 'mesial' for 'premedial', 'labial' for 'outer' and 'lingual' for 'inner', in conformity with current European terminology. Abbreviations and methodology for measurements follow the FAO system of COMPAGNO (1984) except for the following correction : The measurement MOL (mouth length) was incorrectly shown in the diagram (COMPAGNO, 1984 : 12) as extending from the lower symphysis to the mouth corners, but should be from the upper symphysis to the mouth corners.

Abbreviations for catalog numbers follow LEVITON *et al.* (1985) and COMPAGNO (1988) and include : BMNH : British Museum (Natural History), London; ISH : Institut für Seefisherei, Hamburg; LACM-C : Los Angeles County Museum of Natural History, uncataloged Applegate cranial specimen; LJVC : L. J. V. COMPAGNO collection; MNHN : Muséum national d'Histoire naturelle, Paris; RUSI : J. L. B. Smith Institute of Ichthyology, Grahams-town; SU : Stanford University fish collection, now housed at California Academy of Sciences, San Francisco; USNM : United States National Museum of Natural History, Washington, D.C.

RV "Africana" regular field numbers for hake demersal cruises (eg., A6300 056 082 3366) include a consecutive station number for the ship (A6300), the cruise number (056), the consecutive station for the cruise (082), and a block coordinate number (3366). "Africana" experimental field numbers on hake cruises (eg., A5309 050 E07) include only a consecutive experimental station number (E07) in addition to ship station (A5309) and cruise (050) numbers. Field numbers are also listed for the U.S. National Marine Fisheries Service research vessels RV "Oregon", RV "Oregon II", and RV "Silver Bay" for uncataloged comparative material examined by me.

#### Family SCYLORHINIDAE Gill, 1862

#### Subfamily SCYLORHININAE Gill, 1862

Scope of this family follows SPRINGER (1979), and COMPAGNO (1984, 1988). COMPAGNO (1988) divided the family into four subfamilies, one of which, Scyliorhininae, includes *Scyliorhinus* along with *Poroderma* Smith, 1837, and *Cephaloscyllium* Gill, 1862.

#### Genus SCYLORHINUS Blainville, 1816

Subgenus *Scyliorhinus* Blainville, 1816 : 121 (genus *Squalus* Linnaeus, 1758). Type species : *Squalus canicula* Linnaeus, 1758, by subsequent designation of GILL (1862 : 407, as "*Scylliorhinus canicula* Blainville"). For definitions and synonymies of this genus see BIGELOW & SCHROEDER (1948), SPRINGER (1979), and COMPAGNO (1984, 1988).

The latest revision of *Scyliorhinus* is that of SPRINGER (1979), culminating his earlier work on the genus (SPRINGER, 1966; SPRINGER & SADOWSKY, 1970). SPRINGER (1979), followed by COMPAGNO (1984, 1988), included thirteen species in *Scyliorhinus* : *S. besnardi* Springer & Sadowsky, 1970, *S. boa* Goode & Bean, 1896, *S. canicula* (Linnaeus, 1758), *S. capensis* (Smith, in Müller & Henle, 1838), *S. cervigoni* Maurin & Bonnet, 1970, *S. garmani* (Fowler, 1934), *S. haeckelii* (Ribeiro, 1907), *S. hesperius* Springer, 1966, *S. meadi* Springer, 1966, *S. retifer* (Garman, 1881), *S. stellaris* (Linnaeus, 1758), *S. torazame* (Tanaka, 1908), and *S. torrei* Howell-Rivero, 1936.

SPRINGER's revision of *Scyliorhinus* was based primarily on external morphology and vertebral counts, and coloration figures heavily in his key to species. The present investigation suggests that additional character systems, including cranial and clasper morphology and intestinal valve counts, will be important in elucidating the interrelationships of species within *Scyliorhinus*, but such an investigation is beyond the scope of this paper and was not possible with the limited material available. A key to species, extensively revised from that of COMPAGNO (1984), is presented below.

KEY TO SPECIES

- 1A. Anterior nasal flaps contacting each other at upper symphysis; shallow nasoral grooves present between nostrils and mouth ..... *Scyliorhinus canicula* (Linnaeus, 1758)
- 1B. Anterior nasal flaps not contacting each other at upper symphysis; no nasoral grooves between nostrils and mouth ..... 2
- 2A. Color pattern with conspicuous small dark spots or lines ..... 3
- 2B. Color pattern without conspicuous small dark spots or lines, with light spots, dark saddles, or both ..... 9
- 3A. Color pattern of black lines in a reticular pattern ..... *Scyliorhinus retifer* (Garman, 1881)
- 3B. Color pattern without black lines in a reticular pattern, with small dark spots and sometimes light spots and dark saddles ..... 4
- 4A. Saddle marks inconspicuous or masked by spots ..... 5
- 4B. Saddle marks conspicuous ..... 7
- 5A. Small and large dark and sometimes with the spots densely distributed over fins and body ..... *Scyliorhinus stellaris* (Linnaeus, 1748)
- 5B. Large dark spots sparsely distributed on fins and body ..... 6
- 6A. Round dark brown spots on fins and body ..... *Scyliorhinus garmani* (Fowler, 1934)
- 6B. Irregular black spots on fins and body .. *Scyliorhinus besnardi* Springer & Sadowsky, 1970
- 7A. Saddle marks outlined by borders of black spots or broken black lines ..... *Scyliorhinus boa* Goode & Bean, 1896
- 7B. Saddle marks not outlined by black spots or lines ..... 8
- 8A. Anal base as long or longer than interdorsal space ..... *Scyliorhinus cervigoni* Maurin & Bonnet, 1970
- 8B. Anal base shorter than interdorsal space ..... *Scyliorhinus haeckelii* (Ribeiro, 1907)
- 9A. A dwarf species, not exceeding 32 cm. Saddles obscure in adults ..... *Scyliorhinus torrei* Howell-Rivero, 1936
- 9B. Medium to large species, adults 40 cm to over 1 m. Saddles well developed in adults ... 10
- 10A. Ground color dark with darker saddles but light spots few or absent ..... 11
- 10B. Ground color light with darker saddles, blotches, and numerous light spots ..... 12
- 11A. Head broad, width nearly equal to head. Dorsolateral denticles lanceolate and small, skin not very rough ..... *Scyliorhinus meadi* Springer, 1966
- 11B. Head fairly narrow, width about 3/4 of head length. Dorsolateral denticles tricuspidate and large, skin very rough ..... *Scyliorhinus torazame* (Tanaka, 1908)
- 12A. A large species, adults over 70 cm. Saddles with irregular edges, no conspicuous dark bar under eyes ..... *Scyliorhinus capensis* (Smith, 1838)
- 12B. Medium-sized species, adults mature between 40-50 cm. Saddles with sharp edges, a conspicuous dark bar under eye ..... 13
- 13A. Light spots small, wide-spaced, and scattered over body, present inside saddle marks and between them ..... *Scyliorhinus comoroensis*, new species
- 13B. Light spots large and close-set, usually confined to saddle marks, but when outside them large and closely spaced ..... *Scyliorhinus hesperius* Springer, 1966

**Scyliorhinus comoroensis** n. sp.

(Figs. 1, 3-5, 6A, 7A, 8A-B)

HOLOTYPE : MNHN 1984-701, 464 mm TL adult male, Moroni, Grande Comore, Comoro Is., ca. 11°40' S, 43°15' E, 400 m depth, collected by P. FOURMANOIR on 18 June 1983.

DERIVATION OF NAME : *Comoroensis*, from the island group where the holotype was captured.

DIAGNOSIS : A species of *Scyliorhinus* with a bluntly rounded, moderately long snout, preoral length 5.6 % of total length. Head moderately broad, greatest width 0.64 times of head length. Nostrils without nasoral grooves; anterior nasal flaps enlarged, reaching level of mouth but not touching each other at the midline, with a strong medial ridge. Tooth row counts 50/50. First dorsal origin just anterior to pelvic insertions; second dorsal origin over anal midbase; interdorsal space 0.9 times anal base. Denticles fairly large, teardrop-shaped, and barely tricuspidate, skin relatively rough. Inner margins of pelvic fins only partly fused into an apron over claspers, with a deep notch separating them for about half the inner margin length. Claspers long and slender, cylindrical and blunt-tipped, extending behind expanded free rear tips of pelvic fins but falling well anterior to anal origin. Clasper hooks absent, rhipidion well-developed, cover rhipidion weak, accessory terminal and ventral terminal 2 cartilages absent, dorsal terminal 2 present, dorsal and ventral terminal cartilages of equal length, end-style elongated and extending between terminal cartilages for about two-thirds of their lengths. Monospondylous precaudal vertebral count 40, total vertebral count 137. Intestinal valve with 8 turns. Color pattern with bold, discrete dark gray-brown saddles and large blotches on a light-gray brown background, with scattered numerous small white spots size of eye pupil or slightly larger; white spots in saddles and spaces between them but not close-set; no small bold dark spots. Size small, male adult at 464 mm TL.

DESCRIPTION

Measurements and proportions of the holotype (fig. 1) are presented in Table 1. Weight of preserved holotype 290 gm.

TABLE 1. — Measurements in millimeters and proportions as percentages of total length for the holotype of *Scyliorhinus comoroensis*, MNHN 1984-701. Measurements and abbreviations from COMPAGNO (1984).

	mm	Percent total length (% TOT)
Total length (TOT) :	464	100.0
Precaudal length (PRC) :	353	76.0
Prenarial length (PRN) :	16	3.4
Preoral length (POR) :	26	5.6
Preorbital length (POB) :	32	6.9
Prespiracular length (PSP) :	50	10.7
Prebranchial length (PGI) :	70	15.0
Head length (HDL) :	87	18.7
Prepectoral length (PP1) :	82	17.6
Prepelvic length (PP2) :	176	37.9
Snout-vent length (SVL) :	191	41.1
Preanal length (PAL) :	270	58.1
Pre-first dorsal length (PD1) :	215	46.3
Pre-second dorsal length (PD2) :	301	64.8

Interdorsal space (IDS) :	48	10.3
Dorsal-caudal space (DCS) :	25	5.4
Pectoral-pelvic space (PPS) :	62	13.3
Pelvic-anal space (PAS) :	61	13.1
Anal-caudal space (ACS) :	28	6.0
Eye length (EYL) :	15	3.2
Eye height (EYH) :	5	1.1
Interorbital space (INO) :	37	8.0
Nostril width (NOW) :	13	2.8
Internarial space (INW) :	7	1.5
Anterior nasal flap length (ANF) :	9	1.9
Spiracle length (SPL) :	2	0.4
Eye-spiracle space (ELS) :	6	1.3
Mouth length (MOL) :	20	4.3
Mouth width (MOW) :	32	6.9
Upper labial furrow length (ULA) :	0	0
Lower labial furrow length (LLA) :	7	1.5
First gill slit height (GS1) :	8	1.7
Second gill slit height (GS2) :	8	1.7
Third gill slit height (GS3) :	7	1.5
Fourth gill slit height (GS4) :	7	1.5
Fifth gill slit height (GS5) :	6	1.3
Head height (HDH) :	36	7.8
Head width (HDW) :	56	12.0
Trunk height (TRH) :	38	8.2
Trunk width (TRW) :	46	9.9
Caudal peduncle height (CPH) :	15	3.2
Caudal peduncle width (CPW) :	9	1.9
Girth (GIR) :	134	28.8
Pectoral length (P1L) :	65	14.0
Pectoral anterior margin (P1A) :	54	11.6
Pectoral base (P1B) :	34	7.3
Pectoral height (P1H) :	53	11.4
Pectoral inner margin (P1I) :	43	9.3
Pectoral posterior margin (P1P) :	25	5.4
Pelvic length (P2L) :	61	13.1
Pelvic anterior margin (P2A) :	33	7.1
Pelvic base (P2B) :	34	7.3
Pelvic height (P2H) :	23	5.0
Pelvic inner margin (P2I) :	25	5.4
Pelvic posterior margin (P2P) :	44	9.5
Clasper outer length (CLO) :	33	7.1
Clasper inner length (CLI) :	54	11.6
Clasper base width (CLB) :	4.3	0.9
First dorsal length (D1L) :	48	10.3
First dorsal anterior margin (D1A) :	57	12.2
First dorsal base (D1B) :	36	7.8
First dorsal height (D1H) :	29	6.3
First dorsal inner margin (D1I) :	12	2.6
First dorsal posterior margin (D1P) :	23	5.0
Second dorsal length (D2L) :	41	8.8
Second dorsal anterior margin (D2A) :	45	9.7
Second dorsal base (D2B) :	32	6.9
Second dorsal height (D2H) :	22	4.7
Second dorsal inner margin (D2I) :	10	2.2



Second dorsal posterior margin (D2P) :	17	3.7
Anal length (ANL) :	59	12.7
Anal anterior margin (ANA) :	46	9.9
Anal base (ANB) :	51	10.9
Anal height (ANH) :	23	5.0
Anal inner margin (ANI) :	7	1.5
Anal posterior margin (ANP) :	31	6.7
Dorsal caudal margin (CDM) :	110	23.7
Preventral caudal margin (CPV) :	48	10.3
Postventral caudal margin (CPL + CPU) :	47	10.1
Subterminal caudal margin (CST) :	22	4.7
Terminal caudal margin (CTR) :	24	5.2
Terminal caudal lobe (CTL) :	32	6.9

Head short, length 0.7 times in pectoral-pelvic space. Head fairly broad and flattened, roughly trapezoidal in cross-section at eyes. Outline of head in lateral view undulated dorsally, convex in front of spiracles but with a slight depression just in front of gills and a distinct hump over them; in dorsal view head has a broad parabolic outline anterior to gill openings. Preoral snout length short, 0.8 times mouth width, broadly rounded in dorsal view, not noticeably indented anterior to nostrils; snout bulbous and bluntly pointed in lateral view, convex above and below.

External eye opening with prominent anterior and posterior eye notches; eyes large and spindle-shaped, eye length 5.8 time in head length and 3 times eye height. Eyes dorsolateral on head, with lower edges well medial to horizontal head rim in dorsal view, subocular ridges strong. Nictitating lower eyelids of rudimentary type (COMPAGNO, 1970), with shallow, scaled subocular pouches and secondary lower eyelids free from upper eyelids.

Spiracles small, length 7.5 times in eye length, spiracles 0.4 times eye lengths behind and below posterior eye notch. First two gill openings about equally wide, last three tapering down to fifth; fifth slightly shorter than third, width of fifth 0.8 times of third; third 12.4 times in head and 0.5 times of eye length. All gill openings slightly concave, gill filaments not visible from outside. Upper ends of gill openings slightly below lower edges of eyes, gill openings not elevated on dorsolateral surface of head. Wide-spaced but prominent gill-raker papillae present on gill arches.

Nostrils (fig. 3) with large elongated incurrent apertures lacking posterolateral keels, broadly angular nasal flaps with narrowly rounded tips, very small mesonarial flaps, small oval excurrent apertures, and small posterior nasal flaps. Nostrils in front of mouth, with anterior nasal flaps extending just past upper symphysis. Anterior nasal flaps very large but separated by a narrow space, with a strong ventral ridge along their midlengths that does not extend behind their posterior edges; anterior nasal flaps covering posterior nasal flaps and excurrent apertures. Nostril width 0.5 times in internarial space, 1.2 times eye length, and 0.5 times in third gill opening width.

Mouth broadly arched, moderately large, and short, mouth width about 0.6 times of head width at mouth corners, 2.7 times in head length; mouth length 1.6 times in mouth width. Lower symphysis falling well short of upper symphysis, teeth prominently exposed in ventral view. Tongue moderate-sized, flat and rounded, filling most of floor of mouth. Maxillary valve extremely narrow, width about 0.13 times of eye diameter, highly papillose. Large buccal

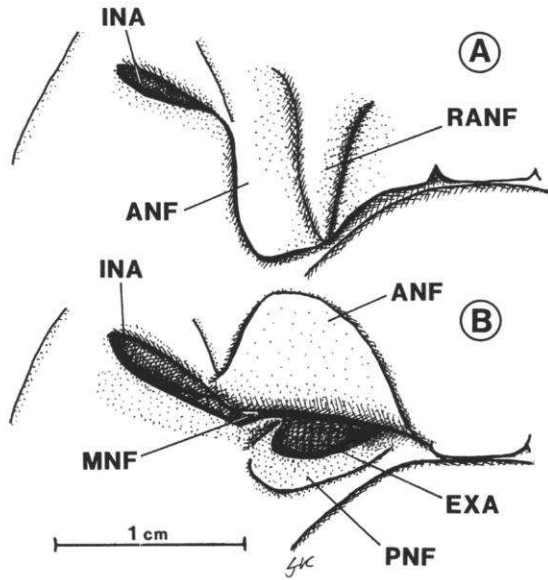


FIG. 3. — *Scyliorhinus comoroensis*, MNHN 1984-771, A, right nostril in ventral view; B, same with anterior nasal flap deflected. Abbreviations : ANF, anterior nasal flap; EXA, excurrent aperture; INA, incurrent aperture; MNF, mesonarial flap; PNF, posterior nasal flap; RANF, ridge on anterior nasal flap (incipient barbel). Figure 3 and subsequent illustrations by L. J. V. COMPAGNO.

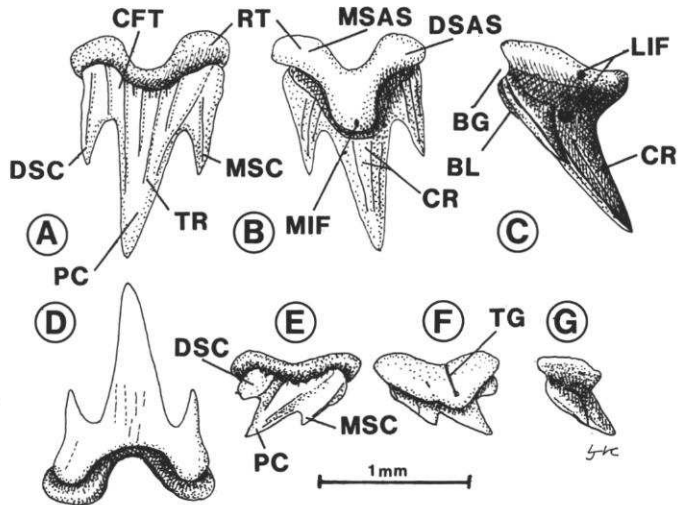


FIG. 4. — *Scyliorhinus comoroensis*, MNHN 1984-771. Teeth in A, D, E, labial view, B, F, lingual view, and C, G, mesial view. A-C, upper right anteroposterior tooth at symphysis; D, lower right anteroposterior tooth at symphysis; E-G, upper right posterior tooth at end of dental band. Abbreviations : BG, basal groove; BL, basal ledge; CFT, crown foot; CR, crown; DSAS, distal attachment surface of root; DSC, distal cusplet; LIF, mesial lingual foramen; MIF, medial lingual foramen; MSAS, mesial attachment surface of root; MSC, mesial cusplet; PC, primary cusp; RT, root; TG, transverse groove; Tr, transverse ridge.

papillae covering floor and roof of mouth behind maxillary valve. Palate and floor of mouth naked, with no buccopharyngeal denticles. Lower labial furrows moderately long, uppers absent, anterior ends of lowers well behind lower symphysis. Labial cartilages large.

Teeth (fig. 4) in 50/50 rows, 2-3/3-4 series functional. Lateroposterior teeth arranged in inconspicuous files in both jaws, no toothless spaces at symphysis. Teeth not highly differentiated in upper and lower jaws and along jaws, tooth row groups include medials (M), symphysials (S), and anteroposteriors (AP). Tooth formula is :

$$\text{Left } \frac{\text{AP24} \quad \text{S1} \quad \text{S1} \quad \text{AP24}}{\text{AP23} \quad \text{M4} \quad \text{AP23}} \text{ Right or } \frac{25-25}{25-25}$$

Sexual heterodonty probably weak, teeth not enlarged or particularly modified in adult male holotype. Upper teeth slightly higher-crowned than lowers, with longer, stronger transverse ridges, otherwise very similar. Medials and poorly differentiated symphysials are higher-crowned and smaller than anteroposteriors, with erect or semierect cusps and one weak cusplet on either side of the cusp. Anteroposteriors in both jaws are larger than medials and symphysials, with strong erect to semioblique cusps, usually one strong high to low cusplet on either side, strong basal ledges and grooves, longitudinal ridges confined to the basal ledges or extending onto the cusps and cusplets, and low, flat roots. Gradient monognathic heterodonty well-developed in anteroposterior teeth; distally the anteroposteriors become smaller, with thicker and more oblique cusps, and lower cusplets. On distalmost teeth the cusp is shifted slightly distal on the crown foot, with sometimes two mesial cusplets, but these teeth are not comb-shaped. Sample teeth examined either have a narrow transverse groove (holaulacorhizous) in distalmost teeth or no groove (anaulacorhizous) in teeth near symphysis, and with prominent centrolingual foramen on linguobasal attachment surface of roots. Tooth histological type (histotype) orthodont, with a definite pulp cavity.

Body fairly slender, trunk vertically oval in section at first dorsal base, length of trunk from fifth gill openings to vent 1.2 times head length. No predorsal, interdorsal or postdorsal ridges on midline of back, and no postanal ridge between anal base and lower caudal origin; lateral ridges absent from body. Caudal peduncle short, fairly high, slightly compressed, cylindrical-tapering and without lateral keels, caudal peduncle height at second dorsal insertion 1.7 times of width there, 1.7 times in dorsal-caudal space.

Lateral trunk denticles (fig. 5) with flat, elongated teardrop-shaped crowns about twice as long as wide, anterior part covered with prominent reticulated depressions. Crown with a strong medial ridge that extends the entire length of the crown onto the long, strong, narrow medial cusp, ridge flanked posteriorly or along most of its length by a pair of low but prominent accessory ridges; medial cusp about as long as the rest of the crown; lateral cusps not well developed, mostly indicated as truncated lateral angles, lateral ridges anterior to them very short or absent. Denticle crowns loosely spaced, not closely imbricated. Denticle pedicels short and slender, but elevating crowns well above skin; denticle roots with 4 lobes.

Pectoral fins broad and rounded-triangular, not falcate, with broadly convex anterior margins, narrowly rounded apices, nearly straight posterior margins, broadly rounded free rear tips, convex inner margins, and broad bases. Pectoral anterior margin 0.8 times pectoral length. Pectorals over twice area of first dorsal. Origins of pectorals under interspace between third and fourth gill openings. Apex of pectoral anterior to its free rear tip when fin is elevated and appressed to body.

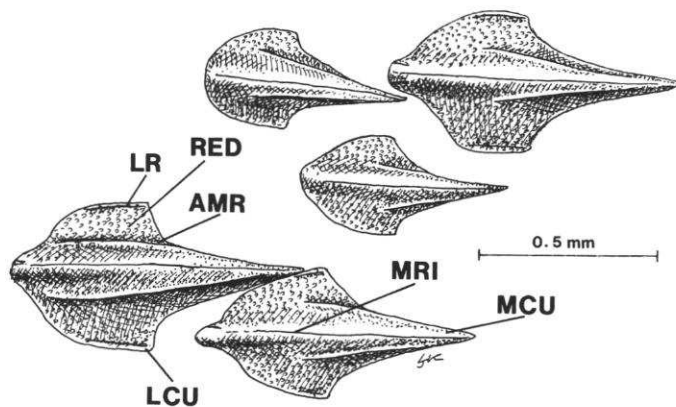


FIG. 5. — *Scyliorhinus comoroensis*, MNHN 1984-771. Lateral trunk denticles from just in front of first dorsal fin, view of denticle crowns. Abbreviations: AMR, accessory medial ridge; LCU, lateral cusp; MCU, medial cusp; MRI, medial ridge; RED, reticular indentations.

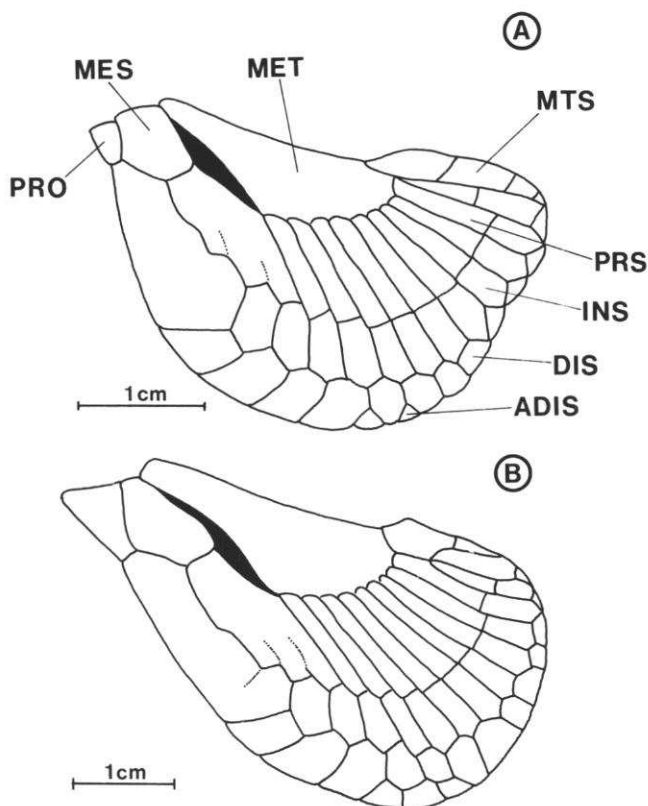


FIG. 6. — Pectoral fin skeleton of: A, *Scyliorhinus comoroensis*, MNHN 1984-771; B, *Scyliorhinus capensis*, RV "Africana" A2372 028 095 4010, 665 mm immature female. Abbreviations: ADIS, accessory distal radial segments; DIS, distal radial segments; INS, intermediate radial segments; MES, mesopterygium; MET, metapterygium; MTS, metapterygial segments; PG, pectoral girdle; PRO, propterygium; PRS, proximal radial segment.

Pectoral fin skeleton (fig. 6A) with radials extending about 0.4 times of pectoral anterior margin length into fin. Radials mostly divided into three segments, longest distal segment 0.3 times length of its proximal segment. Pectoral skeleton tribasal, propterygium probably with a single radial, mesopterygium probably with 5 radials, and metapterygium with 10 radials on basal segment and none on metapterygial axis; total radial count 16. Propterygium small, short, wedge-shaped, and distally elongated in the axis of its radial. Mesopterygium short, subpentagonal, and slightly elongated and distally expanded in the axes of its radials and distally expanded. A large fused plate formed by the propterygial radial, the first mesopterygial radial, and the intermediate segments of the second and third mesopterygial radials; a second fused plate formed by the proximal segment of the second, third and fourth mesopterygial radials. Mesopterygium and metapterygium partly separated by an elongated fenestra. Metapterygial basal segment triangular, elongated slightly diagonal to the axes of its radials; metapterygial axis long, tetrasegmental, and with length about 0.8 times of metapterygial basal segment. Only two accessory distal radial segments intercalated between first and second, and second and third distal metapterygial radial segments.

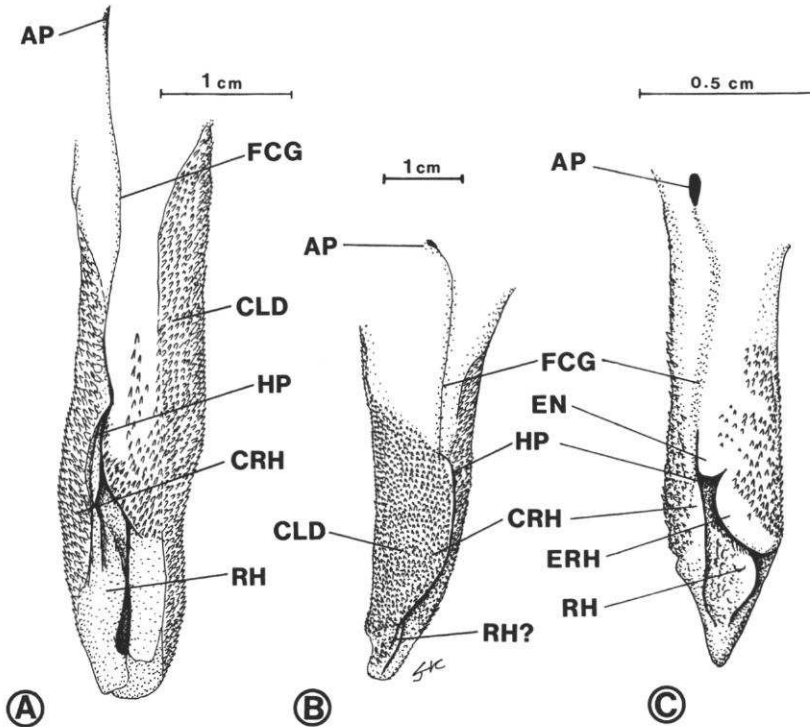


FIG. 7. — Dorsal view of right claspers : A, *Scyliorhinus comoroensis*, MNHN 1984-771; B, *Scyliorhinus capensis*, RV "Africana" A4750 048 029 3368, 945 mm adult male; C, *Scyliorhinus torrei*, RUSI-6054, 267 mm adult male. Clasper drawings adjusted to same width at base. Abbreviations : AP, apopyle; CLD, clasper denticles; CRH, cover rhipidion; EN, envelope; ERH, exorhipidion; FCG, fused clasper groove; HP, hypopyle; RH, rhipidion; RH?, probable rhipidion vestige.

Pelvic fins broadly triangular; pelvic anterior margins 0.6 times of pectoral anterior margins; pelvic area subequal to anal fin area. Pelvic anterior margins nearly straight, apices narrowly rounded, posterior margin slightly concave, free rear tips attenuated and narrowly rounded, inner margins fused for about half their lengths anterior to the free rear tips, forming a partial 'apron' over the claspers.

Claspers (fig. 7A) relatively long and moderately stout, cylindrical, not markedly tapering, and with slightly undulated, blunt-tipped clasper glans. Claspers extending well behind free rear tips, by distance about 0.4 times pelvic inner margin, but falling in front of anal origin by about 0.6 times of anal base. Most of clasper except dorsomedial and posteromedial surface of glans (including rhipidion) and a lateral strip adjacent to the clasper groove covered with large clasper denticles with anteriorly directed cusps. Exorhipidion not differentiated from lateral edge of glans, specialized clasper hooks absent. Rhipidion present and relatively large, partially covered medially by a weakly differentiated cover rhipidion. Pseudosiphon and pseudopora absent. Apophyle and hypophyle connected by a long clasper groove, with its dorsal margins fused over the clasper canal. Clasper skeleton (fig. 8A-B) relatively simple. The axial

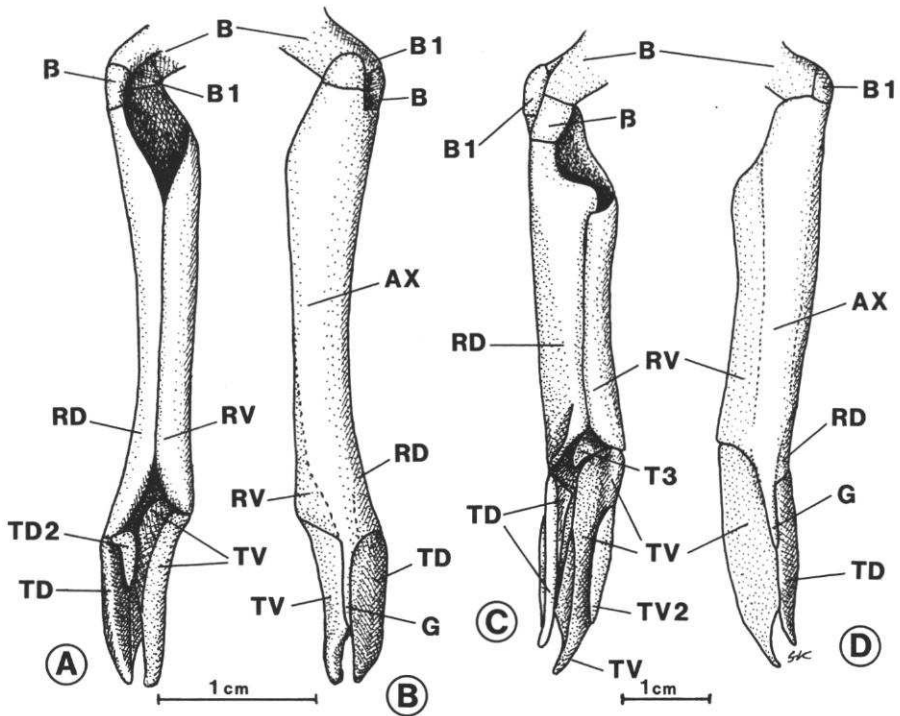


FIG. 8. — Clasper skeleton of : A-B, *Scyliorhinus comoroensis*, MNHN 1984-771 ; C-D, *Scyliorhinus capensis*, RV "Africana" A4750 048 029 3378, 945 mm adult male. Abbreviations : AX, axial cartilage ; B, basipterygium ; B, beta cartilage ; B1, basal segment ; G, end-style ; RD, dorsal marginal cartilage ; RV, ventral marginal cartilage ; T3, accessory terminal cartilage ; TD, dorsal terminal ; TD2, terminal dorsal 2 cartilage ; TV, ventral terminal cartilage ; TV2, ventral terminal 2 cartilage.

cartilage (AX) or appendix-stem is connected proximally by a single basal segment (B1) and a dorsal beta cartilage (B) to the pelvic basipterygium. The clasper shaft, formed from the axial cartilage and tightly rolled dorsal and ventral marginal (RD and RV) cartilages, is slender, and tapers and then expands posteriorly in an elongated hourglass shape. The skeleton of the clasper glans comprises a large, curved, wedge-shaped dorsal terminal (TD) and a similarly shaped ventral terminal (TV), articulating with and separated along their proximo-mesial two-thirds by a terminal extension of the axial cartilage, the narrow, cylindrical end-style (G); the posterior ends of the terminal cartilages are separated by a gap and are slightly hooked. There is no accessory terminal cartilage (T3), but a short, hooked dorsal terminal 2 cartilage (TD2) is present and supports the rhipidion. The TD2 cartilage originates opposite the joint between dorsal marginal and dorsal terminal cartilages, and extends about a third of the length of the dorsal terminal posterior to the joint. Clasper siphons short and narrow, extending about 0.3 times pectoral-pelvic space anterior to pelvic bases and ending well behind pectoral free rear tips.

First dorsal fin low, apically narrow and not falcate, with nearly straight anterior margin, narrowly rounded apex, nearly straight posterior margin, angular free rear tip, and slightly concave inner margin. First dorsal origin slightly anterior to insertions of pelvic fins, midpoint of base slightly anterior to pelvic free rear tips, insertion about 1.5 times closer to anal origin than pelvic insertions, and free rear tip about 0.7 times inner margin anterior to anal origin. Posterior margin vertical from fin apex, insertion anterior to dorsal apex. First dorsal base 1.3 times in interdorsal space, 3.1 times in dorsal caudal margin; first dorsal height 1.2 times in first dorsal base; first dorsal inner margin 2.4 times in first dorsal height, 3 times in first dorsal base.

Second dorsal fin low, apically narrow and not falcate, about 0.7 times of first dorsal area, second dorsal height 0.75 times first dorsal height, base 0.9 times first dorsal base. Second dorsal with nearly straight anterior margin, bluntly rounded apex, straight posterior margin, narrowly rounded free rear tip, and straight inner margin. Second dorsal origin about opposite anal midbase, insertion about opposite anal free rear tip, and free rear tip in front of upper caudal origin by about 1.5 times its inner margin. Posterior margin slanting posteroventrally from apex, insertion slightly anterior to dorsal apex. Second dorsal base 0.9 times in dorsocaudal space, second dorsal height 1.5 times in second dorsal base, second dorsal inner margin 2.2 times in second dorsal height and 3.2 times in second dorsal base.

Anal fin low, apically narrow, not falcate, and somewhat larger than second dorsal, anal height 1.1 times second dorsal height and base 1.6 times second dorsal base. Anal anterior margin nearly straight, apex narrowly rounded, posterior margin slightly undulated, free rear tip acutely pointed, and inner margin straight. Anal base without preanal ridges, anal origin an anal base length behind pelvic insertions, free rear tip slightly more than inner margin length anterior to lower caudal origin. Anal posterior margin slanting posterodorsally, anal insertion posterior to apex. Anal base 0.5 times in anal-caudal space, anal height 2.2 times in anal base, anal inner margin 3.3 times in anal height and 7.3 times in anal base.

Caudal fin narrow-lobed and asymmetrical, with large terminal lobe and ventral lobe hardly developed. Caudal short, dorsal margin 3.2 times in precaudal length; preventral caudal margin 3.2 times in dorsal caudal margin, terminal lobe 3.4 times in dorsal caudal margin, subterminal margin 1.1 in terminal margin. Dorsal caudal margin slightly convex, without lateral undulations, preventral margin basally concave and apically straight, tip of

ventral caudal lobe bluntly rounded, upper and lower postventral margins hardly differentiated, lower convex, upper nearly straight, transition between them a very broad concavity at an angle of about 145 degrees, subterminal notch a narrow, deep slot, subterminal and terminal margins nearly straight, lobe formed by these margins angular, and tip of tail narrowly rounded.

Total vertebral counts (TC) 137, monospondylous precaudal (MP) centra 40, diplospondylous precaudal (DP) centra 51, diplospondylous caudal (DC) centra 46. MP counts 29.2 %, DP counts 37.2 %, and DC counts 33.6 % of TC counts. Ratios of DP/MP counts 1.3, DC/MP counts 1.2, 'A' ratio 143, 'B' ratio 114. Transition between MP and DP centra well behind pelvic bases and over clasper shafts, about ten centra behind pelvic girdle. Last few MP centra before MP-DP transition moderately enlarged, not forming a 'stutter zone' of alternating long and short centra.

Intestinal valve of conicospiral type, with 8 turns.

Cranium not dissected in the holotype, but examined by radiography and by probing its head. The cranium is poorly calcified and is not well detailed on the radiograph. The nasal capsules are apparently quite large, the supraorbital crests are strongly developed, and the occiput is exerted, as in other *Scyliorhinus* species.

COLOR : In alcohol medium gray-brown above, cream-white below on head, trunk, and precaudal tail, medium gray-brown on dorsal fins, upper surfaces of pectoral and pelvic fins, and caudal fins, mottled gray-brown on undersides of pectoral and pelvic fins and anal fin. Bold dark gray-brown saddle-marks on head above eyes, over gills, over pectoral rear tips, over pelvic base, under first and second dorsal bases, and on base and above subterminal notch of caudal fin, complemented by dark blotches below eyes, above gills and pectoral bases, on the pectoral fin web, on flank in front of pelvic bases, on anterior part of pelvic fin web, over anal base, on the anterior anal fin web, and on the hypural caudal lobe. Numerous small white spots about size of eye pupil or smaller scattered over dorsal surface and sides of head, body, tail, and dorsal surface of pectoral and pelvic fins, between and inside dark saddle marks and most other dark spots. No small dark spots on fins or body.

#### COMPARISON WITH OTHER SPECIES OF *Scyliorhinus*

Nine species of *Scyliorhinus* are readily distinguished from *S. comoroensis* by their color patterns, which feature bold dark spots or lines on a light background and combined in some species with dark saddles and light spots. *S. retifer* has a reticulated pattern of dark lines unique in the genus, while *S. besnardi*, *S. boa*, *S. canicula*, *S. cervigoni*, *S. garmani*, *S. haeckelii*, and *S. stellaris* have conspicuous, small to medium-sized, rounded dark spots. *S. meadi* has a somber pattern of dark saddles on a light background, without light or dark spots. *S. canicula* approaches *S. comoroensis* in having relatively larger, broader anterior nasal flaps which reach the mouth; but in *S. canicula* these meet at the midline of the snout and cover shallow nasoral grooves that are lacking in *S. comoroensis*.

*Scyliorhinus comoroensis*, *S. capensis*, *S. torrei*, *S. hesperius*, and *S. torazame* agree with one another in having a color pattern of light spots on a darker background, combined with



dark saddles and large dark blotches in some species but lacking small dark spots. In some *S. torazame* and *S. torrei* the light spots are inconspicuous or obsolete (*torazame*).

*Scyliorhinus capensis* of southern Africa differs from *S. comoroensis* in its much larger size, with males adolescent at about 675-750 mm and adult at 800-950 mm. Its snout is usually more pointed (fig. 2) and shorter than that of *S. comoroensis* (fig. 9A), with preoral length 3.2-4.9% (N = 58, mean 3.91, standard deviation 0.37, and coefficient of variation 9.57) vs. 5.6% total length. *S. capensis* has smaller anterior nasal flaps which are often slightly in front of the mouth, with medial ridges that are broader and less distinct than those of *S. comoroensis*. Tooth counts for *S. capensis* are higher than *S. comoroensis*, 65-70/55-65 (N = 10, mean = 67.7/60.5, standard deviation = 1.89/3.06, coefficient of variation = 2.79/5.06) vs. 50/50. The upper and lower dental arcades of *S. capensis* are closer together than those of *S. comoroensis* (fig. 1-2).

The abdomen of *S. capensis* is relatively longer at all stages of growth than in *S. comoroensis* (fig. 9B), with pectoral-pelvic space 15.6-23.8% (N = 58, mean 19.41, standard deviation 1.37, and coefficient of variation 7.07) vs. 13.3% of total length. The first dorsal origin of most *S. capensis* examined is well behind the pelvic insertions, except in two adult females in which it is over them. All *S. capensis* examined have the second dorsal origin well behind the anal midbase and varying from over last third to last sixth of the base. In adult male *S. capensis* the pelvic inner margins are fused nearly to their tips, with a shallow notch between them, and the pelvic rear tips usually extend posterior to the clasper tips. The pectoral fin skeleton of *S. capensis* (fig. 6B) has slightly longer distal radials than that of *S. comoroensis* (fig. 6A), and, in the specimens examined, has three accessory distal radials rather than two.

The claspers of *Scyliorhinus capensis* and *S. comoroensis* are strikingly different. In the former, these are short, stout, and tapering (fig. 7B) with strong cover rhipidion, rudimentary rhipidion, short, thick straight clasper shaft, no dorsal terminal 2 (TD2) cartilage (fig. 8C-D), a ventral terminal slightly larger than the dorsal terminal, and well-developed ventral terminal 2 (TV2) and accessory terminal (T3) cartilages (lacking in *S. comoroensis*). Dorsal and ventral terminal cartilages (TD and TV) are proportionally much longer and flatter in *S. capensis* than in *S. comoroensis*.

*Scyliorhinus capensis* has higher MP vertebral counts than *S. comoroensis*, 44-46 (N = 14, mean = 45.1, standard deviation = 0.63, coefficient of variation = 1.41) vs. 40, but total counts broadly overlap *S. comoroensis* at 130-144 (combined counts of writer and BASS *et al.*, 1975, N = 26). *S. capensis* has 10 or 11 turns in its intestinal valve, vs. 8 in *S. comoroensis*. Of 35 *S. capensis* counted 14 had 10 valve turns and 20 had 11 turns (mean = 10.58, standard deviation = 0.493, coefficient of variation = 4.66).

The color pattern of *Scyliorhinus capensis* (fig. 2) differs from that of *S. comoroensis* in having poorly defined, irregular dark saddles and light interspaces, and no bold, large dark blotches below its eyes and on its fins. The light spots of preserved *S. capensis* are cream-yellowish in color rather than white as in *S. comoroensis*; live *capensis* have vivid golden spots.

*Scyliorhinus torrei* of the Western North Atlantic differs from *S. comoroensis* in its much smaller size, with one adolescent male examined 203 mm long and three adult males 246, 256, and 267 mm long. It also differs in having a slightly shorter snout; first dorsal origin behind pelvic insertions; second dorsal origin over anal insertion; pelvic inner margins fused nearly to their tips in males, with a shallow notch between them, and usually extending posterior to the clasper tips; possibly fewer intestinal valve turns (6 in one and 7 in two counted); and simpler

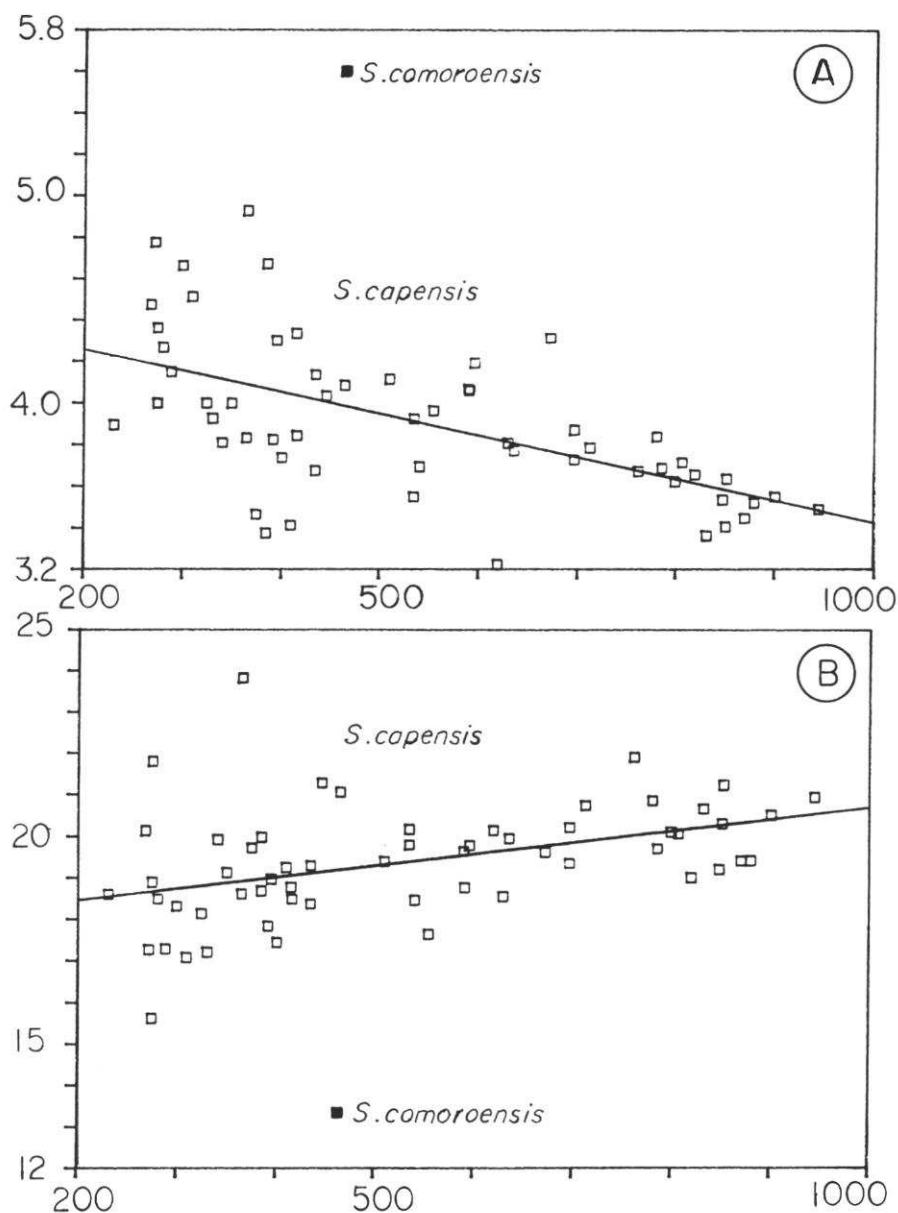


FIG. 9. — Comparison of two proportional measurements of *Scyliorhinus comoroensis* (MNHN 1984-771) and *S. capensis* (58 specimens): A, preoral snout (POR) as percentage of total length (y axis), vs. total length (TOT) in mm (x axis); B, pectoral-pelvic space (PPS) as % TOT (y axis), vs. TOT (x axis). Linear regression ( $Y = a + bx$ ) lines fitted to *S. capensis* data, with values  $POR = 4.47 + (-0.0010)(TOT)$  for data in A ( $R^2 = 0.34$ ) and  $PPS = 17.92 + (0.0028)(TOT)$  for B ( $R^2 = 0.18$ ). Note variation within the sample and allometric trends in *S. capensis*, with preoral snout decreasing relative to total length with growth while pectoral-pelvic space increases with growth. Symbols: *S. comoroensis*, filled square, *S. capensis*, hollow squares.

color pattern, with poorly defined dark saddles and light interspaces, fewer light spots, and no bold dark blotches below eye and on fins and body.

*Scyliorhinus torrei* probably has fewer tooth rows than *S. comoroensis*; one specimen counted had 44/42, while SPRINGER (1979) reported a range of 40-46/38-42 for several specimens (number not stated). *S. torrei* has fewer vertebrae than *S. comoroensis*; for six individuals counted, TC = 114-123 (mean = 117.1, standard deviation = 2.91, coefficient of variation = 2.48), MP = 31-34 (mean = 32.3, standard deviation = 1.37, coefficient of variation = 4.25) and DP = 43-46 (mean = 44.6, standard deviation = 1.24, coefficient of variation = 2.79). SPRINGER (1979) listed 30-34 MP centra for 11 *torrei* counted.

The claspers of *Scyliorhinus torrei* (fig. 7C) are short and stout and have a tapered glans, as in *S. capensis*, but have parallel sides anterior to the glans as in *S. comoroensis*. *S. torrei* has a weak cover rhipidion and large fleshy rhipidion as in *S. comoroensis*, but differs in having a well-developed exorhipidion (without clasper hooks) and a discrete envelope unlike either *S. comoroensis* or *S. capensis*. The clasper skeleton of *S. torrei* (fig. 10) is similar to that of *S. capensis* in having a broad shaft with parallel-sided dorsal and ventral marginals. The dorsal and ventral terminals of *S. torrei* differ from those of *S. comoroensis* in being of unequal length, with the dorsal terminal extending well posterior to the ventral terminal and being differently shaped, clawlike in the former vs. broad and platelike in the latter. The end-style of

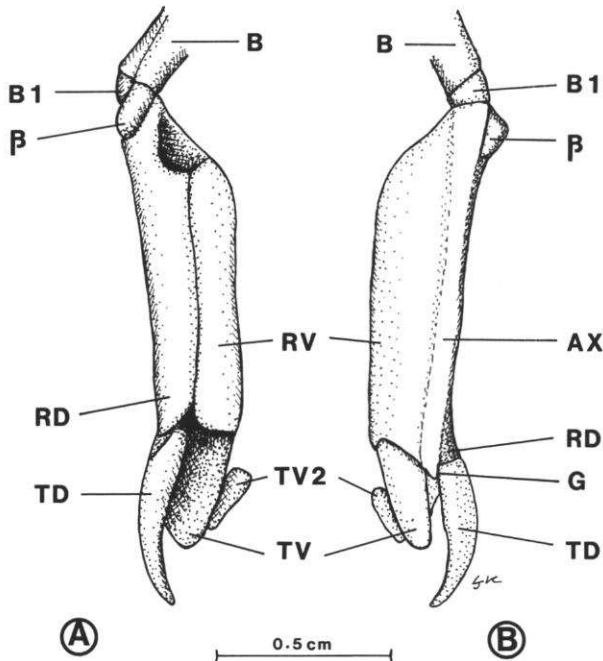


FIG. 10. — Clasper skeleton of *Scyliorhinus torrei*, "Silver Bay" 2457, 256 mm adult male, in A, dorsal, and B, ventral views. Abbreviations: AX, axial cartilage; B, basipterygium; β, beta cartilage; B1, basal segment; G, end-style; RD, dorsal marginal cartilage; RV, ventral marginal cartilage; TD, dorsal terminal; TV, ventral terminal cartilage; TV2, ventral terminal 2 cartilage.

*S. torrei* is extremely short and barely protrudes between the terminal cartilages, unlike *S. comoroensis* and *S. torrei* in which it is elongated and extends about half (*capensis*) or two-thirds (*comoroensis*) to the tips of the marginals. A small ventral terminal 2 (TV2) cartilage is present in *S. torrei* (supporting the exorhipidion), but is lacking in *S. comoroensis*.

Very few specimens of *Scyliorhinus torazame* and *S. hesperius* were available for comparison with *S. comoroensis*. Both are moderate-sized species as in *S. comoroensis*, with adults between 400-500 mm total length. *S. torazame* of the Western North Pacific differs from *S. comoroensis* in having a shorter mouth and snout (NAKAYA 1975, gives 3.7-4.2 for POR); smaller anterior nasal flaps that do not reach the mouth; much more elongated claspers than in *S. comoroensis* (NAKAYA, 1975, fig. 4; SPRINGER, 1979, fig. 96), which nearly or quite reach the anal origin and with long fused pelvic rear tips that extend past them; second dorsal origin over last half of anal base, behind pelvic midline; fewer MP centra, 33-38 (data from NAKAYA, 1975, N = 99; mean = 35.03, standard deviation = 0.99, coefficient of variation = 2.83); and possibly lower intestinal valve counts, with 7 in two counted by me plus a count of 7 mentioned by NAKAYA (1975); and claspers with discrete clasper hooks (SCHMIDT, 1935). Light spots where present are large and relatively few in *S. torazame* (see SPRINGER, 1979, fig. 95). and dark saddles and blotches, when present, are irregular.

*Scyliorhinus hesperius* from the uppermost slope (274-457 m depth) of Atlantic Central America is apparently close to *S. comoroensis*, with a broadly similar shape and color pattern, moderate size, and similar tooth, intestinal valve, and MP vertebral counts. SPRINGER (1966, 1979) records 52/46 tooth rows and 39-42 MP vertebrate (N = 8) for *S. hesperius* while an additional two specimens examined by me had MP counts of 38-41. *S. hesperius* has a short abdomen and relatively long snout as in *S. comoroensis*, with POR 4.7 and 4.8 in two specimens (SPRINGER, 1979), and an intestinal valve count of 8 (one specimen counted by me).

*Scyliorhinus hesperius* differs from *S. comoroensis* most noticeably in its color pattern. Light spots are much larger, less numerous, and more regularly spaced than in *S. comoroensis*, and are close-set within and (in some specimens) between the dark blotches and markings of the body and tail; dark primary saddle markings are more uniformly rectangular (more irregular in *S. comoroensis*), and lighter intercalary saddles are well developed (indistinct in *S. comoroensis*); the elongated lateral blotch on the abdomen in front of the pelvic fins is vertical in *S. hesperius* but horizontal in *S. comoroensis*; the pectoral fins have few large light spots and very vague dark barring (strongly barred and with numerous small light spots in *S. comoroensis*); the dorsal and pelvic fins have very few large light spots (several small ones in *S. comoroensis*); and the pelvic and anal fins and caudal tip are not boldly marked with dark bars (present in *S. comoroensis*).

In addition, the anal fin origin of *Scyliorhinus hesperius* is possibly more anteriorly situated, about opposite the first dorsal free rear tip (well behind it in *S. comoroensis*), and the second dorsal origin is behind rather than opposite the anal midbase. The anterior nasal flaps of *S. hesperius* (see SPRINGER, 1966, fig. 27D) are narrower, do not overlap the mouth, and have less prominent medial ridges than in *S. comoroensis*, *S. hesperius* may also have fewer diplospondylous and total centra than *S. comoroensis*; two specimens counted by me had DP counts of 44, DC counts of 40-45, and TC counts of 122-130.

It is apparent from the comparisons presented above that *Scyliorhinus comoroensis* is not particularly close to its geographically nearest congener, *S. capensis* of southern Africa, and that it may instead have a close relative (and possibly a sister species) in the distantly situated

*S. hesperius* of Central America. However, important features of the morphology of *S. hesperius* are unknown (particularly its clasper structure) and need to be studied to determine the relationship of *S. hesperius* with *S. comoroensis* and other members of its genus.

#### COMPARATIVE MATERIAL

*Scyliorhinus boa* : RV "Oregon II" 11090, immature male, 292 mm, adolescent male, 422 mm, immature female, 345 mm, adolescent female, Western North Atlantic, 530 m.

*Scyliorhinus canicula* : **North Sea** : ISH 52/59, 431 mm, adolescent male, 49°56' N Lat., 5°25' W Long. **England** : LJVC-0430, 60 cm adult male, head only. **Italy**, Naples : LACM-2, male (neurocranium only); SU-20612, 443 mm mature male and two females, 361 and 365 mm.

*Scyliorhinus capensis* : **South Africa** : RUSI-6050, 851 mm adult male, RUSI-6051, 401 mm immature female, and RUSI-6052, 596 mm immature female, Eastern Cape, Algoa Bay, 26-128 m; RUSI-12147, 3 immature males, 367, 399 and 671 mm, Eastern Cape, no further data; RUSI-12159, 231 mm immature male, Eastern Cape, East London, no further data; RUSI-12160, 331 mm immature female, and RUSI-12161, 275 mm immature female, both from Algoa Bay, no further data; RUSI-21879, 435 mm immature male, RV "Africana" A1659 022 072 3154, Western Cape, 30°52' S, 16°06' E, 279 m; RUSI-21880, 541 mm immature female, RV "Africana" A1570 022 023 2579, Western Cape, 35°02' S, 18°58' E, 179 m; RUSI-21881, 385 mm immature female, RV "Africana" A1658 022 071 3139, Western Cape, 30°46' S, 16°06' E, 214 m; RUSI-21882, 300 mm immature female, RV "Africana" A1560 022 017 2546, Western Cape, 34°40' S, 18°49' E, 155 m; RUSI-25218, 325 mm immature female, RV "Africana" A2768 033 024 2675, Western Cape, 35°59' S, 19°58' E, 175 m; RUSI-25219, 385 mm immature male and RUSI-25224, 410 mm immature female, RV "Africana" A2750 033 006 2542, Western Cape, 34°40' S, 18°49' E, 192 m; RUSI-25220, 630 mm immature male RV "Africana" A2786 033 042 4062, Western Cape, 31°38' S, 16°20.5' E, 364 m; RUSI-25221, 672 mm immature male, RV "Africana" A2241 028 017 5138, Western Cape, 34°50' S, 18°17' E, 500 m; RUSI-25222, 392 mm immature male, RV "Africana" A2747 033 003 3373, Western Cape, 35°11' S, 18°57.4' E, 202 m; RUSI-25223, 535 mm immature female, RV "Africana" A2235 028 014 5143, Western Cape, 35°16' S, 18°40' E, 466 m; RUSI-25225, 555 mm immature female, RV "Africana" A2304 028 051 4137, Western Cape, 32°50' S, 16°58' E, 354 m; RUSI-25226, 363 mm immature male, RV "Africana" A1193 015 002 3393, Western Cape, 35°35' S, 19°30' E, 204 m; RUSI-25227, 416 mm immature male, RV "Africana" A2364 028 091 3011, Western Cape, 29°53' S, 15°18' E, 466 m; RUSI-25228, 535 mm immature male, RV "Africana" A1276 015 047 4029, Western Cape, 30°46' S, 15°30' E, 346 m; RUSI-25229, 446 mm immature female, RV "Africana" A2769 033 025 3406, Western Cape, 36°00' S, 19°50' E, 201 m; RUSI-25715, 762 mm adolescent female, RUSI-25720, 697 mm early adolescent male, RUSI-25720, 687 mm early adolescent male, RUSI-25721, 495 mm immature female, RUSI-25722, 697 mm early adolescent female, RUSI-25723, 590 mm immature female, RUSI-25731, 532 mm immature male, RUSI-25927, 591 mm immature female, all from RV "Africana" A3429 039 089 4010, Western Cape, 30°02' S, 15°06.5' E, 365 m; RUSI-25733, 636 mm immature female, RV "Africana" A3346 039 022 4179, Western Cape, 34°31' S, 13°08' E, 313 m; RUSI-25919, 781 mm adult female, and RUSI-25926, 870 mm adult female, Algoa Bay, no further data; RUSI-26323, 620 mm immature male, RV "Africana" A4307 046 021 5138, Western Cape, 34°48' S, 18°16.4' E, 495 m; RUSI-26439, 945 mm adult male, and RUSI-26440, 848 mm gravid female, RV "Africana" A4750 048 029 3378, Southeastern Cape, 32°21.2' S, 22°04.0' E, 146 m; RUSI-27137, 807 mm gravid female, RV "Africana" A5229 050 005 5145, Western Cape, 35°35.7' S, 19°04.0' E, 450 m; RUSI-27138, 832 mm adult male, RV "Africana" A5303 050 067 2002, Western Cape, 29°37.8' S, 15°05.2' E, 270 m; RUSI-27139, 820 mm gravid female, RV "Africana" A5309 050 E07, Western Cape, 29°10.5' S, 14°48.0' E, 215 m; RUSI-27576, 800 mm adult female, RUSI-27577, 901 mm adult male, RUSI-27578, 852 mm adult female, and RUSI-27579, 786 mm adult female, RV "Africana" A5866 054 016 3391, Western Cape, 35°37.5' S, 19°26.7' E, 224 m; RUSI-uncat., PEM-860730, three immature males, 310, 341, 373 mm, and two immature females, 275 and 475 mm, Algoa Bay off Bird Island; RUSI-uncat., LJVC-850722, 665 mm immature female, RV "Africana" A2372 028 095 4010, Western Cape, 30°00' S, 15°05' E, 370 m (skeletonized); RUSI-uncat., 289 mm immature female, RV "Africana" A4814 048 076 3209, Eastern Cape, 35°30.3' S, 21°10.8' E, 108 m; RUSI-uncat., 880 mm adult male, four immature males, 275, 350, 395,

and 415 mm and three immature females, 258, 281 and 465 mm, RV "Africana" A5255 050 030 3124, Western Cape, 30°42.6' S, 16°07.0' E, 217 m; RUSI-uncat., 272 mm immature male, RV "Africana" A6300 056 082 3366, Eastern Cape, 34°24.1' S, 22°04.4' E, 146 m; RUSI-uncat., 713 mm adolescent male, no further data; SU-31455, 400 mm female, 'Cape of Good Hope'. Also, numerous additional specimens seen from trawl catches by RV "Africana" off the south and western Cape, not recorded here.

*Scyliorhinus cervigoni* : **Senegal** : ISH-390/64, 605 mm female, 15°51' N Lat., 16°56' W Long., 140-250 m; ISH-400/64, 640 mm adol. male, 15°56' N Lat., 16°57' W Long., 140-250 m.

*Scyliorhinus garmani* : "**East Indies**" : USNM-43749, 245 mm immature female, holotype of *Halaelurus garmani* Fowler, 1934.

*Scyliorhinus hesperius* : SU-65844, 159 mm immature female and 356 mm immature male, 12°31' N Lat., 82°21' W Long., off Bluefields, Nicaragua.

*Scyliorhinus retifer* : Western North Atlantic, **New England** : LJVC-0197, 300 mm immature female (skeletonized). **Gulf of Mexico** : LJVC-0323, 402 mm immature female, 29°13.5' N Lat., 87°53' W Long.; RV "Oregon" 4069, three immature females, 267, 280, 284 mm, 250 mm immature male, 29°30' N Lat., 87°10' W Long., all five from off Mississippi Delta; RV "Oregon" 4547, 402 mm immature female, 24°30' N Lat., 83°34' W Long.; SU-65841, 330 mm immature female, 24°29' N Lat., 83°29' W Long., both from off Dry Tortugas; SU-65840, 434 mm immature male, 27°46' N Lat., 94°13' W Long., about 200 miles east of Corpus Christi, Texas. No data : RUSI-6055, 235 mm immature male; RUSI-6056, 245 mm immature female.

*Scyliorhinus stellaris* : **England** : BMNH 1975.8.18.1, 960 mm adult male, off Beachy Head. **Italy** : SU-1483, 341 mm immature female and 323 mm immature male, Venice; SU-20625, 375 mm immature male, Naples.

*Scyliorhinus torazame* : **Japan** : SU-22041, 456 mm female, Hakodate, Hokkaido; SU-53386, 340 mm female, Choshi, Honshu.

*Scyliorhinus torrei* : **North coast of Cuba** : RV "Silver Bay" 2457, 213 mm immature male and 256 mm adult male; SU-65845, 130 mm immature male and 256 mm adult male; all from 23°34' N Lat., 79°7' W Long., 458 m. No data : RUSI-6053, 246 mm adult male; RUSI-6054, 267 mm adult male (head dissected).

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#### BIBLIOGRAPHIC REFERENCES

- BASS, A. J., J. D. D'AUBREY, and N. KISTNASAMY, 1975. — Sharks of the east coast of Southern Africa. II. The families Scyliorhinidae and Pseudotriakidae. *S. Afr. Ass. Mar. Biol. Res.*, Oceanogr. Res. Inst., Invest. Rep., (37) : 64 p.
- BIGELOW, H. B., and W. C. SCHROEDER, 1948. — Chapter three, Sharks. *In* : Fishes of the Western North Atlantic. *Mem. Sears Fnd. mar. Res.*, (1) 1 : 56-576.

- BLAINVILLE, H. M. D. DE, 1816. — Prodrôme d'une distribution systématique du règne animal. *Bull. Sci. Soc. Philom. Paris*, **8** : 105-124.
- COMPAGNO, L. J. V., 1970. — Systematics of the genus *Hemitriakis* (Selachii : Carcharhinidae), and related genera. *Proc. Calif. Acad. Sci.*, ser. 4, **38** : 63-98.
- 1979. — Carcharhinoid sharks : morphology, systematics and phylogeny. Unpub. Ph. D. thesis, Stanford U., 932 p.
- 1948. — FAO Species Catalogue. Vol. 4, Sharks of the World. An annotated and illustrated catalogue of shark species known to date. FAO Fisheries Synopsis No. 125, vol. 4, pt. 1 (noncarcharhinoids), pp. viii, i-250, April, pt. 2 (Carcharhiniformes), pp. x, 251-655, Dec. United Nations Development Programme/Food and Agriculture Organization of the United Nations.
- 1988. — Sharks of the Order Carcharhiniformes. Princeton University Press, Princeton, New Jersey. P. xxii, 570.
- DAY, F., 1878. — The fishes of India. 816 p. + atlas. London.
- GILL, T., 1862. — Analytical synopsis of the Order of Squali; and revision of the nomenclature of the genera. Squalorum generum novorum descriptiones diagnosticae. *Ann. Lyc. Nat. Hist. N. Y.*, **7** : 367-413.
- GÜNTHER, A., 1870. — Catalogue of the fishes in the British Museum. Vol. 8, 549 p. British Museum (Natural History), London.
- LEVITON, A. E., R. H. GIBBS, Jr., E. HEAL & C. E. DAWSON, 1985. — Standards in herpetology and ichthyology : Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia*, 1985, (3) : 802-832.
- LLORIS, D., 1986. — Ictiofauna demersal y aspectos biogeograficos de la costa sudoccidental de Africa (SWA/Namibia). *Monografias Zool. Mar.*, Barcelona, **1** : 9-432.
- MISRA, K. S., 1947. — A check list of the fishes of India, Burma, and Ceylon. I. Elasmobranchii and Holocephalii. *Rec. Indian Mus.*, **45** : 1-46.
- 1969. — Elasmobranchii and Holocephali. In : M. L. ROONWAL (ed.), The fauna of India and the adjacent countries. Pisces, (Second Edition). Zoological Survey of India, Gvmt. India Press, Faridabad, 276 pp., viii-xvii.
- MÜLLER, J., and F. G. J. HENLE, 1838. — Systematische Beschreibung der Plagiostomen. Part 1, p. 1-28. Veit, Berlin.
- NAKAYA, K., 1975. — Taxonomy, comparative anatomy and phylogeny of Japanese catsharks, Scyliorhinidae. *Mem. Fac. Fish. Hokkaido Univ.*, **23** : 1-94.
- QURESHI, M. R., 1971. — Sharks, skates and rays of the Arabian Sea. *Pakist. J. Scient. ind. Res.*, **15** (4-5), spec. pap. : 294-311.
- SCHMIDT, P., 1930. — On the Japanese shark *Halaelurus torazame* (Tanaka). *C. r. Acad. Sci. URSS*, (1930) : 223-227.
- SMITH, A., 1837. — (On the necessity for a revision of the groups included in the Linnean genus *Squalus*). *Proc. zool. Soc. Lond.*, (pt. 5) : 85-86.
- 1838. — (On the necessity for a revision of the groups included in the Linnean genus *Squalus*). *Ann. nat. Hist.*, **1** : 72-74.
- SPRINGER, Stewart, 1966. — A review of Western Atlantic cat sharks, Scyliorhinidae, with description of a new genus and five new species. *U. S. Fish Wildl. Serv. Fish. Bull.*, **65** : 581-624.
- 1979. — A revision of the catsharks, family Scyliorhinidae. NOAA Tech. Rep., NMFS Circ., (422) : v, 1-152.
- SPRINGER, Stewart, and V. SADOWSKY, 1970. — Subspecies of the western Atlantic cat shark, *Scyliorhinus retifer*. *Proc. biol. Soc. Wash.*, **83** : 83-98.