EXPLANATION OF PLATE V.

Fig. 1. *Atyloides aucklandicus*, sp. n. First gnathopod.
Fig. 2. Ditto, young. First gnathopod.
Fig. 3. *Aucklandia enderbyi*, sp. n. First gnathopod.
Fig. 4. Ditto. Second gnathopod.
Fig. 5. *Hyale trigonochir*, sp. n. First gnathopod, male.
Fig. 6. Ditto. Second gnathopod, male.
Fig. 7. Ditto. Second gnathopod, female.

VII.—*A Synopsis of the Sharks of the Family* Squalidæ.

By C. Tate Regan, M.A.

The Squalidæ may be diagnosed as sharks without an anal fin, with five or six gill-openings on each side, the last in front of the base of the pectoral fin, which is normally shaped, and with the mouth inferior.

Fourteen genera may be recognized.

Synopsis of the Genera.

I. Snout normal, not produced into a saw-like rostrum. (*Squalinæ.*)

A. Mouth crescentic.

Each dorsal fin preceded by a spine ..... 1. *Centroscyllium.*
No fin-spines ..... 2. *Echinorhinus.*

B. Mouth transverse, but little arched, with a straight oblique groove on each side.

1. Mouth rather small; body trihedral, the flat lower surface margined on each side by a strong dermal fold; dorsal fin-spines present ..... 3. *Oxynotus.*

2. Mouth wide; body elongate, subcylindrical.

a. Each dorsal fin preceded by a spine, which may project or may be small and concealed.

Teeth in the upper jaw erect, tricuspid or pentacuspid; lower teeth oblique, unicuspid, with points strongly deflected laterally ..... 4. *Spinax.*
Teeth in both jaws oblique, unicuspid, with points strongly deflected laterally ..... 5. *Squalus.*
Upper teeth erect, lanceolate, two-rooted; lower teeth erect, triangular ..... 6. *Scymnodon.*
Upper teeth erect, lanceolate, two-rooted; lower teeth oblique, with points deflected laterally.. 7. *Centroscymnus.*
Upper teeth erect or somewhat oblique, triangular, with quadrate bases; lower teeth oblique, with points deflected laterally ..... 8 *Centrophorus.*

b. Dorsal fin-spines vestigial or absent; teeth in the upper jaw erect, unicuspid, lanceolate or narrow triangular.

a. Caudal fin elongate; teeth in the lower jaw erect, triangular, finely serrated ..... 9. *Scymnorhinus.*

β. Caudal fin short and deep; lower teeth not serrated.

*. Lower teeth oblique, with points strongly deflected laterally; dorsal fins subequal in length, the first far in advance of the pelvics ..... 10. *Somniosus.*

**. Lower teeth erect, triangular.

Dorsal fins subequal in length, the first very slightly in advance of the pelvics ..... 11. *Isistius.*

Second dorsal fin much longer than the first, which is not far in advance of the pelvics ..... 12. *Euprotomicrus.*

II. Snout produced into a flat blade, armed with a series of teeth on each side; no fin-spines. (*Pristiophorinæ.*)

Five gill-openings on each side; rostral teeth not serrated ..... 13. *Pristiophorus.*

Six gill-openings on each side; larger rostral teeth with serrated posterior edges ..... 14. *Pliotrema.*

1. Centroscyllium.

Centroscyllium, Müll. & Henle, Plagiost. p. 191 (1841).
Paracentroscyllium, Alcock, Ann. & Mag. Nat. Hist. (6) iv. 1889, p. 379.

Teeth small, compressed, tricuspid or pentacuspid; mouth wide, arched. Each dorsal fin preceded by a spine; first dorsal well in advance of the pelvics. Dermal denticles small, scattered, each with stellate base and a short, erect, pointed cusp.

Three or more species from deep water in the Atlantic and Indo-Pacific.

Synopsis of the Species.

I. Upper lobe of caudal truncated posteriorly; lower edge of the fin with a distinct posterior notch.

Origin of pectoral much nearer to end of snout than to origin of pelvics ..... 1. *fabricii.*

Origin of pectoral equidistant from end of snout and origin of pelvics ..... 2. *nigrum.*

II. Upper lobe of caudal produced and pointed posteriorly; lower edge of the fin without distinct posterior notch ..... 3. *ornatum.*

1. *Centroscyllium fabricii.*

Spinax fabricii, Reinhardt, Dansk. Vid. Selsk. Förh. iii. 1828, p. 16.
Centroscyllium fabricii, Müll. & Henle, Plagiost. p. 191 (1841); Duméril, Elasmobr. p. 449 (1865); Günth. Cat. Fish. viii. p. 425 (1870); Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 11; Collett, Rep. Norweg. Fish. Inv. ii. no. 3, p. 25 (1905).
? *Centroscyllium granulosum*, Günth. 'Challenger' Deep-sea Fish. p. 7 (1880).
? *Centroscyllium ritteri*, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 635, fig. 6.

Pectoral not quite reaching the vertical from the first dorsal spine, which is ½ as long as the second.

Hab. Atlantic and North Pacific, in deep water.

In the British Museum two specimens of 720 and 750 mm. in total length from the North Atlantic. With these I have compared the type of *C. granulosum*, a specimen of 270 mm. from the Falklands, and it appears to me to belong to the same species. The description and figure of *C. ritteri* from Japan lead me to believe that this species also may be a synonym of *C. fabricii*, from which it is said to differ in the shorter pectoral fin and more slender caudal peduncle.

2. *Centroscyllium nigrum.*

Centroscyllium nigrum, Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 28, pls. i., iv., & v.

Centroscyllium ruscosum, Gilbert, Bull. U.S. Fish. Comm. for 1903, p. 581, fig. 230 (1905).

Closely allied to *C. fabricii*, but the first dorsal spine is ⅔ the length of the second, the pectoral extends to or beyond the vertical from the first dorsal spine and its origin is equidistant from the tip of snout and the origin of the pelvics.

Deep water of the Pacific (385 to 555 fath.). Off Tropical America (*Garman*); off Hawaii (*Gilbert*).

3. *Centroscyllium ornatum.*

Paracentroscyllium ornatum, Alcock, Ann. & Mag. Nat. Hist. (6) iv. 1889, p. 379.

Centroscyllium ornatum, Alcock, Journ. As. Soc. Bengal, lxv. 1896, p. 308, and Cat. Ind. Deep-sea Fish. p. 14 (1899), and Ill. Zool. 'Investigator' Fishes, pl. viii. fig. 2, and pl. xxxv. fig. 1.

Very similar to *C. nigrum*, but the terminal part of the caudal fin is more produced and the lower edge has no distinct posterior notch.

Deep water of the Indian Ocean (285 to 690 fath.).

In the British Museum a specimen of 125 mm., one of the types of the species.

2. Echinorhinus.

Echinorhinus, Blainv. Bull. Soc. Philom. 1816, p. 121.

Goniodus, Agass. Poiss. Foss. iii. p. 183 (1836).

This genus resembles *Centroscyllium* and differs from other Squalidæ in the form of the mouth and structure of the dermal denticles. It differs from *Centroscyllium* in the dentition, each tooth having the middle cusp very strongly

developed and with the point deflected laterally, in the absence of fin-spines, and in the posterior position of the dorsal fins, the first above the pelvics.

A single species.

1. *Echinorhinus spinosus.*

Squalus spinosus, Gmelin, Linn. Syst. Nat. i. p. 1500 (1788).
Echinorhinus spinosus, Blainv. Bull. Soc. Philom. 1816, p. 121; Müll. & Henle, Plagiost. p. 96, pl. lx. (1841); Duméril, Elasmobr. p. 459 (1865); Günth. Cat. Fish. viii. p. 428 (1870); Parker, Trans. N. Z. Inst. xvi. 1884, p. 280; McCoy, Prodr. Zool. Vict. pl. cxliv. (1888); Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 58.
Echinorhinus obesus, Smith, Ill. Zool. S. Afr., Fish. pl. i. (1838).

Hab. From the North Atlantic and the Mediterranean to South Africa, Australia, and New Zealand.

In the British Museum four specimens, the largest nearly 3000 mm. in total length.

3. Oxynotus.

Oxynotus, Rafin. Indic. Ittiol. Sicil. p. 45 (1810).
Centrina, Cuv. Règne Anim. ii. p. 130 (1817).

Body rather deep, trihedral; mouth rather narrow, transverse; upper teeth subconical, forming a group in front of the jaw; lower teeth erect, triangular, finely serrated; dorsal fins large, each with a spine.

A single species.

1. *Oxynotus centrina.*

Squalus centrina, Linn. Syst. Nat. i. ed. 10, p. 233 (1758), and ed. 12, p. 398 (1766).
Oxynotus centrina, Rafin. Indic. Ittiol. Sicil. p. 45 (1810); Duméril, Elasmobr. p. 444 (1865); Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 15, fig. 21.
Centrina salviani, Risso, Eur. Mérid. iii. p. 135 (1826); Müll. & Henle, Plagiost. p. 87 (1841); Günth. Cat. Fish. viii. p. 417 (1870).

Hab. Mediterranean and neighbouring parts of the Atlantic.

In the British Museum eight specimens, 220 to 720 mm. in total length.

Centrina bruniensis (Ogilby, Rec. Austral. Mus. ii. 1894 p. 62), from Tasmania, appears to be identical with *O. centrina*, from which it is said to differ in the larger fins. This is due, however, to the small size of the specimen described.

4. Spinax.

Spinax, Cuv. Règne Anim. p. 129 (1817).
Acanthidium, Lowe, Proc. Zool. Soc. 1839, p. 91.

Seven species.

Synopsis of the Species.

I. Dermal denticles close-set, irregularly arranged.

A. Pelvic fins much nearer to caudal than to base of pectoral.

1. Each dermal denticle with one or more slender spines.

Length of head to pectoral fin nearly twice its greatest breadth ..... 1. *niger*.
Length of head to pectoral fin $1\frac{1}{3}$ its greatest breadth .. 2. *pæssleri*.

2. Each dermal denticle with a small tubercle .. 3. *pusillus*.

B. Pelvic fins scarcely nearer to caudal than to base of pectoral. 4. *hillianus*.

II. Dermal denticles arranged in longitudinal series, at least on the tail.

A. Length of base of first dorsal (without the spine) not less than $\frac{1}{6}$ of the distance from the second.

Each dermal denticle with a rather stout spine ..... 5. *princeps*.
Each dermal denticle with a rather slender spine ..... 6. *granulosus*.

B. Length of base of first dorsal (without the spine) not more than $\frac{1}{7}$ of the distance from the second; dermal denticles forming undulating longitudinal series, except on the abdomen. 7. *lucifer*.

1. *Spinax niger*.

Squalus spinax, Linn. Syst. Nat. ed. 10, p. 233 (1758), and ed. 12, p. 398 (1766).
? *Etmopterus aculeatus*, Rafin. Caratt. p. 14 (1810) *.
Spinax niger, Bonap. Faun. Ital., Pesc. (1835); Müll. & Henle, Plagiost. p. 86 (1841); Duméril, Elasmobr. p. 441 (1865); Günth. Cat. Fish. viii. p. 424 (1870); Moreau, Poiss. de France, i. p. 348, fig. 59 (1881).
Etmopterus spinax, Carlos de Braganca, Res. Inv. 'Amelia,' ii. p. 61, pl. ii. fig. 1 (1904).

Hab. Atlantic coasts of Europe; Mediterranean.

In the British Museum eighteen specimens, 170 to 430 mm. in total length, from depths ranging down to 365 fathoms.

2. *Spinax pæssleri*.

Etmopterus pæssleri, Lönnberg, Hamburg. Magelhæns. Sammelreis., Fische, p. 5, fig. 1.

Hab. Magellan.

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* Rafinesque's description and figure of *Etmopterus aculeatus* are evidently very inaccurate, but perhaps agree better with *Spinax niger* than with any other shark known from the Mediterranean; however, this is scarcely sufficient reason for using *Etmopterus* instead of *Spinax*.

3. *Spinax pusillus.*

Acanthidium pusillum, Lowe, Proc. Zool. Soc. 1839, p. 91.
Spinax pusillus, Günth. Cat. Fish. viii. p. 425 (1870); Vaill. 'Travailleur' et 'Talisman' Poiss. p. 72 (1888).
Etmopterus pusillus, Carlos de Braganca, Res. Inv. 'Amelia,' ii. p. 65, pl. ii. fig. 2 (1904).
Etmopterus frontimaculatus, Pietschmann, Anz. Ak. Wien, 1907, p. 395.

Hab. Mediterranean and neighbouring parts of the Atlantic; Japan.

In the British Museum fourteen specimens (including two from Misaki, Japan), 190 to 300 mm. in total length, from depths ranging down to 343 fathoms.

4. *Spinax hillianus.*

Spinax hillianus, Poey, Mem. Cuba, ii. p. 340 (1861).
Etmopterus pusillus, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 10, pl. ii. fig. 5.
Etmopterus spinax, Garm. Mem. Mus. Comp. Zool. xxvi. 1899, p. 27.

Hab. West Indies (Cuba; St. Christopher, 208 fathoms).

Goode and Bean's figure shows the pelvic fins nearly equidistant from the base of the pectoral and the lower caudal lobe; according to Garman the dermal denticles are spinate.

5. *Spinax princeps.*

Etmopterus princeps, Coll. Forh. Vid. Selsk. Christiania, 1904, no. 9, p. 3; and Rep. Norweg. Fish. ii. no. 3, p. 29, pl. i. figs. 1, 2 (1905).

Hab. Near the Faroe Islands, in deep water (750 to 1100 mètres).

Apparently closely allied to *S. granulosus*, but the dermal denticles with shorter and stronger spines.

6. *Spinax granulosus.*

Spinax granulosus, Günth. 'Challenger' Deep-sea Fish. p. 19, pl. ii. fig. C (1880).
Etmopterus villosus, Gilb. Bull. U.S. Fish. Comm. 1903, p. 580, pl. lxvi. (1905).

Pacific, in deep water (Chile, 120 fathoms; Hawaii, 222 to 498 fathoms).

In the British Museum the type, a specimen of 255 mm.

From the description and figure the type of *E. villosus* appears to differ only in features due to its smaller size (170 mm.), *i. e.* head a little longer, interspace between the dorsal fins a little shorter, &c. Similar differences may be seen in *S. niger*.

7. *Spinax lucifer*.

Etmopterus lucifer, Jord. & Snyder, Proc. U.S. Nat. Mus. xxv. 1902, p. 79; Jord. & Fowler, *ibid.* xxvi. 1903, p. 634, fig. 5.

Hab. Japan.

In the British Museum four specimens, 280 to 320 mm. in total length.

5. Squalus.

Squalus (part.), Linn. Syst. Nat. ed. 10, p. 233 (1758).
Squalus, Rafin. Caratt. p. 13 (1810).
Acanthorhinus, Blainv. Journ. Phys. 1816, p. 263.
Acanthias, Risso, Eur. Mérid. iii. p. 131 (1826).
Entoxychirus, Gill, Proc. Ac. Philad. 1862, p. 496.

Eight species.

Synopsis of the Species.

I. Dorsal fin-spines without grooves or ridges; lower lobe of caudal fin without posterior notch; snout obtusely or acutely pointed. (*Squalus.*)

A. Nasal valves simple, triangular; back and sides with scattered rounded or oblong pale spots, which may disappear in large specimens.

1. Pectoral fin, when laid back, extending to the vertical from first dorsal spine, or a little beyond.

Præoral length of snout not greater than the distance from eye to first gill-opening ..... 1. *fernandinus.*
Præoral length of snout greater than the distance from eye to first gill-opening ..... 2. *acanthias.*

2. Pectoral fin, when laid back, extending to below the middle of first dorsal fin ..... 3. *sucklii.*

B. Nasal valves more or less distinctly bilobed; no spots on the body.

1. Free edge of pectoral fin straight or slightly emarginate, posterior angle not acutely pointed.

Pectoral fin, when laid back, extending to below the middle or posterior part of the base of the first dorsal fin ..... 4. *mitsukurii.*
Pectoral fin, when laid back, extending to the vertical from the posterior end of base of first dorsal fin .. 5. *blainvillii.*
Pectoral fin, when laid back, extending well beyond the posterior end of base of first dorsal fin ..... 6. *acutipinnis.*

2. Free edge of pectoral fin distinctly emarginate; posterior angle acutely pointed ..... 7. *megalops.*

II. Each dorsal fin-spine with a prominent anterior ridge with a groove on each side of it; lower lobe of caudal fin with a posterior notch; snout rounded; posterior angle of pectoral fin considerably produced and acutely pointed. (*Entoxychirus.*) .. 8. *uyatus.*

1. *Squalus fernandinus.*

Squalus fernandinus, Molina, Hist. Chil. p. 393 (1788).
Acanthias vulgaris (part.), Günth. Cat. Fish. viii. p. 418 (1870).
Acanthias lebruni, Vaill. Miss. Sci. Cap Horn, Poiss. p. 13, pl. i. fig. 2 (1891).

Very closely allied to *S. acanthias*, but with a shorter snout, the præoral length equal to or less than the distance from eye to first gill-opening, the præocular length equal to the distance from anterior edge of eye to spiracle (more in *S. acanthias*, except in young examples). Dorsal fin-spines higher and spots on the body larger than in *S. acanthias*.

Hab. Southern Australia and Tasmania; New Zealand; Chile and Patagonia.

In the British Museum three specimens, 550 to 800 mm. in total length, from Tasmania, appear to belong to the species described and figured by Vaillant from Magellan. Records of *S. acanthias* from New Zealand doubtless refer to this species.

2. *Squalus acanthias.*

Squalus acanthias, Linn. Syst. Nat. i. ed. 10, p. 233 (1758), and ed. 12, p. 397 (1766); Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 54.
Spinax acanthias, Cuv. Règne Anim. ii. p. 130 (1817); Bonap. Faun. Ital., Pesc. fasc. 8 (1834).
Acanthias vulgaris, Risso, Eur. Mérid. iii. p. 131 (1826); Müll. & Henle, Plagiost. p. 83 (1841); Duméril, Elasmobr. p. 437 (1865); Günth. Cat. Fish. viii. p. 418 (1870).
Acanthias americanus, Storer, Mem. Amer. Ac. ii. 1846, p. 506.

Hab. Atlantic coasts of Europe and North America, southward to the Mediterranean and to Cuba.

In the British Museum twenty-one specimens, measuring up to 600 mm. in total length.

3. *Squalus sucklii.*

Spinax sucklii, Girard, Proc. Ac. Philad. 1854, p. 196.
Squalus sucklii, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 54.

Pectoral fins conspicuously longer and dorsal fin-spines shorter than in *S. acanthias*.

Hab. Pacific coast of North America, southward to California.

In the British Museum two specimens, 700 and 860 mm. in total length.

4. *Squalus mitsukurii.*

Acanthias vulgaris (non Risso), Schleg. Faun. Japon., Poiss. p. 304, pl. cxxxv. (1845).
Squalus mitsukurii, Jord. & Snyd. Proc. U.S. Nat. Mus. xxvi. 1903, p. 629, fig. 3; Gilb. Bull. U.S. Fish. Comm. 1903, p. 580 (1905).

Hab. China; Japan; Hawaii.

In the British Museum two specimens, 290 and 470 mm. in total length.

5. *Squalus blainvillii.*

Acanthias blainvillii, Risso, Eur. Mérid. iii. p. 133, pl. iii. fig. 6 (1827); Müll. & Henle, Plagiost. p. 84 (1841); Duméril, Elasmobr. p. 438 (1865).
Spinax blainvillii, Bonap. Faun. Ital., Pesc. (1834).
Acanthias blainvillii (part.), Günth. Cat. Fish. viii. p. 419 (1870).

Hab. Mediterranean; Portugal.

In the British Museum five specimens, 230 to 540 mm. in total length.

6. *Squalus acutipinnis.*

Squalus blainvillii (part.), Günth. Cat. Fish. viii. p. 419 (1870).
Squalus acutipinnis, Regan, Ann. Natal Mus. ii. 1908, p. 248, pl. xxxvii.

Hab. South Africa; Mauritius.

In the British Museum four specimens, 190 to 560 mm. in total length, including the type of the species.

7. *Squalus megalops.*

Acanthias blainvillii (part.), Günth. Cat. Fish. viii. p. 419 (1870).
Acanthias megalops, Macleay, Proc. Linn. Soc. N. S. Wales, vi. 1881, p. 367.
Squalus megalops, Waite, Rec. Austral. Mus. iv. 1901, p. 33, pl. iv. fig. 2.

Hab. Southern Australia; Tasmania.

In the British Museum five specimens, 400 to 530 mm. in total length.

A stuffed specimen of 900 mm. from Juan Fernandez evidently represents the *Spinax fernandezianus* of Guichenot (Gay, Hist. Chile, Zool. ii. p. 365 (1848); *Acanthias fernandezianus*, Philippi, An. Univ. Chile, lxxi. 1887, p. 559, pl. iv. fig. 3). This Chilian species may, perhaps, be different from *S. megalops*, but I am unable to give any distinctive characters. Ribeiro has described a *Squalus* from Rio Janeiro as *S. blainvillii* (Arch. Mus. Rio Janeiro, xiv. 1907, p. 168); this may be *S. fernandezianus*.

8. *Squalus uyatus.*

Squalus uyatus, Rafin. Caratt. p. 13, pl. xiv. fig. 2 (1810).
Spinax uyatus, Bonap. Faun. Ital., Pesc. (1834).
Acanthias uyatus, Müll. & Henle, Plagiost. p. 85 (1841); Duméril, Elasmobr. p. 439 (1865); Günth. Cat. Fish. viii. p. 419 (1870).

Hab. Mediterranean; Madeira.

In the British Museum two specimens, 330 and 340 mm. in total length.

This species is very distinct from others of the genus, but is a true *Squalus*, and cannot be placed in *Centrophorus*, as has been recently suggested by Garman (Bull. Mus. Comp. Zool. xlvi. 1906, p. 204).

6. Scymnodon.

Scymnodon, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263.
Zameus, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 633.

1. *Scymnodon ringens.*

Scymnodon ringens, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263, fig. 5.
Centrophorus ringens, Günth. Cat. Fish. viii. p. 423 (1870); Sim, Ann. Scot. N. H. 1902, p. 13.

Dermal denticles small, each with from two to four parallel keels. Præoral length of snout $\frac{2}{3}$ of the distance from eye to first gill-opening. Length of base of first dorsal (without the spine) about $\frac{1}{4}$ of the distance from the second.

Hab. Atlantic coasts of Europe, in deep water.

In the British Museum two specimens, 900 and 1000 mm. in total length.

2. *Scymnodon squamulosus.*

Centrophorus squamulosus, Günth. 'Challenger' Deep-sea Fishes, p. 5, pl. ii. fig. B (1887).
Zameus squamulosus, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 633.

Dermal denticles very small, each with a strong median keel and sometimes a pair of short lateral keels. Præoral length of snout $\frac{7}{8}$ the distance from eye to first gill-opening. Length of base of first dorsal (without the spine) less than $\frac{1}{6}$ the distance from the second.

Hab. Japan, in deep water.

In the British Museum one specimen, type of the species, 650 mm. in total length.

7. Centroscymnus.

Centroscymnus, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263.

Synopsis of the Species.

I. Anterior labial grooves moderate, each about as long as its distance from the middle of the upper jaw; nostrils oblique.

Dorsal spines well developed and strongly projecting. 1. *macracanthus.*
Dorsal spines short, slightly projecting; dermal denticles not carinate ..... 2. *cœlolepis.*
Dorsal spines scarcely projecting; dermal denticles on head and on anterior part of body, except the sides, pluricarinate..... 3. *owstoni.*
Dorsal spines not projecting, hidden beneath the skin; dermal denticles on head and on anterior part of body, except the sides, tricarinate ..... 4. *cryptacanthus.*

II. Anterior labial grooves long, each about twice as long as its distance from the middle of the upper jaw; nostrils slightly oblique. 5. *obscurus.*

III. Anterior labial grooves very long, separated by a narrow interspace; nostrils transverse..... 6. *crepidater.*

1. *Centroscymnus macracanthus.*

Centroscymnus macracanthus, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 436.

Hab. Magellan.

In the British Museum one specimen, 640 mm. in total length, type of the species.

2. *Centroscymnus cœlolepis.*

Centroscymnus cœlolepis, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263, fig. 4; Vaill. 'Travailleur' et 'Talisman' Poiss. p. 63, pl. ii. fig. 1 (1888).

Hab. North Atlantic, in deep water.

In the British Museum five specimens, 250 to 1000 mm. in total length.

3. *Centroscymnus owstoni.*

Centroscymnus owstonii, Garman, Bull. Mus. Comp. Zool. xlvi. 1906, p. 207.

Hab. Japan.

4. *Centroscymnus cryptacanthus.*

Centrophorus cœlolepis (non Bocage & Capello), Günth. Cat. Fish. viii. p. 423 (1870).

Centroscymnus cœlolepis, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 14, pl. iv. fig. 13 (1896).
Centroscymnus cryptacanthus, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 437.

Hab. Madeira.

In the British Museum one specimen, 700 mm. in total length, type of the species.

5. *Centroscymnus obscurus.*

Centroscymnus obscurus, Vaill. 'Travailleur' et 'Talisman' Poiss. p. 67, pl. ii. fig. 2 (1888).

Hab. Coast of Soudan, 1400 to 1435 metres.

6. *Centroscymnus crepidater.*

Centrophorus crepidater, Bocage & Capello, Proc. Zool. Soc. 1864, p. 262, fig. 3; Günth. Cat. Fish. viii. p. 421 (1870).
Centrophorus rossi, Alcock, Ann. & Mag. Nat. Hist. (7) ii. 1898, p. 143, and Ill. Zool. 'Investigator,' Fishes, pl. xxvi. fig. 3 (1899).

Hab. Atlantic and Indian Oceans.

In the British Museum one specimen, 750 mm. in total length.

8. Centrophorus.

Centrophorus, Müll. & Henle, Plagiost. p. 88 (1838).
Lepidorhinus, Bonap. Nuov. Ann. Sci. Bologna, ii. 1838, p. 207.
Machephilus, Johnson, Proc. Zool. Soc. 1867, p. 713.
Deania, Jord. & Snyder, Proc. U.S. Nat. Mus. xxv. 1902, p. 80.

Thirteen species, all found at considerable depths.

Synopsis of the Species.

I. Posterior angle of pectoral fin not or but slightly produced.

A. Eye equidistant from end of snout and last gill-opening; dermal denticles tricuspid.

1. Dorsal fins subequal or the second the shorter.

Pectoral, when laid back, extending $\frac{1}{2}$ the distance from its base to the vertical from first dorsal spine ..... 1. *hystricosus.*

Pectoral, when laid back, extending more than $\frac{1}{2}$ the distance from its base to the vertical from first dorsal spine ..... 2. *calceus.*

2. Second dorsal a little longer than the first . 3. *rostratus.*

B. Eye nearer to end of snout than to last gill-opening.

1. Dermal denticles leaf-shaped, with serrated edges, each with a strong median keel and sometimes a weaker keel at each lateral edge.

Length of base of second dorsal (without the spine) $\frac{2}{3}$ that of the first (without the spine), which is $\frac{1}{2}$ the interspace between the two ..... 4. *dumerili.*

Length of base of second dorsal (without the spine) $\frac{3}{4}$ that of the first (without the spine), which is $\frac{2}{7}$ to $\frac{1}{3}$ the interspace between the two ..... 5. *squamosus.*

2. Dermal denticles tricuspid and tricarinate; second dorsal a little shorter than the first.

Length of base of first dorsal (without the spine) $2\frac{2}{3}$ to 3 in the distance from the second; length of snout (in front of the eye) $3\frac{1}{3}$ in the length of head (to first gill-opening) ..... 6. *foliaceus.*

Length of base of first dorsal (without the spine) 2 to $2\frac{2}{5}$ in the distance from the second; length of snout (in front of the eye) $2\frac{1}{2}$ to $2\frac{3}{5}$ in the length of head (to first gill-opening) ..... 7. *steindachneri.*

3. Dermal denticles pluricarinate ..... 8. *acus.*

II. Posterior angle of pectoral fin considerably produced and acutely pointed.

A. Distance from mouth to nostrils $1\frac{1}{2}$ that from nostrils to end of snout.

1. Spine of second dorsal $\frac{1}{2}$ to $\frac{2}{3}$ exposed.

Length of base of second dorsal (without the spine) $\frac{1}{2}$ that of the first (without the spine), which is $\frac{1}{2}$ the interspace between the two ..... 9. *lusitanicus.*

Length of base of second dorsal (without the spine) $\frac{2}{3}$ that of the first (without the spine), which is $\frac{2}{7}$ to $\frac{1}{3}$ the interspace between the two ..... 10. *granulosus.*

Length of base of second dorsal (without the spine) $\frac{3}{4}$ that of the first (without the spine), which is $\frac{1}{4}$ the interspace between the two ..... 11. *bragancæ.*

2. Spine of second dorsal $\frac{1}{3}$ exposed; length of base of first dorsal (? without the spine) $\frac{2}{5}$ the distance from the second. 12. *tessellatus.*

B. Distance from mouth to nostrils more than twice that from nostrils to end of snout; length of base of first dorsal (without the spine) $\frac{1}{4}$ the distance from the second .. 13. *moluccensis.*

1. *Centrophorus hystricosus.*

Acanthidium hystricosum, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 206.

Hab. Japan.

2. *Centrophorus calceus.*

Acanthidium calceum, Lowe, Proc. Zool. Soc. 1839, p. 92.

Centrophorus calceus, Günth. Cat. Fish. viii. p. 423 (1870); Vaill. 'Travailleur' et 'Talisman' Poiss. p. 71, pl. iii. fig. 1 (1888); Collett, Rep. Norweg. Fish. ii. p. 21 (1905).

Centrophorus crepidalbus, Bocage & Capello, Proc. Zool. Soc. 1864, p. 262, fig. 2.

Deania eglantina, Jord. & Snyd. Proc. U.S. Nat. Mus. xxv. 1902, p. 80; Jord. & Fowler, *ibid.* xxvi. 1903, p. 632, fig.

? *Acanthidium aciculatum*, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 207.

Hab. Atlantic coasts of Europe ; Japan.

In the British Museum eleven specimens, measuring up to 950 mm. in total length.

The species is very variable, and the fins are larger in the young than in the adult. In three specimens from Portugal of about 260 mm. the base of the second dorsal (without the spine) varies from $\frac{3}{4}$ to $\frac{9}{10}$ of that of the first dorsal (without the spine), which is contained from less than $1\frac{2}{3}$ to more than $1\frac{2}{3}$ times in the distance between the dorsals. I am unable to separate specifically from these a Japanese specimen of 380 mm. received as *Deania eglantina*. In adult specimens the base of the first dorsal (without the spine) is about $\frac{1}{2}$ the interspace between the dorsals.

3. *Centrophorus rostratus.*

Acanthidium rostratum, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 206.

Hab. Japan.

4. *Centrophorus dumerili.*

Machephilus dumerili, Johnson, Proc. Zool. Soc. 1867, p. 713.
Centrophorus dumerili, Günth. Cat. Fish. viii. p. 422 (1870).
Centrophorus squamosus, Vaill. 'Travailleur' et 'Talisman' Poiss. p. 69, pl. iii. fig. 2 (1888).

Hab. Madeira.

In the British Museum one specimen, 1000 mm. in total length, type of the species.

I am unable to recognize any character in dentition or in structure of the dermal denticles by which this species may be distinguished from *C. squamosus*. I cannot therefore accept Vaillant's opinion, based on examination of a head in the Paris Museum, which appears to be part of the type specimen of *C. squamosus*, that this species rather than the next is the true *Centrophorus squamosus*.

5. *Centrophorus squamosus.*

Squalus squamosus, Gmelin, Linn. Syst. Nat. p. 1502 (1788).
Centrophorus squamosus, Müll. & Henle, Plagiost. p. 90, pl. xxxiv. (1838) ; Duméril, Elasmobr. p. 448 (1865) ; Günth. Cat. Fish. viii. p. 422 (1870) ; Holt & Calderwood, Trans. R. Dublin Soc. (2) v. 1895, p. 373, pl. xiii. fig. 1 ; Jensen, Vidd. Medd. 1899, p. 411, pl. iii. ; Collett, Rep. Norweg. Fish. ii. p. 19 (1905).

Hab. North Atlantic and Mediterranean.

In the British Museum three specimens, 1120 to 1350 mm. in total length.

6. *Centrophorus foliaceus.*

Centrophorus foliaceus, Günth. 'Challenger' Deep-sea Fish. p. 5, pl. ii. fig. A.

Hab. Japan.

In the British Museum two specimens, 355 and 415 mm. in total length, including the type of the species.

7. *Centrophorus steindachneri.*

Centrophorus steindachneri, Pietschmann, Anz. Ak. Wien, 1907, p. 394.

Hab. Japan.

8. *Centrophorus acus.*

Centrophorus acus, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 204.

Hab. Japan.

This species appears to be very similar to *C. granulosus*, differing in having the inner angles of the pectorals only slightly produced.

9. *Centrophorus lusitanicus.*

Centrophorus lusitanicus, Bocage & Capello, Proc. Zool. Soc. 1864, p. 260, fig. 1; Günth. Cat. Fish. viii. p. 421 (1870).

Hab. Coast of Portugal.

In the British Museum one specimen, 750 mm. in total length.

10. *Centrophorus granulosus.*

Squalus granulosus, Schneid. Bloch's Syst. Ichth. p. 135 (1801).
Centrophorus granulosus, Müll. & Henle, Plagiost. p. 89, pl. xxxiii. (1841); Duméril, Elasmobr. p. 447 (1865); Günth. Cat. Fish. viii. p. 420 (1870).

Hab. Mediterranean and neighbouring parts of the Atlantic.

In the British Museum four specimens, 430 to 1050 mm. in total length.

11. *Centrophorus bragancæ.*

Centrophorus bragancæ, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 438.

Hab. Coast of Portugal.

In the British Museum two specimens, 440 and 460 mm. in total length, types of the species.

12. *Centrophorus tessellatus.*

Centrophorus tessellatus, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 205.

Hab. Japan.

13. *Centrophorus moluccensis.*

Centrophorus moluccensis, Bleek. Act. Soc. Sc. Indo-Neerl. viii., Amboyna, p. 3; Günth. Cat. Fish. viii. p. 421 (1870).

Hab. Amboyna.

In the British Museum one specimen, 210 mm. in total length, type of the species.

9. Scymnorhinus.

Scymnorhinus, Bonap. Cat. Pesc. Europ. p. 16 (1836).
Dalatias *, Gray, Chondropt. p. 75 (1851).

This genus differs from *Scymnodon* in the absence of finspines and in having the lower teeth finely serrated.

A single species.

Scymnorhinus lichia.

Squalus licha, Bonnaterre, Encycl. Ichth. p. 12 (1788).
Scymnus lichia, Cuv. Règne Anim. ed. 1, p. 130 (1817); Müll. & Henle, Plagiost. p. 92 (1841); Duméril, Elasmobr. p. 452 (1865); Günth. Cat. Fish. viii. p. 425 (1870).
Dalatias lichia, Gray, Chondropt. p. 75 (1851); Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 637.

Hab. Mediterranean and neighbouring parts of the Atlantic; Japan.

In the British Museum nine specimens, 320 to 1280 mm. in total length, including one from Japan.

10. Somniosus.

Somniosus, Le Sueur, Journ. Ac. Philad. 1818, p. 222.
Læmargus, Müll. & Henle, Plagiost. p. 93 (1838).

Two species.

1. *Somniosus microcephalus.*

Squalus microcephalus, Schneid. Bloch's Syst. Ichth. p. 135 (1801).
Squalus borealis, Scoresby, Arct. Reg. i. p. 538, pl. xv. figs. 3 & 4 (1820).

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* *Dalatias sparophagus*, described and figured by Rafinesque, was probably either *Scymnorhinus lichia* or *Somniosus rostratus*. *Dalatias*, like *Etmopterus*, may be regarded as a *nomen nudum*.

Læmargus borealis, Müll. & Henle, Plagiost. p. 93 (1841); Duméril, Elasmobr. p. 455, pl. v. figs. 1 & 2 (1865); Günth. Cat. Fish. viii. p. 426 (1870).

Somniosus microcephalus, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 57; Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 638.

First dorsal equidistant from the bases of the pectoral and pelvic fins.

Hab. Arctic seas, southward to Japan, Oregon, Cape Cod, and France.

In the British Museum three specimens, 1800 to 4500 mm. in total length.

2. *Somniosus rostratus*.

Scymnus rostratus, Risso, Eur. Mérid. iii. p. 138, fig. 7 (1826).

Læmargus rostratus, Canestrini, Mem. Accad. Sc. Torin. xxi. 1865, p. 364, pl. ii. fig.; Günth. Cat. Fish. viii. p. 427 (1870); Helbing, Nov. Act. Acad. Germ. lxxxii. 1904, p. 335.

First dorsal nearer to the base of the pectoral than to that of the pelvic fins; body more elongate than in *S. microcephalus*.

Hab. Mediterranean.

In the British Museum one specimen, 800 mm. in total length.

11. Isistius.

Isistius, Gill, Proc. Ac. Philad. 1864, p. 264.

A single species.

1. *Isistius brasiliensis*.

Scymnus brasiliensis, Quoy & Gaim. Voy. 'Uranie,' Zool. p. 198 (1824); Müll. & Henle, Plagiost. p. 92 (1841); Duméril, Elasmobr. p. 453 (1865).

Isistius brasiliensis, Gill, Proc. Ac. Philad. 1864, p. 264; Günth. Cat. Fish. viii. p. 429 (1870); Garm. Mem. Mus. Comp. Zool. xxiv. 1899, p. 34, pl. i. fig. 1.

Leius ferox, Kner, Denkschr. Ak. Wien, xxiv. 1865, p. 10, pl. iv. fig. 2.

Hab. Tropical and subtropical seas.

In the British Museum four specimens, 150 to 230 mm. in total length.

12. Euprotomicrus.

Euprotomicrus, Gill, Proc. Ac. Philad. 1864, p. 264.

A single species.

1. *Euprotomicrus bispinatus.*

Scymnus bispinatus, Quoy & Gaim. Voy. 'Uranie,' Zool. p. 197, pl. xliv. figs. 1 & 2 (1824).
Scymnus (*Læmargus*) *labordii*, Müll. & Henle, Plagiost. p. 94 (1841).
Læmargus labordii, Duméril, Elasmobr. p. 457 (1865).
Euprotomicrus labordii, Günth. Cat. Fish. viii. p. 428 (1870); Cunningham, Proc. Zool. Soc. 1899, p. 732.
Euprotomicrus hyalinus, Eigenm. Proc. Cal. Ac. (2) iii. 1890, p. 35.

Hab. Indo-Pacific.

In the British Museum three specimens, 200 to 220 mm. in total length.

13. Pristiophorus.

Pristiophorus, Müll. & Henle, Plagiost. p. 97 (1841).

The form of the rostrum and the arrangement of the rostral teeth change considerably during growth. In the young the snout is relatively much shorter and broader than in the adult and is armed with movable teeth; those of the lateral series are of equal size and correspond to the principal teeth of the adult, the smaller intermediate teeth not having been developed. The barbels are proportionately longer and are inserted more posteriorly in young specimens.

Three species.

Synopsis of the Species.

I. Barbel a little nearer to tip of snout than to nostril (in the adult), or a little nearer the nostril (in the young) ..... 1. *cirratus.*

II. Barbel much nearer to nostril than to tip of snout.

Breadth of snout at its base $3\frac{1}{2}$ in its length (in a specimen of 1000 mm.); barbel, when laid back, reaching nostril (adult) or mouth (young) ..... 2. *nudipinnis.*

Breadth of snout $3\frac{3}{4}$ in its length (in a specimen of 700 mm.); barbel, when laid back, not reaching nostril ..... 3. *japonicus.*

1. *Pristiophorus cirratus.*

Pristis serratus, Latham, Trans. Linn. Soc. ii. 1794, p. 281, pl. xxvi.
Pristiophorus serratus, Müll. & Henle, Plagiost. p. 98 (1841); Duméril, Elasmobr. p. 461 (1865); Günth. Cat. Fish. viii. p. 432 (1870); Jaekel, Arch. f. Nat. 1891, p. 45.

Hab. New South Wales, Victoria, and Tasmania.

In the British Museum six specimens, 300 to 1200 mm. in total length.

2. *Pristiophorus nudipinnis.*

Pristiophorus nudipinnis, Günth. Cat. Fish. viii. p. 432 (1870); McCoy, Prodr. Zool. Vict. vi. 1881, p. 24, pl. lvi. fig. 2.
Pristiophorus owenii, Günth. *l. c.*

Hab. Victoria and Tasmania.

In the British Museum two specimens, types of the species and of *P. owenii* respectively, 1000 and 330 mm. in total length.

3. *Pristiophorus japonicus.*

Pristiophorus cirratus (non Latham), Schleg. Faun. Japon., Poiss. p. 305, pl. cxxxvii. (1850).
Pristiophorus japonicus, Günth. Cat. Fish. viii. p. 433 (1870); Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 639.

Hab. Japan.

In the British Museum two specimens, 600 and 700 mm. in total length, including the type of the species.

14. Pliotrema.

Pliotrema, Regan, Ann. Natal Mus. i. 1906, p. 1.

A single species.

1. *Pliotrema warreni.*

Pliotrema warreni, Regan, Ann. Natal Mus. i. 1906, p. 1, pl. i.

Hab. South Africa.

In the British Museum two specimens, 730 and 810 mm. in total length, including the type of the species.

VIII.—*Rhynchotal Notes.*—XLIV. (*concluded from* vol. i. p. 531). By W. L. Distant.

Homoptera.

Fam. Jassidæ.

Subfam. *Tettigoniellinæ.*

Genus Propetes.

Propetes, Walk. List Hom. iii. p. 797 (1851).

Type, *P. compressa*, Walk.

"Head large, conical, with a longitudinal furrow, not pointed: abdomen compressed towards the base: fore shanks widening towards the tips" (*Walker*).