XVI.—*A Review of the Genera and Species of Diodontidae
found in American seas.*

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Read December 21, 1885.

At the suggestion of Dr. David S. Jordan, I have made a study of the American *Diodontidae*, with a view to ascertain the number of valid species and their correct nomenclature. I give in this paper the synonymy of the species recognized, with keys for their identification. The specimens studied belong to the Museum of the Indiana University, at Bloomington, Ind. Some important questions in regard to the species cannot be settled without a greater amount of material than has been at my disposal; but it is believed that the conclusions here reached represent some advances in our knowledge. I am indebted to Miss Rosa Smith for the description of two specimens from La Paz, at San Diego.

The American genera are two, which may be defined as follows:

- a. Body moderately inflatable; head broad; nasal tentacle in front of eye, with two lateral openings; jaws without median sutures; vertical fins rounded; pectorals short, broad.
- b. Spines slender, mostly two-rooted, erectile; in the three-rooted spines, the anterior root is formed by a prolongation of the anterior ridge of the spine.

DIODON, 1.

- bb. Spines robust, all three-rooted, fixed; the anterior root similar to the lateral roots.

CHILOMYCTERUS, 2.

1. DIODON.

DIODON Linnaeus, Syst. Nat., Ed. X, 335, 1758 (*atinga*, *hystrix*, etc.).

? TRICHODIODON Bleeker, "Atl. Ichth. Gymnod.", 40," 1865 (*pilosus*).

PARADIODON Bleeker, "Atl. Ichth. Gymnod.", 50, plate 3, fig. 2," 1865 (*hystrix*).

The genus *Trichodiodon* is based on a description by Mitchill, of a species which has not been since recognized. It is not unlikely that it is simply the very young of *Diodon hystrix*. At any rate, its place in the system needs verification.

The name *Paradiodon* is the result of Bleeker's rule of always regarding the first species mentioned in any new genus as the type of the genus. In this case, *atinga* is the first species mentioned under *Diodon* by Linnaeus, and this *atinga* is a species of *Chilomycterus*.

ANALYSIS OF THE SPECIES OF DIODON.

- a. Spines terete. HYSTRIX, 1.
 - b. Frontal spines not as long as post-pectoral spines (in adults not half as long, about as long as eye); pre-dorsal spines very short, three-rooted, fixed or nearly so; 20 spines in a series between snout and dorsal; post-pectoral spines very much elongate; dorsal rays, 15; anal, 15; upper lobe of pectorals little longer than lower. Adult above everywhere spotted with round black spots; these are largest in front of dorsal, smallest on naked area about mouth; white below; young with large dark blotches, the coloration precisely similar to that of *holacanthus*. Var. HYSTRIX.
 - bb. Frontal spines longer than post-pectoral spines, about twice as long as eye; pre-dorsal spines not shortened, two-rooted, erectile; 14 to 17 spines in a series between snout and dorsal; post-pectoral spines not especially elongate; dorsal rays, 12; anal, 12; pectoral broader than long, upper lobe pointed, lower lobe rounded. A broad black bar from eye to eye, continued below the eye as a narrow bar; a broad bar across occiput; a black blotch above each pectoral; a short bar in front of dorsal; another in which the dorsal is inserted; a blotch behind the pectoral, and many small spots and blotches on the upper parts. Var. HOLACANTHUS.
- aa. "Spines compressed laterally, short; 15 spines in a series between snout and dorsal; upper parts covered with round spots; those about pectorals sometimes confluent into a blotch; fins immaculate."

MACULIFER, 2

1. DIODON HYSTRIX

a (var. *hystrix*.)

- Ophis chinatus* Rondelet, De Piscibus, 324, 1558 ("Northern Ocean").
- Gummajara gaura* Muregrave, Hist. Nat. Bras., 159, 1648 (Brazil).
- Porc-epics de Mer* Froger, Voyage de la Mer du Sud, 119, 1715 (Isles Sainte Anne).
- Ostacion conico oblongus* Artedi, Genera, 60, No. 19. Succi Desc. Spec. Pisc., 80, No. 21, 1738.
- Cypracium* Nos. 12, 13, 14, Klein, Historia Pisc., 19 and 20, 1740.
- Erio* Parn. Desc. Dif. Piezas Hist. Nat. Cuba, 60, tab. 29, fig. 1, 1787 (Havann).
- Diodon hystrix* Linneus, Syst. Nat., Ed. X, 335, 1758 (India: after Artedi). Id., Ed. XII, 413, 1766 (Cape Good Hope). Bloch, Ausländische Fische, I, 91, plate cxxvi, 1787. Gmelin, Syst. Nat., 1448, 1788 (copied). Walbaum, Artedi Pisc., 597, 1792 (copied). Bloch & Schneider, Syst. Ichth., 512, 1801 (Indian Ocean; copied). Turton Ed. Linneus Syst. Nat., I, 892, 1806 (Indian and American Seas). Cuvier, Règne Animal, Ed. II, 336 (note), 1829. Oken, Naturgeschichte, VI, 116, 1836. Barneville, "Revue Zool.", 141, 1846. Bleeker, En. Spec. Pisc. Arch. Ind., 203, 1859 (Java, Sumatra, Batu, Celebes, Flores, Ternate, Amboina, Ceram, Banda, *in mari*). Castelnau, Mem. Poiss. l'Afr. Aust., 74, 1861. Günther, Voy. Challenger, 58, 1869 (Tahiti). Id., Cat. Fish' Brit. Mus., VIII, 306, 1870 (West Indies, Jamaica, Indian Ocean). Klunzinger, Syn. Fisch. Rothen Meeres, 647, 1870 (Red Sea). Cope, Trans. Am. Phil. Soc., 480, 1870 (Lesser Antilles). Goode, Proc. U. S. Nat. Mus., 1879, 109 (East Coast Florida). Bean, Proc. U. S. Nat. Mus., 1880, 75 (Bermudas). Swain & Smith, Proc. U. S. Nat. Mus., 1882, 141 (Johnston's Island, Mid-Pacific). Jordan & Gilbert, Bull. U. S. Fish Com., 1882, 105 (Mazatlan). Jordan & Gilbert, Syn. Fish N. A., 863, 1883. Jordan, Proc. U. S. Nat. Mus., 1884, 146 (Key West). Id., Cat. Fish N. A., 141, 1885 (name only). Id., Proc. U. S. Nat. Mus., 1885, 393 (Mazatlan).
- Holocanthus hystrix* Gronow, Cat. Fish. Ed. Gray, 27, 1854 (American Seas).
- Paradiodon hystrix* Bleeker, "Atl. Ichth. Gymnod, 56, plate 3, fig. 2," 1865. Poey, Syn. Pisc. Cub., 430, 1868. Id., Enum. Pisc. Cub., 169, 1875. Goode, Bull. U. S. Nat. Mus., V, 21, 1876 (Bermudas). Bleeker, L'île Maurice, 23, 1878. Poey, Anal. de Hist. Nat., 346 (Porto Rico).
- Diodon atinga* var. *hystrix* Walbaum, Artedi, Pisc., 596, 1792.
- Diodon atinga* Bloch, "Ichth., IV, 75," plate cxxv, 1787. Gmelin, Syst. Nat., 1451, 1788 (in part). Walbaum, Artedi, Pisc., 597, 1792 (copied). Bloch & Schneider, 511, 1801 (copied). Shaw, Gen. Zool., V, 434, 1804. Müller & Troschel, "Hist. Barbadoes, 677," 1848. Ruppell, "Verz. Senckenb. Mus. Fish. 35," 1852. Kaup, "Wiegman. Arch., XXI, 227," 1855. Bleeker, Enum. Pisc. Arch. Ind., 203, 1859 (Java, Sumatra, Batu, Celebes, Flores, Ternate, Amboina, Ce-

- rum). Casteleau, Mem. Poiss. l'Afr. Aust., 74, 1801. Journ. Anim. Nov. Caledonie, Mem. Soc. Imp. Sci. Nat. Cherbourg, 18, 1801-03 ? Cope, Trans. Amer. Phil. Soc., 480, 1870 (St. Martins, New Providence ; Tortugas). [Not *Diodon atinga* L., which is a species of *Chilomycterus*]
- Le Diodon atinga* Lacépède, Poissons, II, 1-10, plate XXV, fig. 3, 1798.
- Le Diodon plumier* Lacépède, Poissons, II, 1 and 10, plate III, fig. 3, 1798 (Martinique ; on a drawing by Plumier).
- Le Diodon holacanthus* Lacépède, Poissons, II, 1798 (copied).
- Diodon brachilatus* Bloch & Schneider, 513, 1801 (after Parra, tab. 20, fig. 1).
- Diodon punctatus* Cuvier, Mem. Mus. Hist. Nat., IV, 132, 1829. Id., Règne Animal, Ed. II, 336 (note), 1829. Bleeker, "Verh. Bat. Gen.", XXIV, Blootk. Visch., 19, 1852. Bleeker, Achtste Bij. Ichth. Fauna Celebes, 301, 1855 (Macassar). Id., Zesde Bij. Ichth. Fauna Amboina, 403, 1855. Id., Consp. "Molucc. Coquit.", 21" (Amboina, Ternate, Ceram, Archip. Molucc., Banda). Id., "Elfte Bij. Visch. Celebes, 4" (name only). Id., Zes. Bij. Visch. Sumatra (Lampony). Id., Reschrij. Visch. Amboina, 8, 23 (name only). Id., "Bij. Visch. Amboina, 28" (name only). Id., Tweede Bij. Ichth. Fauna Batav., 4 (name only, Batav.).
- Diodon echinus* "Rafinesque." Bonaparte, Cat. Met. Pisc. Eur., 87, 1846 (Mediterranean Sea, accidental).
- Diodon pilosus* DeKay, Nat. Hist. New York, 326, plate LV, fig. 180, 1842 (New York). [Young ; perhaps not *Diodon pilosus* Mitchill.]
- Diodon maculatus* var. β , Günther, Cat. Fish. Brit. Mus., VIII, 307, 1870 (East Indian Arch., Amboina).

Habitat.—All warm seas.

(*b.* var. ? *HOLACANTHUS*.)

- Oxytracion*, Nos. 9 and 15, Klein, Historia Pisc., 19 and 20 tab. 3, fig. 6, 1740.
- Ostracion oblongus holacanthus* Artedi, Genera 60, No. 20 ; Sueci. Desc. Spec. Pisc., 86, No. 22, 1738.
- Diodon holacanthus* Linnæus, Syst. Nat., Ed. X, 335, 1758 (India ; based on Artedi). Gmelin, Linnæus, 1451, 1788 (American Seas and Good Hope).
- Diodon atinga* var. *holacanthus* Walbaum, Artedi Pisc., 598, 1792 (copied).
- Diodon hystrix*, var. β , Linnæus, Syst. Nat., Ed. XII, 413, 1766 (Cape Good Hope).
- ? *Diodon pilosus* Mitchill, Fish. New York, 471, plate VI, fig. 4, 1814 (New York). Cuvier, Règne Animal, 337 (note), 1829 (very young).
- ? *Trichodiodon pilosus* Günther, Cat. Fish. Brit. Mus., VIII, 316, 1870 (copied). Jordan & Gilbert, Syn. Fish. N. Am., 802, 1883 (copied). Jordan, Cat. Fish. N. Am., 141, 1885 (name only).

- Diodon spinosissimus* Cuvier, Mem. Mus., IV, 134, 1818. Id., Règne Animal, 336 (note), 1829. Günther, Cat. Fish. Brit. Mus., VIII, 307, 1870 (Cape Good Hope; Siam; and type of *D. melanopsis* Kaup.).
- Diodon melanopsis* Kaup., Wiegand, Arch., 1855, 228.
- Paradiodon quadrimaculatus* Bleeker, "Atl. Ichth., Gymnod., plate 8, fig. 2," 1865.
- Diodon maculatus* var. *a*, Günther, Cat. Fish. Brit. Mus., VIII, 307, 1870 (St. Croix; Jamaica; Panama; South America; Sandwich Is.; China; Sooloo Sea; Indian Ocean).
- Diodon maculatus* Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 453 (La Paz), and 1881, 70 (La Paz).
- Diodon liturosus* Jordan, Proc. Acad. Nat. Sci. Phil., 1884, 46 (*Diodon maculatus* var. *a* Günther).

Habitat. All warm seas, its range apparently co-extensive with that of *D. hystrix*.

The following references belong apparently chiefly, to *Diodon holacanthus*, but in some cases the young of *D. hystrix* is more or less confused with the former.

- Erizo Guanabana* Parra. Desc. Dif. Piezas Hist. Nat. Cuba, 62, tab. 29, fig. 2, 1787 (Havana).
- Le Diodon tachelé* Lacépède, Poissons, II, 13, 1798 (New Cytherea).
- Diodon atinga* Turton, Ed. Linnæus Syst. Nat., 898, 1806 (compiled).
- Diodon liturosus* Shaw, "Gen. Zool. V, pl. 2, 436," 1804 (after *Diodon tachelé* Lacépède). Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 377 (Panama). Bean, Collection Fish. Internat. Fish. Exh. London, 42, 1883 (Garden Key). Jordan, Proc. U. S. Nat. Mus., 1884, 150 (Florida Keys). Bean & Dresel, Proc. U. S. Nat. Mus., 1884, 151 (name only). Jordan, Cat. Fish. N. Am., 141, 1885 (name only). Id., Proc. U. S. Nat. Mus., 1885, 393 (Lower California).
- Diodon novemmaculatus* Cuvier, Mem. Mus. Hist. Nat., IV, 136, plate 6, 1818. Id., Règne Animal, Ed. II, 336 (note), 1829. Brevoort, Fish Japan, 285, 1850. Bleeker, Nat. Tyds. Ned. Ind., III, 567, 1852. Id., Con. Spec. Mol. Huc. Cogn., 21 (Amboina). Id., Zesde Bij. Ichth. Fauna (Amboina), 403, 1855.
- Paradiodon novemmaculatus* Bleeker, "Atl. Ichth., V, 57, plate 206," 1865. Id., Poissons du Japon, 26, 1879.
- Diodon seznaculatus* Cuvier, Mem. Mus. Hist. Nat., IV, 136, plate 7, 1818. Id., Règne Animal, 336 (note). Kaup, "Arch. Naturgesch., XXI, I, 229," 1855. Bleeker, Enum. Pisc. Arch. Ind., 203, 1859 (Japan; Sandwich Is.; Hindostan; Mauritius; Good Hope). Günther, Fish. Central Am., 396, 1869 (Panama).

- Diodon quadrimaculatus* Cuvier, Mem. Mus. Hist. Nat., IV, 137, plate 6, 1816 (Oahu). Bleeker, Enum. Pisc. Arch. Ind., 263, 1859 (Amboina). Id., "Act. Soc. Sci. Indo. Néerl., II, Amboina, VIII, 94."
- Diodon multimaculatus* Cuvier, Mem. Mus. Hist. Nat., IV, 130, 1816. Id., Règne Animal, 336 (note), 1829. Kaup, "Arch. Naturgesch., XXI, I, 227," 1855.
- Paradiodon* sp. dubia Poey, Syn. Pisc. Cub., 431, 1808 ("Compárese con el *D. pilosus* de Mitchill").
- Diodon maculatus* var. γ & δ , Günther, Cat. Fish. Brit. Mus., VIII, 308 (Amboina; West Indies; Cape Good Hope; Bourbon; Formosa).
- Diodon maculatus* Streets, Bull. U. S. Nat. Mus., VII, 48 (Lower Cal.).

In the foregoing synonymy, several references are of course doubtful, on account of the confusion in authors of the young of *D. hystrix* with the adult of the variety *holacanthus*.

The *Diodon atinga* of Linnæus is certainly a *Chilomycterus*, probably *Ch. jaculifer* of Günther, but the species so called by Bloch and those following him is the *hystrix* of Linnæus.

Diodon brachiatus of Bloch & Schneider is based upon Parra, tab. 29, fig. 1; this plate represents *D. hystrix*.

The figure of *Diodon pilosus*, given by DeKay, is apparently a young *hystrix*; the *pilosus* of Mitchill is perhaps the young of *holacanthus*, or possibly of some species still unrecognized, with very slender spines.

Under the head of *Diodon maculatus*, Dr. Günther includes the true *holacanthus* and also the young of *hystrix*. The markings of the body are the same in both, and in one young specimen examined (141) the small round spots characteristic of the adult of *hystrix* were seen within the round black blotches which had faded somewhat.

The specimens before me are from Havana, Saint Thomas and Lower California.

As shown by the evidence at my disposal, the form or variety or species, *Diodon holacanthus* differs from *D. hystrix* in having the frontal spines as long as the post-pectoral spines, and in having all of its spines long and similar in form; all without any anterior root.

The *holacanthus* of Linnæus is based upon a description of Artedi. As this description fits this form rather than the *hystrix*, I have substituted the name *holacanthus* for the *liturosus* of Shaw and the *maculatus* of Günther. Shaw based his name

liturosus on Lacépède's description of his "Le diodon tacheté." Lacépède describes merely the coloring of this specimen, giving general statements about the spines; this leaves it uncertain which species he had. - All the references of authors to *liturosus* are equally doubtful, except in the few cases where the specimens have been especially described. The *spinosissimus* of Cuvier is a *holacanthus*, and the fact that Günther refers his specimens to the *holacanthus* seems to indicate that they belong there, although he does not mention in his description the prolongation of the frontal spines. The descriptions of *novemmaculatus*, *sexmaculatus*, *quadrifasciatus* and *multifasciatus*, are none of them so exact as to leave no doubt as to the species intended; although in all these cases I think it likely that *holacanthus* is meant rather than the young of *hystrix*. *Diodon maculatus* var. α Günther is certainly a *holacanthus*; var. β is a *hystrix*. The others I can not certainly identify.

The specimens examined by me are from Havana.

If, as is possible, this is only a variation of the young of *hystrix*, all the foregoing synonymy should be referred to the latter. At present I think the probabilities are in favor of absolute identity of the two forms, but pending the settlement of this question, it has seemed best to group the synonymy as above.

I give below a tabulated account of the different specimens examined by me, and those described by various writers, which seem referable to *Diodon hystrix* and *D. holacanthus*. The extent of the variations in the diagnostic characters will appear from this account.

A. Armature of the tail.

b. In specimens described by authors, and referred by me to *Diodon hystrix*.

1. *D. punctatus* Cuvier. "Autour de la queue il y en a quatre (épines) qui la rendent comme prismatique."
2. *D. hystrix* Günther. The upper and lower sides of the tail with two or three pairs of immovable spines."
3. *D. hystrix* Klunzinger. "Der vordere Theil des Schwanzes ist bestachelt, die Stacheln daselbst nicht dicht, die hintere Hälfte desselben nackt. Stacheln neben dem Schwanzrücken je 3-4, an den Seiten des Schwanzes meist 2, und eben so viele neben der Bauchseite des Schwanzes."

4. *D. hystrix* Swain & Smith. "Shorter and stronger spines in front of dorsal, becoming longer again on tail. Length 24½ inches."

c. In specimens referred to *D. hystrix* var. *holacanthus*

1. *D. novemmaculatus. sexmaculatus. quadrimaculatus, multimaculatus*, Cuvier. "La queue n'en a que deux (épines) en dessus."
 2. *D. spinosissimus* Günther. "Upper part of the tail with a pair of spines besides those on the sides."
 3. *D. maculatus* Günther. "Upper part of tail with a pair of spines besides those on the sides."

d. In specimens examined by me.

1. No. 8728, Mus. Ind. Univ., from Saint Thomas; 20 inches long, with 16 spines on tail; two and a half pairs of spines at base of tail; no spines on sides; a series around root of tail; procumbent spines irregularly placed on upper side (= *hystrix*).
 2. No. 8728, Mus. Ind. Univ., from Havana; 21 inches long, with 15 spines on tail; 3 pairs form 2 ridges on the sides above, 2 pairs similarly placed below, others about the root of tail (= *hystrix*).
 3. No. 876, Mus. Ind. Univ., from Key West; 19 inches long, with 15 spines on tail; 5 on lower side; 4 forming a ridge on one side on top; 3 with a fourth subdermal spine on opposite side; none on sides; the others at the root of the tail (= *hystrix*).
 4. No. 1244, Mus. Ind. Univ., from Lower California near San Diego; 11 inches long with 12 spines on tail, all of them more or less concealed under skin; 2 pairs on lower side, 3 pairs on upper side; none on sides; others at root of tail (= *hystrix*).
 5. No. 383, Mus. Ind. Univ., from Havana; 7 inches long, with 4 spines on tail; a pair on lower side, a pair on upper (= *holacanthus*).
 6. No. 141, Mus. Ind. Univ., from Havana; 5 inches long, with 5 spines on tail; a pair on upper side, others at the root of tail (= *hystrix*).
 7. No. 3727, Mus. Dr. Jordan, from Havana; 5½ inches long, with 2 spines on the tail, one on each side above (= *holacanthus*).
 8. Specimen from La Paz*† at San Diego; "8½ inches long. One spine on either side at the base of caudal peduncle at the middle of the side" (= *holacanthus*).
 9. Specimen from La Paz* at San Diego; "11 inches long. 3 spines along upper edge of caudal peduncle and one at the lower edge" (= *hystrix*).

B. Frontal spines.

e. In specimens referred to *D. hystrix*.

1. *D. punctatus* Cuvier. "Ceux (épines) de la tête en general sont moins longs que ceux du dos et surtout que ceux des flancs."

* Examined at my request by Miss Rosa Smith.

† This is the specimen mentioned by Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 433; 1881, 70, as from near San Diego.

2. *D. hystrix* Günther. "Frontal spines of medium size."
3. *D. maculatus*, var. β , Günther. "The front spines being sometimes shorter than the eye."

f. In specimens referred to *D. hystrix*, var. *holacanthus*.

1. *D. holacanthus* Linnaeus. "Aculeis longissimis teretiformibus in capite imprimis collo."
2. *D. spinosissimus* Cuvier, (Les épines) "du dessus de la tête, qui sont aussi longs que ceux des flancs."
3. *D. noctemaculatus*, etc. Cuvier. "Ceux du dos sont assez égaux" (6 inches long).
4. *D. maculatus*, var. α , Günther. "Spines, especially those in front, long, much longer than eye." Var. γ . "Frontal spines longer than eye." Var. δ . "Frontal spines longer than eye."

g. In specimens examined.

1. No. 3728. Frontal spines about half length of post-pectoral spines, about as long as eye (= *hystrix*).
2. No. 3229. Frontal spines not half length of post-pectoral spines.
3. No. 876. Frontal spines not half length of post-pectoral spines, shorter than eye (= *hystrix*).
4. No. 1244. Frontal spines about two-thirds as long as post-pectoral spines, little longer than eye (= *hystrix*).
5. No. 383. Frontal spines longer than post-pectoral spines, about twice as long as eye (= *holacanthus*).
6. No. 141. Frontal spines about three-fourths post-pectoral spines, as long as eye (= *hystrix*).
7. No. 3727. Frontal spines a fourth longer than post-pectoral spines (= *holacanthus*).
8. "Nasal spines one and one-fourth times in longest post-pectoral spine" (= *holacanthus*).
9. "All the spines from snout to dorsal much shorter than those behind pectoral" (= *hystrix*).

C. Pre-dorsal spines.

h. In specimens referred to *D. hystrix*.

1. *D. punctatus* Cuvier. "La troisième racine . . . n'est guère que la continuation du piquant principal" (not stated what part of body).
2. *D. hystrix* Günther. Spines "of the posterior part of the back short and broad."
3. *D. maculatus* Günther. "Spines varying in length . . . ; those on the posterior part of the back sometimes fixed by the projecting anterior ridge of the spine."
4. *D. hystrix* Klunzinger. Ich finde immer 8 Wurzeln, die mittlere Wurzel oder die Fortsetzung des Stachels nach vorn ist aber bei den vorderen Stacheln Kurz bei den hinteren wird sie länger und dann oft so lang oder länger als der Stachel selbst."

5. *D. hystrix* Swain & Smith. "Shorter and stronger spines in front of dorsal."

4. In specimens referred to *D. hystrix* var. *holacanthus*.

1. *D. spinosissimus* Cuvier. "Les piquants sont de la même forme (as those of *punctatus*) . . . et à deux racines transverses."
2. *D. spinosissimus* Günther. "All spines long, slender."
3. *D. maculatus* Günther (see above, C. h. 8).

— j. In specimens examined.

1. No. 3728. Pre-dorsal spines very short, three-rooted.
2. No. 3729. Pre-dorsal spines short, three-rooted (= *hystrix*).
3. No. 876. Pre-dorsal spines very short, three-rooted (= *hystrix*).
4. No. 1244. Pre-dorsal spines very short, three-rooted (= *hystrix*).
5. No. 383. All spines similar, long, none with three roots (= *holacanthus*).
6. No. 141. All spines more or less three-rooted (= *hystrix*.)
7. No. 8727. Pre-dorsal spines, with the exception of the one immediately in front of dorsal, two-rooted (= *holacanthus*).
8. "The pre-dorsal spines are two-rooted, though a few have a very short prolongation of the base of the spine (= *holacanthus*)."
9. "Pre-dorsal spines conspicuously three-rooted" (= *hystrix*).

2. DIODON MACULIFER.

Diodon maculifer Kaup, "Wieg. Arch., 229," 1855. Günther. Cat. Fish. Brit. Mus., VIII, 809, 1870 (Cape Good Hope, Cuba). Poey, En. Pisc. Cub., 169, 1875 (copied). Bleeker, L'île Maurice, 23, 1855 (Mauritius).

Habitat.—Southern seas.

This species seems to be distinguished from its congeners by its longitudinally compressed spines. It is possibly merely a variation of *hystrix*. Klunzinger (as also Swain and Smith) describes his *hystrix* as having the spines somewhat compressed. Several others speak of compressed spines, but the descriptions are not definite enough to warrant the reference of *D. maculifer* to the synonymy of *D. hystrix*. Günther records *D. maculifer* from Cuba, but Poey has not found it there. The species is known to me only from the description of Günther.

2. CHILOMYCTERUS.

Diodon Linnæus, Syst. Nat., Ed. X, 335, 1758 (in part).

Les *Chilomyctères* Bibron, Mss. Barneville, Revue Zoologique, 1846, 140.
CHILOMYCTERUS Kaup, Wieg. Arch., 865, 1847 (*antennatus*).

CYCLICHTHYS Kaup, Wiegman. Arch., 231, 1855 (*orbicularis*).

CYANICHTHYS Kaup, Wiegman. Arch., 231, 1855 (*caeruleus*).

DIODON Bleeker, "Atl. Ichth. Gymnod.", 55, 1865 (*adlonga*).

This genus is well characterized by the form of the spines, which are all broad, three-rooted and immovable.

ANALYSIS OF THE SPECIES OF CHILOMYCTERUS.

- a. Superciliary spines two; with generally a tentacle between them; a spine in middle of forehead.
- b. Superciliary edge raised; fins unspotted.
 - c. Upper parts dark greenish, with a series of white and bluish lines running from nape backwards; a similar series between eyes and across face; an ocellated black spot above pectoral; a larger one behind pectoral; an ocellated spot on each side of dorsal, and an elongated spot behind each of the ventral antennæ. SCHÖEPLI, 3.
 - cc. Upper parts plain, without a series of lines; spots as in *Schœpfi*. SPINOSUS, 4.
- bb. Superciliary edge not raised; upper parts with numerous black dots, some with a bluish centre; a black spot in the middle of nape; a large kidney-shaped spot above the pectoral, and a subtriangular blotch before and along the base of the dorsal fin; a series of antennæ along the lower part of the side. ANTENNATUS, 5.
- aa. Supraorbital spines three, feeble; none on forehead. Upper parts densely covered with small, round, blackish-brown spots; a large black blotch before and around dorsal; another on each side above gill-opening and pectoral; spines short, compressed, anterior root flat, longer than the others. RETICULATUS, 6.

3. CHILOMYCTERUS SCHÖEPLI.

The Toadfish, Schœpfi, "Schriften Berlin. Gesellsch. Naturf. Freunde, VII, 192," 1788 (Long Island).

Diodon schœpfi Walbaum, Artedi, Pisc., 601, 1792 (after Schœpfi).

?*Diodon meulini* Walbaum, Artedi, Pisc., 602, 1792 (no locality).

Diodon geometricus var. *lineatus* Bloch & Schneider, Ichth., 518, 1801 (after Schœpfi).

Chilomycterus geometricus Kaup, Wiegmann's Archiv, 1847. Gill, Cat. Fish.

E. Coast N. Am., 1861. Poey. Syn. Pisc. Cub., 430, 1868 (Cuba).

Var. α & β , Günther, Cat. Fish. Brit. Mus., VIII, 310, 1870 (American waters).

Cope, Trans. Amer. Phil. Soc., 480, 1870 (Tortugas).

Gill, Cat. Fish. East Coast N. Am., 15, 1873 (Vineyard Sound).

Poey, Enum. Pisc. Cub., 171, 1875. Jordan & Gilbert, Proc. U. S. Nat.

Mus., 1878, 366 (Beaufort Harbor). Goode, Proc. U. S. Nat. Mus.,

1879, 109 (Mouth of St. John, Indian River). Goode & Bean, Proc.

- U. S. Nat. Mus., 1870, 122 (Pensacola, Fla.) and 1870, 333 (Key West). Jordan, Proc. U. S. Nat. Mus., 1890, 18 (Indian River, Fla.). Benn, Proc. U. S. Nat. Mus., 1880, 75 (Noank, Conn.; East Shore, Va.; Beaufort, N. C.; Fort Macon, N. C.; Coast New England; Newport, R. I.). Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 241 (Galveston); and 1882, 610 (Charleston, S. C.). Jordan & Gilbert, Syn. Fish. N. Am., 803, 1883. Benn, Coll. Fish. Internat. Exh., London, 42, 1883 (Pensacola). Jordan, Proc. U. S. Nat. Mus., 1894, 146 (Key West). Id., Cat. Fish. N. Am., 141, 1885 (name only).
- Le Diodon orbe* Lacépède. "Poissons, II, page —," 1798 (Rio Janeiro).
- Diodon maculostriatus* Mitchell, Fish. New York, 470, plate LVI, fig. 3, 1814 (New York). DeKay, Nat. Hist. New York, Fishes, 328, plate LVI, fig. 185, 1842 (New York). Ayres, Boston Journal Nat. Hist., IV, 284, 1842 (Brookhaven, Long Island).
- Diodon riculatus* Cuvier, Mem. Mus. Hist. Nat., IV, 120, plate VI, 1818; Id., Règne Animal, Ed. II, 337 (note), 1820.
- Diodon nigrolineatus* Ayres, Boston Journal Nat. Hist., IV, 68, 1842 (Brookhaven, Long Island).
- Diodon fuliginosus* De Kay, Nat. Hist. New York, Fishes, 324, plate LV, fig. 181, 1842 (New York; young).
- Chilomycterus geometricus* subsp. *fuliginosus* Jordan & Gilbert, Syn. Fish. N. Am., 864, 1883 (young).
- Chilomycterus fuliginosus* Jordan, Cat. Fish. N. Am., 441, 1885 (name only).
- Diodon verrucosus* DeKay, Nat. Hist. New York, Fishes, 325, plate LVI, fig. 184, 1842 (New York).
- Chilomycterus* sp. dubia, "An *Chilomycterus fuliginosus*?" Pöcy, Syn. Pisc. Cub., 429-30, 1868 (Havana).

Habitat.—New England to West Indies.

This species is readily recognized by the dark and light lines of the upper parts. The lines are parallel and meet towards the back. A reticulation is sometimes formed when these lines meet on the anterior part of the back. In the young there seem to be more lines than in the old. Two specimens examined, 3 inches long, have 17 lines between the pectorals; a specimen 5 inches long has 10 lines; and the largest specimen examined, 10 inches long, has 12 lines.

Dr. Jordan has identified the *schæpfi* of Walbaum with the present species. Walbaum in his description of *schæpfi* says, "color in dorso fulvus, lineis albis longitudinalibus notatus;" as the other part of the description agrees quite as well, the name *schæpfi* has been substituted for *geometricus*, which name in fact belongs to the next species rather than to this, if

the two be different. DeKay has well figured and described the young of this species under the names *fuliginosus* and *verrucosus*.

The many specimens examined by me are from Beaufort, N. C., and from Key West.

4. CHILOMYCTERUS SPINOSUS.

- Guamancu alinga* Marcgrave, Hist. Nat. Brns., 168, 1648 (in mari).
Ostracion subrotundus ventris glabro Artedi, Gen., 59, No. 15. Succ. Desc. Spec. Pisc., 86, No. 18 (based on Marcgrave).
Diodon spinosus Linnæus, Syst. Nat., Ed. X, 335, 1758 (India; based on Artedi).
Cyrtopleurus lumpus var. β , Linnæus, Syst. Nat., Ed. XII, 414, 1766.
Diodon geometricus Bloch & Schneider, Ichth., 613, plate 96, 1801 (America).
Cyclichthys cornutus Kaup, "Wiegman. Arch.", 231, 1855 (Bahia).
Chilomycterus geometricus var. γ , Günther, Cat. Fish. Brit. Mus., 311, 1870 (Brazil; Bahia, the latter the type of *C. cornutus* Kaup).

Habitat.—West Indies and coast of Brazil.

This species, according to Günther, differs from *schæpfi* only in the coloration, the lines on the back being absent. Marcgrave gives a figure and description which certainly refer to the same fish. Artedi bases his description on Marcgrave, and this account in turn is the basis of the *spinosus* of Linnæus.

I have seen no specimens of this species, which would seem to be a southern representative of *Ch. schæpfi*. Perhaps the two may be color-variations of the same species, in which case the name *spinosus* must be adopted.

5. CHILOMYCTERUS ANTENNATUS.

- Diodon antennatus* Cuvier, Mem. Mus., IV, 131, plate VII, 1818. Id., Règne Animal, 337 (note), "plate IX, fig. 1," 1829.
Chilomycterus antennatus Kaup, "Wiegman. Arch.", 232, 1855. Günther, Cat. Fish. Brit. Mus., VIII, 311, 1870 (St. Croix; Jamaica; Cape Good Hope). Bran & Dresel, Proc. U. S. Nat. Mus., 1884, 151 (name only).
Chilomycterus puncticulatus Poey, Anal. Hist. Nat., 346, 1881 (Porto Rico).

Habitat.—Southern seas of America.

This species is characterized by the tentacles along the side, by the coloration, and by the colorless fins. It is known to me only from descriptions.

6. *CHILOMYCTERUS RETICULATUS*.

- Ostracion subrotundus* Artedi, Gen., 50, No. 10. Succi, Desc. Spec. Pisc., 80, No. 10, 1738.
- Crayracion* No. 10, Klein, Historia Pisc., 20, 1740 (after Artedi).
- Diodon reticulatus* Linnaeus, Syst. Nat., Ed. X, 334, 1758 (after Artedi). Gmelin, Syst. Nat., 1449, 1788 (copied). Lowe, Fish. Madeira, 87, plate 13, 1843-60.
- Chilomycterus reticulatus* (Bibron Mss.) Barneville, "Revue Zool.", 141, 1846. Bleeker, "Atl. Ichth.", V, 54, 1865. Günther, Cat. Fish. Brit. Mus., VIII, 313, 1870 (St. Helena; Bermudas). Poey, Enum. Pisc. Cub., 171, 1875. Gonde, Bull. U. S. Nat. Mus., V, 21, 1876. Jordan & Gilbert, Syn. Fish. N. Am., 909, 1883 (Florida Reefs). Jordan, Cat. Fish. N. Am., 141, 1885 (name only).
- Diodon atringa* var. *reticulatus* Walbaum, Artedi, Pisc., 596, 1792.
- Diodon atinga* var. *reticulatus* Walbaum, Artedi, Pisc., 596, 1792 (copied).
- Diodon atinga* β, Linnaeus, Syst. Nat., Ed. XII, 413, 1760 (India).
- ?*Diodon atinga* var. *orbicularis* Walbaum, Artedi, Pisc., 588, 1792 (Pacific and Indian Ocean).
- Diodon hystrix* var. *orbiculatus* Bloch & Schneider, Ichth., 512, 1806 (Jamaica).
- Diodon tigrinus* Cuvier, Mem. Mus., IV, 127, plate VI, 1818. Id., Règne Animal, Ed. II, 337 (note), 1829.
- Diodon atinga* Poey, Syn. Pisc. Cub., 429, 1868.
- Chilomycterus orbitosus* Poey, Annals Lyc. Nat. Hist. New York, 1875, 69 (Cuba). Id., Enum. Pisc. Cub., 171, 1875 (Havana).

Habitat.—West Indies north to Bermuda and the Florida Keys.

The *Diodon reticulatus* differs from *antennatus* in the absence of the antennæ, and in the coloration. The fins especially are marked with small black spots.

This species is well known to naturalists, but I have not been able to examine it.

LIST OF NOMINAL SPECIES OF DIODONTIDÆ IN CHRONOLOGICAL ORDER,
WITH IDENTIFICATIONS.[Tenable specific names are in *italics*.]

1. *Diodon reticulatus* Linnaeus, . . . 1758 *Chilomycterus reticulatus*.
2. *Diodon spinosus* Linnaeus, . . . 1758 *Chilomycterus spinosus*.
3. *Diodon hystrix* Linnaeus, . . . 1758 *Diodon hystrix*.
4. *Diodon holacanthus* Linnaeus, . . . 1758 *Diodon holacanthus*.
5. *Cyclopterus lumpus* var. *β*, Linnaeus, 1760 *Chilomycterus spinosus*.
6. *Diodon atluğa orbicularis* Walbaum, 1803 *Chilomycterus reticulatus*.
7. *Diodon schæpfi* Walbaum, . . . 1792 *Chilomycterus schæpfi*.
8. *Diodon moulonii* Walbaum, . . . 1792 *Chilomycterus schæpfi*.
9. *Lo Diodon plumier* Lacépède, . . . 1793 *Diodon hystrix*.
10. *Lo Diodon tacheté* Lacépède, . . . 1793 ? *Diodon holacanthus*.
11. *Lo Diodon orbe* Lacépède, . . . 1793 *Chilomycterus schæpfi*.
12. *Diodon brachiatum* Bloch & Schneider, 1801 *Diodon hystrix*.
13. *Diodon geometricus* Bloch & Schneider, 1801 *Chilomycterus schæpfi*.
14. *Diodon geometricus lineatus* Bloch & Schneider, . . . 1801 *Chilomycterus spinosus*.
15. *Diodon liturosus* Shaw, . . . 1804 ? *Diodon holacanthus*.
16. *Diodon echinus** Rafinesque, . . . 1810 *Diodon hystrix*.
17. *Diodon maculostriatus* Mitchell, . . . 1814 *Chilomycterus schæpfi*.
18. *Diodon pilosus* Mitchell, . . . 1814 ? *Diodon holacanthus*.
19. *Diodon tigrinus* Cuvier, . . . 1818 *Chilomycterus reticulatus*.
20. *Diodon rivulatus* Cuvier, . . . 1818 *Chilomycterus schæpfi*.
21. *Diodon antennatus* Cuvier, . . . 1818 *Chilomycterus antennatus*.
22. *Diodon punctatus* Cuvier, . . . 1818 *Diodon hystrix*.
23. *Diodon spinosissimus* Cuvier, . . . 1818 *Diodon holacanthus*.
24. *Diodon novemmaculatus* Cuvier, . . . 1818 ? *Diodon holacanthus*.
25. *Diodon sexmaculatus* Cuvier, . . . 1818 ? *Diodon holacanthus*.
26. *Diodon quadrimaculatus* Cuvier, . . . 1818 ? *Diodon holacanthus*.
27. *Diodon multimaculatus* Cuvier, . . . 1818 ? *Diodon holacanthus*.
28. *Diodon fuliginosus* DeKay, . . . 1842 *Chilomycterus schæpfi*.
29. *Diodon verrucosus* DeKay, . . . 1842 *Chilomycterus schæpfi*.
30. *Diodon nigrolineatus* Ayres, . . . 1842 *Chilomycterus schæpfi*.
31. *Diodon melanopsis* Kaup, . . . 1855 ? *Diodon holacanthus*.
32. *Diodon maculifer* Kaup, . . . 1855 *Diodon maculifer*.
33. *Cyclichthys cornutus* Kaup, . . . 1855 *Diodon spinosus*.
34. *Diodon maculatus* Günther, . . . 1870 *Diodon hystrix* & *holacanthus*.
35. *Chilomycterus orbitosus* Poey, . . . 1875 *Chilomycterus schæpfi*.
36. *Chilomycterus puncticulatus* Poey, . . . 1881 *Chilomycterus antennatus*.

* Rafinesque, Indice, 58, 1810 (Catania ?; young).