

Article XVIII.—ON *VOMER DORSALIS*, WITH A BRIEF
[REVIEW OF THE GENUS

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The Genus *Vomer* and its Current Species

Jordan and Evermann in *Fishes of North and Middle America*,¹ recognize three species of the genus *Vomer* Cuvier and Valenciennes,² a genus of carangin fishes characterized by very deep and strongly compressed form, weak teeth, and very low fins (except in the young of less than 30 mm.). These are *dorsalis*,³ *setipinnis*,⁴ and *gabonensis*,⁵ all three from West Africa and tropical Atlantic America, and *setipinnis* occurring also in temperate Atlantic America and in Pacific America from Cape San Lucas to Peru. They speak of *dorsalis* and *gabonensis* as "doubtful species, not seen by us," and give the following key for the differentiation of the three supposed species.

- a. Soft dorsal with about 25 rays; depth in adult less than half length. *dorsalis*
- aa. Soft dorsal with 21 or 22 rays.
 - b. Depth in adult about half length. *setipinnis*
 - bb. Depth in adult much more than half length. *gabonensis*

Identification of Material from the Mouth of the Congo
as *Vomer dorsalis*

In examining marine fishes collected by The American Museum of Natural History's Congo Expedition of 1909 to 1915 at the mouth of the Congo (Banana) I find a number of small specimens of *Vomer*. These differ from Atlantic American *setapinnis* in having a slightly higher fin count: the dorsal soft rays usually 24, rarely as low as 22 or as high as 25; anal soft rays usually 20, sometimes 19. The thirty specimens examined definitely establish *dorsalis* as a recognizable form. The following table shows the fin counts, and decrease of depth with age.

¹ 1896, Bull. 47, I, U. S. Nat. Mus., pp. 933-935.

² 1833, Hist. Nat. Poiss., IX, p. 189 (*brownii*).

³ *Vomer dorsalis* Gill, 1862, Proc. Ac. Nat. Sci. Philadelphia, p. 436; after Günther.

⁴ *Zeus setapinnis* Mitchill, 1815, Trans. Lit. and Philos. Soc. N. Y., p. 384, N. Y. Jordan and Evermann use the spelling "*setipinnis*."

⁵ *Vomer gabonensis* Guichenot, 1865, Ann. Soc. Linn. Maine et Loire, p. 42, Gaboon.

TABLE I.—*Vomer dorsalis* from the Mouth of the Congo

Length to base of caudal	No. of specimens	Depth		Dorsal soft rays				Anal soft rays	
		Variation	Average	22	23	24	25	19	20
36 to 39 mm.	9	1.3 to 1.4	1.33	—	—	—	—	—	—
40 to 44	13	1.4	1.40		.54	.46		.31	.69
45 to 49	6	1.4 to 1.5	1.45	.16 $\frac{2}{3}$.16 $\frac{2}{3}$.66 $\frac{2}{3}$.67	.33
50 to 59	4	1.5 to 1.6	1.52	.25	.75	.75		.25	.75
60 to 67	7	1.5 to 1.6	1.53	.14	.14	.42	.29	.14	.86
40 to 67	30			.10	.30	.53	.07	.33	.67

No variation of fin count with age in these fully developed fishes is to be expected. That which the figures show may be entirely fortuitous. It is notable, however, that the lot of smallest fishes counted shows a low dorsal mode and little dorsal variation. Probably there are more chances of getting fishes from one lot of eggs in the smaller sizes, before there has been time for the schools to scatter; and a lot with close relationship would be the least variable, and might also show a mode differing from that of the species as a whole.

Consideration and Comparison of Atlantic Material

For purposes of comparison I have tabulated the characters of twelve Atlantic American *Vomer* in the Museum collections of varying sizes.

TABLE II.—Atlantic American *Vomer* (*setapinnis*, and (*) *cubensis*)

Length to base of caudal	Depth	Dorsal soft rays	Anal soft rays	Remarks
37 mm.	1.2	20	—	N. Y. City (dried)
59	1.4	22	18	Porto Rico
72	1.5	22	18	Porto Rico
78	1.6	21	17	Long Island, N. Y.
*112	1.5	22	18	Cienfuegos, Cuba
*119	1.5	22	18	" "
*122	1.5	22	18	" "
*122	1.6	22	18	Near Santiago de Cuba
*131	1.6	22	18	Cienfuegos, Cuba
*134	1.6	22	18	" "
150	1.8	22	18	New York Aquarium
163	1.8	22	?16 (imperfect)	? Cuba

If one runs the eye down the "depth" column, it is noticeable that, after rising to 1.6 for the 78 mm. specimen, the figures (in inverse ratio to the fish's depth) drop to 1.5 for the 112 mm., rise gradually to 1.6 for the 134 mm., then abruptly to 1.8 for the 150 mm. specimen. That is, the 112 and 119 mm. specimens are proportionately deeper than the 78 mm. although half again as large, and the decrease of depth for the 16 mm. between the 134 and 150 mm. specimens is twice what it is for the 22 mm. between the 112 and 134 mm. specimens. The facts of growth for *Vomer* doubtless entail a steady slackening decrease of depth with age, and the great depth of five Cuban specimens between 112 and 134 mm. is due to their being "*gabonensis*" while the others are *setapinnis*. *V. "gabonensis"* is, then, also a recognizable form. It is noteworthy that the small *setapinnis* in the table comparable with the *dorsalis* examined are appreciably deeper than they. The low fin count of the two New York specimens means nothing unless corroborated by more material.

The rather slight differences between the three forms (*setapinnis*, *dorsalis*, and "*gabonensis*"), taken with the individual variation shown to exist in species of *Vomer*, would indicate that these are geographic races rather than full species. Their reputed ranges, however, are almost identical. It is possible that some of the identifications, and consequently the ranges, will have to be revised or that, though the three are found together, each predominates in a certain region.

The use of "*gabonensis*" (based on a single specimen of 70 mm., "*sa hauteur n'étant que deux fois à peine dans la longueur entiere du poisson*") is certainly not justified for the deep-bodied form. We will suppose that Guichenot's specimen was measured from tip of chin to tip of caudal, which would give a maximum length and minimum comparative depth, and compare depths similarly obtained from our material. A Porto Rican *setapinnis* of 76 mm. (59 snout to base caudal) then has depth 1.85, an African *dorsalis* of 70 mm. (55 snout to base caudal) has depth 2.00, *gabonensis* "scarcely twice." Thus *gabonensis* may perfectly well be a specimen of even *dorsalis*, the most slender of the three! Throwing out *gabonensis*, there seems to be no name available for the deep-bodied form (variety A of Günther in part). *Vomer cubensis* is here proposed for it (Type No. 7148 A. M. N. H., length 122 mm.). Further there seem to be no good records for *cubensis* save in tropical Atlantic America.

Young of *setapinnis* alone reach our temperate waters in summer, irregularly but not uncommonly, presumably through the agency of the Gulf Stream, and have been noted as far north as Saco, Maine (Batchelder). Of their occurrence in Rhode Island, Tracy says:

Of various abundance in different years. Adults usually rare. Occasional specimens in August, September and October. Usually much more frequent than *Selene vomer*. . . . In 1906 a remarkably large number of these fishes were present in Rhode Island waters, from the first of August until the last of September. In this season also, adults were numerous. . . . A male specimen taken in West Passage trap, Narragansett Bay, September 11, 1906, gave milt on gentle pressure.¹

According to Lütken *Vomer setapinnis* reaches a length of about two feet.²

Description of the Deep-bodied *Vomer*

I have selected one of the Cienfuegos specimens for detailed description of the deep-bodied form as follows.

Vomer setapinnis cubensis, new subspecies

Argyreosus setipinnis var. A. (in part), GÜNTHER, 1860, Cat. Fishes, II, p. 459. San Domingo to Bahia.

Vomer gatonensis JORDAN AND EVERMANN, 1896, Bull. 47, I, U. S. Nat. Mus., p. 934. NICHOLS, 1912, Bull. Amer. Mus. Nat. Hist., XXXI, p. 186. Not of Guichenot.

Type No. 7148 A. M. N. H. collected in the market, Cienfuegos, Cuba, March 6 or 7, 1912. Length to base of caudal, 122 mm. Head, 2.8 in this length; depth, 1.56. Length of pectoral, 2.6. Eye, 3.4 in head; preorbital, 2.3; maxillary, 2.4, length of peduncle, 3.2; longest dorsal ray, 3.0. Longest anal ray, 1.1 in eye; longest anterior dorsal spine, 4.0; ventral, 2.0; depth of peduncle, 1.7. Dorsal VI-I, 22. Anal II, 18. Scales very small, those on peduncle somewhat larger, the lateral line peduncular scales very weakly keeled. Upper profile with a slight reentrance below eye (so that broad snout is somewhat projecting) almost vertical to nape directly above eye, thence horizontal to origin soft dorsal, thence rounding downward to peduncle. Lower jaw projecting. Lower profile rounding downward and backward with diminishing convexity to front of anal, thence rising obliquely, almost straight, to peduncle. Anterior convexity of lateral line, 1.2 in straight portion to base of caudal. Greatest breadth of body through the anterior portion of the back. Anterior profiles trenchant.

Examination of Pacific Material

The United States National Museum has kindly loaned seventeen specimens of *Vomer* from the Bay of Panama for comparison with our Atlantic material (U. S. N. M. Nos. 29162, 41183, 41190, 41206, 41212, 41213, 41228, 41239, 41388, 43411, 76834, 76835). Their characters have been tabulated (Table III) to compare with those of *dorsalis* (Table I) Atlantic *setapinnis* and *cubensis* (Table II).

¹Tracy, H. C., 1910, Fishes of Rhode Island. 40th Ann. Rept. Comm. Inland Fisheries R. I., pp. 111-112.

²*Spolia Atlantica*, 1880, p. 605.

TABLE III — *Vomer* from U. S. National Museum, collected in the Bay of Panama

Length to base of caudal	No. of specimens	Depth		Dorsal soft rays				Anal soft rays		
		Variation	Average	21	22	23	24	17	18	19
39 mm.	1	1.3	1.30	—	—	—	—	—	—	—
40 to 44	3	1.3 to 1.4	1.33			.67	.33		.33	.67
64 to 70	3	1.5 to 1.6	1.53		.33½	.33½	.33½		.67	.33
106 to 170	8	1.8 to 2.0	1.90	.12½	.37½	.50		.12½	.62½	.25
215 to 260	2	2.1	2.10		.50	.50			1.00	
40 to 260	16			.06	.31	.50	.13	.06	.63	.31

It will be seen that from the figures these Pacific fish are insignificantly more slender than Atlantic *setapinnis* of the same size, corresponding very closely in depth (for the smaller sizes) with *dorsalis*; and they are notably more slender than *cubensis*. The six specimens of Atlantic *setapinnis* have dorsal rays 22 (.66⅔), 21 (.16⅔), and 20 (.16⅔); that is they average about a ray less than those from Panama, in the dorsal. The four in which the anal has been counted satisfactorily have its rays 18 (.75), and 17 (.25) — again a trifle less, though the mode is the same. Pacific fish represent a geographic variation towards African *dorsalis*,¹ not sufficiently marked to be recognized in nomenclature, and they should stand as *setapinnis*, which they most closely resemble and to which they are most closely allied.

Relationship of *Vomer* to its Specialized Allies and to More Primitive *Caranx*

Lütken places *Vomer setapinnis* (the one species he recognizes) in the same genus with *Selene vomer*. There is no doubt that the two are closely related. They are probably equally closely related to *Hynn timer*, a somewhat more primitive fish, and the three are specializations of *Caranx*, compressed deep-bodied, with reduced scales and teeth. The following table compares the three with *Caranx*.

Also according to Lütken, *Alectis* is the young of *Hynn timer*, in which case *Alectis* has priority. Doubtless from lack of material, he did not demonstrate this as conclusively as he did the changes of age in *Selene vomer* and *Vomer setapinnis* and the view is not accepted by Jordan and Evermann for the American species. It is incorporated hypothetically in the table, and in the following discussion.

¹ See Nichols, 1916, Am. Naturalist, L, Sept., pp. 565, etc., for discussion of "foreign intermediate" forms.

TABLE IV.—Comparison of *Hymnis*, *Vomer*, and *Selene*

	Soft, dorsal and anal		Spinous dorsal		Ventral		Scutes	Body
	in adult	in young	in adult	in young	adult	young		
<i>Hymnis goreensis</i>	moderately falcate	streamers anteriorly (<i>Alectis</i>)	absent	reduced (<i>Alectis</i>)	moderate	large (<i>Alectis</i>)	reduced	deep (especially in young = <i>Alectis</i>) and compressed
<i>Vomer setapinnis</i>	very low	moderately falcate	low	anterior rays high	very small	large	vestigial	very deep (especially in young) and compressed
<i>Selene vomer</i>	falcate produced	moderately falcate	low	anterior rays produced	very small	large produced	absent	very deep (especially in young) and compressed

Some tendencies to specialization in these fishes are (1) towards a deep and compressed body, (2) reduction of peduncular scutes, (3) elongation of ventral fins, (4) production of spinous dorsal, (5) elongation dorsal soft rays. In the reduction of scutes (2) there is simple progression, *Hynniss*, *Vomer*, *Selene*; and, in general, it is most convenient to consider the three increasingly specialized in the order named. Applying this to deepening and compression of body (1), we find *Vomer* and *Selene* about equally more specialized than *Alectis-Hynniss*. In this respect all three become less specialized with age. It is notable that the young are much more abundant than the adults and, taken collectively, they may be considered as the vegetative or somatic portion of each species, in which specialization has been most rapid, adults lagging behind. In elongation of the ventral (3) in the young, *Selene* is most specialized, *Hynniss* and *Vomer* about equally less so. A complication is introduced by the very small ventral of adults of *Vomer* and *Selene*. This reversal of the specialization tendency may be a physiological corollary following exhaustion after early development. As regards the spinous dorsal (4), there is regular progression in the young, here paralleled by that in the adult. It will be noted that in this respect both *Alectis-Hynniss* and the adults of *Vomer* and *Selene* are below the specialization plane of ancestral *Caranx*. This may be explained by supposing that the common ancestor of our three genera was below that plane. The condition in soft dorsal and anal (5) is most complicated. It is highly specialized in *Alectis* (young), normal in *Hynniss* (adult). In *Vomer* and *Selene* young it is normal. This is the one character taken up which would lead one to suppose them less rather than more specialized than *Alectis* (*Hynniss*). The adults of *Vomer* and *Selene* are sharply contrasted here: *Selene* highly specialized (fin falcate, produced), *Vomer* reversely specialized (fins very low). The produced soft-dorsal of adult *Selene* is of very different character from that of *Alectis* (young) and shows no close relationship between the two.

With this review of conditions shown in the table, I will attempt to construct a phylogeny of the three genera. *Hynniss* (adult) is nearest the ancestral form (which I will call *Caranx prohynniss*). *Hynniss* is unquestionably primitive and most readily placed in *Caranx*, some species of which it resembles rather closely. There was a sharp differentiation adaptation after *C. prohynniss*; the *Alectis-Hynniss* fork reversed the general tendency by reduction instead of increase of the spinous dorsal, and lost the tendency to deepening of the preorbital portion of the head found in the other fork. *Vomer* and *Selene* are more closely allied to one another than to *Alectis*. Their general specialization has proceeded as sketched above. Their divergence in the high and low soft dorsal of the adult is a differentiation

adaptation, not an environmental adaptation or general evolutionary tendency. The suppression of spinous dorsal in *Hynnis* (adult), produced soft dorsal of adult *Selene*, and reduced soft dorsal of adult *Vomer* are all specializations which are differentiation adaptations. The fact that they reverse the custom of the environmental or evolution tendency specializations to be most marked in the young is correlated with this fact.

Summary

To sum up the writer's conclusions from the material examined: *Vomer* and *Selene* are both derivatives of *Caranx* through *Hynnis*, and all four genera separable. Three valid forms of *Vomer* exist, as differentiated by Jordan and Evermann on variation in depth and fin rays: *dorsalis*, *setapinnis*, and *cubensis* (= *gabonensis* J. and E., not of Guich.). There is great age variation in depth and considerable individual variation in fin rays. The three forms are close and probably overlap in characters, rather than in ranges to the extent supposed by earlier authors; though, as their migrations, aided by ocean currents, are considerable, this is not certain. *Dorsalis* is the West African form; *setapinnis*, American, both Atlantic and Pacific; *cubensis* West Indian (Cuba). The three should stand as subspecies of *setapinnis*. Pacific *V. s. setapinnis* differs slightly but not recognizably from that of the Atlantic. Following is a revised analysis of the three forms.

- a. Depth in adult about half length, or less.
 - b. Dorsal soft rays usually 24 (22-25). Anal usually 20 (19-20).

Vomer setapinnis dorsalis.
 - bb. Dorsal soft rays usually 22 or 23 (20-24). Anal usually 18 (17-19).

Vomer setapinnis setapinnis.
- aa. Depth in adult much more than half length. Dorsal soft rays 22. Anal 18.

Vomer setapinnis cubensis.