

COMMERCIAL SNAPPERS (LUTIANIDAE) OF THE GULF OF MEXICO¹

By ISAAC GINSBURG, *Assistant Aquatic Biologist*

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INTRODUCTION

There has recently come to the attention of the American fishery industry some species of snappers which have a prevailing red color, are taken in deep water, and have a close resemblance to the common and valuable red snapper, *Lutianus blackfordii*. These snappers, however, are not of the same excellence as the common red snapper, although it should be possible to find a market for them when sold under their own distinctive name. It is desirable, therefore, to point out the specific characters by which they may be distinguished. Current descriptions are based chiefly on young individuals, whereas there is a considerable difference in appearance between the young and the large market fish. Therefore the large fish are described and figured below, and it is shown how they may be distinguished from the more valuable common red snapper. Some problems connected with the further study of the snappers are indicated.

LUTIANUS VIVANUS

Synonyms of common names.—Silk snapper (St. Thomas, West Indies). Yellowtail (Pensacola, Fla.). Pargo de lo alto (Cuba). Vivanet, Vivanenux (Martinique). Chierkie boca blanca (Curacao).

Formulae.—D. X 14. A. III 8. Scales 72 to 73. Gill rakers 11 and 6 rudiments.

Description.—Upper profile rather gibbous in front, markedly ascending to the nape, where it makes a rather narrow curve horizontally, thence descending in a broad gentle curve to the caudal peduncle; lower profile of head gently descending, a broad very shallow curve from throat to anal fin.

Depth at origin of ventrals 2.95; head (measured to soft posterior apex of opercle) 2.82 in length without caudal. Snout (measured to soft anterior margin of eye) medium, 2.60; maxillary somewhat shorter than snout, 2.69 in head. Eye (measured horizontally by placing points of caliper between soft margins) rather large, 5.27 in head, 2.02 in snout, and 1.96 in maxillary; least depth of caudal peduncle 3.45 in head.

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Maxillary nearly reaching under anterior margin of eye; articulation of mandible nearly under anterior margin of pupil; margin of preopercle with a broad shallow emargination above lower angle, its entire edge finely denticulate, the spinules below the emargination coarser; knob on interopercle but faintly indicated.

Teeth in upper jaw with an outer enlarged row, 2 canines in front markedly larger than others with a pair of smaller canines between, one on either side of symphysis; the teeth behind enlarged ones gradually growing smaller posteriorly; a narrow band of villiform teeth behind outer enlarged row extending to angle of mouth and interrupted at symphysis. Lower jaw similarly with an outer row of enlarged teeth, the hindmost two conspicuously larger, the others subequal, the band of villiform teeth extending but a short distance on either side of symphysis. Teeth on vomer in a somewhat anchor-shaped patch, the backward extension on the midline of moderate length. Teeth on tongue in two patches, a large elongate patch on middle and a much smaller oblong patch in front.

Lower limb of first gill arch with 11 gill rakers and 6 tubercles in front, the gill rakers gradually passing into the tubercles; upper limb with 2 graduated gill rakers near the angle and 5 short stumpy subequal ones above, the latter sharply separable from the lower two. Same number of gill rakers on both sides.

Exposed portions of scales on sides, higher in front, the scales behind head at about level of posterior tip of opercle, being about $1\frac{1}{4}$ times as high as those over anal fin. Modified scales of lateral line not overlapping, numbering 51 to base of caudal; 72 vertically oblique rows over lateral line and 62 below (counting the rows running upward and backward); 9 in a row from origin of dorsal and 15 from origin of anal to lateral line; 7 rows on cheek; scales on cheek continued upward behind the eye to a level of upper margin of eye; behind the eye and slightly above a level through its upper margin there is present an isolated horizontal row of 7 small nonimbricate scales (may be called temporal scales).

Origin of dorsal over upper angle of base of pectoral distance of dorsal origin from tip of snout 2.51, and its base 1.95 in length without caudal, soft part angulated, ninth ray longest, 2.58 in head; pectoral strongly falcate, 1.13 in head, its tip reaching a vertical through vent; length of ventral 1.59 in head, its origin but slightly behind lower angle of base of pectoral, its tip falling short of anus by a distance nearly equal to vertical diameter of eye; origin of anal under base of third soft dorsal ray, end of its base under tenth dorsal ray, length of base 2.6 in head, the hind margin rather falcate, third soft ray longest, 2.24 in head, second spine 4 and third 3.58 in head; upper caudal lobe a little longer than lower, middle rays 1.81 in longest upper rays.

Color in fresh condition (iced specimen).—Rose red, darkest at back and gradually shading off to a lighter reddish silvery tint on belly. Centers of most scales on upper half usually greenish, frequently whitish, giving the fish somewhat of a streaked appearance. Caudal fin yellowish, washed with pink, with a marginal band of lighter yellow. Dorsal red margined and irregularly washed with yellow shades, especially on soft part. Anal similar to soft dorsal. Ventral pinkish washed with yellow. Pectoral light yellowish in anterior half becoming hyaline posteriorly, its base deep red. Pupil dark blue. Iris bright yellow. No dark lateral spot.

After being preserved in alcohol the bright red and yellow colors nearly all disappeared, while the black pigments became more prominent. The iris remained golden yellow, but some shadings of black pigment have appeared. A little diffuse black pigment at the base of the pectoral and a very narrow marginal streak of black on the posterior edge of the caudal became evident, although not seen in the fresh specimen. The longitudinal rows of small spot in the centers of the scales are present but have changed from greenish to brownish.

The foregoing description was drawn from a specimen 52 centimeters in total length. Another specimen of 63 centimeters received at the same time showed the following differences: The eye when fresh was orange suffused with red. The body is markedly deeper. The backward extension of the vomerine teeth is somewhat longer. The anterior patch of teeth on the tongue is much better developed, being subquadrate and about as wide as the posterior patch. The origin of the dorsal is further backward, being slightly behind origin of ventrals. The temporal band of scales is more oblique, nearly parallel to the nuchal band; the scales are larger, imbricate, and have a second incomplete row. These differences are slight and are most probably due to variation in the age of the specimens and to individual vari-

ability. To definitely determine their significance would require many specimens, and it is manifestly impractical to preserve great numbers of these large fish. These differences, therefore, are put on record here and their value must await being tested by field observations of the commercial catch. The proportional measurements of this specimen are as follows: Head 2.92, depth 2.75, antedorsal distance 2.56, and base of dorsal fin 1.92 in length without caudal, snout 2.55, maxillary 2.63, eye 5.55, longest dorsal spine (fourth) 2.57, pectoral 1.08, ventral 1.44, base of anal 2.51, second anal spine 3.8, third 3.6, longest soft anal ray (third) 2.26, caudal peduncle 3.16 in head. The color when fresh was of a deeper red all over, and the yellow shades on the fins and eye were not as pronounced. The caudal may best be described as red, washed with yellow shades. Iris orange color tinged with red. Base of pectoral shaded with dusky.

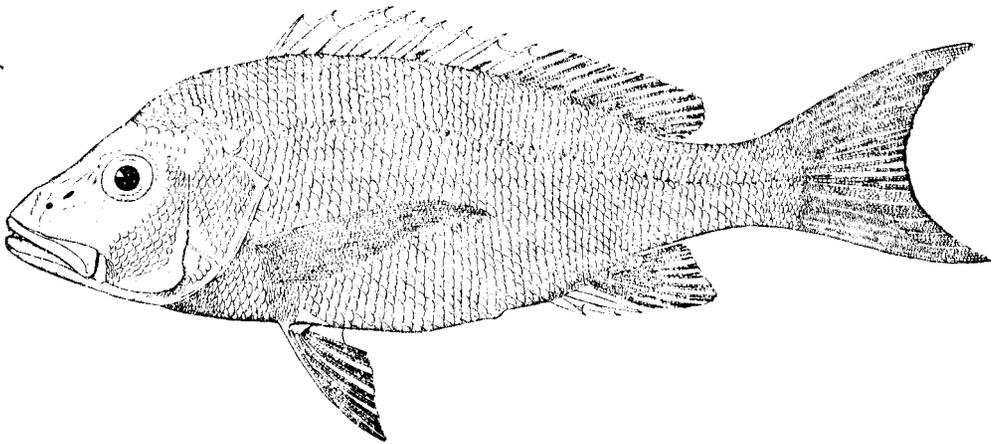


FIGURE 1.—*Lutjanus vivanus*. From a specimen 56 centimeters (22 inches) total length, taken at the Campeche Banks off the coast of Yucatan, in the Gulf of Mexico. Drawn by Miss Louella E. Cable

ECONOMIC IMPORTANCE

This species is a common market fish in the West Indies, where it is said to be highly esteemed. In the Caribbean Sea it seems to replace to a large extent the red snapper of the Gulf of Mexico. In the absence of any definite statistics it is not possible to estimate its exact economic importance or its relative importance to the other deep-water snappers. It is said to reach a weight of 40 pounds.

Students of the fishery industry of the United States have hitherto given little consideration to this fish. Recently, however, the present species appears to have entered the catch of the American snapper fishermen to a considerable extent. In a recent number of the Fishing Gazette (New York, vol. 47, No. 2, p. 37, February, 1930), there is an article regarding a "yellowtail" snapper which states as follows:

PENSACOLA, FLA., January 20.—During the last few months a great many of the fishing vessels from Pensacola have been fishing in deep water, where they have been catching the species of the red snapper known locally as the yellowtail. These fish are caught in deep water only and on being brought to the surface present a very attractive appearance, although they are several shades lighter in color than the red snapper and have a yellow tail and a bright yellow eye.

For some unknown reason the yellowtail will not keep for any length of time, and those that have been on ice only a short time give off a very disagreeable odor when cleaned and cooked. The bringing in of these fish to Pensacola has caused a good deal of complaint from the trade, and in all cases the customers were either made an allowance on the shipment or reshipped real red snappers.

The fishermen were given instructions to the effect that nothing over half of their catch could be yellowtails, but with the increased catches these instructions were changed to *no yellowtails will be accepted*. From now on only the real red snapper will be shipped from Pensacola.

The Bureau of Fisheries, acting on the above report, has received, through the courtesy of the Warren Fish Co. of Pensacola, two specimens of the "yellowtail" referred to above, which form the basis of the foregoing description. In view of the fact that what appears to be the same species is said to be a highly esteemed market fish in the West Indies, it seems possible to find a market for this fish in this country when sold under its own name, instead of lumping it with the red snapper.

J. F. Taylor, president of the Warren Fish Co., in a letter dated March 14, 1930, accompanying the shipment, has made some interesting remarks regarding the economics of this fish, as follows:

Agreeable to your request we are sending you two different specimens of yellowtails and in addition are sending a third specimen which the fishermen have dubbed hambone [*L. buccanella*]. This latter fish is comparatively rare and is taken only on rock bottom.

The yellowtails are very plentiful and are taken, generally, from mud bottom. Whether they take mud into their stomachs when feeding or whether there is some other cause that makes them objectionable we are not certain, but we do know that our trade decline to handle them, claiming that they do not keep well, also that they give off a very strong odor while cooking, and that a great many complaints are received to the effect that the fish "curl"² while cooking.

RELATIONSHIP

This species is very similar in general appearance and coloration to *L. blackfordii* and *L. campechanus*, so that the three may be readily confused. The three species form a group of closely related snappers, having a close resemblance to one another, being of a predominating red color, and found chiefly in deep water. They may be distinguished by the following analysis of their characters. The present species is especially close to *campechanus* from which it may be separated with difficulty, although when two specimens were placed side by side it is evident that they represent two distinct species.

- a. Anal fin with 8 soft rays. Scales in 69 to 73 oblique rows above lateral line. Lower limb of first gill arch with 15 to 17 gill rakers, including the 5 or 6 rudiments.³ Scales on anterior part of body below lateral line not much larger than posterior scales. Eye in large specimens comparatively large, approximately 2 in snout.
- b. Snout conspicuously short and compact, rather shorter than maxillary. Head shorter, 2.94 (in individual 50 centimeters long) to 3.11 (in 72.5-centimeter fish). Scales above lateral line markedly smaller than those below, 69 to 71 oblique rows above and 53 to 57 below. Gill rakers on lower limb of first gill arch 15, including 5 rudiments. Caudal peduncle deeper, 3.00 (in 50-centimeter fish) to 2.9 (in 72.5-centimeter fish). Anal spines comparatively more slender. Posterior edge of preopercle making a right or slightly acute angle with the lower edge. Iris red in life; yellow shades very sparse or absent.-----*L. campechanus*

¹ In connection with the last statement of Mr. Taylor, it is interesting to note that Poey in his description of (Mesoprion) *Lutjanus rosaceus* (Ann. Lyc. Nat. Hist. New York, vol. 9, p. 318, 1870) states with respect to that species: "The flesh is hard to cook; it swells, twists, and remains hard, though its flavor is not bad." *L. rosaceus* is also said to have "the caudal yellowish toward the margin." This latter species, in view of the characters of its teeth, has been doubtfully regarded to be the same as the muttonfish. However, the remarkable coincidence in the character of the meat, which one states that it "twists" and another that it "curls," is significant. Does the name *L. rosaceus* represent a species distinct from the muttonfish, and is the "yellowtail" of Pensacola partly this species? This is a problem which should receive attention in future studies of the snappers of the Gulf. The two specimens sent by Mr. Taylor have the teeth on the vomer and tongue like those described for *L. vitanus*. Very little is really known regarding the deep-water snappers, although of so much economic importance. One great drawback to a comprehensive study of these fishes is their large size. Descriptions are based, therefore, on too few preserved examples, or on market fish where conditions are not favorable for close comparative study.

² The number of gill rakers in the American species of *Lutjanus* generally shows remarkably little intraspecific variation if the "rudiments" are included in the count. These so-called rudiments in the very young are really very short gill rakers; and, while they are rather abruptly shorter than the posterior gill rakers, no consistent line may be drawn between them. As the fish grows older the anterior short ones are gradually reduced and become "rudiments" or "tubercles." Since this process is gradual up until a certain length, conflicting results will be obtained when the rudiments are not included in the count.

bb. Snout a little longer than maxillary. Head 2.82 (in 56-centimeter fish) to 2.92 (in 65-centimeter individual). The difference in the scales above and below the lateral line not so great, 72 to 73 oblique rows above and 62 to 65 below. Gill rakers on lower limb of first arch 17, including 5 rudiments. Caudal peduncle more slender, 3.45 (in 56-centimeter fish) to 3.16 (in 65-centimeter fish), in head. Anal spines notably stouter. Posterior edge of preopercle making an obtuse angle with lower edge. Iris bright yellow in life (becoming reddish orange in older fish); caudal fin more or less extensively diffused with yellow shades.

L. vivanus

aa. Anal fin with 9 soft rays. Scales in 58 to 63 rows above lateral line, 47 to 48 below. Lower limb of first gill arch with 14 gill rakers, including 5 rudiments. Scales on anterior part of the body below lateral line strikingly larger than those on posterior part of body. Eye in large specimens comparatively smaller, about $2\frac{1}{4}$ in snout. Snout slightly longer than maxillary. Iris red in life; yellow shades on caudal not extensively developed.---*L. blackfordii*

The above analysis partly refers only to large specimens, 2 *blackfordii* 77.5 and 79 centimeters, 2 *vivanus* 56 and 63 centimeters, and 2 *campechanus* 72.5 and 50 centimeters. Smaller specimens of this genus differ markedly in their proportional measurements, the principal difference being in the strikingly larger mouth, comparatively, the longer maxillary, the larger eye, and the shorter snout in the young. These characters while of specific significance, are consequently of value only when specimens of approximately like size are compared. Also in the young, the pectoral and ventral fins extend further back in relation to the vent and anal origin, and the spines are relatively longer. The relatively large size of the scales on the anterior part of the side is strikingly evident in a specimen of *blackfordii* of 155 millimeters which has been examined.

NOMENCLATURE AND SYNONYMY

This species is evidently the same as is currently designated by writers as *L. vivanus*, and accepted usage and synonymy have been followed in this paper. One discrepancy, however, may be pointed out. Cuvier and Valenciennes describe 13 dorsal rays. The same number was found by Jordan, who reexamined the types. Also, Gunther, who had four specimens from Jamaica and Bahia records the same number of dorsal rays. Now, since the number of dorsal rays in the species of Lutianus generally show but a small degree of variation, these recorded numbers are significant; and, while they may be due to errors in counting or to individual variation, yet it is well to bear them in mind in any future investigation of the snappers. With regard to *profundus*, which has generally been placed in the synonymy of this species, Poey states that the black lateral spot begins to disappear in individuals over 10 pounds. However, he later made another statement (in Fauna Puerto Riquena by Gundlach, p. 321) that he saw the lateral spot only once in a specimen as large as 160 millimeters, which by implication, corrects his previous statement regarding the lateral spot. Poey, in his description of *profundus*, does not mention any yellow shades on the tail, but on the contrary states "le carmin devient plus vif a l'extremite de la caudale." This may be due, however, to individual variation.

The synonymy of the three species is evidently inextricably scrambled. To straighten this out satisfactorily would require a reexamination of the widely scattered material on which the records are based, a task which is difficult to perform. Some of the records are also based on examination of fish in markets, and, consequently, are impossible of verification, while others no doubt include more than one species. However, it would help toward an understanding of the species, if the synonymy were segregated, in so far as that may be done by considering published descriptions solely.

I have attempted below the thankless task of segregating the synonymy of the three species. This should prove useful, but it must be taken with a grain of salt. Cope's *torridus* has been placed in the synonymy of this species, following the action of Jordan and Swain. It may be pointed out, however, that Cope's fish had a relatively deeper body considering its size, a longer pectoral fin, and the author also mentions a brown stripe under the dorsal fin, characters which would suggest *buccanella* a description of which is given below.

GEOGRAPHICAL DISTRIBUTION AND HABITAT

Since published records are doubtful, no final comprehensive statement may be made now with assurance in regard to the range of the separate species. It seems evident that their ranges overlap. *L. vivanus* and *L. campechanus* are more southern fish, while *blackfordii* ranges further northward; but all three probably occur together in the southern part of the Gulf of Mexico, in the Caribbean Sea, and possibly as far south as Brazil. They seem also to differ with respect to their habitat. *L. blackfordii* occurs on rocky bottom, and the great bulk of the catch is probably obtained in water up to 50 fathoms in depth, while *vivanus* lives on muddy bottoms and generally ranges in deeper water. *L. campechanus* may also be expected to occur in deeper water than *blackfordii*. The specimens here described were obtained by the fishermen out of Pensacola, in the Gulf of Mexico, on the southern edge of the Campeachy Banks in about 73 fathoms.

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- Mesoprion profundus*, Poey, t. c. p. 294, 1868 (Synopsis).
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- Mesoprion vivanus*, Jordan, Pr. U. S. Nat. Mus. 9: 534, (1887), 1886. (Reexamination of types.)
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- Lutjanus vivanus*, Jordan and Fesler, Rep. U. S. Comm. Fish. (1889-91), p. 445, 1893.
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- Neomaenis vivanus*, Evermann and Marsh, Fishes Porto Rico, p. 175, 1900. (Porto Rico.)
- Neomaenis vivanus*, Barbour, Bull. Mus. Comp. Zool. 46: 121, 1905. (Bermuda.)
- Lutianus vivanus*, Bean, Publ. Field Colum. Mus. Chicago, (Zool. ser.) 7: 56, 1906. (Bermuda.)
- Lutjanus vivanus*, Metzlaar, Rap. Kolonie Curacao, p. 64, 1919. (Curacao; St. Martin; St. Eustatius.)
- Lutianus vivanus*, Nichols, Fish. Porto Rico and Virgin Islands, p. 264, 1929. (San Juan, Porto Rico, market.)

LUTIANUS BLACKFORDII

COMMERCIAL IMPORTANCE

This is the common red snapper which is sold in the markets of this country. It is obtained largely in the Gulf of Mexico and marketed chiefly through the port of Pensacola. Small quantities are also taken by the fishermen on the east coast of Florida and off Georgia. Almost the entire catch is obtained with hook and line

in deep water. The red snapper is one of the important food fishes of this country. During 1927, which probably represents an average year, it was marketed to the extent of about 12,000,000 pounds, which brought \$1,000,000 to the fishermen. Among the commercial food fish of the Gulf coast, excluding mollusks and crustaceans and the menhaden, the red snapper is second in point of quantity obtained, being exceeded only by the mullet, while its value to the fishermen is not much less than that of the mullet, although about $2\frac{1}{2}$ times as much of this latter fish is marketed. Aside from its monetary value, the red snapper is of importance as a natural food resource because of the excellence of its meat. This species is well known for its delicious flavor, being second to none among the marine fishes of the United States.

BIOLOGY

While it is a very important food fish, it is significant that practically nothing is known regarding the life history of the red snapper. It is not known definitely when or where it spawns. According to Silas Stearns, who has been quoted by Goode, well-developed ovaries are found in those taken from April to July. It seems highly probable that they spawn in deep water, where the young fry remain and grow. This may be inferred as a consequence of the fact that its young are not taken, or are quite rare, in shallow water. The young of other species of *Lutianus*, such as the gray, dog, and lane snappers, the muttonfish, and the schoolmaster are often taken in shallow water by seining. They are more common in shallow water in the southern part of Florida and form more or less a permanent and characteristic feature of the shore fauna from North Carolina southward. The young of the red snapper, however, are either not present in such situations or they are very rare. They should apparently be looked for in deeper water by means of trawling apparatus.

Smith (in *Fishes of North Carolina*, p. 228, 1907) records young red snappers as having been seined on the beach at Beaufort, N. C. This record, in part at least, is evidently based on an error in identification. I have recently examined in the collection of the Bureau of Fisheries two young specimens, 57 millimeters long, taken at Beaufort, N. C., in 1902, and labelled *L. blackfordii*. These are, apparently, the specimens on which the record in *Fishes of North Carolina* is based. One of these is a young muttonfish. The other specimen, while strikingly similar in appearance, has 12 dorsal rays, a backward extension of the vomerine teeth, and a few less rows of scales. It is most probably a young lane snapper, although I do not have sufficient material of that size to establish the identification with certainty. Young specimens have been recorded from as far north as Massachusetts, these supposedly being stragglers which have been carried there by the Gulf stream.

NOMENCLATURE AND SYNONYMY

The name *Lutianus blackfordii* was undoubtedly applied to the common red snapper and has been frequently used by American writers for this species. Confusion has resulted from attempts to introduce the name *aya* which was based on Marcgrave's account of some Brazilian fish. Now, if the Brazilian "red snappers" were well known it might have been possible to dispose of this name with some degree of assurance that such action would not have to be changed. Since, however, very little is known regarding these fishes on the coast of Brazil, it is not advisable to associate that name at present with the common American fish.

Jordan in his Manual of Vertebrates (ed. 13, p. 175) and again Jordan, Evermann, and Clark in the new edition of the Check List of Fishes (Report, United States Commissioner of Fisheries, 1928 (1929), p. 2, p. 326, 1930) designate the common commercial red snapper of the Gulf of Mexico *Lutjanus campechanus*, purporting to base their action on an investigation by Hildebrand and Ginsburg (Bulletin, U. S. Bureau of Fisheries, Vol. XLII, pp. 77-85, 1927). This is, however, an erroneous interpretation of our conclusions. In the paper cited the name *blackfordii* was applied to the common commercial red snapper of the Gulf. Besides this common species, we have pointed out that there is another species which was apparently confused with *blackfordii*. This second species we have called *campechanus* because it agreed essentially with Poey's description of the type specimen of that species. The relative abundance and geographical range of *campechanus* is unknown at present. A correct interpretation of our paper has been given by Breder (Field Book of Marine Fishes of the Atlantic Coast, pp. 171-172, 1929).

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- Lutjanus blackfordii*, Goode, Game Fish. N. Amer., p. 16, col. pl., 1878.
- Lutjanus blackfordii*, Goode, Pr. U. S. Nat. Mus. **2**: 114 (1880) 1879. (St. John River, Fla.)
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- Lutjanus blackfordii*, Goode and Bean, t. c., p. 43.
- Lutjanus campechanus*, Jordan, t. c., p. 125. (Key West.)
- Lutjanus vivanus*, Jordan and Swain, t. c., p. 453. (Key West.)
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- Lutjanus blackfordii*, Moore, Bull. U. S. Fish Comm., **12**: 375 (1892) 1894. (New Jersey.)
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- Neomaenis aya*, Evermann and Marsh, Fish. Porto Rico, p. 174, col. pl. 20, 1900 (Porto Rico).
- Neomaenis blackfordii*, Bean, Fish. Long Island, p. 440, 1901. (Massachusetts, Long Island, Block Island.)
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- Neomaenis blackfordii*, Bean, Food, Game Fish., New York, p. 415, fig. col. plate, 1903. (In the Report for the Fish and Game Commission, New York, 1901.)
- Lutjanus blackfordii*, Smith, Fishes North Carolina, p. 287, fig. 127, 1907. (North Carolina.)
- Lutjanus aya*, Schroeder, Rep. U. S. Comm. Fish., 1923, app. 12, p. 19, 1924.
- Lutjanus blackfordii*, Hildebrand and Ginsburg, Bull. U. S. Bur. Fish. **42**: 80, fig. 1 (1926) 1925. (Pensacola, Key West.)
- Lutjanus aya*, Nichols and Breder, Zoologia, **9**: 85, fig., 1927.
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- Lutjanus campechanus*, Jordan, Man. Vert. ed. 13, p. 175, 1929.
- Lutjanus blackfordii*, Breder, Field book mar. fish., Atlantic Coast, p. 171, 1929.

LUTIANUS CAMPECHANUS

This is, apparently, the common red snapper of the Caribbean Sea and is quite easily distinguishable from the red snapper of the Gulf of Mexico. Hildebrand and Ginsburg (1925) have pointed out the distinctness of the two species, having at the time but a single specimen of *campechanus*. The conclusion of these authors is now corroborated by another specimen, kindly sent to the bureau by Mr. Taylor of the Warren Fish Co., Pensacola, Fla. The specimen was received in fresh condition, on ice. It was one of a lot of 6,000 pounds of the same species obtained at latitude 16° N., longitude 83° 58' W., on coral bottom, in 35 to 45 fathoms. It agrees closely with the other specimen previously described by the foregoing authors as *campechanus*. In view of the comparatively large catch obtained by one crew at a single locality, it seems probable that the common red snapper of the Caribbean Sea represents this species rather than *blackfordii*. The present species is readily separable from *blackfordii* when specimens are directly compared; and after one becomes familiar with the appearance of the two species and the differentiating structural characters, it is an easy matter to identify them. However, it is difficult to formulate well-marked differences by which the present species may be separated from *vivanus*, although the two are evidently distinct. The chief differences which the specimens at hand indicate are a lesser number of oblique rows of scales below the lateral line; a somewhat shorter snout, which may be expressed by the numerical value of the ratio of the eye to the snout and the snout to the maxillary; a somewhat deeper caudal peduncle when fish of approximately the same size are compared; and one or two less gill rakers on the lower limb of the first gill arch, in *campechanus*. Previous authors who examined fresh material emphasize the yellow color of the iris in *vivanus*. This was also strikingly shown in the smaller specimen of *vivanus* at hand (56 centimeters), but in the larger specimen (63 centimeters) the iris was suffused with pink color, which would seem to show that in older examples this character loses its usefulness to a certain extent.

NOMENCLATURE AND SYNONYMY

The references given below, in part at least, seem to belong to this species which evidently was quite generally confused with *blackfordii* and perhaps with other species of *Lutianus*. It is evident that Poey's original description of *campechanus* was based on a specimen of this species. This author also evidently supposed that the common red snapper of the Gulf of Mexico was the same as his species. His later references to the "pargo guachinango," for which he uses the Latin name *campechanus*, may be taken, therefore, to include also *blackfordii*. Jordan, basing his action on the same supposition, placed *campechanus* in the synonymy of (*aya*) *blackfordii*. However, in view of the data presented here, it seems highly probable that the "pargo guachinango" of the Cuban fishermen is a mixture of the two species. Poey also had two specimens of snappers, one from Santo Domingo and another from the southern coast of Cuba, which he called *aya* and later changed the name to *purpureus*. He stated that they differed from (*profundus*) *vivanus* chiefly in having a red eye. They were evidently examples of the present species, and these references are therefore included here.

?Acara aya, Marcgrave, Hist. Brasil, p. 167, 1648. (Brasil.)

Anthias aya, Bloch, Ichthyol. pl. 227, 1797. (Linnean name for Marcgrave's account.)

Anthias ruber, Bloch and Schneider, Syst. Ichthy. p. 330, 1801. (Based on Marcgrave's account.)

- Mesoprion aya, Cuvier and Valenciennes, Hist. Nat. Poiss. 2: 457 (quarto ed., p. 346), 1828. (Santo Domingo.)
- Mesoprion aya, Gunther, Cat. Fish. Brit. Mus. 1: 198, 1859. (Jamaica; South America.)
- Mesoprion campechanus, Poey, Memorias Hist. Nat. Cuba 2: 149, 1860.
- Mesoprion aya, Poey, Reportorio Fis. Nat. Cub. 1: 267, 1866. (Santo Domingo.)
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- Mesoprion campechianus, Poey, Ann. Lyc. Nat. Hist. New York 9: 317, 1870.
- Lutjanus purpureus, Poey, An. Soc. Esp. Hist. Nat. 4: 102, 1875 (Enumeratio, p. 29). (Santo Domingo; Cuba.)
- Lutjanus campechianus, Poey, An. Soc. Esp. Hist. Nat. 4: 105 (Enumeratio, p. 29), 1875.
- Lutjanus campechianus, Jordan and Gilbert, Bull. U. S. Nat. Mus., 16: 921, 1882.
- Lutjanus vivanus, Jordan and Swain, Pr. U. S. Nat. Mus., 7: 455 (1885), 1884. (Description of type.)
- Neomaenis aya, Miranda Ribeiro, Arch. Mus. Nac. Rio de Janeiro, vol. 17, Lutianidae, p. 8, 1915 (Brazil). (In the description the anal rays are like *blackfordii*. The proportional measurements resemble more *vivanus* or *campechanus*, but these may be due to the size of the specimen described, which is not stated.)
- Lutjanus aya, Metzlaar, Rap. Kolonie Curacao, p. 64, 1919. (Aruba.)
- Lutianus campechanus, Hildebrand and Ginsburg, Bull. United States Bur. Fish., 42: 82, fig. 2 (1926) 1927. (Off Honduras.)
- Lutianus campechanus, Breder, Bull. Bingham Oceanographic Collection 1: 46, 1927.
- Lutianus campechanus, Beebe and Tee-Van, Zoologica, 10: 150, fig., 1928 (outline drawing more nearly like *blackfordii*).
- Lutianus campechanus, Breder, Field book mar. fish. Atlantic Coast, p. 172, 1929.
- Lutianus aya, Nichols, Fish. Porto Rico and Virgin Islands, p. 263, fig. 132, 1929 (drawing more like *blackfordii*). (Ponce, Porto Rico, market.)

LUTIANUS BUCCANELLA

Common names.—Blackfin snapper (Bermuda; Jamaica). Sesi (Cuba). Sesi de lo alto (Cuba). Oreille noire (Martinique). Bouchanelle (Martinique). Calala di hindu (Curacao).

Formula.—D. X 14: A. III 8. Scales 67. Gill rakers 12 and 5 rudiments.

Description.—Form oblong, deep bodied, and high backed. The anterior profile rapidly ascending almost to origin of dorsal. Back arched rather high. Lower profile of head gently descending. Belly from gill opening to origin of anal fin a nearly straight line.

Depth at origin of ventrals 2.53; head 2.59 in length to caudal base. Snout medium 2.52; and maxillary but slightly longer than snout, 2.49 in head. Eye rather large, 5.35 in head, 2.12 in snout, and 2.15 in maxillary. Depth of caudal peduncle 3.38 in head.

Extremity of maxillary reaches under anterior margin of eye; articulation of mandible under anterior margin of pupil. Margin of preopercle with a broad, rather well-developed emargination, the middle of the emargination having a rounded spur projecting backward, the outline of the emargination thus being biconcave; interopercle with a well-marked knob; edge of preopercle finely but distinctly serrate, the serræ below the emargination being somewhat coarser.

Outer row of canines in upper jaw, with 2 teeth on either side of symphysis rather larger than others. Mandible with 2 lateral teeth somewhat larger than others. The inner band of villiform teeth in upper jaw extends nearly to angle of mouth, in lower jaw reduced to a short elongate patch on either side of symphysis. Teeth on vomer in a somewhat anchor-shaped patch, the prolongation on the midline rather short. Teeth on tongue in an elongate patch in middle with a small patch in front.

Lower limb of first arch with 12 gill rakers and 5 tubercles on right side, 10 gill rakers with 7 tubercles on left; upper limb with 2 graduated gill rakers at the angle and 6 short stumpy, subequal ones above.

Scales below lateral line rather higher on anterior part of body, than those over anal fin. Scales in lateral line 51, not overlapping one another. Oblique rows of scales quite irregular, 67 rows above lateral line and 56 below; 8 scales in a row from lateral line to origin of dorsal and 13½ to origin of anal; 6 longitudinal rows on cheek.

Origin of dorsal nearly over that of ventral, distance of dorsal origin from tip of snout 2.27, and its base 2.07 in length to caudal base; fourth spine the longest, 2.68; and eighth soft ray the longest, 3 in head, the soft part rounded. Pectoral 1.2 in head, its tip reaching nearly to a vertical

through origin of anal. Length of ventral 1.82 in head, its origin under lower angle of base of pectoral, its tip falling short of arms by a distance equal to one-half diameter of eye. Origin of anal under base of first dorsal soft ray, its posterior angle under eleventh dorsal soft ray, length of its base 2.8 in head; posterior outline rounded; third soft ray longest, 2.7; second spine 3.95; third spine subequal to second, 3.90 in head.

Color in fresh condition (iced specimen).—Ground color of body light red, more intense above shading to lighter below, centers of scales a much lighter pink. Tail with a broad marginal band of yellow washed with reddish, interrupted in middle by continuation of the predominating red color of rest of tail. On one side the broad marginal interrupted band of yellow, preceded by a definite band of red of a more intense color than base of tail, which is red lightly washed and blended with yellow. Anal and ventral red irregularly margined and washed with yellow. Dorsal red washed and margined with yellow and irregularly shaded with bluish. Pectoral red mingled with yellow above, light pink below. Base of pectoral black, a wide, somewhat diffuse black blotch behind and a narrower curved jet black band in front. A dark diffuse band on the scales covering base of soft dorsal, gradually fading out under spinous dorsal, the band consisting of purplish blue and black pigment mixed with the red ground color. No black lateral spot. Pupil dark blue; iris pinkish yellow on one side and reddish orange on the other. According to Poey, the young, up to

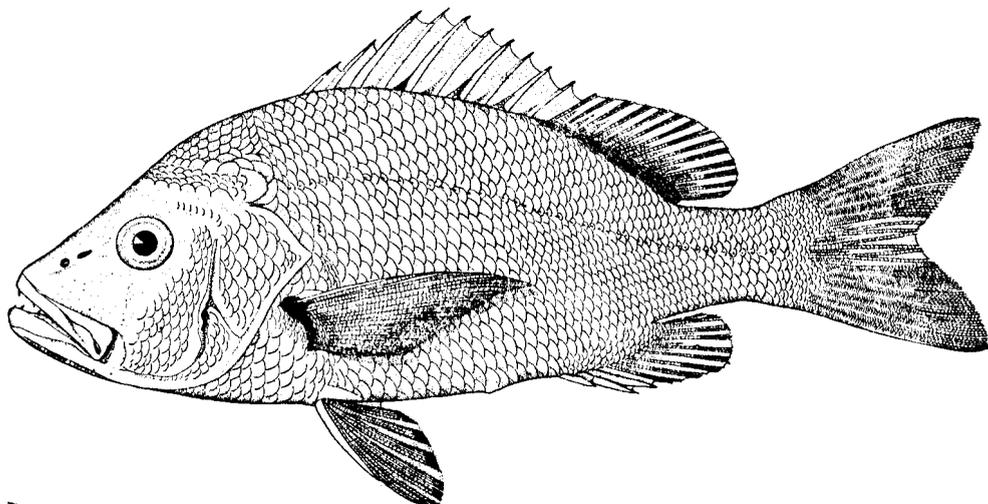


FIGURE 2.—*Lutianus buccanella*. From a specimen 52 centimeters (20.5 inches) total length, brought in by the snapper fishermen in a sea going schooner and taken in the Gulf of Mexico, exact locality not being known. Drawn by Miss Lonella E. Cable.

about 6 or 7 inches, have the caudal peduncle yellow above. In the large specimen at hand this part was of the same color as the rest of the body.

After being in alcohol nearly all of the bright red and yellow pigments have disappeared. The black at the base of the pectoral and the diffuse dark band at the base of the posterior part of the dorsal persist.

ECONOMIC IMPORTANCE

It is used for food when captured, and its flesh is well liked. It is, however, usually not as common as *blackfordii* and *vivanus*, although it is reported to be common in the market at times. Cuvier and Valenciennes report a weight as high as 20 pounds, but the average is much less, and the species does not seem to attain to the size of the red snapper.

GEOGRAPHICAL DISTRIBUTION AND HABITAT

This is another species of snapper of a predominating red color which occurs in deep water like *blackfordii*. It is taken on rocky bottom, but its range is apparently in deeper water. It has been previously reported from various islands bordering

the Caribbean Sea; namely Cuba, Jamaica, St. Thomas, St. Martin, Martinique, and Curacao. It also occurs at Bermuda. The present specimen was obtained by the Pensacola fishermen in the Gulf of Mexico, exact location not being given.

RELATIONSHIP

This species is closely related in its structural characters to the other three deep-water snappers analyzed above. The rounded form of the anal fin distinguishes the present snapper. When the anal fin is broken it may be recognized by its relatively deeper oblong body. A good color mark which persists in preserved specimens is the jet black spot at the base of the pectoral. It is well to mention, however, that in the other three species there may be some black pigment of varying intensity at the base of the pectoral.

NOMENCLATURE AND SYNONYMY

Because of the characteristic jet black spot at the base of the pectoral this species seems to have been generally correctly identified. Goode's (1876) *aya* from Bermuda, judging by the description of the characteristic color marks is apparently of the same species as our specimen. According to Bean (1906), (*aya*) *blackfordii* does not occur at Bermuda. Jordan and Swain (1884), basing their description on a specimen from Cuba, state "body rather slender." This statement does not apply to the present fish and is unlike descriptions of other authors who mention depth of body. It may possibly be due to the size of their specimen, which was 8 inches, but in Poey's figure of a young individual the body is not particularly slender for a snapper. As stated above (p. 270) Cope's *L. torridus* may represent a specimen of this species.

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- Mesoprion buccanella, Guichenot, Hist. Fis. Nat. Cuba, ed. by Ramon de la Sagro, 4: 156 (Spanish ed.), 1853. (Cuba.)
- Mesoprion caudonotatus, Poey, Memorias Hist. Nat. Cuba 1: 440 pl. 3, fig. 3, 1854. (Cuba.)
- Mesoprion buccanella, Gunther, Cat. Fish. Brit. Mus. 1: 198, 1859. (Cuba; Jamaica.)
- Mesoprion buccanella, Poey, Repertoria, Fis. Nat. Cuba 1: 267, 1866.
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- Lutjanus buccanella, Jordan and Swain, Pr. U. S. Nat. Mus. 7: 445 (1885), 1884. (Cuba.)
- Lutjanus buccanella, Jordan and Fesler, Report United States Comm. Fish. 1889-91, p. 445, 1893. (St. Lucia.)
- Lutjanus buccanella, Diaz, Peces de Cuba, p. 55, 1893.
- Neomoenis buccanella, Jordan and Rutter, Pr. Ac. Nat. Sc. Philadelphia, 1897, p. 108. (Jamaica.)
- Lutianus buccanella, Bean, Publ. Field Mus. Nat. Hist. Chicago (Zool. ser.) 7: 57, 1906.
- Neomaenis buccanella [Sic.], Nichols, Amer. Mus. Nat. Hist. 31: 188, 1912. (Habana market.)
- Lutjanus buccanella, Metzlaar, Rap. Kolonie Curacao, p. 63, fig. 23, 1919. (Curacao; St. Martin, West Indies.)