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ON SOME BRACKISH WATER MOLLUSCA FROM THE LAKE OF MARACAIBO

by

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INTRODUCTION

The Lake of Maracaibo, situated in the northwestern part of the Venezuelan Republic, occupies the centre of a large topographical and structural depression between the Colombian Andes on the west and the northeast trending Venezuelan Andes on the south and east. It is a flask-shaped body of water, measuring about 200 kilometers from north to south and its width varies from about 100 kilometers in the south to less than 10 kilometers between the City of Maracaibo and the village of Altigracia. Though it has an open connection with the Caribbean sea through the Gulf of Venezuela, the water of the Lake is almost fresh on account of the many rivers emptying into it from the mountains to the south, west and east.

North from Maracaibo, however, where the Lake empties into a small bay, called the Bay of Tablazo, the water changes gradually from slightly brackish to more saline. The water in this part of the Lake is extremely shallow because of filling in with sediments and only one deep and narrow channel running between the Peninsula of San Carlos and the Isle of Zapara allows medium sized ships to reach the City of Maracaibo.

Hedberg (1934) investigated the occurrence of recent foraminifera in the lake waters and recognized a number of brackish and shallow water species. He points out that the salinity of the water of the Maracaibo Strait and the Bay of Tablazo is variable, because especially during the rainy season a considerable quantity of fresh water finds its way into the Gulf of Venezuela through the Maracaibo Strait. On the other hand, semidiurnal tides may affect the salinity of the northern part of the Strait to some extent. Analyses of the lake water from Maracaibo and vicinity, however,

show the maximum salinity never to exceed a small fraction of that of normal sea water.

Since the distribution of recent Molluscan faunas is highly influenced by ecological factors, the characteristic brackish water fauna from the northern part of Lake Maracaibo deserves special attention. It is an extremely poor fauna as far as the number of species is concerned, though locally some of the species involved may occur in large quantities as the author has been able to observe. The following species have been collected at various localities from the northern part of Lake Maracaibo, duplicates of which were presented to the Rijksmuseum van Natuurlijke Historie at Leiden (Holland):

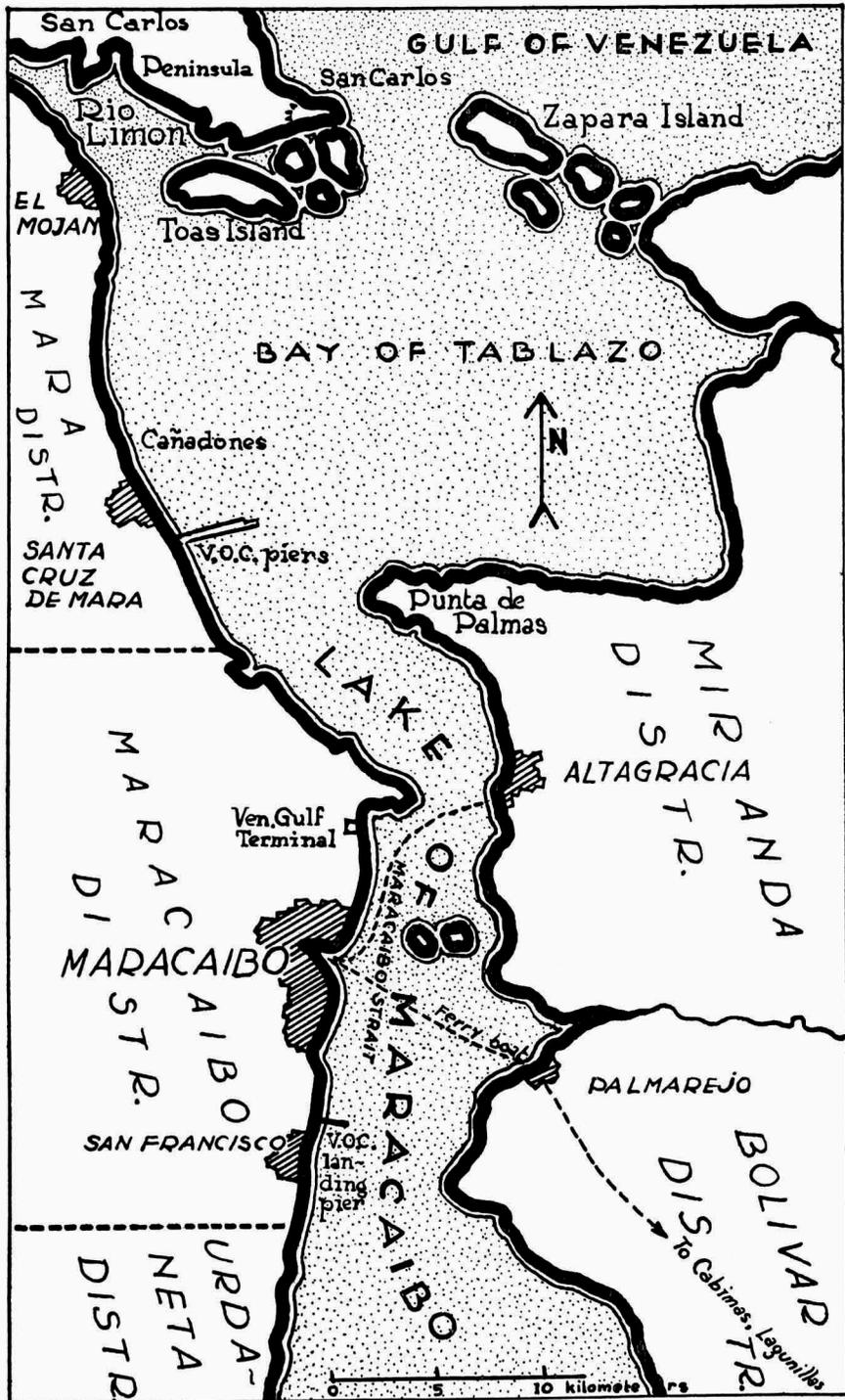
- Polymesoda arctata* (Deshayes)
- Neritina reclinata* (Say)
- Neritina meleagris* Lamarck
- Littorina nebulosa* (Lamarck)
- Melampus coffeus* (Linné)

A few kilometers more to the north, however, a rich and completely marine Molluscan fauna is found along the northern coasts of the Peninsula San Carlos and the Isle of Zapara, including such genera as *Tellina*, *Donax*, *Cypraea*, *Melongena*, *Cymatium*, etc.

In view of the prevailing topographical conditions it is extremely interesting to compare this fauna with the poor brackish water fauna from the northern part of Lake Maracaibo, referred to in the preceding paragraph.

Since the northern coasts of the San Carlos Peninsula and Zapara Island are directly facing the Gulf of Venezuela, it is by no means surprising to find a rich and fully marine Molluscan fauna there. It is noteworthy, however, that in spite of the open connection between the Gulf of Venezuela and the northern part of Lake Maracaibo, this marine fauna apparently has never been able to spread a few kilometers more to the south, to the shores of the Bay of Tablazo. It is true that along these shores the shells of more marine species have occasionally been found, but always in limited quantities and the bleached and worn appearance of these shells clearly points to transport by currents from the north. The brackish water species referred to above, however, have all been found here in large quantities and always in a fresh or even living state, with the exception of *Melampus coffeus* (L.), of which so far only a few empty shells have been collected.

Thus we may safely assume that the striking difference between the Molluscan fauna of the Gulf of Venezuela and the northern part of Lake Maracaibo is due to an abrupt change in physical conditions. The sudden decrease in the salinity of the water from North to South undoubtedly



Sketch Map of Maracaibo Strait and Bay of Tablazo (Lake of Maracaibo), Estado Zulia, Venezuela. Slightly altered after H. D. Hedberg.

must be considered as one of the most important factors in causing a different faunal community. However, changes in the depth of the water, different bottom conditions and temperature of the water may well have contributed also towards this change in fauna.

The different species which have been collected will be more fully discussed hereafter. The author is very grateful to various persons who enabled him to study some of the species involved more closely in the collections of different scientific institutions. Among these are Dr. Ch. Bayer (Museum of Natural History, Leiden); Mrs. W. S. S. van der Feen-van Benthem Jutting (Zoological Museum, Amsterdam); Dr. W. Adam (Museum of Natural History, Brussels); and Dr. C. G. Aguayo (Museum Poey, La Habana).

I am also much indebted to Dr. R. Wright Barker (Maracaibo) for his helpful suggestions and constructive criticism. Finally I wish to thank my friend Mr. P. Kaas (The Hague) to whom I owe the figures accompanying the present article.

DESCRIPTION OF THE SPECIES

***Polymesoda arctata* (Deshayes, 1854) (fig. 5)**

Cyrena arctata Deshayes, 1854, Proc. Zool. Soc. London, xxii, p. 20.

Cyrena arctata, Prime, 1865, Mon. Am. Corbiculadae, p. 16, fig. 10.

Cyrena arctata, v. Martens, 1873, Binnenmoll. Venezuela's, p. 211.

Polymesoda arctata, Baker, 1930, Occ. Pap. Mus. Univ. Michigan, no. 210, p. 60.

The following is a short description of this species: Shells solid, trigonal, heart-shaped and rather inflated. Slightly inequilateral, beaks pointed and curved forward. Sculpture of many close-set strong riblets, running parallel to the base. Shells covered with a heavy blackish-green epidermis. Interior of valves dirty-white, stained with violet near the muscular impressions; pallial sinus short and V-shaped. Hinge with two medium sized and one smaller cardinal; lateral teeth prominent and unequal in shape and size. Dimensions: very variable; average length 35, average width 35 mm.

This species is extremely abundant in the waters of the northern part of Lake Maracaibo. Deshayes (1854) gives Maracaibo as the type locality and Prime (1865) says that the species has not been collected in any other locality except Lake Maracaibo. The author collected *Polymesoda arctata* in large quantities at various localities in the northern part of the Lake, where the species is especially abundant on hard sandy bottoms of shallow brackish water. It is a closely allied form of *Cyrena radiata* Hanley and *Cyrena solida* Phil., both of which occur in Central America (Nicaragua and

Belize). South of Maracaibo the water of the Lake apparently becomes too fresh for *Polymesoda arctata* and the species is hardly seen there.

Localities: El Moján (extremely abundant); Isla Toas (abundant); Santa Cruz de Mara (common); Bella Vista, N. of Maracaibo (common).

Remark: H. B. Baker (1930, p. 61) describes another species of *Polymesoda* from Maracaibo, viz., *Polymesoda zulia*. The shells of *P. zulia* H. B. Baker are of an elongate subtrigonal form; they are scarcely sub-solid and have a weak and shallow hinge. They are also lacking the distinctly ridged surface of *Polymesoda arctata*. Unfortunately the author has not been able to recognise this species amongst the material collected in the neighborhood of Maracaibo.

Neritina reclivata (Say, 1822) (fig. 1 a-c)

Theodoxus reclivatus Say, 1822, Journ. Acad. Nat. Sci. Phil. iii, p. 257.

Neritina reclivata, Sowerby, 1855, Thes. Conch. II, p. 533, cxvi, 240, 241.

Neritina reclivata, v. Martens, 1879, in Syst. Conch. Cab., Genus Neritina, p. 119, x, 7-10.

Neritina reclivata, Tryon, 1888, Manual of Conchology X, p. 39, xii, 25-30.

Neritina lineolata, v. Martens, 1900, Biologia Centrali Americana; p. 471, xxviii, 2, 6.

Neritina virginea reclivata, Baker, 1923, Occ. Pap. Mus. Zool. Univ. Michigan, no. 137, p. 12.

Neritina reclivata, Russell, 1941, Rec. Moll. fam. Neritidae Western Atlantic, p. 384, iii, 7, 8.

The following is a short description of this species: Shells rather globose and of an olivaceous-green color. A thick black line runs along the sutures from the aperture to the apex. The shells are especially characterised by numerous and extremely fine undulating black lines, running across the whorls. Although there is a considerable variation in the number and thickness of these lines, they never attain a pattern as seen in *Neritina zebra* Brug., a closely allied species, where they are much thicker and much more widely spaced. The columellar area is smooth, rather convex and of a bluish-white or dirty yellow color.

Neritina reclivata (Say) occurs in large quantities in the waters of the Maracaibo Strait and the Bay of Tablazo. It is a typical brackish to fresh water species and is usually found attached to floating wood, stones or other hard objects in the water. Comparison with specimens from Florida, which the author was able to examine in the collections of the Museo Poey, show the Maracaibo specimens to be smaller in size and much more variable. Average specimens from Maracaibo and vicinity attain an altitude of 10-12 mm and about the same diameter. *Neritina lineolata* Lamarck seems to be the same species and according to Tryon (1888) Lamarck's name should have even a few months' priority. Unfortunately the author has not been able to

solve this question with the available literature at the moment. For a study of the rather complicated synonymy of this species reference is made to von Martens (1879 and 1900). Meanwhile, following Russell (1941) the author has used Say's name *reclivata* under which this species is most commonly known.

Localities: El Moján (common); Isla Toas (common); Santa Cruz de Mara (very abundant); Bella Vista, N. of Maracaibo (rare).

Neritina meleagris Lamarck, 1822 (fig. 2)

Neritina meleagris Lamarck, 1822, Anim. sans Vert. vi, p. 187.

Neritina meleagris, Sowerby, 1855, Thes. Conch. II, p. 534, cxvi, 252, 253.

Neritina meleagris, Reeve, 1855, Conchologia Iconica, Monograph Neritina, species 112.

Neritina meleagris, Russell, 1941, Rec. Moll. fam. Neritidae Western Atlantic, p. 379, ii, 3-4.

The shells are globose and thin with 3 to 3½ rounded whorls and a typically low and obtuse spire. They are especially distinguished by their characteristic color pattern of many light subtriangular spots, arranged like imbricating scales. The ground color as well as the color of the triangular lighter spots is extremely variable. Sometimes these spots are olivaceous, at other times bluish grey. They are arranged in irregular bands and may be outlined with a thicker black line. Between these spots thin reticulating angular lines are seen. Specimens from the Lake of Maracaibo attain a diameter of about 8-10 mm.

This species is not very common in the waters of the Lake, as far as the author has been able to observe. *Neritina meleagris* has been considered by some authors as a synonym of *Neritina virginea* (L.) (Tryon, 1888; von Martens, 1879). Although there can be little doubt that both species are closely allied, both of them being typically brackish water forms, *Neritina meleagris* seems to be more globose and has a less produced and more obtuse spire than *Neritina virginea* (L.). The typical color pattern in *Neritina meleagris* seems also to be quite characteristic. Russell (1941) examined large series of both forms and considers them to be different, although he admits that the range of *meleagris* falls within that of *virginea*.

Localities: Santa Cruz de Mara (rare); Isla Toas (rare).

Littorina nebulosa (Lamarck, 1822) (fig. 3)

Phasianella nebulosa Lamarck, 1822, Anim. sans Vert. vii, p. 54.

Littorina nebulosa, Reeve, 1857, Conchologia Iconica, Monograph Littorina, species 55.

Littorina scabra var. *nebulosa*, Tryon, 1887, Manual of Conchology IX, p. 244, xlii, 14.

Littorina nebulosa, Bequaert, 1943, Johnsonia I no. 7, p. 11, iv, 1-4.

Shells elongate conical, rather thin, with 7 to 8 gradually increasing and

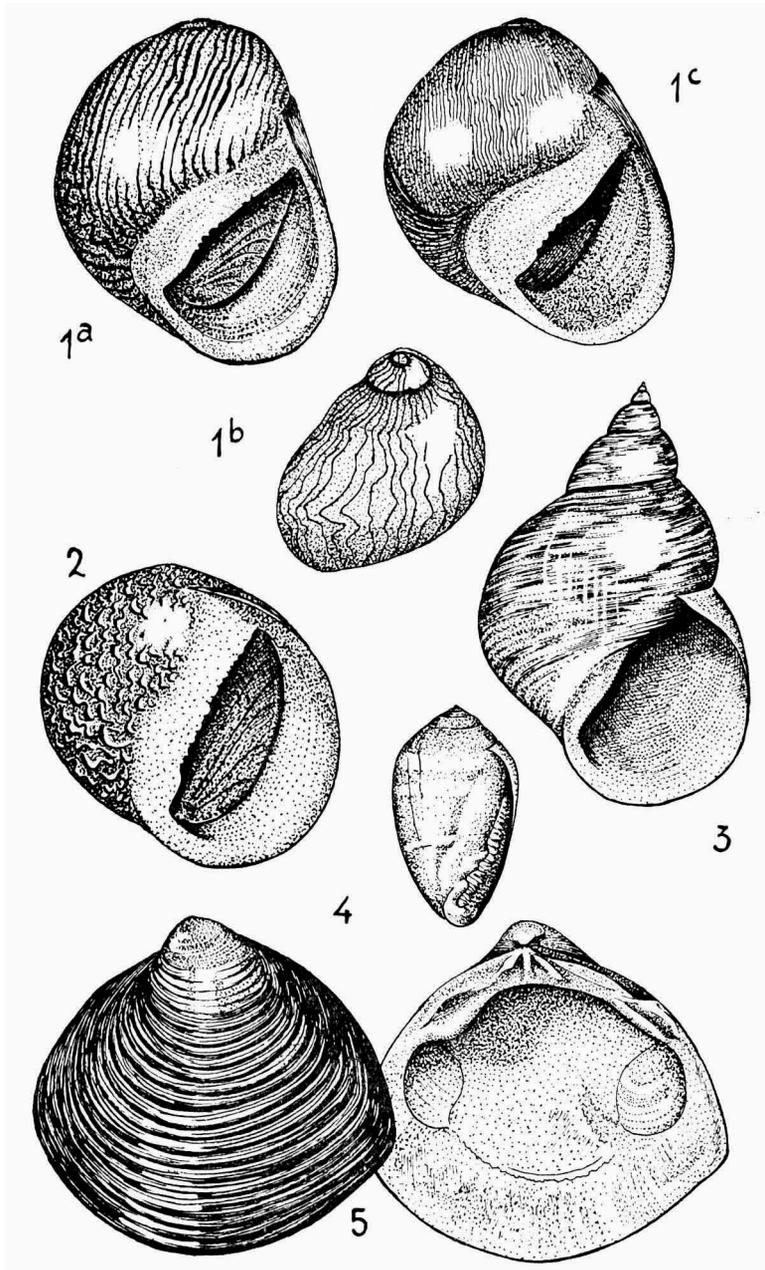


Fig. 1 a-c, *Neritina reclinata* (Say), $\times 5$; fig. 2, *Neritina meleagris* Lamarck, $\times 4$; fig. 3, *Littorina nebulosa* (Lamarck), $\times 3$; fig. 4, *Melampus coffeus* (Linné), $\times 2$; fig. 5, *Polymesoda arctata* (Deshayes), $\times 1\frac{1}{2}$.

rather convex whorls. The aperture is subcircular; outer edge sharp, columellar area smooth and somewhat thickened. Top whorls smooth, body whorl and preceding whorls clearly sculptured with numerous spiral engraved lines. The ground color varies from bluish purple to dirty orange-brown. A pattern of reddish-brown streaks and spots is seen on the ground color, usually obliquely arranged and sometimes forming streaks or zig-zag lines. These spots are generally lacking on the larger part of the body whorl. Mouth unicolorous brown, yellowish within. Dimensions: length 21-23 mm.; diameter 13-14 mm.

From this species numerous specimens have been collected alive near El Moján, about 40 km north of Maracaibo. The specimens were found attached to a stone wall or wooden poles at little distance above the water.

Melampus coffeus (Linné, 1758) (fig. 4)

Bulla coffea Linné, 1758, Syst. Nat. ed. X, p. 729.

Auricula coniformis, Küster, 1844, in Syst. Conch. Cab., Genus Auricula, p. 31, iv 14-17.

Auricula coniformis, Reeve, 1875, Conchologia Iconica, Monograph Auricula, species 57.

Melampus coffeus, Perry, 1940, Bull. Am. Pal. xxvi (95), p. 177, xxxix, 286.

Melampus coffeus, Smith, 1945, Eastcoast marine shells, p. 146, lv, 7.

Shells with about 5 whorls of which the body whorl is by far the largest. Spire low and conical. The aperture has nearly the same length as the body whorl, it is somewhat contracted above and widest below. Outer lip thin with numerous ridges on the inner side; inner lip recurved and somewhat thickened at the base where it joins the columella. There are two white folds in the columella of which the upper is the largest. Color brown to grey-brown with a light band at the shoulder and two narrower light bands below. Average length about 18 mm.

Melampus coffeus inhabits mangrove swamps, muddy banks near the mouth of rivers, etc. Although only a few empty shells have been collected from muddy creeks, it may be assumed from their state of preservation that this species also occurs living along the shores of the northern part of Lake Maracaibo.

Locality: Ancón, Edo. Zulia (Miranda District).

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