Conchological Redescriptions of *Mytilopsis sallei* and *Mytilopsis leucophaeta* of the Brackish Western Atlantic

(Bivalvia : Dreissenidae)

BY

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(1 Plate; 6 Text figures)

INTRODUCTION

THE GENUS *Mytilopsis* Conrad, 1857 (type-species by M: *Mytilopsis leucophaetus* Conrad, 1831), one of the two extant dreissenid genera, is generally considered to comprise 9 extant species: *Mytilopsis adamsi* Morrison, 1946; *M. africana* (Van Beneden, 1835); *M. allyneana* Hertlein and Hanna, 1949; *M. cochleata* (Kickx, 1835); *M. domingensis* (Récluz, 1852); *M. leucophaeta* (Conrad, 1831); *M. sallei* (Récluz, 1849); *M. trautwineana* (Tryon, 1866) and *M. zeteki* Hertlein and Hanna, 1949. All members of the genus are mytiliform, byssate and epifaunal, and inhabit brackish waters of tropical, sub-tropical and, in two cases *(M. cochleata* and *M. leucophaeta),* temperate latitudes. Most of the species are of New World geographic distribution, with 6 species occurring in the Americas, one in western Africa, one in northwestern Europe, and one in Fiji and eastern India.

Most species of *Mytilopsis* were described during the middle to late nineteenth century; many were redescribed several times, and there exist 66 synonyms. The descriptions and redescriptions, and their infrequently accompanying illustrations are of little value in species identification. With the possible exception of these by RÉCLUZ (1952), HERTLEIN & HANNA (1949) and MORRISON (1946), any of the original descriptions can easily apply to a specimen of any species of the genus. Additionally, there has been little effort made to provide diagnoses for the species, except for the limited treatment of RÉCLUZ (1852), MORRISON (1946) and OLSSON (1961).

The purpose of this paper is to provide more precise definitions of the species of *Mytilopsis leucophaeta* and *M. sallei,* and to provide a means for workers in subtropical western Atlantic estuaries to easily distinguish one from another. The descriptions and discussion contained herein are based entirely on conchological characters.

A complete list of the materials examined by the authors in the course of this work may be obtained from the authors upon request and submission of a stamped, self-addressed legal sized envelope.

MATERIALS

Materials were examined from the following museums: Academy of Natural Sciences, Philadelphia, Pennsylvania (ANSP); British Museum (Natural History), London, England (BMNH); California Academy of Sciences, San Francisco, California (CAS); Los Angeles County Museum, Los Angeles, California (LACM); United States National Museum, Smithsonian Institution, Washington, D.C. (USNM); as well as the private collections of one of us (DCM). All materials, with the exception of those of the senior author (DCM), consisted of dried shells. Shells of both *Mytilopsis leucophaeta* and *M. sallei* have been deposited as voucher specimens at the United States National Museum (USNM 818345 and 818346, respectively).

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REDESCRIPTIONS

Mytilopsis leucophaeta (Conrad, 1831)

(Figures 1, 2, and 7)

References and Synonymy:

Mytilopsis leucophaetus CONRAD, 1831. Journ. Acad. nat. Sci. Phila. 6: 263; plt. XI, fig. 13
Mytilus cochleatus KICKX *in* NYST, 1835. Bull. Acad. roy. Sci., Brux. 2: 235; figs. 1-3
Mytilina cochleata CANTRAINE, 1837. Ann. Sci. nat., 2nd ser. (Zool.) 7: 310
Mytilina cochleata CANTRAINE, 1837 (1838). Bull. Acad. roy. Sci., Brux. 4: 117
Dreissena cochleata NYST, 1843. Coquilles de la Belgique: 264
Tichogonia cochleata DUNKER, 1853. Zeitschr. Malak. 10: 91
Dreissenia cumingiana DUNKER, 1855. Comm. de Septiferis: 14
Dreissenia cochleata DUNKER, 1855. Comm. de Septiferis: 17
Mytilus americanus REEVE, 1858, Conch. Icon. 10(2): plt. X, fig. 43
Mytilus tenebrosus REEVE, 1858. Conch. Icon. 10:(2): plt. X, fig. 46
Mytilus cochleatus REEVE, 1858. Conch. Icon. 10(2): plt.X, fig. 50
Dreissena cochleata FISCHER, 1858. Journ. Conchyl. 7: 129
Dreissena americana FISCHER, 1858. Journ. Conchyl. 7: 131
Tichogonia cochleata KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 15; plt. 12, figs. 7, 8
Tichogonia americana KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 28
Congeria leucophaeta DALL, 1898. Trans. Wagner Free Inst. Sci. 3(4): 809 and *auct. sequ.*
Congeria cochleata DALL, 1898. Trans. Wagner Free Inst. Sci. 3(4): 809

Material Examined:

Fifty-five lots, comprising 1019 specimens; of these **Europe:** 2 lots, comprising 13 specimens, from Antwerp, Belgium. **United States:** 49 lots, comprising 980 specimens, from the Hudson River, Rockland County, New York, to the Colorado River, Cameron County, Texas. **Mexico:** 4 lots, comprising 26 specimens, from Tampico to Veracruz.

Comments: *Mytilopsis leucophaeta* was originally described by T. A. Conrad from shells attached to the oyster, *Crassostrea virginica* (Conrad, 1831). His original description is as follows:

"Shell incurved, white, with a very rugose epidermis; anterior [ventral] side much depressed; hinge margin excavated, with the teeth obsolete; on the posterior [dorsal] side, under [posterior to] the beaks, is a pointed laminar tooth directed inwards. Cab. Academy, No. 1453. Inhabits the southern coast of the U.S."

This description is so poor that one cannot get an idea of the general shape of this animal. The accompanying figure is life size and nondescript, so that a reader has difficulty distinguishing *Mytilopsis leucophaeta* from other Dreissenidae or even Mytilidae based on the information provided by Conrad. CONRAD (1831) even confused ventral with anterior and dorsal with posterior in his description, which have been corrected with bracketed comments. The description of NYST (1835) for *M. cochleata* is far more complete in terms of characters discussed and detail of such. Nyst even attempted a diagnosis between *M. cochleata* and its supposed congeners, and provided the best illustrations of any species of *Mytilopsis* to date. Nyst, too, seems to have somewhat confused the anatomical directions of the mytiliform bivalve as can be seen in the following translation of his original description:

"Type specimen: shell oblong, subcylindrical, slightly curved, depressed posteriorly [dorsally], compressed towards the upper edge [anteriorly] and slightly expanded at the posterior extremity of the cardinal ligament, covered with cob-webby threads, which causes it to appear finely and transversly striated and which gather [accumulate] with age in some of the species of curved lamellibranchs.

The beaks are pointed, weakly curved, the shell is furnished in the interior with a septum-like lamina, such as in several species of the genus, but it is moreover furnished with a spoon shaped appendage, placed below [posterior to] the septum-like lamina in the direction of the upper [dorsal] edge.

The right valve of this species is larger than the left; this character is most perceptible on the lower [ventral] edge. The shell is usually brown in color, ashen, and intersected by whitish zones; the young individuals sometimes appear zebra striped."

From the supplementary information presented in the paper, NYST (1835) mentions that *Mytilopsis cochleata* was collected in the Escaut [Schelde] River, Antwerp, but from the presence of barnacles he presumed that *M. cochleata* was not a lotic species, but that it was probably introduced to the river by ocean going ships.

After examining topotypes of *Mytilopsis cochleata* (USNM 122466) as well as two lots from the British Museum (one

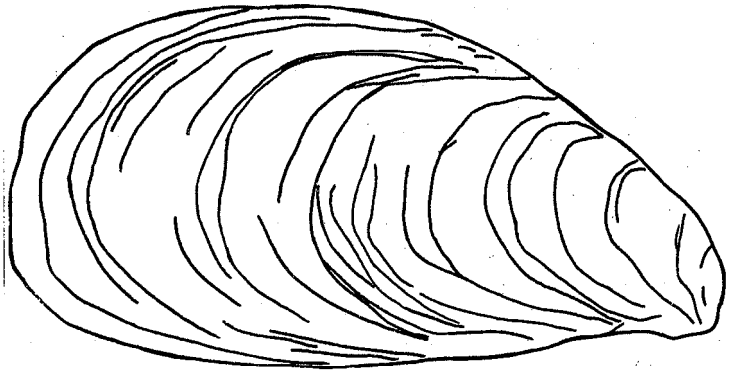

Figure 1

Exterior of the right valve of a specimen of *Mytilopsis leucophaeta* from Student Lake, Miami, Florida. (USNM 818345). Bar length equals 2.0mm

Explanation of figure abbreviations

AP — Apophysis
EVS — Extension of ventral shell margin
NYM — Nymph
PL — Pallial line
PAM — Posterior adductor muscle scar
PRM — Posterior retractor muscle scar
SEP — Septum

of which contained a specimen figured by REEVE, 1858), and over 60 lots of *M. leucophaeta* (including a virtual syntype, USNM 54227) from the United States National Museum, the Academy of Natural Sciences, Philadelphia, the Los Angeles County Museum, and the California Academy of Sciences we have concluded that *M. cochleata* and *M. leucophaeta* are synonyms. These nominal species are nearly identical in overall shape, color, size, and in the character states of the muscle scars, the ligament, the septum and the apophysis (Figure 2). Both species are also the only members of an overwhelmingly sub-tropical and tropical genus to range into temperate regions. Therefore, we have concluded that *M. cochleata* (Kickx, 1835) is a junior synonym of *M. leucophaeta* (Conrad, 1831), and have treated it as such herein. Further subjective synonyms are listed in the synonymy.

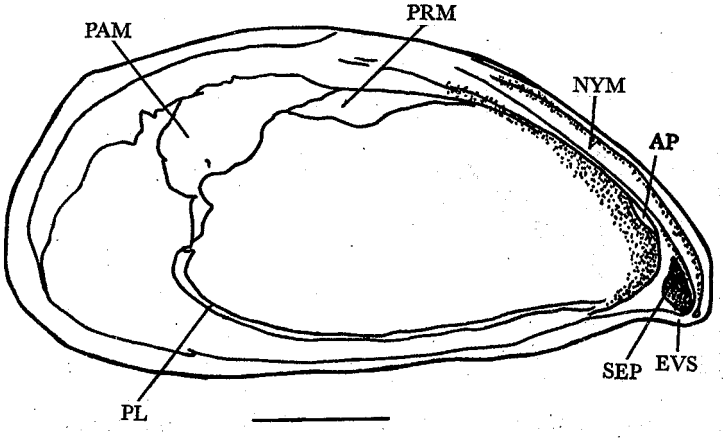

Figure 2

Interior of the left valve of a specimen of *Mytilopsis leucophaeta* from Student Lake, Miami, Florida. (USNM 818345). Bar length equals 2.0mm

REDESCRIPTION

Shell mytiliform, byssate; exterior bearing fine to medium rough concentric lines, periostracum cream colored to dark brown and heavy, yet easily broken (or eroded) off; shell sometimes marked with zig-zag lines, somewhat like *Dreissena polymorpha*, especially in juveniles. Shell inequivalve, the right valve slightly overlapping the left posteroventrally. General appearance of organism is long and wide, height to width ratio always less than 1.25:1 (for representative size measurements see Table 1).

Ventral margin of shell nearly straight, slightly convex one-third of the way from anterior to posterior margins in larger specimens; byssal notch slightly developed. Dorsal margin broadly convex in the area from the beaks to the posterior margin, at which point it changes direction, becoming only slightly curved and extending to the posterior margin; at this point the angle of the margin changes abruptly, and curves ventrally with a slight convexity down to join the ventral margin, where it becomes directed anteriorly rather abruptly. Small specimens appear to have more smoothly curving margins than larger specimens, which tend to appear very elongate and rectangular. Beaks well rounded to bluntly pointed and directed anteroventrally at an angle much less than 45°.

Shell interior white, with grayish areas postero-dorsally in some specimens. Pallial and extra-pallial regions porcellaneous; pallial line and posterior muscle scars glossy. Posterior muscle scars do not extend anteriorly to the posterior limit of the nymph. Anterior adductors attached to a shelf-like septum, which in this species is relatively short and small, appearing cup-like in the larger specimens, especially on the right valve. Left valve bears anteroventrally a well developed extension of the ventral shell margin which may act like a tooth. Anterior retractor muscles attached to an apophysis which in this species is

Table 1

Mean shell sizes and standard deviations from representative populations of *Mytilopsis leucophaeta*

Locality	N	Length (mm)	Height (mm)	Width (mm)
? Belgium (BMNH 1829)	5	21.48 ± 2.30	9.34 ± 0.89	7.96 ± 0.52
Galveston Bay, Texas (DCM)	12	8.38 ± 2.37	4.55 ± 0.87	4.15 ± 1.26
Lake Pontchartrain, Louisiana (DCM)	27	8.52 ± 2.17	4.37 ± 0.93	3.65 ± 1.01
Student Lake, Univ. of Miami campus, Coral Gables, Florida (DCM)	45	12.65 ± 4.56	6.93 ± 2.37	5.34 ± 2.05

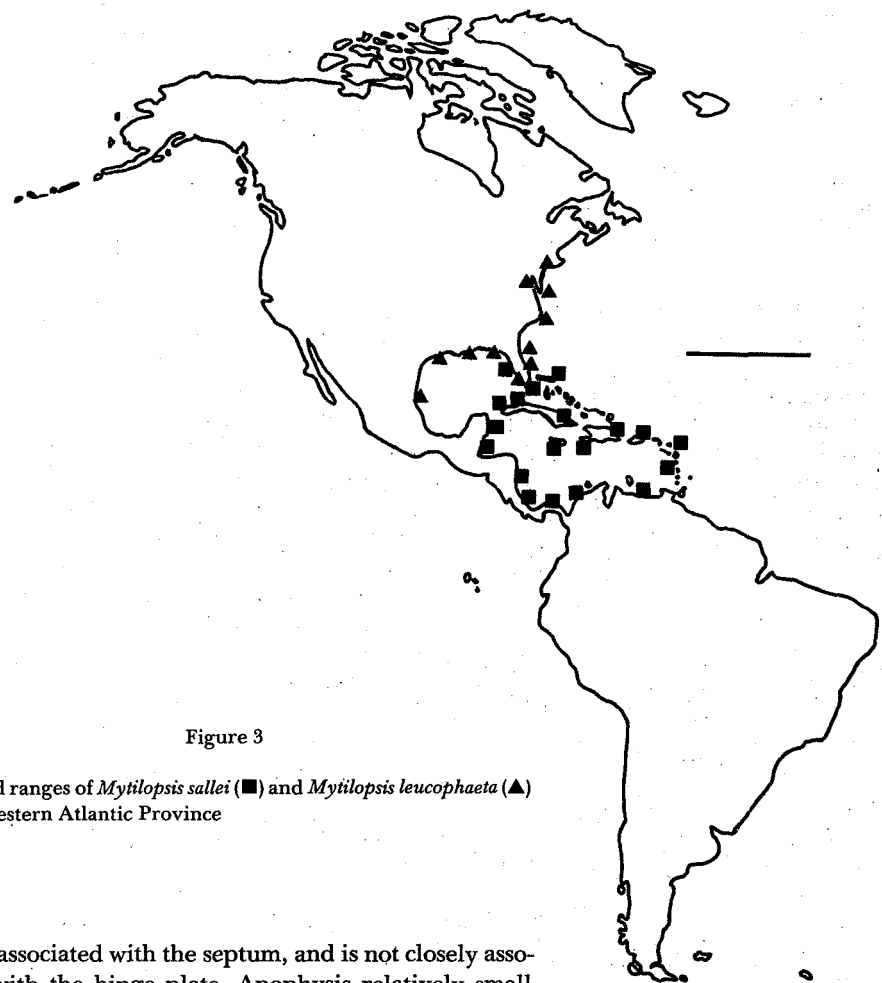

Figure 3

Reported ranges of *Mytilopsis sallei* (■) and *Mytilopsis leucophaeta* (▲) in the Western Atlantic Province

closely associated with the septum, and is not closely associated with the hinge plate. Apophysis relatively small and rounded, but occasionally appearing almost pointed postero-dorsally; the apophysis does not extend posterior of twice the length of the septum.

Hinge plate low and wide, bearing a wide nymph which extends from the beaks to a point ⅓ to ⅖ of the way from anterior to posterior margins. Nymph bears a ligament of the same length. Anteriorly the hinge plate remains relatively high, causing the anterior end of the shell to appear rounded.

Range: Brackish waters in northern France, Belgium and Holland, and the Atlantic and Gulf of Mexico coasts of the Americas from the Hudson River estuary to Tampico, Mexico (CONRAD, 1831; NYST, 1835; RÉCLUZ, 1849; DUNKER, 1853; REEVE, 1858; FISCHER, 1858; KÜSTER, 1889; JOHNSON, 1890; PILSBRY, 1911; NYLANDER, 1921; REHDER, 1937; FAIRBANKS, 1963; MORTON, 1970; SWINGLE & BLAND, 1974; ARCHAMBAULT-GUEZOU, 1976; RISTICH, CRANDALL & FORTIER, 1977; WARDLE, 1980; and museum records examined by the authors) (Figures 3 and 4).

Type Locality: "Southern coast of the United States." (CONRAD, 1831).

DISCUSSION

We suspect that NYST (1835) was correct in presuming that *Mytilopsis leucophaeta* was introduced into the Escaut River, since the ranges of fossil and Recent species indicate that *Mytilopsis* is predominantly a New World group. The mode of introduction is unknown, although such things as ballast rocks in somewhat less than watertight wooden vessels seem to be likely candidates.

This species has been reported from both coastal lakes and streams along the Atlantic and Gulf coasts of the United States. *Mytilopsis leucophaeta* is a highly euryhaline species whose upstream limits are presumably controlled by the physiological tolerances of its larvae, and perhaps by

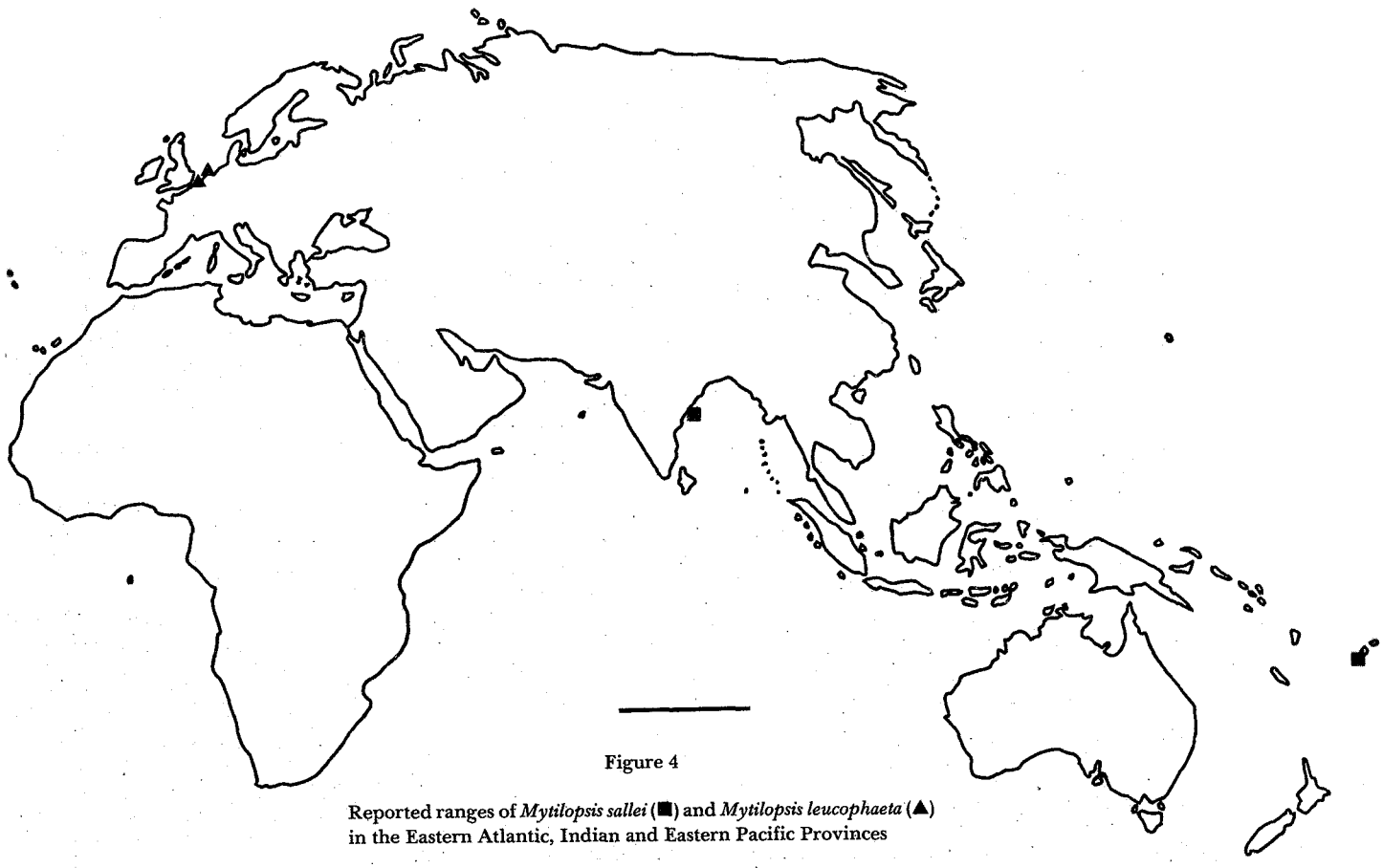

Figure 4

Reported ranges of *Mytilopsis sallei* (■) and *Mytilopsis leucophaeta* (▲) in the Eastern Atlantic, Indian and Eastern Pacific Provinces

the lack of high salinity pulses necessary to initiate spawning behavior (SIDDALL, 1980). These are only hypotheses, however, since the biology and natural history of *M. leucophaeta* are largely unknown. It is likewise not known what limits the seaward distribution of *M. leucophaeta.*

Mytilopsis sallei (RÉCLUZ, 1849)

(Figures 5, 6 and *8*)

References and Synonymy:

Dreissena sallei RÉCLUZ, 1849. Revue Zool. 2: 69
Dreissena sallei RÉCLUZ, 1852. Journ. Conchyl. 3: 255; plt. X, fig. 9
Dreissena domingensis RÉCLUZ, 1852. Journ. Conchyl. 3: 255; plt. X, fig. 8
Tichogonia pfeifferi DUNKER, 1853. Zeitschr. Malak. 10: 88
Tichogonia rossmaessleri DUNKER, 1853. Zeitschr. Malak. 10: 89
Tichogonia riisei DUNKER, 1853. Zeitschr. Malak. 10: 91
Tichogonia sallei DUNKER, 1853. Zeitscher. Malak. 10: 91
Dreissenia rossmaessleri DUNKER, 1855. Comm. de Septiferis: 17
Dreissenia pfeifferi DUNKER, 1855. Comm. de Septiferis: 17
Dreissenia gundlachii DUNKER, 1855. Comm. de Septiferis: 18
Dreissenia sallei DUNKER, 1855. Comm. de Septiferis: 18
Dreissenia moerchiana DUNKER, 1855. Comm. de Septiferis: 18
Dreissena riisei DUNKER, 1855. Comm. de Septiferis: 19
Dreissenia domingensis DUNKER, 1855. Comm. de Septiferis: 20
Mytilus sallei REEVE, 1858. Conch. Icon. 10(2): plt. X, fig. 44
Mytilus rossmassleri [sic] REEVE, 1858. Conch. Icon. 10(2): plt. X, fig. 45
Mytilus domingensis REEVE, 1858. Conch. Icon. 10(2): plt. X, fig. 48
Mytilus morchianus [sic] REEVE, 1858. Conch. Icon. 10(2): plt. X, fig. 51
Dreissena roosmassleri FISCHER, 1858. Journ. Conchyl. 7: 132
Dreissena pfeifferi FISCHER, 1858. Journ. Conchyl. 7: 132
Dreissena gundlachi FISCHER, 1858. Journ. Conchyl. 7: 132
Dreissena morchiana [sic] FISCHER, 1858. Journ. Conchyl. 7: 132
Dreissena riisei FISCHER, 1858. Journ. Conchyl. 7: 133
Dreissena domingensis FISCHER, 1858. Journ. Conchyl. 7: 133
Dreissena sallei FISCHER, 1858. Journ. Conchyl. 7: 133
Tichogonia sallei KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 17; plt. 12, figs. 13, 14
Tichogonia moerchiana KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 18; plt. 12, figs. 11, 12

Tichogonia riisei KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 25; plt. 15, figs. 12, 13
Tichogonia domingensis KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 26; plt. 15, fig. 14
Tichogonia rossmaessleri KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 27; plt. 15, fig. 7
Tichogonia gundlachi KÜSTER, 1889. Syst. Conch.-Cab. 8.3: 29
Congeria rossmaessleri DALL, 1898. Trans. Wagner Free Inst. Sci. 3(4): 809
Congeria sallei DALL, 1898. Trans. Wagner Free Inst. Sci. 3(4): 809 and *auct. sequ.*
Congeria gundlachi DALL, 1898. Trans. Wagner Free. Inst. Sci. 3(4): 809
Mytilopsis allyneana HERTLEIN & HANNA, 1949. Bull. So. Calif. Acad. Sci. 48: 14

Material Examined:

Sixty-four lots, comprising 1844 specimens, of these **Florida:** 9 lots, comprising 213 specimens, from Tampa to Miami. **Caribbean Islands:** 29 lots, comprising 407 specimens, from Lyford Cay, Bahama Islands to Roseau, Dominica. **Western Atlantic Mainland:** 19 lots, comprising 1082 specimens, from Quintana Roo, Mexico to Barcelona, Venezuela. **Indo-Pacific:** 7 lots, comprising 82 specimens, from Viti Isle, Fiji and Visakhapatnam, India.

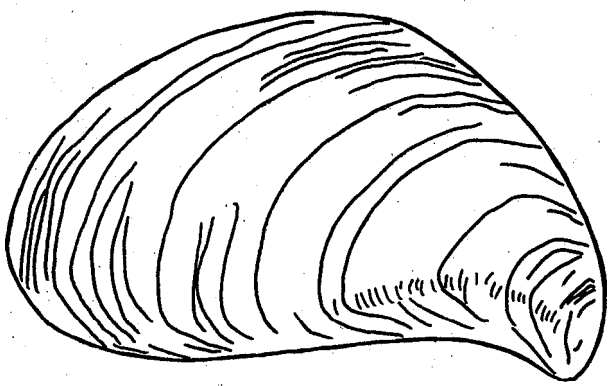

Figure 5

Exterior of the right valve of a specimen of *Mytilopsis sallei* from Laguna Bacalar, Mexico. (USNM 818346). Bar length equals 2.0mm

Comments: *Mytilopsis sallei* was originally described by C. A. Récluz from shells collected by August Sallé from the Rio Dulce, Guatemala (Récluz, 1849). The translation of the original description is as follows:

> "Shell oval-oblong, inequivalve towards the posterior end of the ventral region; beaks curved; valves slightly convex, chalky white below a rugose olivaceous colored epidermis: interior tinted with unequally concentric blackish zones. Length, 19-23mm. Height, 13-14mm."

Récluz' description, without illustrations, is very poor. The general shape of the animal is not even mentioned. That the means of attachment by byssus is not reported is not surprising since Récluz was probably given shells only, but one wonders why he did not attempt to draw conclusions about the mode of life of *Mytilopsis sallei* from its superficial similarity to *Mytilus.*

In 1852 RÉCLUZ described another species of *Mytilopsis* from the West Indian province, *M. domingensis* (RÉCLUZ, 1852). In this paper he again presented the description of *M. sallei,* and provided a diagnosis of sorts between *M. sallei* and its congeners in (at that time) *Dreissena.* The diagnosis is as follows:

> "This species, already conspicuous by the circumstance that it will be found boring, differs also from its congeners by its coloration, and by the rugosity of its epidermis. It has been brought back by Monsieur Sallé, to whom we dedicated it. We have already given a description of it in the *Revue Zoologique* of Monsieur Guérin, in 1849; but this species has not yet been illustrated, and we have had to recall the characteristics of it in depicting it on one of the plates of the Journal."

Unfortunately the illustration that Récluz refers to is of little value, since it depicts what we presume to be the type specimen at life size and only in an exterior view. The reference to boring is interesting, but unlikely to be correct. From our observations of *Mytilopsis sallei* in its habitat and those of MORRISON (1946) of *M. adamsi* in Panama, it appears that members of this genus have a tendency to nestle in small holes, but not to actually bore the holes.

RÉCLUZ (1852) also describes *Mytilopsis domingensis* in this paper, which has been translated into the following:

> "Small longitudinal shell, elongated, narrow, irregular, like most of its congeners, striated, or rather concentrically lined, but the epidermis does not show the lamellae like most of the other species. Its dorsal edge is generally angular towards the

Explanation of Figures *7* and *8*

Figure *7:* Scanning electron micrograph of the anterior hinge area of a specimen of *Mytilopsis leucophaeta* from Galveston Bay, Texas. (DCM) Bar length equals 500μm

Figure *8:* Scanning electron micrograph of the anterior hinge area of a specimen of *Mytilopsis sallei* from Laguna Bacalar, Mexico. (DCM) Bar length equals 500μm

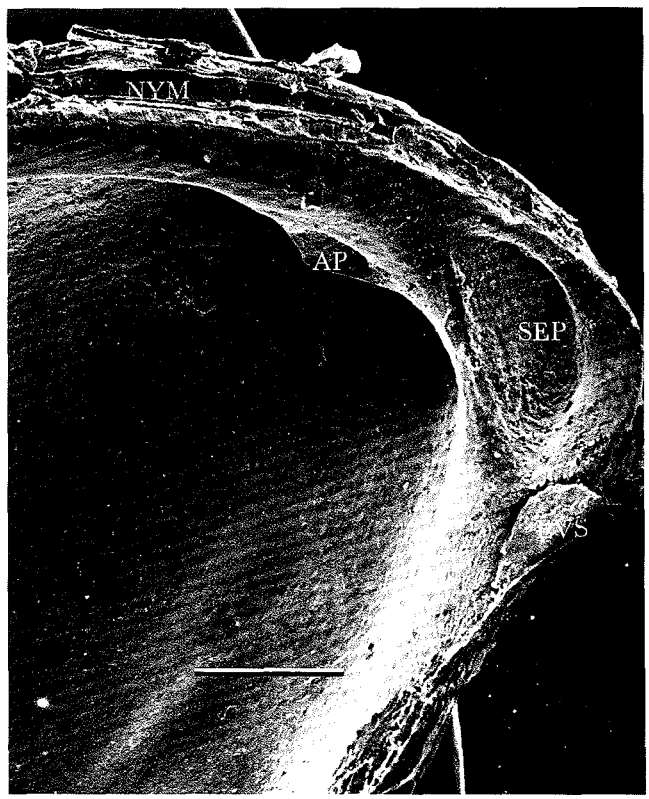

Figure 7

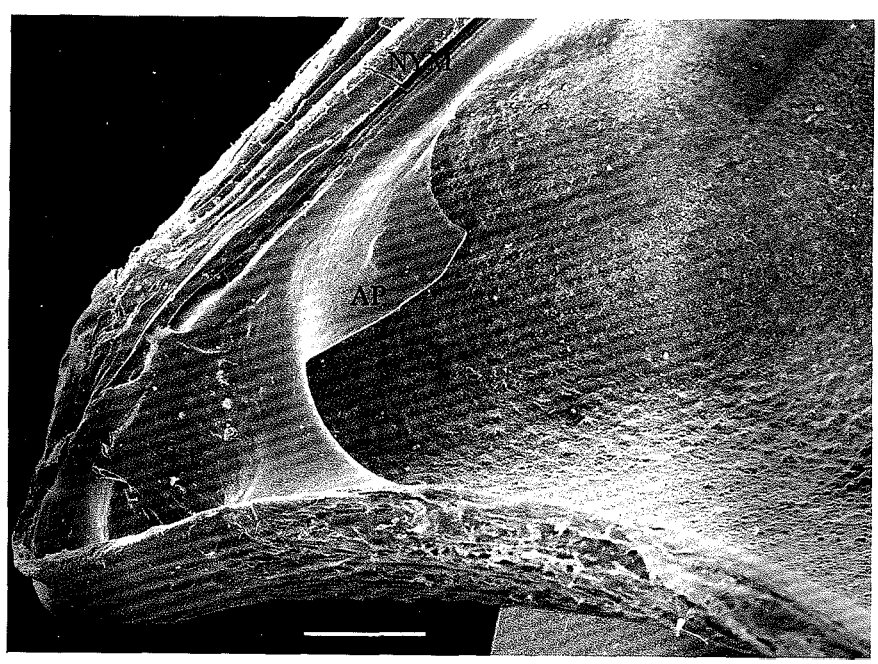

Figure 8

center, and the ventral edge is sometimes straight, sinuous, concave, or protuberant. In this case, the right valve overlaps the left valve. Beaks projecting, curved toward the ventral side: the ventral side, closest to the beaks, bears an elongated aperture, narrow and linear, for the passage of the byssus. The general color of the species is of a more or less dark brown, frequently adorned with two longitudinal lines of yellowish-white. The interior of the valves has a blackish-violet tint. Length 22-24mm. Height 10-13mm. Width 8mm."

The accompanying "diagnosis" for this species is as follows:

"Our species has some relationship with *Dreissena cochleata* by its narrowness, but it differs from it [*D. cochleata*] by its dimensions, its irregularity, and its ever pronounced yellowish-white lines: it also differs from *D. cochleata* by its proportionately larger partition [septum], and by the lamella placed below the septum, [which is] always larger and less dentiform."

The information provided by Récluz for *Mytilopsis domingensis* is far better than that provided for *M. sallei,* and it demonstrates that, with respect to the shells, he had a good idea of the important characters and character states of the genus. It appears that his work is based on very few specimens however, and although Récluz does indicate some of the important characters in the 1852 descriptions, they are still somewhat ambiguous, especially considering the plethora of species which have been described since 1852. As a final comment on the 1849 and 1852 descriptions by Récluz, it is interesting to note that he, at least, does not confuse the anatomical poles of the Dreissenidae.

Based on examinations of specimens of *Mytilopsis sallei* from the type locality (ANSP 125268, CAS 46744), and specimens of *M. domingensis* from its type locality (USNM 215620), as well as over 60 lots of *M. sallei* and *M. domingensis* from the Academy of Natural Sciences, Philadelphia, California Academy of Sciences, Los Angeles County Museum and the United States National Museum we have concluded that *M. domingensis* and *M. sallei* are synonyms based on shell characteristics. We have therefore treated *M. domingensis* (Récluz, 1852) as a **junior synonym** of *M. sallei* (Récluz, 1849) herein. This conclusion is based on similarities in the shell character states of these nominal species, as well as the apparent limitation of *M. sallei/M. domingensis* to the tropical western Atlantic. Other nominal species which have been treated as junior synonyms of *M. sallei* in the present paper are listed in the synonymy, including *M. allyneana* Hertlein and Hanna (1949), which MORTON (1981) has recently synonomized with *M. sallei.*

REDESCRIPTION

Shell mytiliform, byssate; exterior bearing fine concentric lines, periostracum translucent to colored so that the shell appears white, cream colored or bluish-grey to medium brown; periostracum thin but not fragile, generally eroded anteriorly. Shell of very small specimens occasionally bearing brown zig-zag markings, while large specimens are never marked in this manner, but rarely bear a single light radial band. Shell inequivalve, the right valve overlapping the left postero-ventrally. General appearance of the animal is long, high and narrow; height to width ratio greater than 1.3:1 (for representative size measurements, see Table 2).

Ventral margin straight to slightly convex in its posterior half, slightly concave in its anterior half; byssal notch well developed and generally more pronounced on the right valve. Dorsal margin extending from beaks nearly vertically for a short distance, then curving smoothly posteriorly with a slight convexity to a point about one-half of the way from anterior to posterior, where the margin is directed more abruptly ventrally and joins the convex posterior margin, which in turn joins the ventral margin at an abrupt (about 90°), but somewhat rounded angle. Beaks bluntly to sharply pointed and directed antero-ventrally at an angle of more than 45°.

Table 2

Mean shell sizes and standard deviations from representative populations of *Mytilopsis sallei*

Locality	N	Length (mm)	Height (mm)	Width (mm)
Laguna Bacalar, Mexico 1976 collection (DCM)	50	12.71 ± 4.11	7.68 ± 2.31	5.34 ± 1.8
Laguna Bacalar, Mexico 1977 collection (DCM)	62	11.66 ± 3.49	7.23 ± 2.03	4.93 ± 1.53
Lake Izabal, Guatemala (USNM 684754, 684728, 684729)	58	18.67 ± 4.42	10.66 ± 2.16	7.56 ± 1.54
Robin's Bay, St. Mary, Jamaica (USNM 442006)	18	24.09 ± 3.24	11.51 ± 1.34	8.73 ±0.92
Roseau, Dominica (USNM 215620)	9	15.04 ± 6.32	7.94 ± 3.02	6.92 ± 2.99
Torbeck, Haiti (USNM 440374)	38	25.57 ± 3.49	12.58 ± 1.65	9.68 ± 1.31

Shell interior mottled gray-black and white to cream colored, bluish-gray or blue-black in the central portion; marginal areas white to bluish-gray (including hinge plate); interior sometimes bears a somewhat cancellate pattern of concentric dark bands and radial bands on a light background. Pallial region porcellaneous, extra pallial region glossy. Pallial line and posterior muscle scars also glossy; posterior muscle scars extend to anterior of the posterior limit of the nymph. Anterior adductor muscles attached to a shelf-like septum, which in this species is relatively flat, being nearly on the same plane as the hinge plate, but is overall relatively small. Left valve bears antero-ventrally a small extension of the shell margin, which extends over the right shell margin when the valves are closed. Anterior retractor muscles attached to an apophysis, located lateral to the septum near the dorsal shell margin; in this species the apophysis is well developed and not closely associated with the septum; the apophysis extends laterally well into the shell cavity, and posteriorly to twice the length of the septum, generally becoming pointed postero-ventrally and appearing hook-shaped; the apophysis in this species is generally closely associated with the hinge plate.

Hinge plate high, bearing a high nymph which extends from the beaks to a point $^2/_5$ to $^1/_2$ of the way from anterior to posterior margins; the nymph bears a ligament of the same length. Anteriorly the hinge plate becomes lower, so that the beaks remain relatively sharply pointed.

Range: Brackish waters in southern Florida, along the western Atlantic coast from Yucatan to Venezuela, and on many of the islands of the West Indies (RÉCLUZ, 1849, 1852; DUNKER, 1853, 1855; REEVE, 1858; FISCHER, 1858; KÜSTER, 1889; HINKLEY, 1920; ESCARBASSIÈRE & ALMEIDA, 1976; MARELLI & BERREND, 1978; and museum records examined by the authors). Introduced to Fiji and eastern India (MORTON, 1980, 1981) (Figures 3 and 4).

Type Locality: Mouth of the Rio Dulce, Guatemala (RÉCLUZ, 1849).

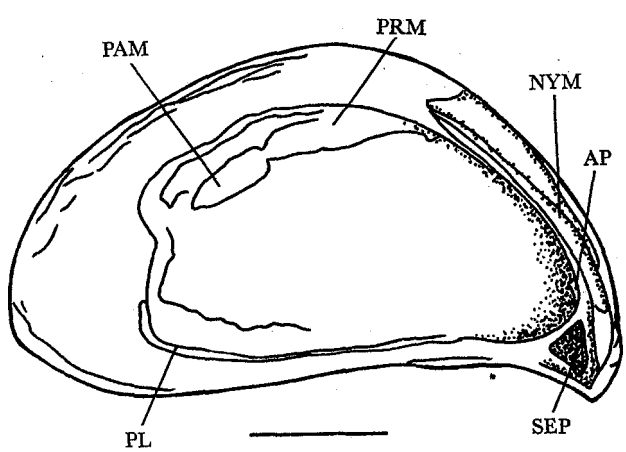

Figure 6

Interior of the left valve of a specimen of *Mytilopsis sallei* from Laguna Bacalar, Mexico. (USNM 818346). Bar length equals 2.0mm

DISCUSSION

The range and distribution of *Mytilopsis sallei* are much less well known than those of *M. leucophaeta*, and consequently many of the records for *M. sallei* are undocumented and based on dried shells and old handwritten labels in museum drawers. If one accepts these records, however, *M. sallei* is seen to have a considerable range; essentially throughout the Caribbean and introduced to Fiji and India. It is an intriguing range since *M. sallei* is an estuarine inhabitant, and thus each of the island populations must be considered disjunct. Within its range, the distribution of *M. sallei* has not been examined in detail, but it is apparently found in coastal lakes (MARELLI & BERREND, 1978) and streams (HINKLEY, 1920; ESCARBASSIÈRE & ALMEIDA, 1976), probably much like *M. leucophaeta* in the United States. Next to nothing is known about the life cycle of *M. sallei*, or the physical-chemical factors affecting such. The physiological tolerances of *M. sallei* and the factors affecting its distribution, both upstream and downstream, are likewise unknown.

CONCLUSIONS

There are two representatives of the genus *Mytilopsis* inhabiting the western Atlantic coast of the Americas; *M. leucophaeta* and *M. sallei*. The known geographic ranges of these mussels are as follows: *M. leucophaeta*, western Atlantic coast from the Hudson River estuary to southern Florida and along the Gulf of Mexico from Florida to Tampico, Mexico (*M. leucophaeta* has also been introduced into northwestern Europe); *M. sallei*, southern Florida, the Caribbean coast of Central and South America from Bacalar, Mexico to just east of Caracas, Venezuela, scattered throughout the West Indies, and also in Fiji and Visakhapatnam, India. Since *M. leucophaeta* and *M. sallei* are parapatric, with ranges overlapping in southern Florida, it is useful to be able to distinguish them from each other. From information provided in this paper it is clear that the two species differ in external shape, *M. leucophaeta* being rather elongated and having a height/width ratio of less than 1.25:1, whereas *M. sallei* appears higher, having a height/width ratio greater than 1.3:1, and is also concave

ventrally with slightly recurved beaks, causing *M. sallei* to appear more "hatchet-shaped" as described by Olsson (1961). The interior of shells of *M. leucophaeta* and *M. sallei* are more distinctly different, with noticeable differences in the hinge plate, the septum, the apophysis, the position of the posterior muscle scars and the coloration and general appearance (glossy or porcellaneous) of the interior surface of the valves. The hinge plate of *M. leucophaeta* is lower, wider and shorter than that of *M. sallei,* extending for only one-third to two-fifths of the length of the shell, as opposed to a hinge plate that extends for two-fifths to one-half of the shell length in *M. sallei.* The septum of *M. leucophaeta* is more rounded anteriorly than that of *M. sallei,* and tends to appear more "cup-shaped" rather than being nearly on the same plane as the hinge plate as is that of *M. sallei.* The apophysis of *M. leucophaeta* is closely associated with the septum, and therefore less apparent than that of *M. sallei.* The apophysis of *M. leucophaeta* is also not closely associated with the dorsal hinge plate, as is that of *M. sallei,* and tends to be small and rounded in appearance as opposed to that of *M. sallei,* which is comparatively larger and almost always pointed or "hook-shaped" posteroventrally. The posterior muscle scars of *M. leucophaeta* do not extend anteriorly to the posterior limit of the nymph, whereas those of *M. sallei* do, reflecting the longer relative length of the *M. sallei* ligament and hinge plate. *M. leucophaeta* also tends to have a lighter colored shell interior than that of *M. sallei,* which is often bluish-gray to dark blue-gray or black. Finally, the extra pallial region of the *M. leucophaeta* shell interior is usually porcellaneous, whereas that of *M. sallei* is glossy.

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