photoperiod of 16 hr light:8 hr dark, whereas our snails were kept for 1 week at 22-24°C with a 12 hr:12 hr light: dark photoperiod. Moreover, analysis in the Thompson & Mejia-Scales (1993) study was by spectrophotometry, whereas HPTLC was used in our study.

Regardless of the feeding regimens used in both studies, the range of hemolymph glucose values in *B. glabrata* in mg% was 3.2 to 8.1 in Thompson & Mejia-Scales (1993) and 59.3 to 101.3 in the present study. As mentioned in the previous paragraph, differences between the two studies probably accounted in part for such disparate results.

Our previous reports on sugars in planorbid snails (Anderton et al., 1993; Perez et al., 1994; Conaway et al., 1995) have identified trehalose, in addition to glucose, as major hemolymph carbohydrates. The identification of trehalose in these studies was based on comigration of sample zones at R_f 0.19 with a trehalose standard zone using the acetonitrile-water (85:15) solvent system of Fell (1993). During the present study, comigration of the trehalose standard band and the corresponding snail sample bands did not occur, but a major sugar zone at R_f 0.22 comigrated with maltose and was clearly separated from the trehalose standard band in the acetonitrile-water solvent. Identification of this second major sugar in hemolymph as maltose was confirmed using triple development with the acidic solvent system of Fell (1993) and spiking experiments in both solvents, as described above. The presence of maltose in gastropods has been reported previously (see review in Livingstone & de Zwann, 1983). Other zones were detected in the chromatograms of hemolymph and DGG samples, but they did not line up with any of the standard zones and could not be identified.

We are not sure of the occurrence of trehalose in planorbid snails. Fairbairn (1958) first reported on the presence of trehalose in *B. glabrata* based on spectrophotometric analysis. Our earlier HPTLC studies (not confirmed in the present study) based on comigration of a significant sugar zone with an authentic trehalose standard also suggested significant amounts of trehalose in *B. glabrata*, the concentrations of which were reported (Anderton et al., 1993; Perez et al., 1994; Conaway et al., 1995). Unpublished observations by S. N. Thompson (personal communication, 1995) based on HPTLC analysis of *B. glabrata* hemolymph extract suggested the presence of trace amounts of trehalose; moreover, unpublished observations by N. Wisnewski (personal communication, 1992) based on gas chromatography/mass spectrometry (GC/MS) analyses indicated the presence of trehalose in both the hemolymph and DGG of *B. glabrata*. The qualitative and quantitative analysis of trehalose in planorbid snails needs further examination.

Acknowledgments

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New Records of Phylliroidae (Opisthobranchia: Nudibranchia) from the Gulf of California, Mexico

by

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Nudibranchs of the family Phylliroidae lead a pelagic existence, spending their entire life cycles in the open ocean. They have been considered parasites of medusae and siphonophores by Ankel (1952), Martin & Brinckmann (1963), Martin (1966), and Sentz-Braconnot & Carré (1966). Recently, Lalli & Gilmer (1989) re-examined the

particular nutritional types of members of this family and their species relationships with other planktonic animals. They suggested that the association with coelenterates is clearly one of predator and prey. This paper reports the occurrence of two species of Phylliroidae in the Gulf of California. Both are well known from the Mediterranean Sea (Ankel, 1952; Rose, 1957; Martin & Brinckmann, 1963). They also occur in the Atlantic Ocean (Van der Spoel, 1970; Abbott, 1974), but their records in the Pacific Ocean are scarce.

Taxonomy and Geographic Distribution

Suborder Dendronotina Odhner, 1934

Superfamily DENDRONOTOIDEA Odhner, 1934

Family PHYLLIROIDAE Férussac, 1821

Genus *Phylliroe* Péron & Lesueur, 1810

Phylliroe bucephala Péron & Lesueur, 1810

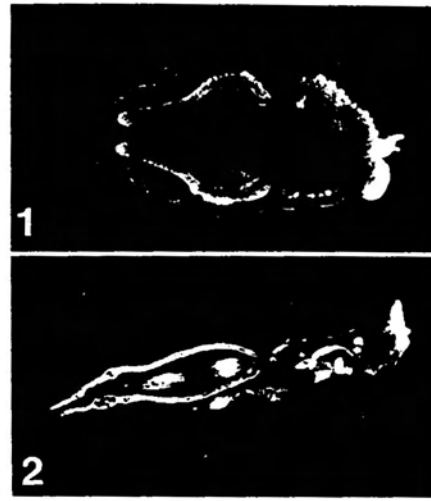
(Figure 1)

Previous records in the Pacific Ocean: New Zealand, Hauraki Gulf between Mokohinau Islands and Kawan Island, and off Cape Bret (Powell, 1937, 1979). Coastal waters off New South Wales, Australia (Dakin & Colefax, 1940). North-east Pacific off North American coast at 33°19'N, 128°27'W (Dales, 1953). West coast of Mexico, between latitudes 14° and 24°N (Keen, 1971).

Material examined: It was collected by Centro Interdisciplinario de Ciencias Marinas (CICIMAR), Instituto Politécnico Nacional in La Paz, Baja California, México, during the GOLCA 8404 cruise in March and April 1984, with oblique net-tows from a depth of 200–0 m. Station data are: sta. 92 (26°16'N, 110°29'W) 31 March, 1 specimen; sta. 95 (25°50'N, 110°12'W) 1 April, 3 specimens; sta. 98 (26°22'N, 109°43'W) 1 April, 1 specimen; sta. 105 (25°14'N, 110°16'W) 2 April, 1 specimen; sta. 110 (25°09'N, 109°20'W) 3 April, 1 specimen; sta. 123 (24°27'N, 108°30'W) 4 April, 1 specimen; sta. 125-A (24°02'N, 108°18'W) 6 April, 1 specimen.

Additional material: Specimens were sorted from zooplankton samples collected with open-closed net (Leavitt 1 m), during the El Golfo 6311-12 cruise (November–December, 1963) of the Scripps Institution of Oceanography, University of California, San Diego (SIO) in the following localities: sta. III (26°32'N, 111°03'W) 19 November, 50 m depth, 1 specimen; sta. III-A (26°36'N, 110°03'W) 20 November, 40 m depth, 1 specimen; sta. III-A (26°36'N, 110°03'W) 20 November, 50 m depth, 2 specimens; sta. III-B (26°32'N, 111°03'W) 20 November, 60 m depth, 5 specimens.

Measurements in millimeters: Largest: 19.0 length, 8.0 width; smallest: 4.0 length, 1.7 width.



Explanation of Figures 1 and 2

Figure 1. *Phylliroe bucephala* from the GOLCA 8404 cruise, sta. 123. L.I.UNAM3767. A preserved specimen in formalin. Size: 17 × 8 mm.

Figure 2. *Cephalopyge trematoides* from the GOLCA 8404 cruise, sta. 117-A. L.I.UNAM3776. A preserved specimen in formalin. Size: 5.9 × 0.7 mm.

Genus *Cephalopyge* Hanel, 1905

Cephalopyge trematoides (Chun, 1889)

(Figure 2)

Previous records in the Pacific Ocean: Shimizu Bay, Japan (Baba, 1933); off coast of New South Wales, Australia (Dakin & Colefax, 1936, 1937); North-eastern Pacific, 28°30'N, 117°58'W (Dales, 1953); Camp Cove, Port Jackson, New South Wales, Australia, North-eastern Pacific, 28°38.1'N, 115°15.9'W; 33°24'N, 117°55'W (Steinberg, 1956).

Material examined: It was collected by CICIMAR, Instituto Politécnico Nacional, La Paz, Baja California Sur, during the GOLCA 8404 cruise in March and April 1984, with oblique net-tows from a depth of 200–0 m. Station data are: sta. 61 (27°33'N, 112°23'W) 26 March, 1 specimen; sta. 93 (25°39'N, 110°40'W) 31 March, 2 specimens; sta. 100 (26°15'N, 109°25'W) 1 April, 1 specimen; sta. 106 (24°41'N, 110°19'W) 2 April, 2 specimens; sta. 108 (24°53'N, 109°55'W) 3 April, 1 specimen; sta. 110 (25°08'N, 109°20'W) 3 April, 1 specimen; sta. 116 (24°45'N, 109°04'W)

4 April, 1 specimen; sta. 117 A (24°24'N, 110°04'W) 4 April, 4 specimens; sta. 120 (24°03'N, 109°20'W) 5 April, 1 specimen; sta. 122 (24°14'N, 108°46'W) 5 April, 1 specimen; sta. 123 (24°47'N, 108°29'W) 5 April, 1 specimen; sta. 129 (23°47'N, 108°03'W) 7 April, 1 specimen; sta. 134 (23°07'N, 109°20'W) 7 April, 1 specimen.

Additional material: A zooplankton sample from the El Golfo 6311-12 cruise (November–December, 1963) of the Scripps Institution of Oceanography, University of California, San Diego. It was taken with open-closed net (Leavitt 1 m) in the Station II-A (25°36'N, 110°15'W) 17 November, 40 m depth, 1 specimen.

Measurements in millimeters: Largest: 7.5 length, 0.7 width; smallest: 2.7 length, 0.5 width.

Comments: Detailed descriptions and illustrations of this species are given by Stubbings (1937, as *Cephalopyge arabica*), and Steinberg (1956). In the studied specimens it was not possible to find the radula, possibly because of preservation in formalin. However, in a specimen which was dissected, the jaws had a very small papilla, possibly the odontophore.

The sizes of the specimens are smaller than those recorded by Steinberg (1956) for specimens of *C. trematoides* from the southwestern Pacific, and are similar or somewhat smaller than those of specimens of *Cephalopyge* described by other authors such as Chun (1889, in Stubbings, 1937), André (1906), and Stubbings (1937).

All specimens of *P. bucephala* and *C. trematoides* collected by CICIMAR from the GOLCA 8404 cruise were deposited in the Laboratorio de Invertebrados, Facultad de Ciencias, Universidad Nacional Autónoma de México, and all specimens from the El Golfo 6311-12 cruise were deposited in the Scripps Institution of Oceanography, planktonic invertebrates collection.

Discussion

The species of the family Phylliroidae are best known from the Mediterranean Sea and Atlantic Ocean. Few records of these nudibranchs exist in the Pacific Ocean. Most have been made from the southwestern Pacific, in the waters of New Zealand and Australia (Dakin & Colefax, 1940; Powell 1937, 1979; Steinberg, 1956). Baba (1933) recorded a new species, *Cephalopyge orientalis*, from Japanese waters, but Steinberg (1956) placed it in synonymy with *C. trematoides*.

There are fewer records from the eastern Pacific. Dales (1953) recorded one specimen of *Phylliroe bucephala* and one *Cephalopyge trematoides*, collected at 33°19'N, 128°27'W, and 28°30'N, 117°58'W, respectively, off the coast of Baja California. Steinberg (1956) recorded *Cephalopyge trematoides* from two localities (28°38.1'N, 115°15.9'W; 33°24'N, 117°55'W). Lance (1961) mentioned *Cephalopyge trematoides* in his distributional list of Southern California opisthobranchs as "usually collected accidentally in plankton tows." These are the first records of *Phylliroe bucephala* from the Gulf of California. Keen (1971) mentioned that "numerous free-swimming adults have been collected during plankton tows by the Scripps Institution of Oceanography off the west coast of México between latitudes 14° and 24°N." However, there are no records of this species in the invertebrate collections of SIO (M. Ohman and A. Townsend, personal communication), so Keen's records are apparently from the Pacific.

Stubbings (1937) mentioned that the distribution of some species of *Cephalopyge* is almost worldwide in tropical and subtropical waters. However, the specimens of the Phylliroidae are difficult to see in zooplankton samples because of their very small size, and they can escape through the meshes of the net, and if caught, they are readily overlooked in sorting large masses of zooplankton.

From this study, it is possible to conclude that these animals are in fact hidden in the zooplankton masses; however, they do not escape due to their small size, and it is necessary to carefully check the whole sample with the stereoscope microscope in order to find them. It is possible that the largest specimens have evasion capacity and could not be captured by the net. Under these circumstances and by the exhaustive revision of 77 and 70 zooplankton samples from two cruises in the Gulf of California and the western coast of Baja California, including the Guadalupe, Cedros, and Socorro Islands, it is possible to conclude that *Phylliroe bucephala* and *Cephalopyge trematoides* were widespread in the southern region of the Gulf of California during March–April of 1984; and they were in only two and one localities, respectively, during November–December of 1963 at depths of 40–60 m.

Acknowledgments

I would like to thank Marco Sánchez Hidalgo and Mark Ohman for permitting me to examine the collections of zooplankton samples under their care in CICIMAR, IPN, México and SIO, UCSD, respectively, and for the use of facilities to sort the specimens from these samples. I am particularly grateful to Annie Townsend who assisted me in the revision of zooplankton samples during my visit at SIO. I would also like to thank Jim Lance for his valuable criticism, and Margaret Knight for her substantial help in the preparation of the manuscript. My appreciation also is due to Hans Bertsch for his critical review and recommendations on the manuscript. I am grateful to Maricela Vicencio Aguilar for her cooperation. José Antonio Hernández made the photographs in the Laboratorio de Microcine, Facultad de Ciencias, UNAM. This research was supported by grants from CONACYT, México, and DGAPA, UNAM.

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The Occurrence of *Mytilopsis leucophaeata* (Conrad, 1831) (Veneroida: Dreissenidae) in Southern New England

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The Dreissenidae has had a dynamic biogeographic history, especially in recent times (Nuttall, 1990; Carlton, 1992; Morton, 1993). Much of the group's rapid global spread has been the direct result of human activity. Almost certainly, the enormous potential for dispersal is due to biological factors (Boss, 1982; Morton, 1993), especially the production of a free-swimming larva, a relatively labile ecology enabling them to tolerate, to varying degrees, both fresh and brackish water, and, in extant genera, the sessile nature of the adult mussel. *Mytilopsis leucophaeata* (Conrad, 1831) is the only Recent species of the dreissenid genus *Mytilopsis* Conrad, 1858, known in eastern North America. Until the mid-twentieth century, it was not known from farther north than Chesapeake Bay on the North American Atlantic coast.

Materials and Methods

Housatonic River specimens of *M. leucophaeata* collected in 1992 and 1995 have been placed in the Museum of Zoology, University of Massachusetts (UMA MO.1794, 1831, respectively). Charles River material of the same species has been deposited in the Museum of Comparative Zoology, Cambridge, Massachusetts (MCZ 316062), and the Museum of Zoology, University of Massachusetts, Amherst, Massachusetts (UMA MO.1795). Salinity was determined by a LaMotte Salinity Titration kit (Model POL-H).

Results and Discussion

Mytilopsis leucophaeata was first observed in the lower Hudson River in the late 1930s (Rehder, 1937), and by the 1950s was firmly established throughout the lower Hudson River basin (Jacobson, 1953; Jacobson & Emerson, 1961). The mussel's entry into the Hudson River estuary was believed to be the result of artificial introduction (Jacobson, 1953). In September 1992, one of us (D.G.S.) found a single valve and other fragments of *M. leucophaeata* in the Housatonic River in Shelton, Fairfield County, Connecticut, just south of Twomile Island. The