

Annotated Checklist of the Aquatic snails of the Mariana Islands, Micronesia

by

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SUMMARY

This report provides an annotated checklist of all the aquatic snails known from the Mariana Islands, with notes on taxonomy, physical description, biology and distribution. A total of 25 species of gastropods are known to inhabit the fresh- and brackish waters of the Marianas, including 18 native species: 13 species of Neritidae, four species from Thiariidae, and one from the Lymnaeidae. Seven species have been introduced: two from Ampullariidae, two from Planorbidae, as well as one each from the Physidae, Thiariidae and Viviparidae.

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INTRODUCTION

Tropical oceanic islands have a surprisingly diverse fauna in their freshwater habitats. These species tend to be good travellers, with larvae that disperse on ocean currents, and, as a consequence, they have a broad geographical distribution. Other species of oceanic islands have been introduced, usually inadvertently, by man, either as potential food or as a contaminant in aquaculture, ornamental plants or the aquarium trade. This account provides a comprehensive annotated listing of the aquatic snails of the Mariana Islands, Micronesia.

The Mariana Islands are small (10 to 540 km²) volcanic or tectonically uplifted limestone islands in the western tropical Pacific Ocean (13° to 20° N, 142° to 144° W), approximately 2400 km east of the Philippines. Of the 14 "main", i.e. largest, islands, only five possess sizable and permanent freshwater habitats. Guam's southern half is volcanic and laced with streams and a few sizable rivers, as well as lotic systems in the form of reservoirs. Rota, Tinian, Saipan and Pagan all have small streams or lakes.

The first students of Marianas aquatic zoology were Jean-René Constant Quoy and Joseph Paul Gaimard, both of whom served as zoologists aboard two voyages around the world (Freycinet 1825; d'Urville 1834) that stopped for about a week each voyage on the largest and southernmost island in the archipelago, Guam. They described numerous new species of marine and terrestrial animals from the island, including a



Figure 1. A plate from Sowerby's (1842) *Thesaurus Conchyliorum* showing some freshwater nerites native to south-east Asia and western Pacific Islands. (From Biodiversity Heritage Library.)

stream-inhabiting lymnaeid snail, *Lymnaea viridis*, later found in south-east Asia.

Later additions to the aquatic molluscan fauna of the Marianas are from another Frenchman, Constant Récluz, who described four species occurring in the Marianas. These came largely from the natural-history cabinets of European collectors and includes a neritid *Septaria janelli* whose type locality is given as Umatac, a village in southern Guam. Other taxonomic authorities of Mariana aquatic snails include Linnaeus, Lamarck and Lesson.

A total of 25 species of gastropods are known to inhabit the fresh- and brackish waters of the Marianas, including 18 native species: 13 species of Neritidae, four species from Thiaridae, and one from the Lymnaeidae. Seven species have been introduced: two from Ampullariidae, two from Planorbidae, as well as one each from the Physidae, Thiaridae and Viviparidae. Nearly all of these species are known only from Guam

This report provides an annotated systematic account of the aquatic gastropods of the Mariana Islands. Species are arranged alphabetically within family. Information is given on each species synonymy and any notable aspect of taxonomic history, a brief description, notes on biology, such as sexual system, reproductive mode and habitat, status as native or introduced, distribution within the Mariana Islands, Micronesia and worldwide. Finally, a reference is given to an illustration in the literature or on the web.

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SYSTEMATIC ACCOUNT

NERITIDAE

Clithon corona (Linnaeus, 1758)

Crown nerite

Taxonomy: *Nerita corona*; *Neritina corona*; *Neritina brevispina* Lamarck, 1816; *Clithon brevispina* Riech, 1937.

Description: Shell 7-21 mm. Shell black, aperture white, apex often red. Shell globulose, oblong, striated, body whorl with peripheral long, often broken spines, outer peristome thin and sharp, inner lip with obtuse lobe, columellar edge slightly serrated, operculum horny. (From Potiez & Michaud 1858.)

Biology: Develops from a veliger larvae Herbivorous. Found in fresh to brackish-water streams and intertidal areas.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Smith 1991), Yap (Smith 1989), and Chuuk/Pohnpei (Maciolek & Ford 1987; Haynes 1988) in Micronesia. Widely distributed in the western tropical Pacific Ocean.

Photo: Reeves (1842), pl. CCI, fig. 20.

Clithon oualaniensis (Lesson, 1831)

Dubious nerite, Guamanian nerite

Taxonomy: *Neritina oualaniensis*; *Theodoxus (Pictoneritina) oualaniensis*.

Description: Shell 7-12 mm. Shell quite variably colored and patterned, usually yellow to olive with purple-black or reddish lines overlain; aperture usually yellowish, sometimes bluish white, columellar area yellowish. Shell smooth, shiny, columellar area narrow, a little convex, the margin with a central sinus which has four or five minute teeth, and a larger one above them.

Biology: Develops from a veliger larvae. Herbivorous. Found in fresh to brackish water often intertidally, including mangroves. If in saltwater, there is usually freshwater intrusion.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Not reported elsewhere in Micronesia. Found from India to the western Pacific from Japan to Polynesia and Australia.

Photos:

http://www.schnecken-und-muscheln.de/product_info.php?products_id=2514.

<http://www.wildsingapore.com/wildfacts/mollusca/gastropoda/neritidae/oualaniensis.htm>

Clithon sowerbiana (Récluz, 1843)

Taxonomy: *Neritina* (*Clithon*) *sowerbiana*; *Theodoxus sowerbyanus*. Some recent authorities synonymise this species with *C. faba* (Sowerby, 1836). Some authors incorrectly give the date as 1842 (see Kabat & Finet 1992).

Description: Shell 10-15 mm. Solid, subopaque, closely, faintly striate, shiny, yellowish brown, orange brown or rosy, frequently with minute white and red spots, sometimes more or less interruptedly banded or longitudinally striated with black; aperture usually bluish white, columellar margin dentate for most of its length with a single supermedial larger tooth. (From Pilsbury 1888.)

Biology: Develops from a planktonic veliger larvae. Herbivorous. Brackish water.

Distribution: Smith (2003) lists this sp from the Marianas and gives a specimen number UGI 6813. Found from south-east Asia to Philippines and Japan.

Photo: <http://mkohl1.net/Neritidae.html>, as *C. cf. sowerbiana*.

Neritina auriculata Lamarck, 1816

Bat snail, Batman snail

Taxonomy: *Neripteron* (*Neripteron*) *auriculata* Lamarck, 1816; *Nerita dubia* Turton, 1932; *Nerita tomlini* Turton, 1933.

Description: Shell 15-25 mm. Rather convex, slightly striate, somewhat shiny, brownish or olive, barely visible reticulation with black lines or with lighter spots, aperture yellowish white, bluish black around the lip and on the columellar area, margin of columella slightly arcuate medially, and minutely dentate. (From Pilsbury 1888.)

Biology: Develops from a planktonic veliger larvae Herbivorous. Can tolerate brackish water near river mouths.

Distribution: Native. Reported from Guam (Smith 2003). Also found in Palau (Haynes 1988) and Yap (Smith 1991) in Micronesia. Occurs widely in the Indo-Pacific region to eastern Africa.

Photo: Reeves (1856), pl. XVII, figs. 83a, b.

Neritina petiti (Récluz, 1841)

Taxonomy: *Nerita* (*Neritina*) *petiti*. The often used, but incorrect *N. "petiti"* traces to Sowerby (1849; see Kabat & Finet 1992).

Description: Shell 30-40 mm. Shell dark brown, faintly black-spotted to fully black, aperture and columellar area yellowish to orange. Striate, body whorl somewhat extended above, but no covering spire, appressed, not ridged, columellar edge serrate to smooth. (From Pilsbury 1888.)

Biology: Develops from a planktonic veliger larvae Herbivorous. Attached to stones and boulders. Found in fresh and brackish water, including fast-flowing streams and rivers (Haynes 1990).

Distribution: Native. Reported from Guam (Smith 2003). Also found in Palau (Smith 1991), Yap (Smith 1989), and Chuuk or Pohnpei (Maciolek & Ford 1987; Haynes 1988) in Micronesia. Found in the western Pacific Ocean, including Japan and Taiwan.

Photo: <http://www.sealifebase.fisheries.ubc.ca/summary/Neritinapetiti.html>

Neritina pulligera (Linnaeus, 1767)

Taxonomy: *Nerita pulligera*; *Neritina rara* Dufo, 1840; *Neritina bruguieri* Récluz, 1841. Date sometimes incorrectly given as 1758.

Description: Shell 10-40 mm. Shell brown, aperture orange with white edge, columellar area dark. Body whorl nearly to fully eclipses spire.

Biology: Develops from a planktonic veliger larvae. Herbivorous. Prefers rocky, fast-moving freshwater to brackish rivers and streams, particularly nearer the ocean.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Haynes 1988; Smith 1991), Yap (Smith 1989), Chuuk/Pohnpei (Maciolek & Ford 1987; Haynes 1988) and Kosrae (B.D. Smith, unpubl.) in Micronesia. Widely distributed in the Indo-western Pacific region, from east Africa to Micronesia.

Photos: http://www.schnecken-undmuscheln.de/product_info.php?products_id=1508
http://content61.eol.org/content/2010/08/07/04/07941_orig.jpg

Neritina squamaepicta (Récluz, 1843)

Taxonomy: *Nerita* (*Neritina*) *squamaepicta* Récluz, 1843; N. "*squamipicta*" appears to be an error traceable to Martens (1875; see Kabat & Finet 1992). Sometimes date incorrectly given as 1842 (see Kabat & Finet 1992).

Description: Shell 25-35 mm. Striate, shining, yellowish olive to brown, nebulous or with reticulations or angular markings of black lines, varying from minute to large, sometimes as bands or absent, last whorl appressed and enveloping spire, aperture bluish white to olive, columellar area slightly punctate, flattened, yellowish white or pale olive, margin minutely dentate. (From Pilsbury 1888.)

Biology: Develops from a planktonic veliger larvae Herbivorous. Found on stones near the mouths of rivers and streams emptying into the sea.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Smith 1991), and Yap (Smith 1989) in Micronesia. Appears restricted to a few large islands of Melanesia and Micronesia (Haynes 1988).

Photo: http://www.guamreeflife.com/htm/freshwater_all_images.htm

Neritina turrita (Gmelin, 1791)

Taxonomy: *Nerita turrita*; *Nerita* (*Vittina*) *turrita*.

Description: Shell 25-32 mm. Shell oblong-conical, lightly striulate, shiny, spire elevated, pointed, olive or brownish with oblique, curved or rippled black stripes; aperture bluish white, columellar area yellow tinted. (From Pilsbury 1888.)

Biology: Develops from a planktonic veliger larvae Herbivorous. In tidally influenced brackish waters near the mouth of rivers and streams. Often near shore in mud or on stones.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Haynes 1988; Smith 1991), and Yap (Smith 1989) in Micronesia. Occurs in the western Pacific Ocean from Japan to Indonesia.

Photo: http://www.guamreeflife.com/htm/freshwater_all_images.htm

Neritina variegata Lesson, 1831

Taxonomy: *Neritina (Vittoidea) variegata*; *Vittina variegata*.

Description: Shell size 16-23 mm. Somewhat shiny, spire elevated, variegated with yellowish brown and black, usually in an irregular network pattern, the meshes large or small, sometimes the black reticulations form irregular broad bands, and occasionally they cover the entire surface making it appear unicoloured, aperture whitish or bluish white, the columella with a tinge of orange-brown. (From Pilsbury 1888.)

Biology: Develops from a planktonic veliger larvae Herbivorous. Often found on rocks in rivers and streams in both fast- and slow-moving water.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Bright 1979; Haynes 1988), Yap (Smith 1989), Chuuk/Pohnpei (Maciolek & Ford 1987; Haynes 1988) and Kosrae (B.D. Smith, unpubl.) in Micronesia. Occurs in the western Pacific Ocean from Japan to the Solomon Islands and western Samoa.

Photo: http://www.guamreeflife.com/htm/freshwater_all_images.htm

Neritodryas subsulcata (Sowerby, 1836)

Taxonomy: *Neritina subsulcata*.

Description: Shell 21-33 mm. Shell sturdy, often eroded in spots, spire depressed conical, body whorl convex, distinctly spiral sculpture with low, rounded riblets, brown, columellar margin barely serrate, columellum white with black blotches nearer whorl. (From Pilsbury 1888.)

Biology: Herbivorous. Develops from a veliger larvae. Found in freshwater streams and the brackish intertidal, including mangroves.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Bright 1979; Haynes 1988), Yap (Smith 1989), Chuuk/Pohnpei (Maciolek & Ford 1987; Haynes 1988) and Kosrae (B.D. Smith, unpubl.) in Micronesia. Found in the western Pacific Ocean, from Japan to Vanuatu and Micronesia.

Photo: Reeves (1856), pl. VIII, figs. 31a, b.

Septaria lineata (Lamarck, 1827)

Taxonomy: *Navicella lineata*.

Description: Shell 25 mm wide. Shell light yellowish, with radiating pattern of chestnut or purplish longitudinal reticulations, forming tessellations and triangular markings of a lighter colour. Shell compressed elliptical, very thin, translucent, interior showing all the exterior markings, light bluish or yellowish. (From Reeves 1856 and Pilsbury 1888.)

Biology: Develops from a veliger larvae Herbivorous. Occurs attached to rocks in fresh to brackish water streams.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Chuuk/Pohnpei (Maciolek & Ford 1987; Haynes 1988) in Micronesia. Widely distributed from India and southeast Asia to the Philippines.

Photo: Reeves (1856), pl. VIII, figs. 31a, b.

Septaria janelli (Récluz, 1841)

Taxonomy: *Navicella janelli*. I dont see this in any recent list of Mariana snails, yet also do not see it synonymised with other Mariana *Septaria*.

Description: Shell 30 mm. Shell olive-yellow, reticulated with oblique blackish-green lines, sometimes concentrically blotched with black; interior bluish, columellar area tinged with orange. Shell oblong-ovate, convexly depressed. (From Reeves 1856.)

Biology: Develops from a veliger larvae Herbivorous. Occurs attached to rocks in fresh-water streams.

Distribution: Native. Type locality is Guam (Récluz, 1843). Not reported elsewhere in Micronesia. Reported from southeast Asia to the Philippines.

Photo: Reeves (1856), pl. I, figs. 1a, b.

Septaria porcellana (Linnaeus, 1758)

Taxonomy: *Patella porcellana*; *Navicella porcellana*; *Neritina (Dostia) porcellana*; *Septaria suborbicularis* Sowerby, 1825.

Description: Shell 20-26 mm. Shell background light yellowish, finely to coarsely reticulated with olive-black, interior blue, columellar area blotched with black at the sides. somewhat triangularly ovate, rather solid, margin rather expanded, columellar area slanting; operculum internal.

Biology: Develops from a veliger larvae Herbivorous. With its limpet-like shell, it lives attached on or under rocks. Found upstream away from tidally influenced waters, in either fast-flowing or standing water.

Distribution: Native. Reported from Guam (Smith 2003; Haynes 1988). Also found in Palau (Haynes 1988; Smith 1991), Yap (Smith 1989), and Chuuk/Pohnpei (Maciolek & Ford 1987; Haynes 1988) in Micronesia. Found from India to the western Pacific from Japan to New Caledonia.

Photos: Reeves (1842), pl. CXIX, figs. 5, 8. Reeves (1856), pl. II, figs. 6a, b.

THIARIDAE

Tarebia granifera (Lamarck, 1822)

Quilted melania

Taxonomy: *Melania granifera*; *Thiara granifera*; *Melanoides granifera*; *Melania obliquigranosa* Smith, 1878.

Description: Shell dark brown with light brown body whorl. Shell sharply conoid, whorls six to seven, spirally ridged throughout, ridges strongly warty; aperture ovate, columella reflected at base, no umbilicus.

Biology: All thiarids are thought to consist of parthenogenic females. Broods young internally. Herbivorous. Found in freshwater and brackish rivers and streams, including mangroves and standing ponds.

Distribution: Native. Reported from Guam (Haynes 1990; Smith 2003) and the northern Mariana Islands (Starmuehlner 1976). Not reported from elsewhere in Micronesia. Widely distributed from India and southeast Asia to Japan and Polynesia, including Hawaii, where it has been introduced.

Photos: <http://www.nature-of-oz.com/freshwater.htm>

<http://www.nature-of-oz.com/freshwater.htm>

Thiara scabra (O. F. Müller, 1774)

Pagoda tiara

Taxonomy: *Buccinum scabrum*; *Plotia scabra*; *Melania granum* Branca, 1908.

Description: Shell height 5 to 8 mm. Shell cream to white with reddish mottling often forming vertical bands. Shell thin, strong spiral striae, strong carina near suture with large widely spaced spines, ca. 7 per whorl, whorls convex, spire acute, suture indented, peristome simple, thin, columella curved, reflexed, non-umbilicate in adult specimens

Biology: All thiarids are thought to consist of parthenogenic females. Herbivorous. Often found in freshwater rivers and streams, including cascades.

Distribution: Introduced to the Mariana Islands and elsewhere in Micronesia. Reported from Guam (Haynes 1990; Smith 2003). Also found in Palau (Bright 1979; Smith 1991), Yap (Smith 1989), and Pohnpei (Haynes 1990) in Micronesia. Widely distributed from eastern Africa to the Philippines.

Photo: <http://www.nature-of-oz.com/freshwater.htm>

Melanoides tuberculata (O. F. Müller, 1774)

Red-rimmed melania, Malaysian trumpet shell

Taxonomy: *Nerita tuberculata*; *Thiara tuberculata*.

Description: Shell height 25-35 mm. light brown, usually reddish mottling sometimes forming subsutural spiral bands, columella lighter. Shell turrete, whorls nine, convex, with fine granular striations and superperipheral curved ribs, aperture oblong-ovate, peristome thin, unreflexed, columella straight closing umbilicus.

Biology: All thiarids are thought to consist of parthenogenic females. Herbivorous. Occurs in a wide range of freshwater habitats. Can be found in clear rocky to gravelly, fast-moving freshwater rivers and streams, but also ponds and other standing bodies of water. Common as an aquarium snail.

Distribution: Native. Reported from Guam (Smith 2003). Also found in Palau (Bright 1979; Smith 1991), Yap (Smith 1989), Chuuk and Pohnpei (Maciolek & Ford 1987; Haynes 1990) and Kosrae (B.D. Smith, unpubl.) in Micronesia. Widely distributed from the eastern Mediterranean and Indian Ocean to Japan and Australia.

Photo: <http://www.nature-of-oz.com/freshwater.htm>

Melanoides riqueti (Grateloup, 1840)

Taxonomy: *Melania riqueti*; *Melanoides riqueti*; *Thiara riqueti*; *Sermyla riqueti*.

Description: I haven't found a description of this species.

Biology: All thiarids are thought to consist of parthenogenic females. Herbivorous. Prefers tidally influenced freshwater and brackish rivers and streams, including mangroves and standing ponds.

Distribution: Native. Reported from Guam (Smith 2003). Not reported from elsewhere in Micronesia. Known from India to the western Pacific, including Australia, Papua New Guinea, Philippines and the coast of China.

Photos: <http://www.femorale.com.br/>

http://www.eurasiashells.net/Thiaridae/Sermyla_riqueti_16-3.jpg

Stenomelania plicaria (Born, 1780)

Taxonomy: *Thiara plicaria*; *Melanoides* (*Stenomelania*) *plicaria*.

Description: I haven't found a good description of this species.

Biology: All thiarids are thought to consist of parthenogenic females. Herbivorous. Rarely found in brackish habitats, preferring upstream portions of rivers. Usually seen near shore in mud or sand.

Distribution: Native. Reported from Guam (Smith 2003). Also found in Palau (Bright 1979; Smith 1991) and Yap (Smith 1989) in Micronesia. Distributed from India through south-east Asia and the western Pacific from Taiwan to the Solomon Islands.

Photo: <http://www.guamreeflife.com/>

AMPULLARIIDAE

Pila conica (Gray, 1828)

Taxonomy: *Ampullaria conica*.

Description: Shell width 80-100 mm. Shell yellowish olive, whitish lip. Shell subglobose, spire rather prominent, whorls convex, smooth, shining; umbilicus covered; aperture ovate, lip barely reflected. (Based on Reeve 1843.)

Biology: Oviposits distinctive clutches of white eggs above the waterline. Herbivorous. Prefers freshwater, but found in a wide variety of habitats, especially standing bodies of water, but also rivers and streams.

Distribution: Introduced, perhaps as a food item from the Philippines. Reported from Guam (Smith 2003). Not reported elsewhere in Micronesia. Introduced to Hawaii. Occurs from India, through south-east Asia to the Philippines.

Photos: http://ampullariidae.lifedesks.org/image/view/42/_original
http://applesnail.net/content/details/pila_conica_eggdep_02_xl.jpg

Pomacea canaliculata (Lamarck, 1819)

Golden Apple Snail

Taxonomy: *Ampullaria canaliculata*.

Description: Shell large, 80-100 mm wide. Shell pale ash, dark bands beneath a thin olive epidermis; aperture pyriform-ovate, bluish, orangered next to columella. Shell globose, somewhat ventricose, widely umbilicate, spire short, sharp, whorls convex, longitudinally striated, concavely channelled at the upper part. (Based on Reeve 1843.)

Biology: Oviposits distinctive clutches of pink eggs above the waterline. Herbivorous. Prefers freshwater, but found in a wide variety of habitats, especially standing bodies of water, but also rivers and streams.

Distribution: Introduced, perhaps as a contaminant in aquaculture or as a food item. Reported from Guam (Smith 2003). Reported from Palau in Micronesia, but considered eradicated (D. Idip 1987, pers. comm. to B.D. Smith). Native to South America and now introduced worldwide, including Hawaii.

Photos: <http://old.padil.gov.au/pbt/index.php?q=node/15&pbtID=157>
<http://www.hawaiiinvasivespecies.org/pests/images/applesnail2.jpg>

VIVIPARIDAE

cf. *Sinotaia magnificiana* (Heude, 1889)

Taxonomy: The tentative identification is from B.D. Smith, unpublished. Viviparids, including *Sinotaia*, have lots of taxonomic issues.

Description: Shell brownish green. All viviparid opercula are asymmetrical with concentric ridges. The shell from animals on Guam are conical, apex acute, whorls flat, subperipherally carinate, sutures impressed, aperture round.

Biology: Viviparids are live bearing. Herbivorous. The family possesses wide physiological tolerances and is often found near human habitation.

Distribution: Introduced, perhaps as a contaminant in aquaculture. Reported from Guam (Smith 2003). Not reported elsewhere in Micronesia. The family Viviparidae is found worldwide, sans South America; *Sinotaia* is native to China and southeast asian mainland.

Photo: There are no published photos of this species as far as I can find.

LYMNAEIDAE

Lymnaea viridis Quoy & Gaimard, 1832

Green pond snail

Taxonomy: *Radix viridis*; *Fossaria viridis*; *Austropeplea viridis*; *Viridigalba viridis*; *Galba viridis*.

Description: Shell height 8 to 12 mm. Shell brownish green, body dark grey. Shell thin, translucent, dextral, oblong-ovate, spire small, longitudinally striate; five convex whorls; aperture large, oval; umbilicate; spire acute. (From Quoy & Gaimard 1832.) Tentacles squat, triangular.

Biology: Hermaphroditic, self-fertilising, eggs laid in gelatinous mass. Herbivorous and detritivorous. Prefers lakes and ponds, rather than rivers and streams, and usually in association with bottoms of fine sediment, often in high numbers.

Distribution: Native. Sometimes incorrectly reported as 'introduced', but this species is described from Guam. Not reported elsewhere in Micronesia. Distributed in the western Pacific from southern Korea to Australia, where it has been introduced.

Photo: See vol. V of Quoy & Gaimard (1832), pl. 58, figs.16-18.

PHYSIDAE

Physid sp. 1

Taxonomy: Generic identification is possible via the shell. Identification of species generally requires checking soft anatomy.

Description: Shells of physids vary from 5-20 mm in height. Shell colour in the Physidae can vary from transparent to almost black. Physid shells are sinistral, thin,

shiny, often translucent or transparent, elongate aperture, high, often short, acute spire, large body whorl, whorls convex, non-umbilicate, parietal callus, peristome often thickened.

Biology: All physids are hermaphrodites capable of self-fertilisation. All are herbivores and detritivores. All species inhabit freshwater.

Distribution: Introduced, likely via the aquarium trade. One unidentified species of Physidae is reported from Guam (B.D. Smith, unpubl.). Not reported elsewhere in Micronesia. The family Physidae is native to North and South America.

Photo: A *Physa* sp. from Hawaii is shown at
<http://hbs.bishopmuseum.org/waipio/Critter%20pages/physa.html>

PLANORBIDAE

Planorbid spp. 1 and 2

Ram's-horn snail

Taxonomy: Most of planorbid taxonomy is in flux.

Description: Most species are yellow to brown. Shell thin, smooth, convex whorls, aperture often hemilunate to oblong-ovate, peristome reflected, growth striae often evident. Most species carry shell umbilicus upwards, so appears dextral, but is sinistral; nearly planispiral, spire sunken, umbilicus very wide and shallow. Relatively long, filiform tentacles.

Biology: I have no information on these unidentified species.

Distribution: Introduced, likely via the aquarium trade. Two unidentified species of Planorbidae are reported from Guam (B.D. Smith, unpubl.). Not reported elsewhere in Micronesia. The family Planorbidae is native worldwide, excluding oceanic islands.

Photo: Apical and umbilical views of *Planorbella duryi* Wetherby, 1879, a typical planorbid and a species introduced to Hawaii is shown at
<http://www.jaxshells.org/ref3.htm>

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