

SHORT NOTE

Preliminary check-list of the marine, shelled gastropods (Mollusca) of Golfo Dulce, on the Pacific coast of Costa Rica

Tore Høisæter

University of Bergen, Department of Fisheries and Marine Biology, Høyteknologisenteret, N-5020 Bergen, Norway.
E-mail: tore.hoisater@ifm.uib.no

(Rec. 10-XII-97. Rev. 26-III-98. Acep. 11-XI-98)

Abstract: Based on partly worked up material from three brief collecting excursions to the peninsular shore of Golfo Dulce, 252 species of shelled gastropods, mostly prosobranchs and pyramidellids, have been identified. This being the first report on intertidal and shallow water gastropods from the gulf, the list may be taken as a preliminary check list of this fauna element from Golfo Dulce. Only partly sorted material from two additional trips to the gulf contains at least 100 additional species not yet identified.

Key words: Shelled gastropods, mollusks, check list, Golfo Dulce.

The benthic fauna of Golfo Dulce is known mainly from the results from the samples taken during the R/V Victor Hensen (1993-1994) expedition to the Pacific coast of Costa Rica. The mollusks from that expedition has been reported on by Cruz (1996). The samples were all taken by beam trawl, mesh size 2.5 cm, or by otter trawl, mesh size 1 cm, from depths deeper than 20 m.

As part of the University of Costa Rica Golfo Dulce Research Program, field work was conducted in the littoral and upper sublittoral of the gulf in 1994, 1995, and 1997. In 1994 and 1995 gastropods were collected on several occasions, as part of a general survey of the gastropod fauna of the littoral and upper sublittoral of Costa Rica. In 1997, a sampling program for a more representative coverage of the shores of Golfo Dulce was planned. In the period 11 to 18 April 1997, thus eleven localities around the bay were sampled for decapod crustaceans and gastropods.

Only the material from the two first years have been worked up so far. Out of a total of 61 samples in all of Costa Rica, 20 separate collections of gastropods were taken, all of them from the SW shore of the Golfo Dulce.

Localities. In common with much of the Pacific shores of Costa Rica south of and including Golfo de Nicoya, the inshore waters of Golfo Dulce is characterized by muddy water and poor visibility. This may be one reason for a rather sparse algal cover, and thus the virtual lack of an algae-living component of the gastropod fauna. Most of the shores visited were muddy to sandy and very shallow out to a fair distance into the bay. Extensive areas along the shores are covered by mangals, and a mangal were visited, close to Puerto Jiménez. Intertidal mud flats and sand flats were also sampled, while the faunistically much richer platforms, with a mixture of gravel and small stones, were sampled wherever found. Sub-

tidally, mostly a mixture of mud, shell sand and gravel was found. Finally, a number of rocky outcrops with typical hard bottom littoral fauna was also sampled. High energy, sandy beaches are common in the outermost part, but were not sampled in this survey.

During the sampling in 1994 and 1995, three localities yielded successful samples:

- a) Playa Blanca near La Palma, 30.8. and 31.8. 1995 - 14 stations
- b) Puerto Jiménez 4.11. 1994, 30.11. and 1.12. 1995 - 5 stations
- c) Punta Panamá, 4.11. 1994 - a single station.

The first of these localities, Playa Blanca near La Palma, is in the inner parts of the bay, with little swell or waves. The beach consists of stretches of muddy sand interrupted by areas covered with stones and 'conglomerates' under which a lot of snails were found. Very little algae, except for one species of *Spyridia*. This species was most common in a littoral pool, superheated at low water when it is isolated from the water in the bay. In the sublittoral, the sediment consisted of muddy sand and gravel, mixed with coral rubble. In the transition zone high up on the beach there was also found a lot of coral rubble. No living corals were observed however.

The second locality, outside Puerto Jiménez, may be described as typical of much of the shallow zone in the bay, with some mangroves in the creeks and close to the shore, and extensive mud flats stretching for as much as several hundred meters offshore. Solid substrate is in short supply, except for mangrove roots, seedlings and dead leaves.

The third locality, close to Punta Panamá, is faunistically very rich, a wide beach plateau, partly exposed at low tide, with rock and stones and rock pools with silty-sandy bottom. Outside there is a narrow reef barrier partly protecting the beach plateau from the not inconsiderable swell. This locality is thus rather more wave exposed than the other two visited, but far from the extreme exposure experienced by the beaches in the outer part of the bay. On the reef barrier there was a lush vegetation of macroalgae, while the algae were for the most part grazed down to a thin felt inside the barrier.

During the field trip, in 1997, I, together

with Ole Petter Horg a graduate student from our department, attempted to survey the littoral zone of much of the Golfo during an eight day excursion. Eleven localities, seven on the western, one on the northern, and three on the eastern shores of Golfo Dulce were sampled. The material from the 29 samples from this field trip is currently being worked up, and consequently not included in the present list.

MATERIALS AND METHODS

The material was collected by the author in the intertidal area, or when free-diving down to a maximum of 8 m. An effort was made to visit the various localities at maximum low tide, but sometimes the tides were rather unfavorable. The sampling was intense in the intertidal during low tide, and more sporadic in the upper sublittoral. All gastropods were hand-picked from the various substrates, or scooped up with plastic bags or with a bag made of plankton-net while swimming.

Voucher specimens are deposited at Zoological Museum, University of Bergen, Norway.

RESULTS

So far the material from 16 of the stations, a total of 3 350 gastropods belonging to at least 260 different species, has been identified. This may be compared to the 5 450 gastropods belonging to at least 462 species so far identified, from all localities I have visited in Costa Rica. Several of these species are probably new to science, and several more unknown from other parts of the Pacific coast of Costa Rica. Practically all are new to Golfo Dulce, as no published species list from the intertidal and shallow subtidal are known from this part of Costa Rica.

In this preliminary list, no attempts have been made to distinguish between gastropods collected alive and empty shells. Most of the 'macro' gastropods in the material have been identified by reference to Keen (1971). In this work only the species longer than 5-10 mm are described, however, and for the smaller species, I have tried to use available original descriptions. Many of these groups of microgastropods are sorely in need of revision, and I have not yet been able to compare my material

of these groups with type specimens. To underscore the preliminary nature of the 'checklist' I have thus made frequent use of 'cf' and 'aff' in the latin names. By 'cf' I mean to indicate that the identification is preliminary, but that the name I use is not at all unlikely to be correct. By 'aff' on the other hand, I indicate a species that I have not been able to find a description of, but that has certain traits in common with the species whose name I use.

As far as possible I have tried to follow the latest available systematic revisions in the arrangement of the taxa (one exception is the use of Aclididae as a family for three genera of minute snails that certainly belong elsewhere, perhaps the newly proposed family Ebalidae, close to the Pyramidellidae).

PROSOBRANCHIA

PATELLOGASTROPODA

Family LOTTIIDAE (LOTTIINAE)

Tectura subrotundata (Carpenter, 1865)

Family LOTTIIDAE (PATELLODINAE)

Patelloida semirubida (Dall, 1914)

VETIGASTROPODA

Family FISSURELLIDAE (FISSURELLINAE)

Fissurella microtrema Sowerby, 1835

Fissurella virescens Sowerby, 1835

Family FISSURELLIDAE (DIODORINAE)

Diodora cf. digueti (Mabille, 1895)

Diodora cf. inaequalis (Sowerby, 1835)

Diodora cf. pusilla Berry, 1959

Family TROCHIDAE (TEGULINAE)

Tegula panamensis (Philippi, 1849)

Tegula verrucosa McLean, 1970

Tegula sp. A {may be an undescribed species}

Tegula sp. B {may be a variant of sp. A}

Family TURBINIDAE (TURBININAE)

Astraea buschii (Philippi, 1844)

Turbo saxosus Wood, 1828

Family TURBINIDAE (LIOTINAE)

Arene sp. A {probably undescribed}

Family TURBINIDAE (TRICOLIINAE)

Eulithidium perforata (Philippi, 1848)

{= *Tricolia perforata* (Philippi, 1848)}

Eulithidium phasianella (Philippi, 1849)

{= *Tricolia phasianella* (Philippi, 1849)}

Family SKENEIDAE

Parviturbo erici (Strong & Hertlein, 1939)

Parviturbo stearnsii (Dall, 1918)

Family NERITIDAE (NERITINAE)

Nerita funiculata Menke, 1851

Nerita scabricosta Lamarck, 1822

Theodoxus luteofasciatus Miller, 1879

CAENOGASTROPODA

Family CERITHIIDAE (CERITHIINAE)

Cerithium adustum Kiener, 1841

Cerithium cf. *browni* (Bartsch, 1928)

Cerithium sp. A. {may be an Indo-Pacific species known from Hawaii}

Cerithium gollapaginis Sowerby, 1855

Cerithium cf. *nicaraguense* Pilsbry & Lowe, 1932

Cerithium stercusmuscarum Valenciennes, 1833

Cerithium uncinatum (Gmelin, 1791)

Family CERITHIIDAE (BITTIINAE)

Bittium cf. *cerralvoense* (Bartsch, 1911)

Family OBTORTIONIDAE

Finella cf. *veraguaensis* Strong & Hertlein, 1939

Family LITIOPIIDAE

Alaba cf. *interruptilineata* Pilsbry & Lowe, 1932

Family POTAMIDIDAE

Cerithidea cf. *mazatlanica* Carpenter, 1857

Cerithidea valida (C.B. Adams, 1852)

Cerithidea pulchra (C.B. Adams, 1852)

Rhinocoryne humboldti (Valenciennes, 1832)

Family PLANAXIDAE (PLANAXIINAE)

Planaxis planicostatus Sowerby, 1825

Family MODULIDAE

Modulus catenulatus (Philippi, 1849)

Modulus cerodes (A. Adams, 1851)

Modulus disculus (Philippi, 1846)

Family TURRITELLIDAE (TURRITELLINAE)

Turritella gonostoma Valenciennes, 1832

Turritella sp.

Family TURRITELLIDAE (VERMICULARIINAE)

- Vermicularia pellucida* (Broderip & Sowerby, 1829)
Vermicularia sp. {may be an undescribed species}

Family LITTORINIDAE (LITTORININAE)

- Littoraria aberrans* (Philippi, 1846)
Littoraria fasciata (Gray, 1839)
Littoraria varia (Sowerby, 1832)
Littoraria zebra (Donovan, 1825)
Nodilittorina aspera (Philippi, 1846)
Nodilittorina modesta (Philippi, 1846)
Nodilittorina cf. *porcata* (Philippi, 1845)

Family BARLEEIDAE

- Barleeia* cf. *zeteki* Strong & Hertlein, 1939

Family RISSOIDAE (RISSOINAE)

- Alvania inconspicua* C.B. Adams, 1852

Family RISSOIDAE (RISSOININAE)

- Rissoina* sp.
Schwartziella clandestina (C.B. Adams, 1852)
Schwartziella cf. *firmata* (C.B. Adams, 1852)
Folinia ericana Hertlein & Strong, 1951

Family TORNIDAE

- Macromphalina* cf. *carinata* (Pilsbry & Olsson, 1945)
Macromphalina cf. *recticeps* (Pilsbry & Olsson, 1945)
Macromphalina cf. *symmetrica* (Pilsbry & Olsson, 1945)

Family VITRINELLIDAE

- Cyclostremiscus trigonatus* (Carpenter, 1857)
Solariorbis hannai (Strong & Hertlein, 1939)
Solariorbis millepunctatus (Pilsbry & Olsson, 1945)
Solariorbis cf. *minutus* (C.B. Adams, 1852)
Solariorbis aff. *millepunctatus* (Pilsbry & Olsson, 1945)
Teinostoma concavaxis Pilsbry & Olsson, 1945
Teinostoma herbertianum Hertlein & Strong, 1951
Teinostoma imperfectum Pilsbry & Olsson, 1945
Teinostoma cf. *ochsneri* Strong & Hertlein, 1939
Teinostoma cf. *politum* A. Adams, 1851
Teinostoma aff. *soror* Pilsbry & Olsson, 1945
Vitrinella cf. *modesta* C.B. Adams, 1852
Vitrinella cf. *ponceliana* de Folin, 1867
Vitrinella aff. *proxima* Pilsbry & Olsson, 1952

Family CAECIDAE

- Caecum* cf. *bahiahondense* Strong & Hertlein, 1939
Caecum elongatum Carpenter, 1857
Caecum cf. *farcimen* Carpenter, 1857
Caecum firmatum C.B. Adams, 1852
Caecum laqueatum C.B. Adams, 1852
Caecum cf. *lohri* Strong & Hertlein, 1939

Caecum richthofeni Strong & Hertlein, 1939

- Caecum* cf. *semilaeve* Carpenter, 1857
Caecum undatum Carpenter, 1857
Elephantulum cf. *abnormale* (Carpenter, 1857)
Elephantulum heptagonum (Carpenter, 1857)
Elephantulum subsolutum (Carpenter, 1857)
Elephantulum cf. *subspirale* (Carpenter, 1857)
Fartulum cf. *dextroversum* (Carpenter, 1857)
Fartulum cf. *laeve* (C.B. Adams, 1852)
Fartulum teres (Carpenter, 1857)

Family STROMBIDAE

- Strombus* cf. *gracilior* Sowerby, 1825
Strombus granulatus Swainson, 1822

Family HIPPONICIDAE

- Hipponix* cf. *grayanus* Menke, 1853
Pilosabia pilosus (Deshayes, 1832)

Family CALYPTRAEIDAE

- Calyptraea* cf. *lichen* Broderip, 1834
Calyptraea mamillaris Broderip, 1834
Crepidula incurva (Broderip, 1834)
Crepidula sp.
Crucibulum cf. *pectinatum* Carpenter, 1856
Crucibulum cf. *scutellatum* (Wood, 1828)
Crucibulum spinosum Sowerby, 1824

Family VERMETIDAE

- Petalococonchus* cf. *macrophragma* Carpenter, 1857
Petalococonchus sp.

Family CYPRAEIDAE

- Macrocypraea cervinetta* (Kiener, 1841)

Family NATICIDAE

- Natica chemnitzii* Pfeiffer, 1840
Natica cf. *inexpectans* Olsson, 1971
Polinices cf. *ravidus* Souleyet, 1852
Polinices uber (Valenciennes, 1832)

Family RANELLIDAE

- Cymatium* cf. *amictoideum* Keen, 1971
Cymatium lignarium (Broderip, 1833)
Cymatium cf. *parthenopeum* (von Salis, 1798)
Cymatium vestitum (Hinds, 1844)

Family BURSIDAE

- Bursa* cf. *caelata* (Broderip, 1833)

Family TRIPHORIDAE

- Metaxia* cf. *convexa* (Carpenter, 1857)
Triphora alternata C.B. Adams, 1852

Triphora cf. *oweni* Baker, 1926
Triphora cf. *inconspicua* C.B. Adams, 1852
Triphora cf. *dalli* Bartsch, 1907

Family CERITHIOPSIDAE

Cerithiopsis cf. *eiseni* Strong & Hertlein, 1939
Cerithiopsis cf. *gissleri* Strong & Hertlein, 1939
Cerithiopsis cf. *infrequens* (C.B. Adams, 1852)
Cerithiopsis cf. *neglecta* (C.B. Adams, 1852)
Cerithiopsis aff. *io* Dall & Bartsch,
Seila pulmoensis DuShane & Draper, 1975
Seila aff. *kanoni* (de Folin, 1867)

Family EPITONIIDAE

Epitonium eutaenium (Dall, 1917)
Epitonium cf. *mitraeforme* (Sowerby, 1844)
Epitonium replicatum (Sowerby, 1844)
Epitonium cf. *suprastriatum* (Carpenter, 1857)

Family ACLIDIIDAE

Bermudaclis sp.

Graphis sp.

Henrya sp.

(This placement is provisional, they certainly do not belong to this family)

Family EULIMIDAE

Eulima aff. *barthelowi* (Bartsch, 1917)
Melanella cf. *solitaria* (C.B. Adams, 1852)
Melanella spp.
Polygireulima sp.
Sabinella sp.
Stilapex coakeana (Bartsch, 1917)

Family MURICIDAE (MURICINAE)

Dermomurex cf. *cunninghamae* (Berry, 1964)
Favartia erosa (Broderip, 1833)
Homalocantha oxyacantha (Broderip, 1833)
Murex recurvirostris Broderip, 1833
Murexiella cf. *lappa* (Broderip, 1833)
Murexiella vittata (Broderip, 1833)
Muricanthus ambiguus (Reeve, 1845)
Muricopsis cf. *zeteki* Hertlein & Strong, 1951

Family MURICIDAE (OCENEBRINAE)

Trachypollia lugubris (C.B. Adams, 1852)

Family MURICIDAE (RAPANINAE)

Acanthais brevidentata (Wood, 1828)
Cymia tecta (Wood, 1828)
Mancinella speciosa (Valenciennes, 1832)
Mancinella triangularis (Blainville, 1832)
Stramonia biserialis (Blainville, 1832)

Thais (Vasula) melones (Duclos, 1832)

Family BUCCINIDAE (BUCCININAE)

Bailya anomala (Hinds, 1844)
Colubraria ? sp.
Engina maura (Sowerby, 1832)
Engina tabogaensis Bartsch, 1931
Engina cf. *jugosa* (C.B. Adams, 1852)
Gemophos gemmatus (Reeve, 1846)
Gemophos cf. *vibex* (Broderip, 1833)
Pollia ringens (Reeve, 1846)
Pollia sanguinolenta (Duclos, 1833)

Family BUCCINIDAE (NASSARIINAE)

Nassarius cf. *catallus* (Dall, 1908)
Nassarius corpulentus (C.B. Adams, 1852)
Nassarius luteostomus (Broderip & Sowerby, 1829)
Nassarius myristicatus (Hinds, 1844)
Nassarius cf. *pagodus* (Reeve, 1844)
Nassarius cf. *stimpsonianus* (C.B. Adams, 1852)
Nassarius versicolor (C.B. Adams, 1852)

Family BUCCINIDAE (FASCIOLARIINAE)

Latirus mediamericus Hertlein & Strong, 1951
Latirus cf. *praestantior* Melvill, 1892
Leucozonia cerata (Wood, 1828)
Opeatostoma pseudodon (Burrow, 1815)

Family COLUMBELLIDAE

Anachis boivini (Kiener, 1841)
Anachis cf. *coronata* (Sowerby, 1832)
Anachis cf. *dalli* Bartsch, 1931
Anachis fluctuata (Sowerby, 1832)
Anachis cf. *gracilis* (C.B. Adams, 1852)
Anachis hannana Hertlein & Strong, 1951
Anachis cf. *lentiginosa* (Hinds, 1844)
Anachis lyrata (Sowerby, 1832)
Anachis cf. *milium* (Dall, 1916)
Anachis cf. *moesta* (C.B. Adams, 1852)
Anachis nigricans (Sowerby, 1844)
Anachis cf. *pygmaea* (Sowerby, 1832)
Anachis rugosa (Sowerby, 1832)
Anachis cf. *vexillum* (Reeve, 1858)
Anachis aff. *rugosa* (Sowerby, 1832)
Columbella strombiformis Lamarck, 1822
Cosmioconcha cf. *rehderi* (Hertlein & Strong, 1951)
Mitrella ocellata (Gmelin, 1791)
Nassarina cf. *anita* Campbell, 1961
Strombina cf. *mendozaana* Shasky, 1970

Family OLIVIDAE

Oliva sp.

Olivella cf. *inconspicua* (C.B. Adams, 1852)

Olivella cf. *riverae* Olsson, 1956

Family MARGINELLIDAE

Cypraeolina cf. *margaritula* (Carpenter, 1857)

Gibberula cf. *minor* (C.B. Adams, 1852)

Family MITRIDAE

Mitra inca d'Orbigny, 1841

Mitra lens Wood, 1828

Family TEREBRIDAE

Terebra sp.

Family STRICTISPIRIDAE

Pilsbryspira cf. *melchersi* (Menke, 1851)

Family TURRIDAE (TURRINAE)

Polystira oxytropis (Sowerby, 1834)

Family TURRIDAE (CRASSISPIRINAE)

Carinodrillia alboangulata (E.A. Smith, 1882)

Crassispira incrassata (Sowerby, 1834)

Family TURRIDAE (COCHLESPIRINAE)

Knefastia cf. *howelli* (Hertlein & Strong, 1951)

Knefastia cf. *walkeri* Berry, 1958

Family TURRIDAE (ZONULISPIRINAE)

Compsodrillia aff. *opaca* McLean & Poorman, 1971

Family CONIDAE (CONINAE)

Conus gladiator Broderip, 1833

Conus mux Broderip, 1833

Conus perplexus Sowerby, 1857

Family CONIDAE (MANGELINAE)

Agathotoma cf. *alcippe* (Dall, 1918)

Agathotoma stellata (Mörch, 1860)

Kurtziella sp.

Tenaturris cf. *concinna* (C.B. Adams, 1852)

Family CONIDAE (DAPHNELLINAE)

Microdaphne cf. *trichodes* (Dall, 1919)

"*Drillia*" aff. *actinocycla* Dall & Simpson, 1901

HETEROBRANCHIA

Family ARCHITECTONICIDAE

Helicacis bicanaliculatus (Valenciennes, 1832)

Helicacis mazatlanicus Pilsbry & Lowe, 1932

Family PYRAMIDELLIDAE (ODOSTOMINAE)

Chrysalida cf. *communis* (C.B. Adams, 1852)

Chrysalida inconspicua (C.B. Adams, 1852)

Chrysalida cf. *paupercula* (C.B. Adams, 1852)

Chrysalida cf. *swetti* Strong & Hertlein, 1939

Chrysalida cf. *telescopium* Carpenter, 1857

Miralda cf. *terebellum* (C.B. Adams, 1852)

Odostomia cf. *mamillata* Carpenter, 1857

Salassia cf. *tropidita* (Dall & Bartsch, 1909)

Family PYRAMIDELLIDAE (TURBONILLINAE)

Turbonilla cf. *aculeus* (C.B. Adams, 1852)

Turbonilla cf. *andrewsi* Dall & Bartsch, 1909

Turbonilla crebrifilata Carpenter, 1864

Turbonilla excolpa Dall & Bartsch, 1909

Turbonilla cf. *festiva* de Folin, 1867

Turbonilla cf. *indentata* (Carpenter, 1857)

Turbonilla cf. *lara* Dall & Bartsch, 1909

Turbonilla macbridei Dall & Bartsch, 1909

Turbonilla masayona Hertlein & Strong, 1951

Turbonilla cf. *muricata* (Carpenter, 1857)

Turbonilla subangulata (Carpenter, 1857)

Turbonilla cf. *terebralis* (Carpenter, 1857)

Turbonilla vestae Hertlein & Strong, 1951

Family AMATHINIDAE

Iselica cf. *kochi* Strong & Hertlein, 1939

OPISTHOBANCHIA

Family BULLIDAE

Bulla cf. *gouldiana* Pilsbry, 1895

Family RETUSIDAE

Volvulella cf. *cylindrica* (Carpenter, 1864)

Family CYLICHNIDAE

Acteocina cf. *carinata* (Carpenter, 1857)

Cylichna stephensae Strong & Hertlein, 1939

Cylichna veleronis Strong & Hertlein, 1939

Cylichnella cf. *defuncta* Baker & Hanna, 1927

Cylichnella cf. *zeleki* Bartsch, 1918

PULMONATA

Family SIPHONARIIDAE

Siphonaria gigas Sowerby, 1825

Williamia cf. *peltoides* (Carpenter, 1864)

ACKNOWLEDGEMENTS

Ricardo Soto, José A. Vargas, Jorge Cortés, Franco Guillén, Rita Vargas, Daisy Arroyo and the administrative staff at CIMAR, are all thanked for assistance in the field and the laboratory, and with logistic support during my visits to Costa Rica. This work was conducted under the Agreement for Scientific and Academic Cooperation signed between the University of Bergen, Norway, and the University of Costa Rica-CIMAR.

RESUMEN

Con base en material parcialmente analizado a la fecha y colectado en tres viajes cortos a las costas del Golfo Dulce, costa Pacífica de Costa Rica, se ha identificado 252 especies de moluscos gastrópodos, en su mayoría prosobranquios y piramidelidos. Este es el primer informe de gastrópodos de la zona intermareal y ambientes costeros poco profundos del Golfo Dulce y debe ser tomado como de carácter provisional. Material de dos viajes adicionales contiene cuando menos 100 especies no identificadas todavía.

REFERENCES

- Abbott, R.T. 1974. *American Seashells*. 2. edition. Van Nostrand Reinhold, New York. 663 pp.
- Bartsch, P. 1907. The West American mollusks of the genus *Triphoris*. Proc. Unit. States Nat. Mus. 33: 249-262.
- Brann, D.C. 1966. Illustrations to "Catalogue of the collection of Mazatlan shells" by Philip C. Carpenter. Paleontol. Research Institution, Ithaca, N.Y.
- Carpenter, P.P. 1857. Catalogue of the Collection of Mazatlan Shells, in the British Museum. The Trustees of the British Museum, London.
- Cermohorsky, W.O. 1975. The taxonomy of some west American and Atlantic Nassariidae based on their type specimens. Rec. Auckl. Inst. Mus. 12: 121-173.
- Cowan, I.M. 1974. The west American Hipponicidae and the application of *Malluvium*, *Antisabia*, and *Hipponix* as generic names. Veliger 16: 377-380.
- Cruz, R.A. 1996. Annotated checklist of marine mollusks collected during the R.V. Victor Hensen Costa Rica Expedition 1993/1994. Rev. Biol. Trop. 44 Suppl. 3: 59-67.
- Dall, W.H. & P. Bartsch 1909. A monograph of west American pyramidellid mollusks. Bull. (USA). Nat. Mus. 68: 1-258.
- DuShane, H. & B.C. Draper. 1975. The genus *Seila* in the eastern Pacific. Veliger 17: 335-345.
- Hertlein, L.G. & A.M. Strong. 1951. Eastern Pacific expeditions of the New York Zoological Society. Mollusks from the west coast of Mexico and Central America. Part X. Zoologica, New York 36: 67-120.
- Hertz, C.M., B.W. Myers & J. Gemmell. 1992. Two new vitrinellid species from the Gulf of California, Mexico (Gastropoda: Vitrinellidae). Veliger 35: 70-73.
- Hertz, J. 1994. Review of the type species of *Lirobarleeia* Ponder, 1983. Veliger 37: 110-116.
- Hoagland, K.E. 1977. Systematic review of fossil and recent *Crepidula* and discussion of evolution of the Calyptraeidae. Malacologia 16: 353-420.
- Houbrick, R.S. 1993. Phylogenetic relationships and generic review of the Bittininae (Prosobranchia: Cerithioidea). Malacologia 35: 261-313.
- Keen, A.M. 1968. West American mollusk types at the British Museum (Natural History). IV. Carpenter's Mazatlan collection. Veliger 10: 389-439.
- Keen, A.M. 1971. Sea shells of tropical west America. Marine mollusks from Baja California to Peru. Stanford University Press, Stanford. 1064 p.
- Kool, S.P. 1993. Phylogenetic analysis of Rapaninae (Neogastropoda: Muricidae). Malacologia 35: 155-259.
- Lindberg, D.R. & J.H. McLean 1981. Tropical eastern Pacific limpets of the family Acanthidae (Mollusca, Archacogastropoda): Generic criteria and descriptions of 6 new species from the mainland and the Galápagos Islands. Proc. Calif. Acad. Sci. 42: 323-339.
- McLean, J.H. 1970a. New species of panamic marine gastropods. Veliger 12: 310-315.
- McLean, J.H. 1970b. Descriptions of a new genus and eight new species of eastern Pacific Fissurellidae, with notes on other species. Veliger 12: 362-367.
- McLean, J.H. 1970c. New species of tropical eastern Pacific Gastropoda. Malacol. Rev. 2: 115-130.
- McLean, J.H. & L.H. Poorman. 1971. New species of tropical eastern Pacific Turridae. Veliger 14: 89-113.
- Myers, B.W. C.M. Hertz & A. D'Attilio. 1993. A new *Muricopsis* from the Gulf of California, Mexico. Veliger 36: 78-80.
- Nesbitt, E.C. & W. Pitt. 1986. *Nassarius* (Gastropoda: Neogastropoda) from the Galápagos Islands. Veliger 28: 294-301.

- Pilsbry, H.A. & H.N. Lowe 1932. West Mexican and Central American mollusks collected by H.N. Lowe, 192-931. *Proc. Acad. Nat. Sci. (Philadelphia)* 84: 33-144.
- Pilsbry, H.A. & A.A. Olsson 1945. Vitrinellidae and similar gastropods of the Panamic province. Part I. *Proc. Acad. Natural Sci. Phil.* 97: 249-278.
- Pilsbry, H.A. & A.A. Olsson 1952. Vitrinellidae and similar gastropods of the Panamic province. Part II. *Proc. Acad. Natural Sci. Phil.* 104: 35-88.
- Ponder, W.F. 1983a. Reclassification of some American species assigned to the Rissoidae (sensu lato). *Nautilus* 97: 90-91.
- Ponder, W.F. 1983b. Review of the genera of the Barleciidae (Mollusca: Gastropoda: Rissoacea). *Rec. Austral. Mus.* 35: 231-281.
- Ponder, W.F. 1985a. A review of the genera of the Rissoidae (Mollusca: Gastropoda: Rissoacea). *Rec. Austral. Mus.* 4: 1-221.
- Ponder, W.F. 1985b. The anatomy and relationships of *Elachisina* Dall (Gastropoda: Rissoacea). *J. Moll. Stud.* 51: 23-34.
- Skoglund, C. 1992. Additions to the Panamic Province Gastropod (Mollusca) literature 1971 to 1990. *Festivus* 24: 1-169.
- Sphon, G.G. 1976. The Mitridae of the Galapagos Islands. *Nautilus* 90: 63-64.
- Strong, A.M. 1949. Additional Pyramidellidae from the Gulf of California. *Bull. Sout. Cal. Acad. Sci.* 48: 71-93 (+pls. 11-12).
- Strong, A.M. & L.G. Hertlein 1939. Marine mollusks from Panama collected by the Allan Hancock Expedition to the Galapagos Islands, 1931-1932. *Allan Hancock Pac. Exped.* 2: 177-245.
- Turner, R.D. 1956. The eastern Pacific marine mollusks described by C.B. Adams. *Occasional Papers on Mollusks Harvard* 2: 21-135.
- Vermeij, G.J. & S.P. Kool 1994. Evolution of labral spines in *Acanthis*, new genus, and other rapanine muricid gastropods. *Veliger* 37: 414-424.
- Vokes, E.H. 1985. Review of the west coast aspelloids *Aspella* and *Dermomurex* (Gastropoda: Muricidae), with the description of two new species. *Veliger* 27: 430-439.
- Warén, A. 1992. Comments and descriptions of culimid gastropods from tropical west America. *Veliger* 35: 177-194.
- Warén, A. & M.R. Crossland 1991. Revision of *Hypermastus* Pilsbry, 1899 and *Turveria* Berry, 1956 (Gastropoda: Prosobranchia: Eulimidae), two genera parasitic on sand dollars. *Rec. Austral. Mus.* 43: 85-112.