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# IN THIS ISSUE



**New Address :**
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Front Cover: Angaria sphaerula from the Philippines. Background is Kusumba Beach (Black Beach), Bali.

Back Cover: Architectonica perspective from Thailand. Background is aerial view near Singapore.

Photos by: Somwang Patamakanthin

*In Memoriam*
Richard A. Van Belle

Photo this page - Promthep Cape, Phuket, Thailand by Paisan Mongkolsatitporn

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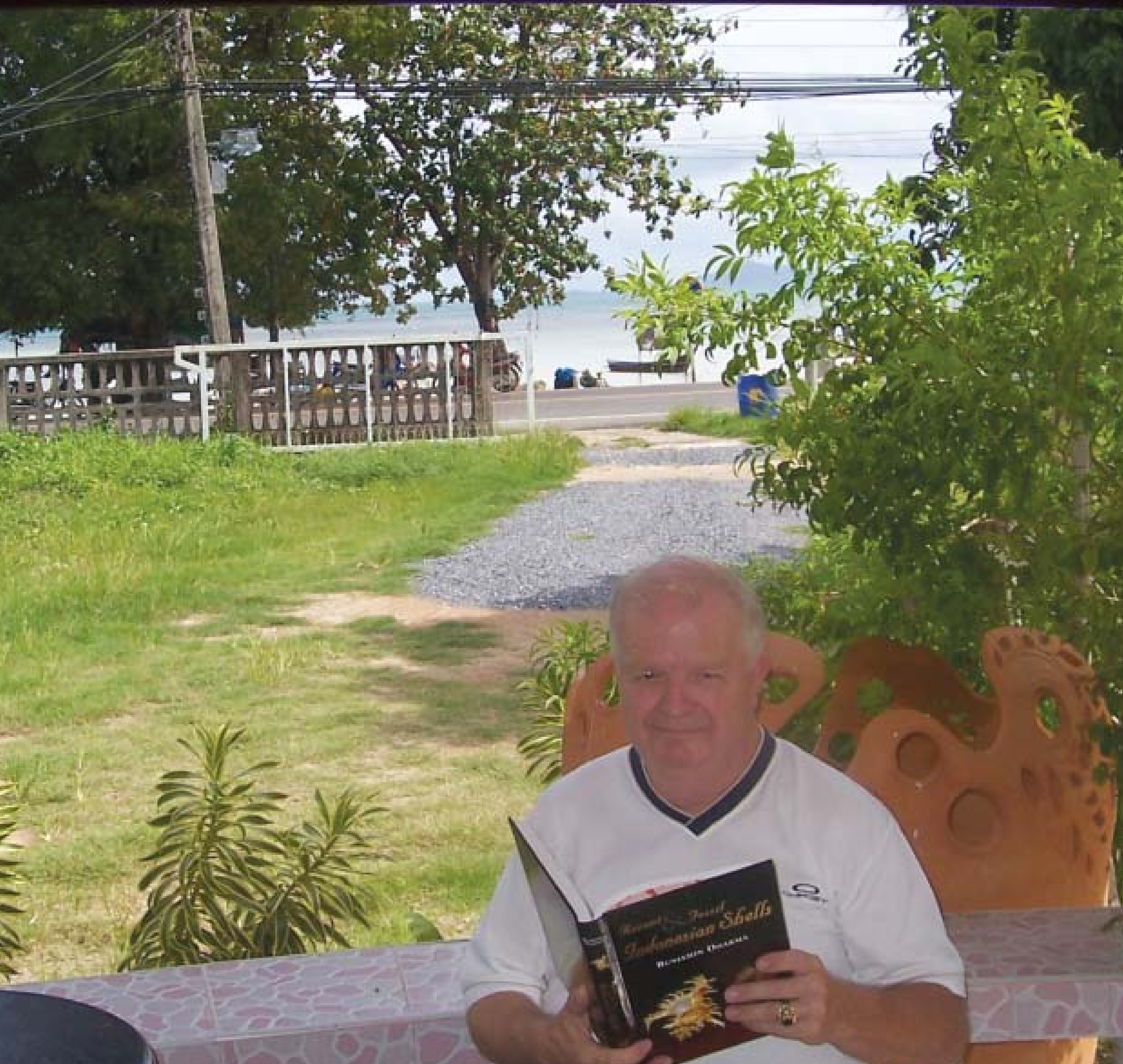
We all appreciate the nice comments our subscribers pass along regarding the color plates in each issue. I agree they're gorgeous and much of the credit goes to our graphics man, Ong. Authors have said the printed results of their own photographs are often better than the originals. Of course, we also get a lot of comments on the large number of articles we present dealing with abalones – both positive and a bit negative. My reply to the latter is that we print everything submitted and that by eliminating some of Buzz's Haliotis articles would result only in a smaller magazine! If we receive more diverse articles, of course we'll consider reducing the number of abalone articles we run. But, meanwhile, thank goodness Buzz is so prolific (and presenting such important material regarding this family of mollusks).

Our next issue (Vol. 27, No. 3) will include a recounting of a collecting trip made this past year to the Tuamotu Islands of French Polynesia and another chronicling fifteen or more years of collecting here on Phuket. Plus your article if you'll only send it to our new address.

I am also working on the 22nd edition of A Catalog of Dealers' Prices for Shells, which, I hope, will be published and distributed by others in Europe and/or the U.S.. Details in our next issue. Back with you then.

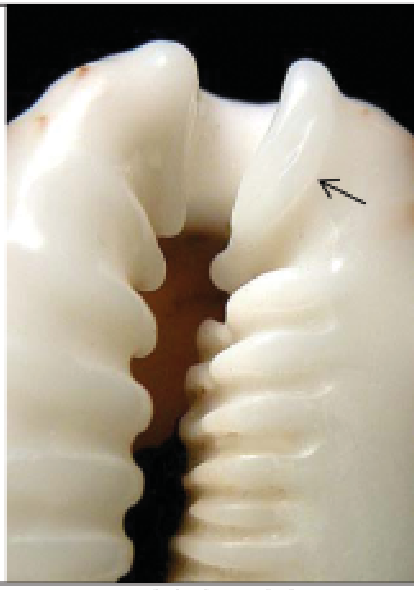
Tom Rice

**Tom Rice, Editor**



1. Shell with an oval shape

2. Shell with an oblong-oval shape



3. Right lateral rim

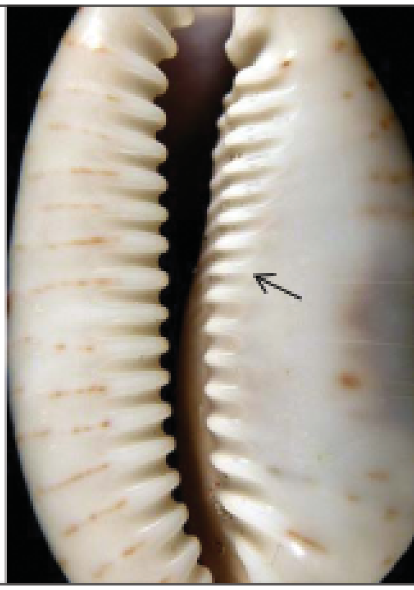
4. Left margin rounded

5. Left margin angular

6. Narrow aperture dilated in front

7. Wide aperture dilated in front

8. Narrow aperture



9. Fine columellar teeth

# INTRASPECIFIC VARIATION IN *EROSARIA EROSA* (LINNAEUS, 1758)

E. L. Heiman

(See color pages 76, 79 - 82, 85 - 88)

**Abstract**: Intraspecific variation in *Erosaria erosa* is studied using 1681 shells of the species. Three subspecies are distinguished in the studied conchological material by their statistical shell characteristics: *E. erosa lactescens* of French Polynesia, *E. erosa pulchella* of New South Wales, Australia and *E. erosa phagedaina* of Andaman Is. to Central Malaysia, Indonesia, the Philippines, W. Papua to Japan. The other populations of the species are treated as intermediate zones with mixed shell characteristics. These populations can be treated as *E. erosa* in a broad sense and their taxonomic rank deserves farther research.13 formae of *E. erosa* are found in the studied material, illustrated and shortly discussed. It is shown that formae can be used as diagnostic shell characteristics of cowry populations.

**Key word**s: Mollusca, Gastropoda, Cypraeidae, intraspecific variation, formae.

## Introduction

*Erosaria erosa* (Linnaeus, 1758) inhabits the Indo-Pacific region from the coastal waters of East Africa in the West to French Polynesia in the East. Six subspecies of *E. erosa* are described in Schilder & Schilder (1938)—the Prodrome—with the following range of distribution:

*Erosaria erosa erosa* (Linnaeus, 1758)-Central Lemuria to Algoa Bay, Mombasa and Madras and possible Gulf of Oman.

*Erosaria erosa similis* (Gmelin, 1791)-East Africa from Pondoland to Aden and Rodriguez I. and possible Gulf of Oman.

*Erosaria erosa phagedaina* (Melvill, 1888)-Central Malaysia to Andaman Is., Cocos Is., W. Papua and Japan.

*Erosaria erosa chlorizans* (Melvill, 1888)-Central Melanesia to Kermadec Is., Tonga, Ogasawara Is. and Palau.

*Erosaria erosa lactescens* (Dautzenberg & Bouge, 1933)-E. Polynesia: Rarotonga to Gambier and Hawaii Is.

*Erosaria erosa purissima* (Vredenburg, 1919)-E. Australia to Sydney, Lord Howe I. and Exmouth Gulf. .

This approach remained the same later, in Schilder & Schilder (1952), and the authors added: “Dautzenberg’s shells confirm the characters and distribution of the races; *lactescens*, however, is evidently more allied to *chlorizans* than suggested before. The East African *similis* might possibly be regarded as a distinct species in analogy to *Monetaria icterina*; its occurrence in Madagascar and in the Mascarene Is. seems to be sporadical only.”

Schilder (1964) mentioned the seventh subspecies—*E. erosa pulchella* (Coen, 1949) of New South Wales, Australia.

Finally, in Schilder & Schilder (1971) only *E. erosa erosa*, *E. erosa pulchella* and *E. erosa nebrites* (Melvill, 1888) are listed as subspecies and all the other taxa mentioned above are listed as synonyms. There is no explanation to this change in a taxonomic rank of *E. erosa* populations, especially of *Erosaria erosa similis,* but many cowry specialists currently accept it. The taxonomic identity of *E. nebrites* (Melvill, 1888) as a valid species is analyzed in Heiman & Mienis (1999) and Heiman (2003, 2004) and is not in the scope of this article.

Definitions of terms used in this research are given in the Appendix. Subspecies by definition are diagnosed by statistical shell characteristics, which may reflect genetic changes in the majority of shell in a population comparing to other populations of the same species. A method used below is to calculate statistical shell characteristics of cowry populations in question and compare them with those given in the description of the relevant subspecies. The more shells are used in each case the better but a number of shells may be reasonable small comparing to the same work, which must be done when subspecies are first described. This is in fact a kind of a spot check similarly to quality control checks used in industry when several representatives of a large batch of manufactured articles chosen from the large batch are checked in order to draw a conclusion about the quality of the whole batch. The aim of the current research is to check whether a subspecific rank of currently known subspecies of *E. erosa* can be confirmed and shell collectors can separate one subspecies from the other.

Certain problems arose with a taxon *Erosaria erosa similis*: it is not reported from the Red Sea, the Gulf of Aden and from the Gulf of Oman and Eastern Arabia according to Bosch & Bosch (1982) and Bosch et al. (1995) where it is replaced by *E. nebrites.* Its presence in East Africa together with *Erosaria erosa erosa* contradicts the main criterion of diagnosing subspecies. Hence in this research *Erosaria erosa similis* is treated as synonym and all *erosa* populations of East Africa are related to *Erosaria erosa erosa.* Hence only six subspecies are taken into consideration below.

## Statistical study

In this research, each of 1681 shells was checked in order to learn whether the shell characters (or qualities, see Figs. 1- 12) given in the original descriptions of the subspecies of *E. erosa* are present. The results of this check can be seen in Table 1 (pg.84). The details regarding composition of different batches of examined shells and their localities are given in Heiman (2005).

The shell shape of *E. erosa* is oval (Fig. 1) to oblong-oval (Fig. 2). Shells of *E. erosa chlorizans*, *E. erosa lactescens* and *E. erosa purissima* are mostly oval; shells of *E. erosa phagedaina* and *E. erosa pulchella* are mostly oblong-oval. Left margin is mostly rounded (Fig. 4) only in shell of *E. erosa pulchella*; in shells of the other

populations it is more or less distinctly angular (Fig. 5). The aperture is mostly narrow and slightly dilated in front (Fig. 6) in shells of *E. erosa phagedaina*; it is wide and dilated in front (Fig. 7) in *E. erosa pulchella.*
Terminal ridge (Fig. 3) is broad and slit longitudinally in shells of all the studied populations and a small difference, which can be sometimes seen in this shell character, is too subtle to be counted.

The base is white in the majority of shells in all the studied populations but shells with light beige colored base are found sporadically in all batches of the studied shells and in shells of certain batches the base is pigmented; this is forma pigmented (see below).

Fine and rather distant columellar teeth (Fig. 9) prevail in the majority of shells; more rarely these teeth are close and coarser (Fig. 10). The difference in the shell fossula is not found.

Dorso-marginal blotches are present in the majority of shells but shells without one or both blotches are found in all the studied populations (Figs. 11-12).

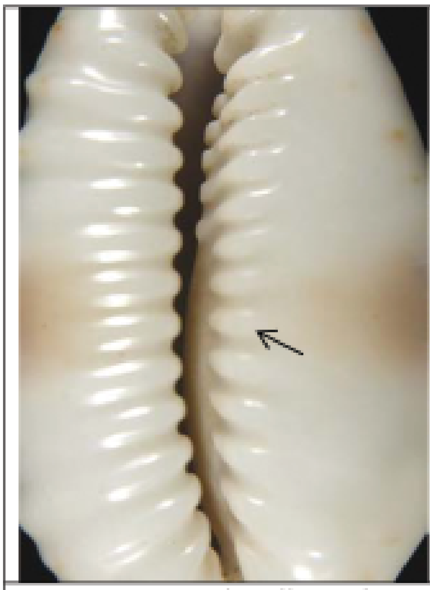
Three groups of *E*. *erosa* populations can be separated as subspecies by their shell characteristics (Table 1).
*E. erosa pulchella* of NSW, Australia: the majority of shells is characterized by the wide and dilated in front aperture and the absence of dorso-marginal blotches in 76% of shells.
*E. erosa lactescens* of French Polynesia*:* in the majority of shells a shape is oval and columellar teeth are coarse, forma dilatata is present, and small white spots often stand out against the dorsal color.
*E. erosa phagedaina* of Andaman Is. to Central Malaysia, Cocos Is., Indonesia, the Philippines, W. Papua to Japan: differs from the other populations by oblong-oval shells with narrow, slightly dilated in front aperture.

The other populations of the species seem to be intermediate zones with mixed shell characteristics making their separation difficult.
*E. erosa chlorisans* of Melanesia is apparently an intermediate zone connecting populations of the western Pacific Ocean with *E. erosa lactescens* and shells of the former is often difficult to distinguish from shells of *E. erosa lactescens*. From the other side, shell characteristics of both these taxa differ regarding the shell shape, columellar teeth and f. dilatata hence one cannot treat them as one subspecies.
*Erosaria erosa purissima* of NE Australia and Queensland: seems to be an intermediate zone between *E. erosa phagedaina* and *E. erosa pulchella.*
*E. erosa erosa* of NE Africa to S. Africa and Lemuria*:* no diagnostic shell characteristic of a subspecific level is found.
Farther study is needed in order to answer a question how to treat and name these intermediate zones.

**Formae**
The percentage of 13 formae (Figs. 13-65) found in the studied conchological material can be seen in Table 1.
Forma oblonga (Figs. 13-15): shell elongate, light, often larger; regularly found in all populations especially in *E. erosa pulchella*.
Forma pigmented (Figs. 16-18): base (or other parts of the shell) are tinted with unusual colors or blotched whereas in typical shells the base is white or light beige; sporadically found.
Forma confused (Figs. 19-28): dorsal pattern irregularly confluent, confused, partly absent; regularly found in all populations of the species.
Forma dilatata (Figs. 29-36): shell stunted, heavy, margins callous, thick, expanded; regularly found. In populations of *E .erosa chlorizans* and *E. erosa lactescens* f. dilatata comprises the majority of shells and can be used as a diagnostic characteristics.
Forma labrospinosa (Figs. 29, 31, 34-35, 52-53, 62-63): shell with thick margins, the base and margins with spines and tubercles. Often shells of f. dilatata can be related to f. labrospinosa too but sometimes margins of a not dilated shell may be thick and tuberculated. Similar shells were treated in Heiman (2001) as forma long toothed.
F. saturata (Figs. 36-39): shell very richly colored to rather dark; more or less regularly found in different populations of the species.
F. rostrata (Figs. 40-45 ): shell with elongate, beaked extremities; sporadically found in the studied populations and regularly found in New Caledonia.
Forma overcallused or bicallosa (Figs. 46-48): shell with both margins callused, callus forming a ring visible from the dorsum; found most often in populations of *E. erosa chlorizans* and *E. erosa lactescens*
Forma overglazed (Figs. 49-50): a semi-transparent layer of enamel covers the dorsum.
Forma pallida or subalba (Figs. 51-54): numerous small white specks produce an albinotic effect, brownish spots almost invisible; regularly found in the studied populations.
Forma suffused (Figs. 55-56): shell (or at least the dorsum) suffused with an uniform layer of rich white or different colored enamel; sporadically found.
Forma 'golden' (Figs. 57-59): shell with vivid golden color of the dorsum. Perhaps these are specimens well preserved in sand and washed ashore after a storm. From time to time such shells are mentioned in the literature.
Forma deformed (Figs. 60-61): shell with abnormal shape, growths, and different kinds of deformation; found sporadically.

**Acknowledgements**
I am very grateful to Henk K. Mienis, the Curator of the National Mollusc Collections at the Department of Evolution, Systematics & Ecology, Hebrew University, Jerusalem (HUJ) and Zoological Museum, Tel Aviv University (TAU). Henk made it possible for me to study conchological material in the collections of HUJ and TAU and use their libraries.

**Continued on page 83**


10. Coarse columellar teeth


11. Left dorso-marginal blotch absent


12. Right dorso-marginal blotch absent


13. F. oblonga, 29.2 mm, Vietnam


14. F. oblonga, 42.1 mm, Mozambique


15. F. oblonga, 42.9 mm, Guam


16. F. pigmented,
South Africa


17. F. pigmented,
Philippines


18. F. pigmented,
red lines on the base, Madagascar

19. F. confused,
26.2 mm, French Polynesia

20. F. confused,
34.3 mm. Vietnam

21. F. confused,
30.4 mm, French Polynesia

22. F. confused,
30.5 mm, French Polynesia

23. F. confused
32.3 mm, Vietnam

24. F. confused,
34.6 mm, Guam

25. F. confused, 35.2 mm, Vietnam

26. F. confused, 37.8 mm, Malaysia

27. F. confused, 38.1 mm,
Mozambique

28. F. confused,
40.2 mm, Mozambique

29. F. dilatata+labrospinosa,
46.9 mm, Tonga

30. F. dilatata,
34 mm, French Polynesia

31. F. dilatata+labrospinosa,
45.5 mm, French Polynesia

32. F. dilatata,
40.6 mm, Mozambique

33. F. dilatata, 43.1 mm,
Mozambique

34. Forma saturata+dilatata+labrospinosa, 32.8 mm, Tonga

35. Forma saturata+dilatata+labrospinosa, 37.3 mm, Mozambique

36. F. saturata+dilatata, 33.5 mm, American Samoa



Mama takes the kids for a stroll.

Many thanks to Rika and Fernand Dedonder (Belgium), Jean and Janine Demartini (France), Edwin Fraser (Australia), Mike Hart (New Zealand), Jean-Paul Lefort (French Polynesia), Werner Massier (Namibia), Wolfgang Proestler (Germany), Jan Purvis (UK), Trevor Roberts (USA), Mike Woodcock (Canada) for sending a part of the conchological material for this research.

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**Appendix**

Definitions used in this research:

a) Shell character—a natural quality of an individual shell (shape, profile, color, pattern, fossula etc.).

b) Main diagnostic shell character (MDSC) of species—the most prominent well-recognizable shell character found in all shells of a species; the MDSC allow distinguishing one species from the other.

c) Shell characteristic—the result of measurements or calculations for a group of shells (the average shell length or width or number of teeth in the aperture or a number of shells in a population with a given quality, etc.); shell characteristics are applicable only to a group of cowry populations as a whole and may allow distinguishing one subspecies of a species from other subspecies of the same species.

d) Diagnostic shell characteristic—a statistical shell characteristic shared by the majority (at least 70%) of shells in a population or a group of populations. For example, if more than 70% of cowry shells have the dorsal blotch and in other populations of the same species this blotch is absent or rarely found this shell characteristic can be used as diagnostic characteristic.

e) Taxon—a taxonomic unit, whether named or not: i.e. a group of populations of organisms (according to the ICZN, 1999), in this case cowries.

f) Species—a group of cowry populations the shells of which can be separated from all other cowry populations by at least one well-recognizable diagnostic character (MDSC) showing no intermediates even in extreme specimens.

g) The main criterion for diagnosing cowry species—the existence or absence of at least one MDSC.

h) Subspecies—a geographically separated group of populations the majority of shells of which differs by at least one diagnostic shell characteristic from other groups of populations of the same species.

i) The main criterion for diagnosing cowry subspecies—the existence of at least two conditions at the same time: geographical separation of populations and the difference in their diagnostic shell characteristics.

j) Taxon, which is not separable conchologically (nsc) or can not be diagnosed conchologically:

for species—a taxon the main diagnostic shell characters of which are not known at the moment and it can not be conchologically distinguished from other cowry species;

for subspecies—populations the main diagnostic shell characteristics of which are not yet known, or very close.

k) Formae: regularly found unusual shells differing from the other shells of a population in shape, color, or pattern. Formae are sporadically or regularly found in populations of a species and sometimes can be found in large numbers. Unlike subspecies, several different formae of a single species can be found together in the same locality and may comprise a considerable part of that population.

Table 1
The percentage of shells with a given quality
in the studied groups of populations of *E. erosa*

| number of studied shells → | | 440 | 440 | 128 | 157 | 179 | 337 |
|---|---|---|---|---|---|---|---|
| localities or subspecies → / shell characters and formae ↓ | | *erosa erosa* 35.64.17.14 | e. *phagedaina* 29.63.17.14 | e. *purissima* 35.59.17.14 | e. *chlorizans* 31.64.17.14 | e. *lactescens* 29.64.17.14 | e. *pulchella* |
| shape | oval | 46 | 14 | 25 | 59 | **70** | 12 |
| | oblong-oval | 54 | **86** | **75** | 41 | 30 | **88** |
| left margin | rounded | 22 | 17 | 10 | 7 | 5 | 40 |
| | less angular | 30 | 36 | 18 | 10 | 3 | 21 |
| | angular and pitted | 48 | 47 | **72** | **83** | **92** | 39 |
| aperture | wide and dilated in front | 45 | 2 | <1 | 1 | 2 | **70** |
| | narrow, slightly dilated in | 39 | **83** | **71** | 59 | 44 | 30 |
| | wide throughout | <1 | 0 | 0 | 0 | 0 | 0 |
| | narrow | 16 | 15 | 28 | 40 | 54 | 0 |
| base color | white | **65** | **97** | **94** | **99** | **98** | **99** |
| | light beige to tan | 35 | 3 | 6 | <1 | 2 | 1 |
| columellar teeth | fine and rather distant | **88** | **79** | **95** | 46 | 24 | **98** |
| | coarse | 12 | 21 | 5 | **54** | **75** | 2 |
| dorso-marginal blotches | only left absent | 1 | <1 | 0 | <1 | 1 | 0.5 |
| | only right absent | 10 | 23 | 16 | 10 | 6 | **62** |
| | both absent | 4 | 5 | 3 | 3 | 2 | **14** |
| characters in color | brown dorsal spots reduced | 46 | 15 | 20 | 25 | 27 | 6 |
| | red basal lines more | 8 | 3 | 3 | 3 | <1 | 0 |
| | lateral blotches reduced | 23 | 17 | 20 | 9 | 6 | 14 |
| | small white spots stand out against the dorsal color | 4 | 6 | 15 | **45** | **54** | 6 |
| formae | confused | 5 | 4 | 2 | 3 | 8 | 6 |
| | deformed | 3 | 3 | 2 | 0 | 1 | 2 |
| | dilatata | 27 | 5 | 12 | **66** | **79** | 1 |
| | 'golden' | 0 | 1 | 0 | 0 | 0 | 0 |
| | labrospinosa | 19 | 5 | 9 | **65** | **59** | 0 |
| | oblonga | 11 | 15 | 22 | 19 | 5 | **65** |
| | overcallused or bicallosa | 3 | 2 | 0 | 25 | 7 | 0 |
| | overglazed | <1 | <0..5 | 0 | 0 | 0 | 0 |
| | pallida or subalba | 9 | 5 | 7 | 6 | 11 | 0 |
| | pigmented | 5 | 0 | 0 | 0 | 3 | 0 |
| | rostrata or subrostrata | <0..5 | 1 | 2 | 5 | 9 | 0 |
| | saturata | 3 | <0..5 | 2 | 6 | 2 | 0 |
| | suffused | <1 | <0..5 | 0 | 0 | 0 | 0 |

37. F. saturata,
40.8 mm, W. Australia

38. F. saturata,
35.3 mm, QLD, Australia

39. F. saturata,
45.5 mm, Madagascar

40. F. rostrata,
43.1 mm, New Caledonia

41. F. rostrata,
42.8 mm, New Caledonia

42. F. rostrata,
44.1mm, New Caledonia

43. F. rostrata,
40 mm, New Caledonia

44. F. rostrata,
39.7 mm, New Caledonia

45. F. rostrata,
41.3 mm, Philippines

46. F. overcallused or bicallosa
32.4 mm, American Samoa

47. F. overcallused or bicallosa
30.6 mm, Tahiti

48. F. overcallused or bicallosa
35 mm, Philippines

49. F. overglazed
32 mm, NSW, Australia

50. F. overglazed
38.3 mm, Mozambique

51. F. subalba
27.1 mm, Mozambique

52. F. subalba+labrospinosa
31 mm, Philippines

53. F. subalba+labrospinosa
32.5 mm, Mozambique

54. F. subalba,
32.7 mm, Philippines

55. F. suffused
38.5 mm, Mozambique

56. F. suffused
37.2 mm, Mozambique

57. F. 'golden',
28.2 mm, Philippines

58. F. 'golden',
31 mm, Philippines

59. F. 'golden',
38 mm, Philippines

60. F. deformed
29.7 mm, Philippines

61. F. deformed,
47.8 mm, Madagascar

62. F. labrospinosa
31 mm, Philippines

63. F. labrospinosa
34 mm, Philippines

# Plant species and strata selected by *Liguus fasciatus achatinus* Clench, 1934 (Mollusca: Orthalicidae) in semideciduous forest in El Yayal, Holgu n Province, Cuba.

**Alejandro Fern ndez Vel zquez**
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**Abstract**
The determination of which environmental resources are selected more frequently than other is of particular interest because they provide information about the animal's nature and their requirements for survival, and therefore suggest actions of habitat conservation to preserve *Liguus fasciatus*, an extinction-prone species. During five years (1992-1996) the field work was carried out in a semideciduous forest, where three fixed plots were visited monthly; data of age's structure (adult and juvenile), plant species, height to the ground, strata and substratum type (trunk, branch, leaf, ground) were obtained. *Lysiloma latisiliquum* (Wild Tamarind) was used consistently and high percentages (54.5 to 68.8%) were found. As well it was demonstrated that the Wild Tamarind had an important role as structural resources and thermoregulation mechanism in *Liguus fasciatus* is explained.
**Key words**: Ecology, Mollusk, *Liguus fasciatus*, use of resources.

## INTRODUCTION

In the Cuban archipelago most of the species of *Liguus* Montfort, 1810, have restricted distribution, except *L. fasciatus* M ller, 1774 (Jaume, 1954; Espinosa & Ortea, 1999) and they represent a conspicuous element of the Cuban fauna, with large size and elegance (Jaume,1954) and after of *Polymita* Beck, 1837, it is maybe the most beautifully colored land snail.

In the WorkShop for the Conservation Analysis and Planned Managing of a selection of Cuban species (CAMPII) Fern ndez et al.,(1997) reported *L. fasciatus* as a threatened species and it was included in CITES Convention, although at an international level it had been recognized as an extinction-prone species (Kay, 1995).

In Holgu n, the forests are disturbed by human activities and many of them with are in early stages of ecological succession and some populations had been affected (Fern ndez & Berovides 2000). Two objectives were focused: 1. to know the relationship plants-animal and 2. to find regularities of the following subniches: a. plant species used as structural resource, b. Height to the ground and strata, c. Selection of the trunk size, d. Substratum.

## MATERIALS AND METHODS.

The habitats of *L. fasciatus* to the south of Holguin city in El Yayal, are semideciduous forests in a system of low elevations. Localization: N 20 50 20.9 y W 76 14 49.2 . The samples were carried out in three plots located in the western part of El Yayal locality, visited monthly between 1992-1996. The population was composed by high frequency of adults (55 to 100%) although the percentages varied from one year to another.

The following structural subniches were measured:

- Selected plants. The mollusks individually were counted and recording all the species of plants selected by the mollusk (1992 to 1995).
- Height to the ground and strata. The height to the ground level reached by each mollusc was measured and three classes were considered: Stratum I (<2 m), Stratum II (2 to 4 m) and Stratum III (>4 m).
- Diameter of trunk at (1.3 m) breast height. The caliper was used to obtain the measurements and two classes (dbh size) were established: Class I: <10 cm, Class II: e"10 cm.
- Substratum. The mollusks were counted and located in three categories: I, Trunk; II, Branches; III, Other (Leaf + ground, logs).

## RESULTS AND DISCUSSIONS

### Plant species selected by *Liguus fasciatus*.

32 plant species used by *L. fasciatus* were recorded, where *Lysiloma* in the environmental conditions varied among 42.0 to 56.0%, but only 13 had the biggest use and among them, Wild Tamarind, *L. latisiliquum* (54.5 to 68.8%) had the highest value and the bushes had low selection: *Guettarda elliptica* (4.4 to 10.8%), *Eugenia axillaris* (4.3 to 6.8%) and *Canella winterana* (4.0 to 5.2%) **(Table 1, next page).**

Other studies in relationships of plant-mollusk confirmed similar results: Voss (1976) registered 65% of *L. fasciatus* on *Lysiloma latisiliquum*; Brown (1978) found 52% of them on this plant; Tuskes (1981) recorded 16 species of available trees, and Bennetts et al.,(2000) in Big Cypress of the Florida, 21 plant species were selected, which were not used in proportion of its abundance and the most common plant was *Lysiloma latisiliquum* and was used consistently by 67% of the mollusks. These results and ours results demonstrate the value of importance of *Lysiloma latisiliquum* (Wild Tamarind) where this species exists.

The plant with dbh e" 10 cm preferred by the mollusk inside the forest was *Lysiloma* (60.9 to 71.6%), this result reinforces the value of *L. latisiliquum* inside the arboreal stratum due to the great size and large trunk diameter, providing more surface where they can find food, shelter and enough space (vertical and horizontal) as regards environmental adjustment needs.

**Table 1.** Values of frequencies (%) of plant species used by *L. fasciatus*, El Yayal. Number of mollusks recorded (N). G-Test of the simple classification.

| Nro | Plant species selected by the mollusk | 1992 | | 1993 | | 1994 | | 1995 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | % | N | % | N | % | N | % | N | % |
| 1 | *Lysiloma latisiliquum* | 233 | 67.5 | 419 | 68.8 | 355 | 61.2 | 192 | 54.5 | 1199 | 63.6 |
| 2 | *Gettarda elliptica* | 27 | 7.8 | 27 | 4.4 | 31 | 5.3 | 38 | 10.8 | 123 | 6.5 |
| 3 | *Canella winterana* | 18 | 5.2 | 27 | 4.4 | 47 | 8.1 | 14 | 4.0 | 106 | 5.6 |
| 4 | *Eugenia axillaris* | 16 | 4.6 | 26 | 4.3 | 31 | 5.3 | 24 | 6.8 | 97 | 5.1 |
| 5 | *Comocladia platyphylla* | 5 | 1.4 | 10 | 1.6 | 24 | 4.1 | 15 | 4.3 | 54 | 2.9 |
| 6 | *Erytroxylon rotundifolium* | 5 | 1.4 | 5 | 0.8 | 2 | 0.3 | 2 | 0.6 | 14 | 0.7 |
| 7 | *Alvaradoa amorphoides* | 7 | 2.0 | 10 | 1.6 | 9 | 1.5 | 6 | 1.7 | 32 | 1.7 |
| 8 | *Pictetia arborescens* | 3 | 0.9 | 5 | 0.8 | 1 | 0.2 | 3 | 0.8 | 12 | 0.6 |
| 9 | *Metopium brownie* | 8 | 2.3 | 11 | 1.8 | 17 | 2.9 | 15 | 4.3 | 51 | 2.7 |
| 10 | *Eugenia maleolens* | 4 | 1.2 | 3 | 0.5 | 7 | 1.2 | 4 | 1.1 | 18 | 0.9 |
| 11 | *Casearia spinicens* | 5 | 1.4 | 15 | 2.5 | 9 | 1.5 | 8 | 2.3 | 37 | 2.0 |
| 12 | *Sideroxylon salicifolium* | 3 | 0.9 | 3 | 0.5 | 2 | 0.3 | 3 | 0.8 | 11 | 0.6 |
| 13 | *Cupania glabra* | 1 | 0.3 | 5 | 0.8 | 5 | 0.9 | 6 | 1.7 | 17 | 0.9 |
| 14 | Other *spp.* | 10 | 3.0 | 43 | 7.1 | 40 | 7.0 | 22 | 6.2 | 115 | 6.1 |
| Total | | 345 | 99.9 | 609 | 99.9 | 580 | 99.8 | 352 | 99.9 | 1886 | 99.9 |
| G = 78.34; P < 0.001 | | | | | | | | | | | |

**Height to the ground, a thermoregulation mechanism**.

In this topic some terms were introduced by Pianka (1983); they contribute to a better understanding of the biological phenomenon analyzed: Animals that maintain relatively constant internal body temperatures are known as homeotherms; those whose temperatures vary widely from time to time, usually approximating the temperature of their immediate environment, are called poikilotherms. An organism that obtains its heat from its external environment is an ectotherm. All plant and the vast majority of animals are ectothermic.

Land snails are classified as poikilotherms and ectotherms, aspect well-known, but how do they do regulate the thermoregulation? Many different pathways are involved; here only one of them will be analyzed. Knowing that the thermoregulation often involves both physiological and behavioral adjustments and the homeostasis is never perfect.

Different behavioral strategies of the thermoregulation in the mollusks exist among them, the changes of height to the ground of the mollusks, as well as have evolved dormant stages, such as hibernation occurred during cooler periods and aestivating when there is warmer conditions in summer, becoming inactive, and lowering their metabolic rate. During the summer *Theba pisana* reaches bigger height in the vegetation, to avoid the highest temperatures that occur at ground level (Cowie, 1985).

Fern ndez et al., (1995) suggested the hypothesis that the height to the ground level reached by *L. fasciatus* and *Polymita muscarum*, is a thermoregulation mechanism, a phenomenon that is demonstrated here with this work, because tendencies were found that changes in height mean values to the ground of *L. fasciatus* and its repetitive character from year to year showed statistical association, closed with the same tendencies of temperature changes, as was theoretically expected, giving validity to the hypothesis suggested by Fern ndez et al.,(1995).

The Pearson's correlation between mean height vs. temperature: 1993 R = 0.7435, P <0.01; 1994 R = 0.9578, P <0.001; 1995 R = 0.6959, P <0.01. Minimum temperatures vs. mean height: 1993 R = 0.8634, P <0.001; 1994 R = 0.8161, P <0.001; 1995 R = 0.8252, P <0.001, although it didn't happen in a consistent way with relationship to maximum temperature vs. mean height, and the rains don't prove statistical association, possibly because chaotic occurrence had.

The drought should be considered as a factor inhibiting the individuals' mobility, and its interaction with lower temperatures induce the hibernation and therefore smaller height to the ground level reached by them, just the opposite happened when there was warmer conditions in summer and rainy period; during the warmest months avoiding the overheating and dehydration, reaching major height above the ground; the contrary occurs during the coldest months, where the highest temperatures are presented at lower levels in the vegetation, therefore the mollusks find major heating, caused by infrared radiation effects.

**Strata.**

*L. fasciatus* maintained high frequency in stratum I, in the months with lower temperatures (December, January, February, and March), as well high percentage of hibernation had been observed, when the activity of the organisms is diminished, it statistically was proved by Spearman's correlation (1993, Rs=-0.8437, P <0.001; 1995, Rs=-0.7336, P <0.01). But more later, when the temperatures were higher than previous time, they reached to superior strata (II and III).

**Diameter of trunk (Dbh) in selected plants by *Liguus fasciatus*.**

In the most of the months (1993 and 1994) the mean values of diameter at breast height (dbh) used by *L. fasciatus* were superior than 10 cm, due probably to more surface for displacements and movements required or needed, it inferred by the shell size, which is large; but in 1995 it was just the opposite, because the felling of the forest, availability as structural resource probably diminished, thus its use was lower; these results were coincident with *L. fasciatus* in Roman Cayo Romano ( lvarez & Berovides (1989) and clearly the trees preferred by the mollusks were those characterized by thick trunks.

**Substratum.**

The population had maintained high frequency of use of branches (1993, 60.1%; 1994, 52.4% and 1995, 53.0%), and trunk (1993, 37.6%; 1994, 45.2% and 1995: 42.2%) but this was reduced later, fall 1995 – 1996, because cutting of the forest occurred for wood to be used as energetic material. Our results demonstrated that the high frequency of use of branches and trunks carried out by *L. fasciatus*, evidenced with preference by arboreal stratum and stable habitat, which is a logical idea because *L. fasciatus* has K strategy and was considered as a "extinction-prone-species **(Table 2, below).** Results agree with Kay (1995).

**Conservation perspectives**

**Table 2.** Biological Characteristic of *Liguus fasciatus* as prone-species to extinction and some complementary data given by different authors.

| Nº | Characters | Population attributes |
|---|---|---|
| 1 | Reproductive strategy | 1. Reproductive maturity: three or more years (Voss, 1976; Blackwell, 1940) and reproductive adults with shell length superior than 39.5 mm (X= 55.7 mm; C.V. 16.33 %) (Fernández & Berovides, 2001).<br>2. Longevity: 6 years (Voss, 1976)<br>3. Low fecundity: eggs per nest, X=28.6 (Fernández & Berovides, 2001), and –19 (Voss, 1976)<br>4. Incubation Period: 6 months in the Florida (Blackwell, 1940) and 6.6-8 months in Holguin (Fernández & Berovides, 2001).<br>5. Self-fertilization (Hillis, 1989) |
| 2 | Dispersion capacity | 1. Low, speed 8 m/day (Blackwell, 1940) |
| 3 | Shell size | 1. Large. *L. fasciatus achatinus* reaches the biggest size in the genus (Clench, 1934). |
| 4 | Requirement in the habitat | 1. Large and thick trees of the *Lysiloma latisiliquum*.<br>2. Conservation of the forest, his disturbance affects the viability of the eggs (Fernández y Berovides, 2001) and the intensity of the cutting of the trees reduces the population density (Fernández & Berovides, 2000). |
| 5 | Population abundance | 1. Low. Mean Value of annual density in El Yayal (1992-1996) was 0.12 ind/m$^2$ (Min 0.005 Max. 0.17 ind/m$^2$ (Fernández & Berovides, 2000) and<br>2. When the population effective size diminish, the probability of extinction increases by genetic and demographic effects, these occur to at random (Fernández *et al.*, 1997). |

On basis of the proposal letter given me by Steffen Franke and Marlies Marker (wonderful naturalist and special friends) in October, 2002, and their Ideas for the better protection of the Liguus- and Polymita-populations in "EL YAYAL" was elaborated the following project.

**Title of the Project**: Conservation of the habitats of *Liguus fasciatus* and *Polymita muscarum* (Mollusca: Gastropoda) in the "classroom in the nature" of the Primary School of El Yayal, Holgu n. Cuba.

The project includes a small area of approximately 4 ha (Microsanctuary: "classroom in the nature" with ecological path), located in the Western part of El Yayal locality, on North hillside to the top of the elevation, with the purpose to divulge and teach to the members of the community (children, young, farmers, technicians and workers, horse wives and local leaders) the importance of two "notable species" of the Cuban fauna (*Liguus fasciatus* and *Polymita muscarum*), then both "flag species" would become pillars for the conservation of the species that coexist with them and its habitats. The children and young of the community will have "a classroom in the nature" and an "ecological path" in the area selected, which will be appropriately defined by live hedges (living fence), signalling and informative posters for the school will be elaborated as a "mural of the biodiversity: picture hunt". The results of this project will be a model multiplier for the conservation of "notable species" and the whole biodiversity of the area. The information obtained on the biodiversity in El Yayal and their conservation state will be shown to the visitors of the following institutions: Museum of Natural History "Carlos de la Torre y Huerta " and in the Botanical Garden of Holgu n, by means of posters and information in electronic support (On biodiversity, conservation actions, environmental education program, and others.) and to the visitors' application to establish the interactive relationship with the zoological collections and herbarium material, what will allow to satisfy interests of detailed knowledge on the biodiversity.

We are given many thanks to Marlies Marker and Steffen Franke, both friends with high interest in the conservation of our biodiversity and making a good plan to give economic support for the project, we also give thanks for help carried out by Steffen Franke here in Cuba on malacological studies in Holguin province and, of course in a professional context, giving me very much help.

**CONCLUSIONS**

The habitat and relationship plants-animal in populations of *Liguus fasciatus*, have great importance for management strategy and conservation, where *Lysiloma latisiliquum* in the canopy is a dominant species, and any disturbance occurring, will be reduce the quality and quantity of the available resources, therefore the mollusk will be affected, and accelerate the threat of extinction of this species. The disturbance of the natural stratification of the forest should affect vital processes implied in the thermoregulatory devices, phenomenon that should be demonstrated. Today's effort is to protect the forest and its diversity of species, flora and fauna as a whole.

**ACKNOWLEDGMENTS**

I am very grateful to the many friends and colleagues who have helped me clarify some ideas in the investigation, specially to Dr. Vicente Berovides (Universidad de la Habana), Dr. Jos Espinosa (Instituto de Oceanolog a), M. Sc. Liana Bidart (Instituto de Ecolog a y Sistem tica), Dr. P. Finsinger (Biodiversity & Conservation, USA). My thanks also go to Steffen Franke & Marlies Marker (German naturalist), Adri n Gonzalez (Cuban naturalist), Dr. A Pardo (Colombia, Geologist), Dr. Robert H. Cowie (Bishop Museum, University of Hawaii), E. Alison Kay (IUCN/SSC Mollusc Specialist Group, UK) and Michael G. Hadfield (University of Hawaii) for sending me much literature on *Liguus fasciatus* and on Conservation Biology and to CISAT-CITMA, which has always supported the investigation.

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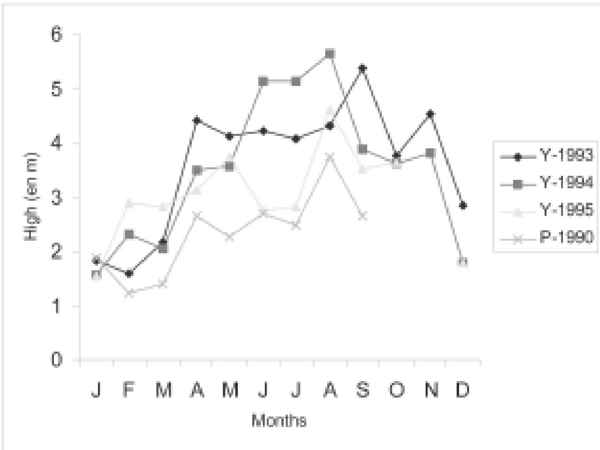
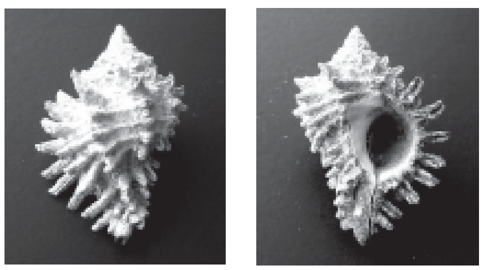



**Figure 1.-** Mean height to the ground (m) of *L. fasciatus*, El Yayal locality: Y-1993, Y-1994, Y-1995) and date of Pedernales P-1990.





# Shell Queries That Pass in the Night, and Other Memoranda

By PAUL R. JENNEWEIN* and MORRIS K. JACOBSON**

The following include some extracts from letters received at various times by the senior author in his capicity as corresponding secretary of the American Malacological Union. Other extracts are from letters sent to various curators of mollusks who were good enough to pass them on to the junior author for his collection of curiosa. In compiling this collection, the authors do not intend to poke fun at anybody. Many wise men have acknowledged that the best humor is often unconscious humor from whatever source it rises. And everybody must admit that our sad sad world may be a bit better off for a few honest laughs. The original spelling has been preserved.

To Whom It May Concern. Last summer my family and I went to Florida and I love shells so I got more than I thought I was going to get. Well I got home and I didn't know what kind or anything about them. I'm wiriting because I would like some more information about shells. If you have time please write to:

Dear Sirs, I am just getting interested in the study of mollusks. I think these creatures are very interesting and I have a question to ask. The question is are there any openings in the field of Malacology? If there are where are they to be found? I would appreciate a quick reply very much; Thank you for reading this letter.

Dear Sirs: I found your address in a book which advised writing to you for information. However it did not clearly state what the information was. Even so, I would like any available information.

Dear Sirs, I would like some information about mollusks or any other shells if you have them.

Dear Secretary, I've never wrote a letter like this before. So I hope I'm doing it right. Well, what I wanted to ask you, is, what do clams eat? You see, I went down to the beach and found a clam alive. And also, how and where can I get the food? Please hurry because I don't want my clam to die. Thank you very much.

Dear to Whome this may concern. I don't know if you can help me answer my questions about shells and shell collecting. These are my questions. 1) Can you make a shell live? 2) Where can you find shells? 3) Can you put shells in a fish tank? 4) When you write about your shells, what do you write? I've got a little shell collection but the ones I got took hard work trying to get them. One shell its just a little one I was at the beech and I had a floating raft and I saw a shell so I chased it kind of and it went over the rope and you can't take things past the rope but I did it anyway and the lifeguard called me in. I had already caught the shell and the life guard made me stay out of the water for 3 hours and it was all because of that shell.

Dear Curator, In a school science fair I am doing a project with some shells I collected here on the beach. But teacher says I don't know enough about shells. She says I need more information. Please send me everything you know about shells. Maybe that will be enough. Also some samples.

Dear Sir, I am interested in malacology. Please send me some.

Dear Sir, I want to join the New York Shell Club. Please send me the following information: 1) How many members do you have? 2) What proportion are male and what proportion are female? 3) What proportion of the females are under 15 and what proportion are older? 4) What proportion of the younger females are willing -- to exchange shells I mean? 5) What do you do at each meeting? 6) What proportion of your meetings are for professionals and what proportion for amateurs? 7) If I join your club, what do I get free at each meeting? Please answer me soon if you want me to be a member.

Dear Sir: I am planning to write my PhD thesis on the prosobranchs of the Atlantic coast from Labrador to Tierra del Fuego. Please send me a complete bibliography and the names of all the prosobranchs and their genera to be found there. Also how to tell one from the other. I may also decide to include the opisthobranchs. So please send similar information for these also. Thank you.

Dear Sir, I have the rarest shell in the world. It is white and has some red. I think it is worth $400, but I will not send it to you till I get the money first. Please send cash or money order, I don't trust banks.

Dear Curator, I read in a book that a Cypraea leucodon is worth about $1,000 and a Gloria Maries at least $2,000. I looked in my son's shell collection and was surprised to find 3 leucodons and about 4 maries. Do you want to buy them?

(To a shell dealer) Dear Madam, I am in need of a seashell to serve as a washbasin in the bathroom of my new house. I don't want one of those heavy white ones with the big wavy ridges on the edge. Instead I want a round one with a smooth, beautiful greenish iridescent inside. I saw one like it some time ago but is was too small and it had holes along the top. The one I need must be at least 3 feet in diameter and without holes. (The shell dealer, Veronica Parker Johns of Seashells Unlimited, New York, wrote in answer: Dear Madam, I am afraid that the Lord, when he created the world, did not foresee your needs. Sorry.)

(From a shell club periodical in the course of a book review) This book has very beautiful pictures of shells. The text is all in Japanese but fortunately all the Latin names are in English.

(Overheard in Florida) Visitor: "How come I can't see any Liguus tree snails on the trees?" Native: "It's winter now and that's the season when the snails go into hiding to change their color patters."

Tony D'Attilio and MKJ were once called to evaluate the large shell collection of a man who had just died. When we saw the collection, we pointed out to the widow that it was worthless as museum specimens because all the data was missing. "What's data?" she asked. "Information telling where each specimen came from," we explained. "What do you need that for? You're experts. You know that."

Dear Curator: I have two snails in a vivarium and yesterday I saw them do something which I had never seen described in a shell book before. The snails suddenly got big bumps on their necks and they put the bumps together. What were they trying to do? Please answer me quick because they are doing it again. Sincerely yours.

Dear Sirs, For the past eight to ten years I have observed the tracings, drawings in hieroglyphic form and some reproductions of symbols and photo outlines drawn by snails which crawl out of the adjacent garden (see photo attached) and leave a distinct reflecting fluid making these lines on the cement paved car port. I have been wondering if there is any connection between the snails' drawing and metempsychosis, as some of the drawings are evidently from several friends who have passed on about eight years ago as the messages are recognized as personal happenings known to be actual facts .... My question is, Have you ever heard of the Snail Drawings as being a message from the Spirit WORLD?

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**Editor's Note:**
This article is reprinted from our Volume 5, No. 3 (page 137) at the suggestion of long-time subscriber Winston Barney

## THE GALAPAGOS ABALONE, *HALIOTIS DALLI DALLI* HENDERSON, 1915, REVISITED – A SPECIAL REPORT WITH TWO PHOTO PLATES

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**(See color pages 95, 96)**

In of Sea and Shore Vol. 26, No. 3, a paper treating *H. dalli dalli*, and its subspecies *H. dalli roberti* McLean, 1970, was presented. Since then, a fairly large number of specimens (>20) from Isla Isabela in the Gal pagos have become available for study. The specimens were all live-taken, with one exception, in late 2004, by diving in 20-30 meters. These examples differ dramatically, in two parameters, from the group of shells examined in the first study. First and perhaps of most interest, the >20 specimens studied so far, have been the morphological variant described as "Type 2" in the earlier paper. This is the larger, flat form with the wide, expanded carina, and often very pronounced mid-dorsal rib. This is also the form that was used by Henderson as the type when he described the species in 1915. The other morphological variant, described in the first paper, is more inflated, being noticeably deeper in shell proportions and more strongly arched. It also has a less expanded carina, and is much smaller. Most specimens examined thus far measure less than 25 mm at maturity (maximum 30 mm). Several examples of both forms are illustrated for comparison on Plate 2. The possibility that these two forms represent different species exists but, from my observations, I believe it is more likely that the species is polymorphic (they represent polymorphic forms [different shell forms] of a single species). Perhaps DNA studies will one day resolve this question.

It is interesting to speculate why the earlier group of approximately 30 specimens studied consisted of such a large percentage of the very inflated "Type 1" form (Plate 2, B, C, D, and F), while this recent group of 2004 consists entirely of the "Type 2" larger, flat form. To this latter lot of specimens can be added a group of 27 examples which were live-taken "under rocks" in 1972 at a depth of 25 to 28 meters, all which were this very flat form. When added to the 2004 group, which was also live-taken, the total number of specimens is approximately 50. All other shells used in this first report were dredged, mostly as empty shells, from depths in excess of 50 meters. As just stated, a large percentage of this group were the very inflated, deeply proportioned, "Type 1" form, and were dredged from more "open" rubble bottom, and not found live under rocks. I suspect, therefore, that: 1) the "Type 1" form may exist primarily at depths greater than 35-40 meters, being found less under rocks, and more living on red branching coral, as does its subspecies *H. dalli roberti* at Cocos Island, Costa Rica (which morphologically it resembles very closely), and that: 2) the larger "Type 2" flat form is found in its largest concentrations in shallower water (~20-30 meters), living under rocks (as the data with the 2004 specimens states they were found). This is also suggested by its flatter, much less inflated shell proportions: species of *Haliotis* which are generally found under rocks as adults, are most often flatter in form (an excellent example of this is *H. walallensis* Stearns, 1899).

This recent group of specimens is much darker in color, and often has vivid and colorful flammules and chevrons (Plate 1). This is most probably explained by their being live-taken very recently. The specimens examined in the earlier paper were found, mostly as empty shells, over 30 years ago – many over 40 years ago. This often causes colors to fade, which probably explains this difference. It seems that in *both* groups, the presence of flammules and chevrons is more common in the larger, flat "Type 2" specimens. Included in this 2004 group is a giant 47.5 mm specimen that was recently found dead (crab kill). That this specimen represents the larger "Type 2" form is hardly a surprise. It is illustrated on Plate 2. A very similar broken specimen measuring 42.5 mm was found at Cocos Island, Costa Rica, and was illustrated in the earlier paper (Vol. 26, No. 3).

**ACKNOWLEDGEMENTS**

I wish to thank Steve Browning and Tom Grace for loaning me many of the specimens that were used in Plate 1, and also for reviewing the manuscript. I would also like to thank David Leighton and Emilio Garcia for reviewing the manuscript and offering helpful suggestions. Robert "Bob" Kershaw in Australia generously provided me the photos of his "World Record" 47.5 mm specimen, which are presented herein.

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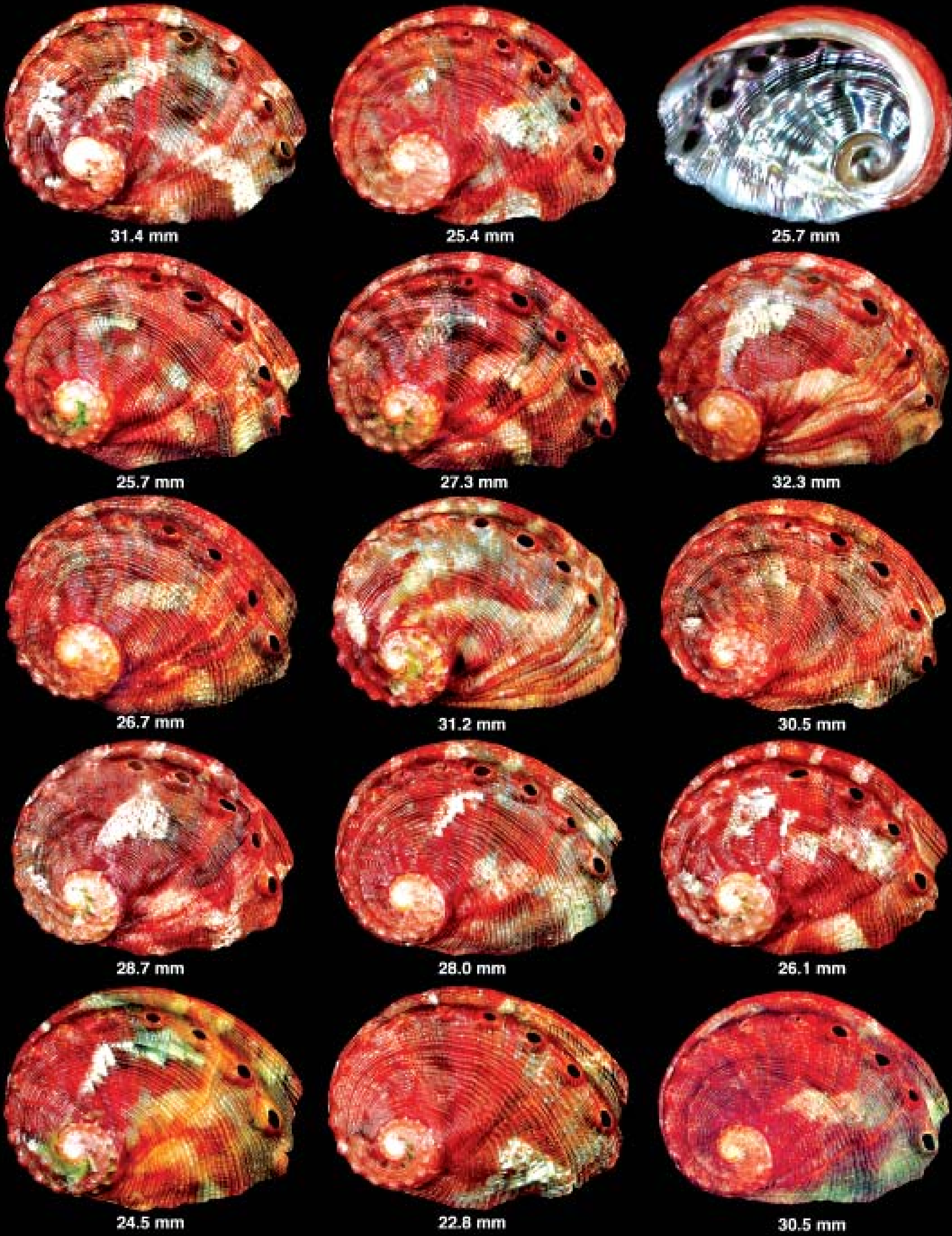



**Plate 1**

***Haliotis dalli dalli*** **Henderson, 1915**

**Bahía Isabel, Isla Isabela, Galápagos Islands, Ecuador. Live-taken by lobster divers in 20-30 m. 2004**

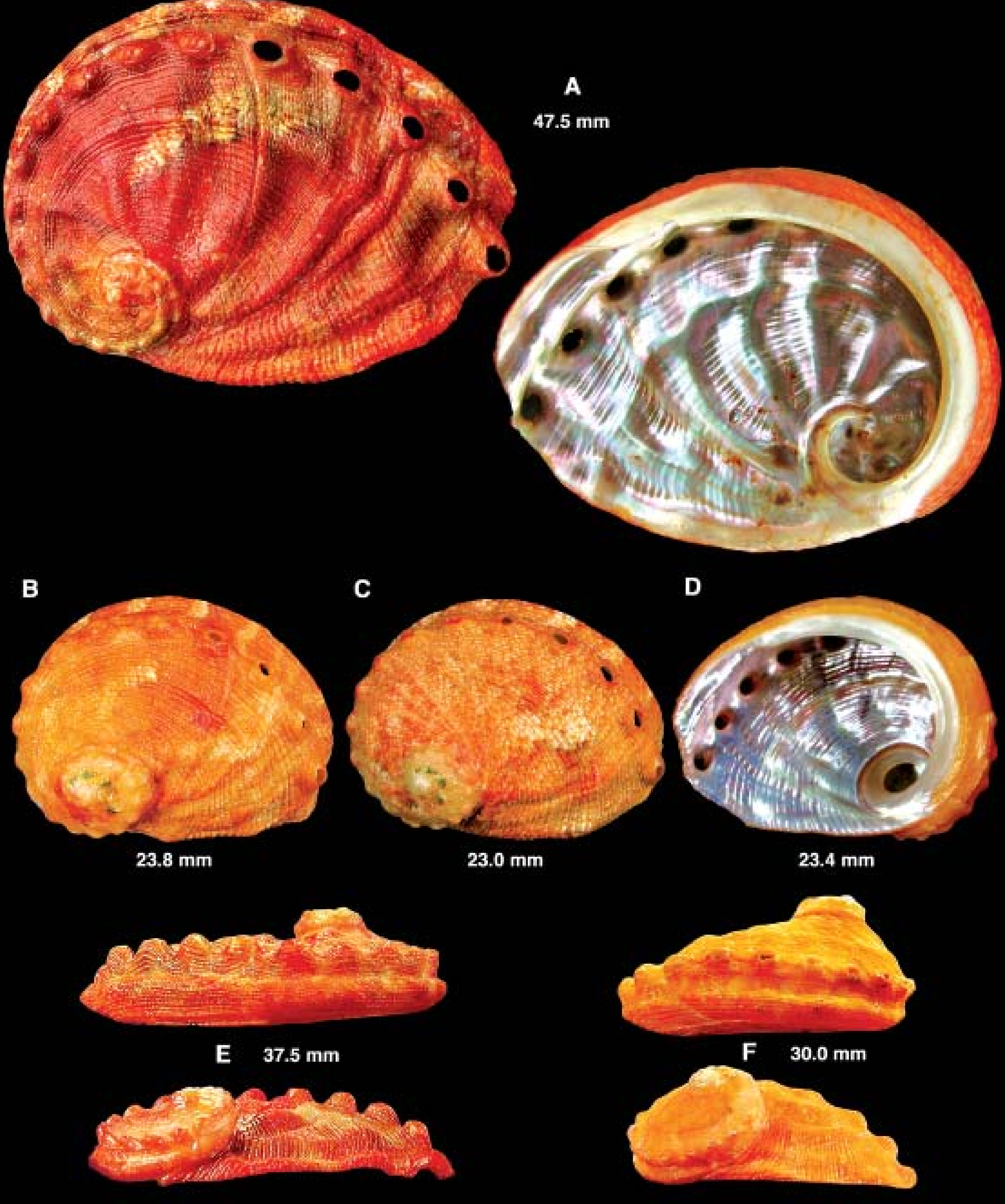



**Plate 2**

A ***Haliotis dalli dalli*****, "Type 2". Largest known specimen (April, 2005). Taken in 2004 (Fresh dead).**

**B, C, & D *Haliotis dalli dalli*, "Type 1". Dredged dead >50 m. Before 1970.**

**E *Haliotis dalli dalli*, "Type 2"; F "Type 1". Largest known (2005). Dredged dead > 50 m. Before 1970.**

## 2006 SHELL SHOWS & RELATED EVENTS

**- Following information is subject to change. Please verify with individual organization -**

Jan. 21-22 **SPACE COAST SHELL FESTIVAL**, Melbourne, FL. The Melbourne Auditorium, 625 E. Hibiscus Blvd. Jim & Bobbi Cordy, 385 Needle Blvd. Merritt Is., FL 32953 (321) 452-5736
E-mail: corshell@earthlink.net

Jan. 27-29 **BROWARD SHELL SHOW**, Pompano Beach, FL. Pompano Beach Recreation Center, NE 18th Av. & NE 6th St. Linda Sunderland, 3970 NW 39th Street Sunrise, FL 33351 (305) 749-9858
E-mail: klshells@mindspring.com

Feb. 17-19 **SARASOTA SHELL SHOW**, Sarasota, FL Sarasota Municipal Auditorium, Tamiami Trail Fran Schlusseman, 11328 Rivers Bluff Circle Bradenton, FL 34202 (941) 739-0908
E-mail: hanksfran@aol.com

Feb. 24-26 **ST. PETERSBURG SHELL SHOW**, Treasure Is., FL Treasure Is. Community Center, 1 Park Place. Bob & Betty Lipe, 348 Corey Avenue; St. Pete Beach, FL 33706. (727) 360-0586; FAX: 360-3668
E-mail: blipe@tampabay.rr.com. Exhibit form available at web site: http://web.tampabay.rr.com/shellclub

Mar. 2 - 4 **SANIBEL SHELL SHOW**, Sanibel, FL Sanibel Community Center, Periwinkle Way Marilyn Northrop, 1528 Education Court Lehigh Acres, FL 33971 (239) 694-1837 E-mail:jnorthrop@worldnet.att.net

Mar. 11-12. **6th AUSTRALIAN NATIONAL SHELL SHOW** The Ryde Eastwood Leagues Club; 117 Ryedale Rd.; West Ryde, NSW 2114. www.sydneyshellclub.net

Mar. 18-19 **XVIII me RECONTRES INTERNATIONALES DU COQUILLAGE,** Paris, France
Bourse de Commerce, 2 rue des Viarmes**,** 75004 Paris, France M. & D. Wantiez, 88, Rue du General Leclerc 95210 Saint Gratien, France 33 (1) 34-17-00-39
E-mail: wantiez.mada@wanadoo.fr

Mar. 18-19 **TREASURE COAST SHELL CLUB SHOW**, Jensen Beach, FL Langford park Field House, 2369 N.E. Dixie Highway. Carole Marshall, 932 Cochran Drive, Lake Worth, Florida, 33461-5711
E-mail: marshalldq.aol.com (561) 582-2148

Mar. 23-25 **MARCO ISLAND SHELL CLUB SHOW XXIV**, Marco Is., FL. Marco Presbyterian Church, Elkcam Circle Amy Tripp, 961 Swallow Ave., #208 Marco Island, FL 34145 (239) 393-1770

April 29 **BRITISH SHELL COLLECTOR'S CLUB CONVENTION,** N. Romford, England. North Romford Community Centre, Clockhouse Lane, Collier Row. Tom Walker, 38 Redlands Road Reading, Berkshire RG1 5HD, England 44 (118) 987-4294. E-mail: tom@tmwalker.co.uk

May 6 - 7 **XVI BELGIUM INTERNATIONAL SHELL SHOW**, Antwerp, Belgium Schijnpoort, Schijnpoort Straat. L. Broekmans, Gerststraat 4; B-2861 O.L.Vrouw-Waver Belgium 32 - 15 76 15 77
E-mail:bvc.international@pandora.be

Jun. 22-26 **42nd Oregon Shell Show,** Portland, OR. Oregon Museum of Science & Industry Maxine Hale, 347 N.E. 136 Avenue Portland, OR 97230-3308 (503) 253-5379

May 31 – Jun. 4 **CONCHOLOGISTS OF AMERICA ANNUAL CONVENTION,** Mobile, AL The Mariott Renaissance Hotel, 64 S. Water Street. Doug Shelton, 2370 Hillcrest Road Suite G, PMB 236 Mobile, AL 36695-3838, U.S.A.
E-mail:unio@aol.com (251) 533-6383

Jun. 17-18 **JACKSONVILLE SHELL SHOW,** Jacksonville, FL Morocco Shrine Temple, 3800 St. Johns Bluff Road Judy Blocker, 2109 Beach Avenue Atlantic Beach, FL 32233-5932 (904) 246-4012

Jul. 29 – Aug 3 **JOINT AMERICAN MALACOLOGICAL SOCIETY / WESTERN SOCIETY OF MALACOLOGY MEETING,** Seattle, WA University of Washington. Dr. Roland C. Anderson, 1483 Alaskan Way Seattle, WA 98101, USA E-mail: roland.anderson@seattle.gov (206)386-4346

Information provided by:

**DONALD DAN**, COA Award Chairman • 6704 Overlook Drive • Ft. Myers, FL 33919 • U.S.A.
Tel. Voice & Fax (239) 481-6704 •
E-mail: donaldan@aol.com and other sources

**Black and White Plate 1, page 99**

***Tornus rachelae*** **Rolan & Rubio, 2002**
Type locality: Miamia, Ghana, 38-40m
Distribution: from Mauritania to Ghana
Size: to 2.1mm **[Pl. 1, fig 1]**

***Tornus erici*** **Rolan & Rubio, 2002 [Pl. 1, fig 2]**
Type locality: Luanda, Angola
Distribution: Ivory Coast, Congo and Angola
Size: to 3.2mm in diameter

***Tornus attenuatus*** **Rolan & Rubio, 2002**
Type locality: Pointe Norte, Congo **[Pl. 1, fig 3]**
Distribution: Senegal to Angola
Size: to 3mm

***Sigaretornus disjunctus*** **Rolan & Rubio, 2002**
Type locality: Mussulo, Luanda, Angola, 90-100m
Distribution: Angola and possibly Ghana
Size: 2.2mm (diameter) **[Pl.1, fig. 4]**

***Tornus ryalli*** **Rolan & Rubio, 2002 [Pl. 1, fig 5]**
Type locality: Miamia, Ghana, 38-40m
Distribution: Ghana and Angola
Size: 1.9mm

***Ponderinela carlosi*** **Rolan & Rubio, 2002**
Type locality: Abidjan, Ivory Coast **[Pl. 1, fig. 6]**
Distribution: Ivory Coast to Angola
Size: 3mm in diameter

***Tornus aemilii*** **Rolan & Rubio, 2002 [Pl. 1, fig 7]**
Type locality: Miamia, Ghana
Distribution: Guinea Conakry to Angola
Size: 1.8mm

***Tornus umbilicorda*** **Roland & Rubio, 2002**
Type locality: Miamia, Ghana, 35-40m **[Pl. 1, fig 8]**
Distribution: Ghana and Angola
Size: 1.7mm in diameter

***Tornus anselmoi*** **Rolan & Rubio, 2002 [Pl. 1, fig 9]**
Type locality: Banc d'Arguin, Mauritania
Distribution: Mauritania
Size: 1.0mm in diameter

***Ponderinella skeneoides*** **Rolan & Rubio, 2002**
Type locality: Luanda, Angola **[Pl. 1, fig. 10]**
Distribution: Mauritania to Angola
Size: up to 3mm (diameter)

***Ponderinella minutissima*** **Rolan & Rubio, 2002**
Type locality: Miamia, Ghana, 35-50m **[Pl. 1, fig. 11]**
Distribution: Ivory Coast, Ghana & Angola
Size: 1.2mm high, 1mm in diameter

**Black and White Plate 2, page 100**

***Ponderinella finalis*** **Rolan & Rubio, 2002**
Type locality: Abidjan, Ivory Coast **[Pl. 2, fig. 12]**
Distribution: Ivory Coast and Ghana
Size: 1.8mm (height and diameter)

***Discopsis similes*** **Rolan & Rubio, 2002**
Type locality: off Luanda, Angola, dredged 60m
Distribution: Guinea Conakry, Ghana and Angola
Size: 1.6mm (diameter) **[Pl. 2, fig. 13]**

***Naricava discreta*** **Rolan & Rubio, 2002**
Type locality: Along Mussulo, Luanda Province, Angola, 90-100m **[Pl. 2, fig. 14]**
Distribution: Ghana to Angola
Size: 1.5mm (diameter)

***Discopsis nodulosus*** **Rolan & Rubio, 2002**
Type locality: Pointe Noire, Congo **[Pl. 2, fig. 15]**
Distribution: the Congo
Size: 2mm (diameter)

***Pseudoliotia battenbergeri*** **Rolan & Rubio, 2002**
Type locality: Pointe Noire, Congo **[Pl. 2, fig. 16]**
Distribution: known only from type locality
Size: 2.7mm (diameter)

***Discopsis exmilitare*** **Rolan & Rubio, 2002**
Type locality: Pointe Noire, Congo **[Pl. 2, fig. 17]**
Distribution: Ghana to Angola
Size: to 2mm (diameter)

***Discopsis irregularis*** **Rolan & Rubio, 2002**
Type locality: Barra do Dande, Bengo, Angola
Distribution: Congo and Angola **[Pl. 2, fig. 18]**
Size: 2 mm. (diameter)

***Discopsis ferreirorum*** **Rolan & Rubio, 2002**
Type locality: Miamia, Ghana, 38m **[Pl. 2, fig. 19]**
Distribution: known only from Ghana
Size: 1.5mm (diameter)

***Discopsis apertus*** **Rolan & Rubio, 2002**
Type locality: Radiale Grand Bassam, Ivory Coast
Distribution: Guinea Conakry to Angola, excluding the islands of the Gulf of Guinea **[Pl. 2, fig. 20]**
Size: to 5mm (diameter)

***Discopsis rarus*** **Rolan & Rubio, 2002 [Pl. 2, fig. 21]**
Type locality: region of Abidjan, Ivory Coast, dredged on continental plateau
Distribution: Ivory Coast and Ghana
Size: to 6.2mm (diameter)

***Naricava dilatata*** **Rolan & Rubio, 2002**
Type locality: Miamia, Ghana, 38-40m **[Pl. 2, fig. 22]**
Distribution: known only from holotype
Size: 1.7mm (diameter)

Rolan, E. and E. Rubio. The Family Tornidae (Gastropoda: Rissoidae) in the East Atlantic. Supplement to Resenas Malacologica, SEM, 2002

**Continued on page 103**

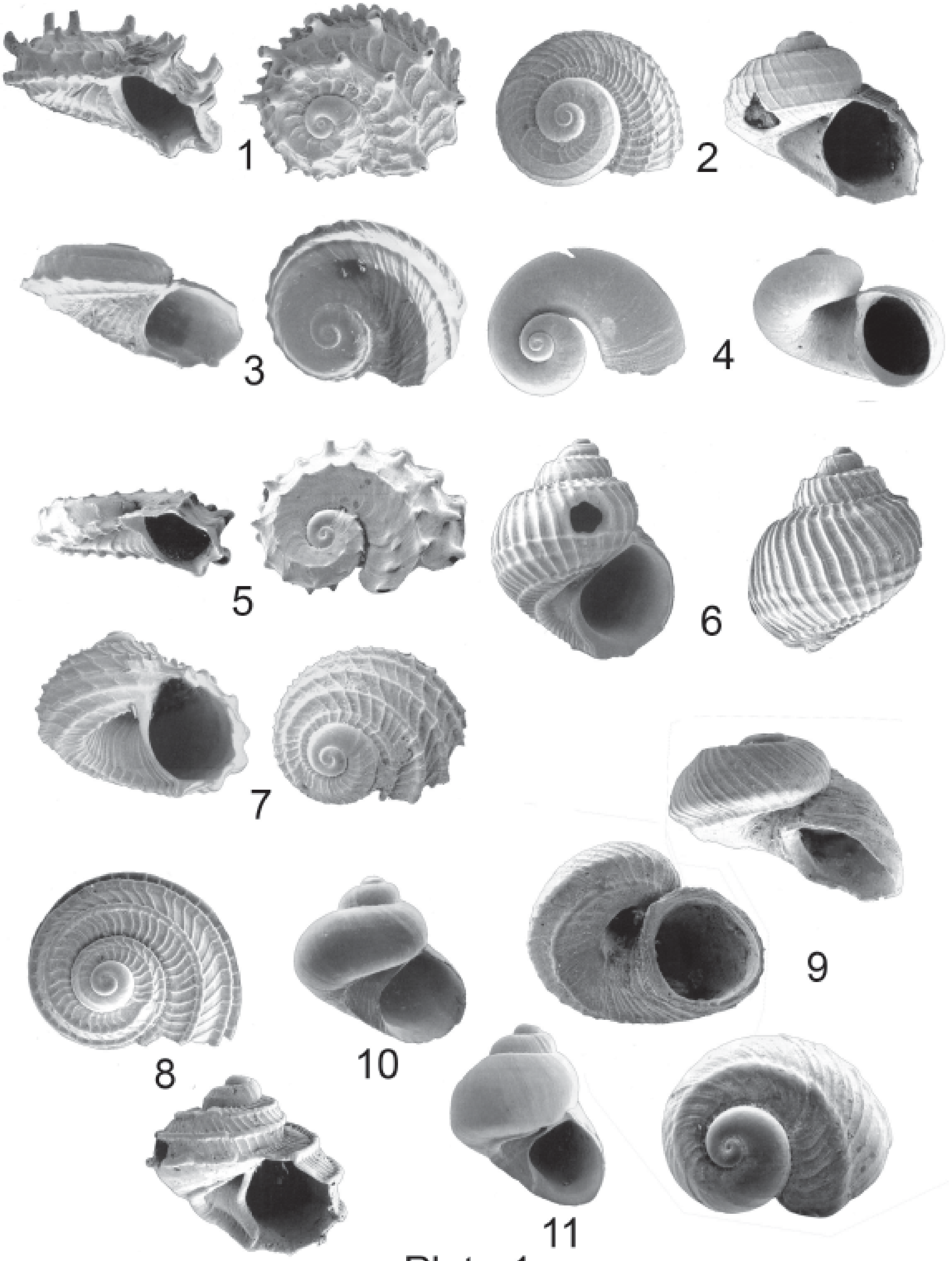



Plate 1

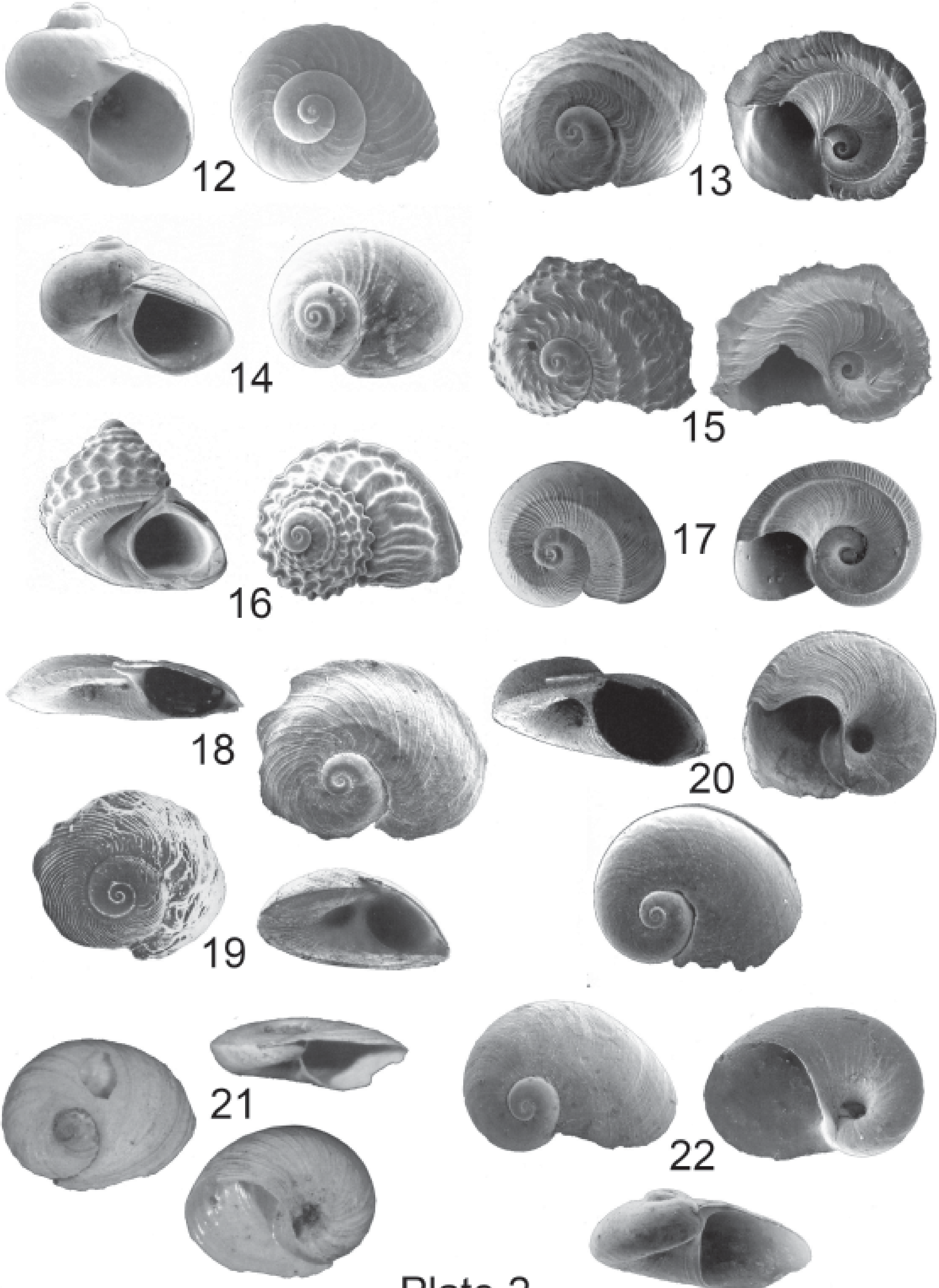



Plate 2


Plate 1


Plate 2

Continued from page 98

**Black and White Plate 3, page 104**

***Cystiscus carinifer*** **Wakefield & McCleery, 2005**
Type locality: Tahanea, Tuamotus **[Pl. 3, fig. 23]**
Distribution: Tahanea and Makemo Atolls, Vanuatu
Size: to 1.55mm

***Cysticus mosaica*** **Wakefield & McCleery, 2005**
Type locality: Makemo, Tuamotus **[Pl. 3, fig. 24]**
Distribution: known only from type locality
Size: to 1.5mm

***Cysticus nebulosa*** **Wakefield & McCleery, 2005**
Type locality: Faaite Atoll, Tuamotus **[Pl. 3, fig. 25]**
Distribution: known only from type locality
Size: to 1.58mm

Wakefield, Andrew and Tony McCleery. Three new species of *Cysticus* Stimpson, 1865 (Gastropodae: Cystiscidae) from the Tuamotu Archipelago. Novapex 6 (1-2): 19-30, 10 March

***Calliostoma (Fautor) stroblos*** **Vilvens, 2005**
Type localty: Somosomo St., between Vanua Levu & Taveuni, Fiji **[Pl. 3, fig. 26]**
Distribution: Fiji, 416 m
Size: to 14.5mm (height)

***Calliostoma (Fautor) chlorum*** **Vilvens, 2005**
Type locality: Somosomo St., between Vanua Levu & Taveuni, Fiji **[Pl. 3, fig. 27]**
Distribution: Fiji, 300-370m
Size: height up 13.6mm

***Calliostoma (Fautor) metabolicum*** **Vilvens, 2005**
Type locality: NE of Espiritu Santo Id., Vanuatu
Distribution: Vanuatu, 210-320 m **[Pl. 3, fig. 28]**
Size: up to 9.6mm in height

***Calliostoma (Fautor) xylocinnamomum*** **Vilvens, 2005**
Type locality: off Vanua Balavu, Fiji **[Pl. 3, fig. 29]**
Distribution: Fiji and Tonga, 275-371 m
Size: height to 11.5mm

***Calliostoma (Benthastelma) arx*** **Vilvens, 2005**
Type locality: south of Eua, Tonga **[Pl. 3, fig. 32]**
Distribution: Tonga and Fiji, 450-531 m
Size: up to 18.1mm in height

Vilvens, Claude. New records and new species of Calliostoma and Bathyfautor (Gastropoda: Callio-stomatidae) from the Vauatu, Fiji and Tonga. Novapex 6 (1-2): 1-17, 10 March

***Mareleptopoma defluxa*** **Rol n, 2005 [Pl. 3, fig. 30]**
Type locality: Palmeira, Sal Id., Cape Verde
Distribution: only from Cape Verde Archipelago
Size: to 1.7mm

Rol n, E. A new species of *Mareleptopoma* (Mollusca: Pickworthiidae) from the Cape Verde archipelago. Gloria Maris 44 (1-2): 1-9, April

***Favartia coltrorum*** **Houart, 2005 [Pl. 3, fig. 31]**
Type locality: Sulfur Bank, off Alcoba a, Bahia, Brazil
Distribution: Brazil (Pitangui, Rio Grande do Norte to Anchieta, Espirito Santo, 20-25m) and Guadeloupe
Size: up to 20.5mm

Houart, Roland. Description of a new species of *Favartia* (Gastropoda: Muricidae: Muricopsinae) from Brazil. Novapex 6 (1-2): 41-44, 10 March

***Trophon partodizi*** **Pastorino, 2005 [Pl. 3, fig. 32]**
Type locality: Le Maire Strait, Argentina
Distribution: known only from type locality
Size: up to 30mm

Pastorino, Guido. A revision of the genus *Trophon* Montfort, 1810 (Gastropoda: Muricidae) from southern South America. The Nautilus 119(2): 55-82, July 20

**Black and White Plate 4, see page 114**

## COLOR PLATES

***Marginella nebulosa abyssinebulosa*** **Massier, 2004**
Type locality: Jeffreys Bay, South Africa
Distribution: between Jeffreys Bay and East London, dredged 50-90m **[Pl. 1, fig. 1]**
Size: to 41.4mm

***Marginella felixi*** **Massier, 2004 [Pl. 1, fig. 2]**
Type locality: Cape St. Francis, South Africa
Distribution: type locality (live, crayfish trap, 160m) and on the Agulhas Bank (trawled 120m)
Size: to 42.8mm

Massier, Werner. Descriptions of new Marginellidae species from South Africa. (Gastropoda: Marginellidae). Schriften zur Malakozoologie, Heft 21: 21-28. Dec. 30.

***Nassarius arcadioi*** **Rolan & Hernandez, 2005**
Type locality: off Mauritania, 200-300m **[Pl. 1, fig. 3]**
Distribution: Gabon to Angola and probably Cape Verde Islands
Size: to 28.4mm

Rolan, E. and J.M. Hernandez. The West African species of the group *Nassarius denticulatus* (Mollusca, Neogastropoda), with the description of a new species. Journal of Conchology 38(5): 499-511

***Nassarius herosae*** **Kool, 2005 [Pl. 1, fig. 4]**
Type locality: New Caledonia, 680-700m
Distribution: from the Chesterfield Islands and New Caledonia to Fiji, Tonga and the Marquesas Islands
Size: to about 10mm

***Nassarius vanpeli*** **Kool, 2005 [Pl. 1, fig. 5]**
Type locality: new Caledonia, 440m
Distribution: Western Pacific, from the Chesterfield Islands and the Solomon Islands, New Caledonia, to Fiji and Tonga
Size: to 7.3mm

Continued on page 114

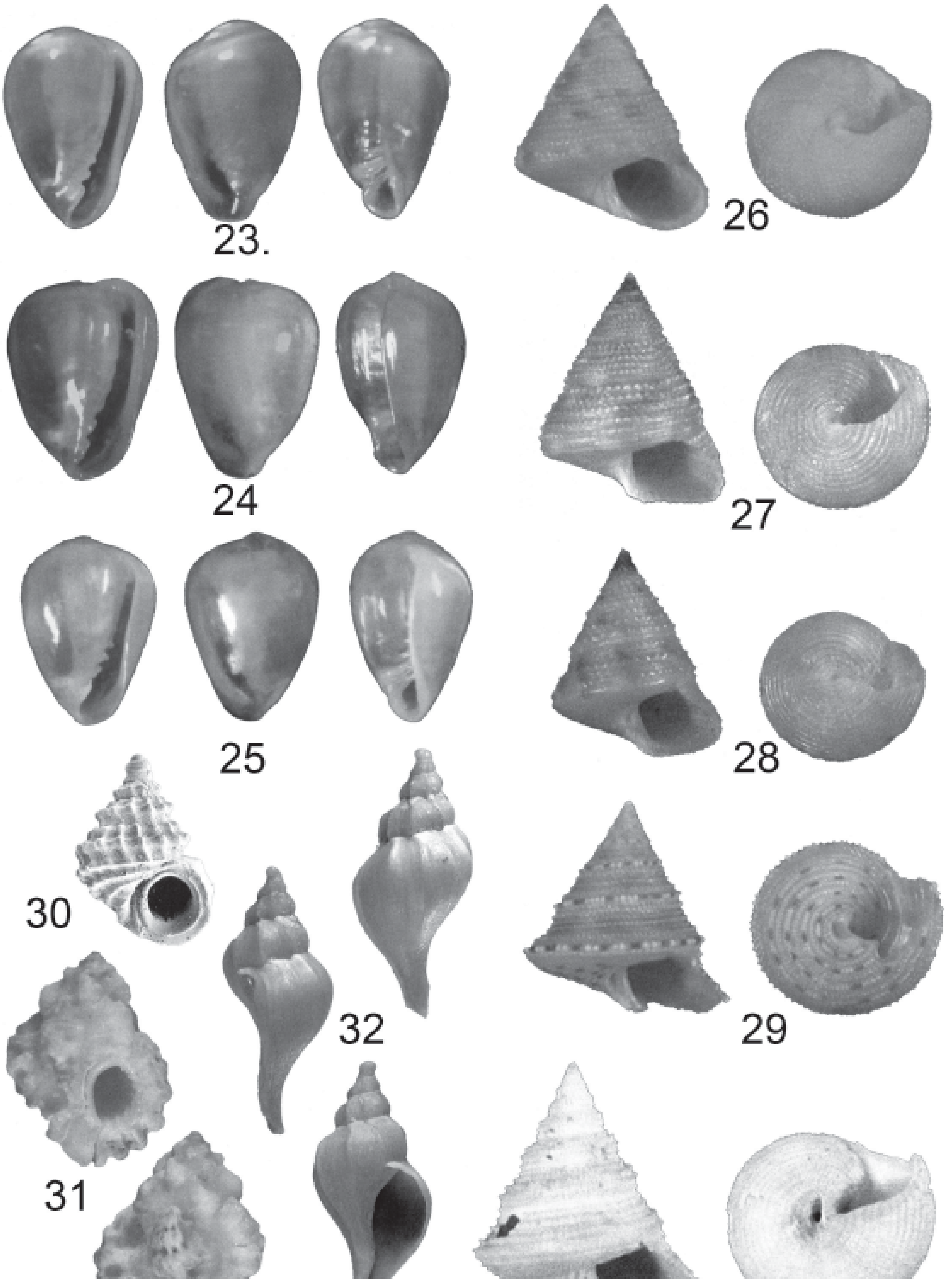



Plate 3

# DECOMPOSITION OF DEAD BIRDS AND FISHES ON A SANDY BEACH

**Willem Krommenhoek**

**(See photos next page)**

On sandy beaches, e.g. along the North Sea, accumulations of valves of Bivalvia are a common sight. But along the swash marks, close to the dunes, there is more that draws the beachcomber's attention. Besides driftwood, empty bottles and cans, ropes and a variety of plastic articles ranging from shoes to crates, put overboard by passing ships, one can find a variety of dead birds and fishes in different stages of decomposition.

In recent years such remains, as well as those of other vertebrates and invertebrates, have a central place in taphonomy, that is the study of fossilization. Although the German literature already focused attention on this process of disintegration for most of the 20th Century, only in the last decades has a wider audience become interested in this process with the aim to reconstruct ancient environments. Nowadays the study of taphonomic processes in present day environments has become an essential instrument for the interpretation of ancient environments. For that reason modern taphonomy is concerned with the processes of alteration, transport and burial that occur after the death of an animal. Usually the death of an animal is not followed immediately by burial. The dead body is subject to chemical decomposition and mechanical destruction. Eventually all traces of life disappear from the earth's surface, while some will fossilize when covered with sediment.

Let's see in more detail what changes take place when a bird dies in the coastal region. It may die accidentally, of old age, or as a victim of parasites (mainly worms), from lack of food, or as a consequence of bad weather. Carcasses of birds can be found the year round, but the numbers increase in spring and autumn when extreme weather conditions affect manybirds during migration.

When a bird dies on the sea, the body drifts on the surface for a considerable time. The air in the quills, between the down feathers and in the tubular bones keep the body floating. According to Sch fer's observation s (1972), a dead herring gull sinks to the sea floor only after a period of more than one month. After two months the carcass is still held together by muscles and ligaments. In shallow sea the skeletal parts are eventually scattered about by bottom currents. But many birds die on land or near the beach. Once the carcass lies on dry sand, e.g. in the swash zone, mummification sets in. The process starts with postmortal contractions of certain muscles and shrinking of the skin, especially at the chest and the skull. In a later state of the process muscles of the back and neck contract, resulting in the head and neck being bent upward. When mummification continues, the strong backward bend of the neck and head forces the shrinking windpipe of the animal to a dorsal position. There it remains and solidifies by dehydration. The postmortal contraction of the muscles of the chest pushes the wings away from the body. In this position the dead body is often covered and preserved by sand. At the same time predation by insect larvae and amphipods takes place on the underside of the carcass which stays wet for a long time. When the internal parts have gone, the abdominal and chest cavity are invaded by blowing sands.

However, if the carcass stays wet before it gets embedded in the beach sand, no contractions of muscles occur. In this case the joints remain mobile and the final position of the limbs, neck and head are determined by the current flow. The hind limbs finally separate from the trunk, the pelvis from the vertebrae., and are transported away. Wings, coracoid, clavicle and sternum continue as a unit for a long time. The head, with the cervical vertebrae, separates from the body. In all cases the flight feathers and tail feathers remain connected with the skeleton for a long time.

Although we all prefer to look at the living birds and enjoy their gracious dance in the wind, the beachcomber may witness a process of transformation from living animal into a set of future fossil remains.

The the case of fishes it is a somewhat different story. Most fishes die from predate-ion or old age, but depending on the type of fish, the body will sink or float, depending on the amount on gases produced by the decaying body. In case the dead fish is washed ashore, there is a gradual reduction of the skeleton resulting from the loss of finrays and vertebrae, starting at the tailpart. The skull remains intact for a long period, but eventually also breaks apart, leaving the jawbones and teeth and some loose bony fragments.

LITERATURE

Sch fer, W. 1972. Ecology and Paleontology of Marine Environments. University of Chicago Press.



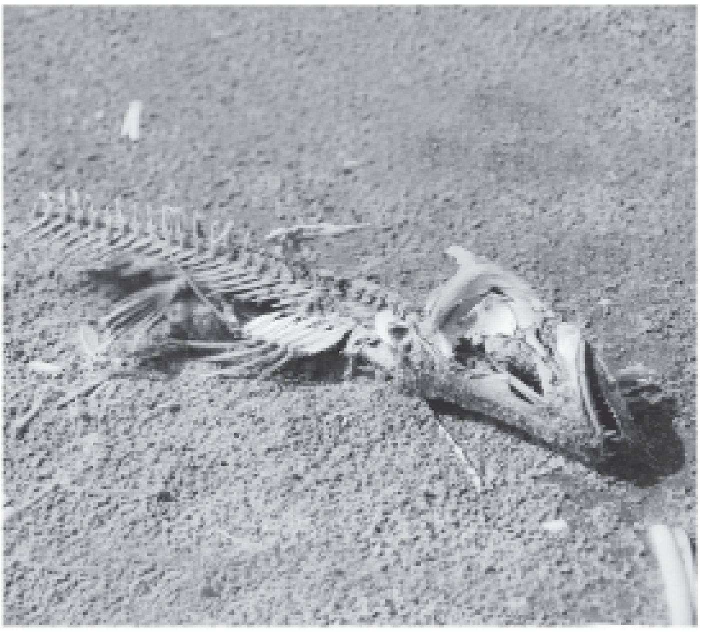
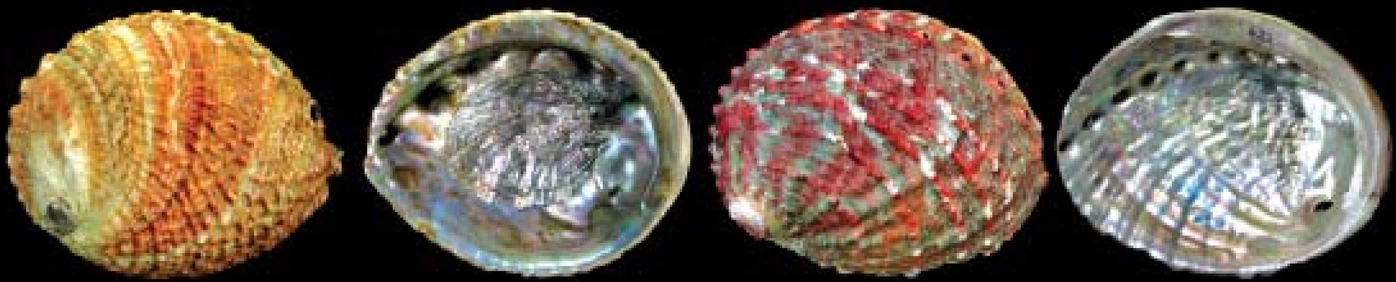




Plate 3


Plate 4



153.2 mm Baja California, Mexico. 10-15 m 133.0 mm San Miguel Island. 20 m


154.1 mm Baja California, Mexico. 10-15 m 136.8 mm Pt. Loma, California. 25 m

*Haliotis corrugata* *Haliotis kamtschatkana assimilis*

Parent Species (above)

A 163.4 mm B 152.9 mm

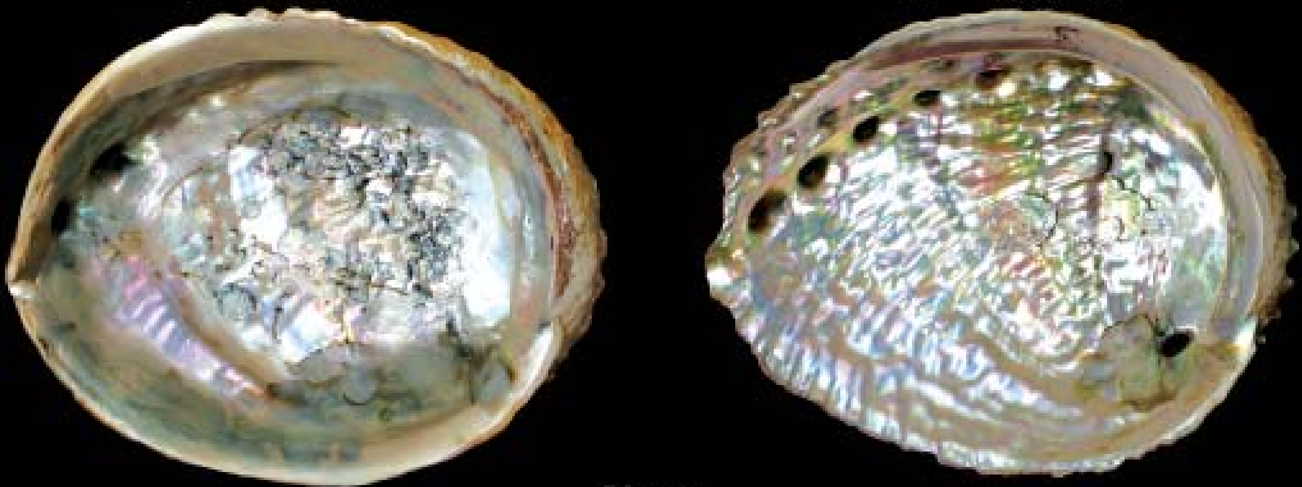
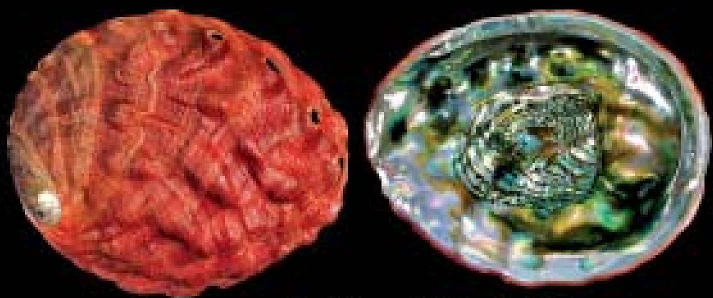
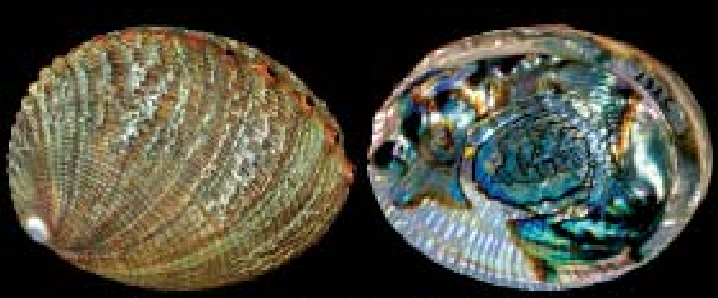


**Plate 1**

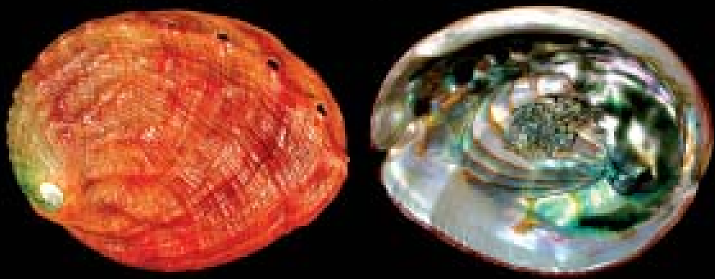
A and B: *Haliotis corrugata* x *H. kamtschatkana assimilis.* Both specimens From California: A - Santa Cruz Island; B - Point Loma. 15-20 m. 1959-1967.





211.5 mm  San Miguel Island. 8-10 m

174.8 mm  Santa Cruz Island. 5-8 m



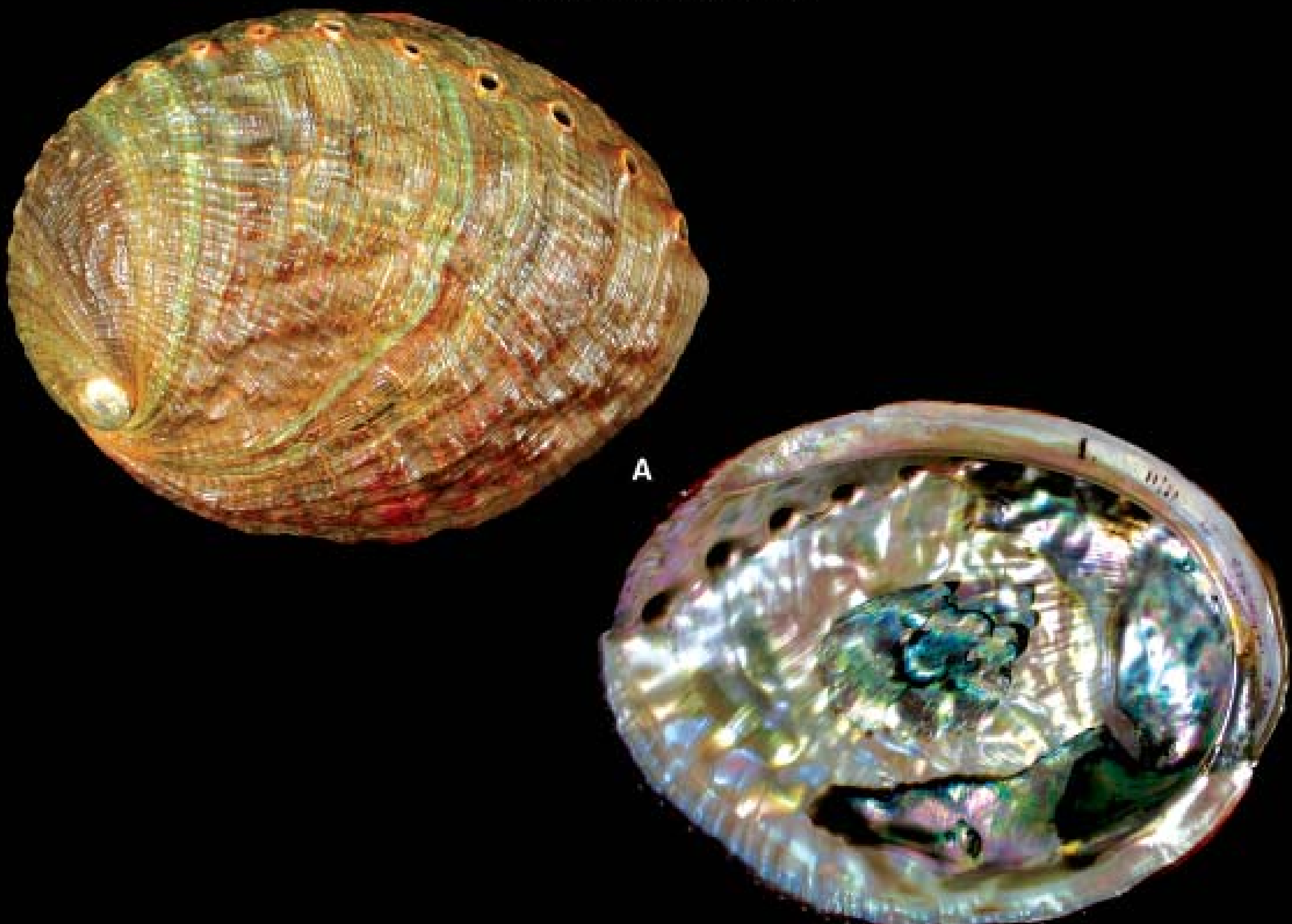
191.2 mm  Santa Cruz Island. 10-15 m

164.2 mm  Baja California, Mexico. 5 m

*Haliotis rufescens*

*Haliotis fulgens*

Parent Species (above)



A

**Plate 2**

A : *Haliotis rufescens* x *H. fulgens*. One of two known specimens. 177.2 mm
Coches Prietos Anch., Santa Cruz Island, California. Live-taken on 4 August 1961. 5-10 m

# A PHOTO STUDY OF THE EASTERN PACIFIC HYBRID ABALONES (GENUS *HALIOTIS*).

**Buzz Owen**
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Gualala, California 95445
buzabman@mcn.org

**Part 8**

1) *Haliotis rufescens* Swainson, 1822 x *H. fulgens* Philippi, 1845
2) *Haliotis sorenseni* Bartsch, 1940 x *H. walallensis* Stearns, 1899
3) *Haliotis corrugata* Wood, 1828 x *H. kamtschatkana assimilis* Dall, 1878

## ABSTRACT

Three of the four known specimens of three extremely rare hybrid abalone are illustrated with high-resolution color photography. Two specimens of each of the respective parent species are also illustrated for comparison purposes. Reasons for the necessity of this review of the West American hybrid *Haliotis* are discussed.

## INTRODUCTION

The present work is the eighth in a series of ten papers that will illustrate each of the fourteen interspecific Eastern Pacific *Haliotis* hybrids that are currently known to have been retrieved from natural populations. Parts one and two treated *H. rufescens* x *H. corrugata* (*Of Sea and Shore*, Vol. 25, No. 2), and *H. corrugata* x *H. walallensis* (Vol. 25, No. 3). Parts three and four covered *H. corrugata* x *fulgens* (Vol. 25, No. 4), and *H. rufescens* x *H. kamtschatkana assimilis* (Vol. 26, No. 2), while part five treated *H. corrugata* x *H. sorenseni* (Vol. 26, No. 3). Part six continued the review with the examination of *H. rufescens* x *H. sorenseni* (Vol. 26, No. 4), followed by part seven which began our treatment of the extremely rare hybrids, with *H. kamtschatkana assimilis* x *H. sorenseni*; *H. rufescens* x *H. walallensis*; and *H. kamtschatkana assimilis* x *H. walallensis* (in press). A ninth paper will illustrate three unique specimens that represent hybridization of two of these hybrid varieties with a third *Haliotis* species, and the back-crossing of a hybrid with one of its parent species. The tenth paper of this series is out of sequence and was presented earlier (2002), when Owen and Leighton described two hybrids of *H. cracherodii* Leach, 1814, crossed with *H. corrugata* and *H. fulgens.* These are the first and only known examples of hybrids of *H. cracherodii*.

Hybridization of the Eastern Pacific *Haliotis* has been well documented. Owen (1961) presented a report on six varieties found in Southern California and the adjacent Channel Islands. Owen et al. (1971) expanded this report to include six additional hybrids. These 12 crosses involved all west coast species with the exception of *H. cracherodii*. Additionally, hybrid *Haliotis* have been reported in South and Western Australia, by Owen and Kershaw (2002, 2003).

Beginning in the early 1980s, a severe population decline was noticed in all *Haliotis* species native to the Southern California Channel Islands. Simultaneously, few, if any, of these hybrids were retrieved by commercial *Haliotis* divers (C. Sites, J. Marshall pers. comm.). The reasons for this decline remain unclear. Commercial overfishing doesn't appear to be a major factor as two species that were never taken commercially in that area, *H. walallensis,* and *H. kamtschatkana assimilis*, suffered a severe decline during the same period as well.

This severe population decline continued in all *Haliotis* species throughout Southern California and the adjacent Channel Islands and finally led to closure of the sport and commercial fisheries in these areas in 1997. This closure is still in effect. It appears clear that few, if any, of the very rare hybrid varieties (hybrids other than the most common: *H. rufescens* x *H. sorenseni*) were taken after the period from 1975 to 1980. Thus, virtually all known specimens exist in either the Buzz Owen Collection (BOC), Gualala, California, or in the Los Angeles County Museum of Natural History (LACM). The LACM specimens were deposited by Owen as reference for the earlier paper on Eastern Pacific hybrids (Owen et al. 1971). The primary purpose of this first work was to prove the actual existence of hybrid *Haliotis* specimens. Thus, only a single shell specimen was photographed in black and white for each hybrid variety illustrated. This led to much confusion in subsequent years when Haliotiphiles tried to use this paper as an identification guide during searches of commercial *Haliotis* shell piles, where the vast majority of hybrid *Haliotis* specimens have been found to date. This has proven to be especially true in Lower California, Mexico, where a commercial fishery still exists (2005). Therefore, the primary impetus for this reappraisal is to illustrate a number of specimens of each hybrid in color so as to facilitate a greater understanding of each variety and make it possible to accurately identify hybrid *Haliotis* shell specimens.

## MATERIAL AND METHODS

Abbreviations of Collections: LACM: Los Angeles County Museum of Natural History; BOC: Buzz Owen Collection.

**(See color pages 109, 110, 115)**

All illustrated specimens of these three rare forms are from the BOC and were taken from the California Channel Islands or adjacent coastal areas by Owen or by commercial abalone divers with whom he worked. Where noted, the identity of a specimen was confirmed by study of the animal as well as the shell.

Photography was performed with Canon A70 and G6 digital cameras and the resulting images processed with an iMac computer using Adobe Photoshop 8.

## RESULTS

1) ***Haliotis rufescens* x *H. fulgens.***

Only two specimens of this extremely rare form are known. Both are from Santa Cruz Island, the "discovery" specimen coming from near Gull Rock (Island). It was taken by Henry ("Huck") Kuzen, Owen's diving partner at the time, and recognized immediately due to the morphology of both shell and animal equally demonstrating both parent species. The second specimen was discovered in a Santa Barbara abalone processing shop. It was deposited in the LACM as the reference specimen to the 1971 paper on Eastern Pacific *Haliotis* Hybridization (Owen et al. 1971). The first specimen is in the BOC.

2) ***Haliotis sorenseni* x *H. walallensis*.**

This hybrid is represented by a single specimen found in a pile of commercial shell in Goleta, California, in 1968. It was taken on the south side of Santa Cruz Island, probably near Gull Rock (Island). The morphology of the shell strongly and equally demonstrates both parent species, and its identity was never in question, even though the animal was unavailable for study. The shell is deposited in the BOC. For further details see the earlier paper (Owen et al. 1971). (A second specimen may exist which was taken commercially in Baja California, Mexico. It is not included here as its identity is uncertain).

3) ***Haliotis corrugata* x *H. kamtschatkana assimilis.***

A single specimen of this extremely rare form was found in a commercial shell pile in San Diego, California, in 1959. It was immediately recognized due to its strikingly uniform display of the characters of both parent species. It remained unique until 2001 when a second specimen was discovered in the collection of a friend of Owen who was a commercial abalone diver during the 1950s and 1960s. It was live taken at Santa Cruz Island in 1967 and the animal was not saved. The shell is more mature than the first specimen (Pl. 1, Fig. A), has fewer open holes, but otherwise the two are morphologically very similar. Both specimens are in the BOC.

## DISCUSSION

1) ***Haliotis rufescens* x *H. fulgens.***

This cross is by far the rarest of the *H. rufescens* hybrids. It is also the last to be discovered (August, 1961). By the time the first example was found (alive with animal) by Owen's diving partner "Huck" Kuzen, all other possible hybrids of *H. rufescens* with other species had been well established – most with numerous specimens (the exception being with *H. cracherodii* which wasn't known to hybridize with *any* species until about 1997). Thus, this initial specimen fit perfectly into the only "slot" available for it, by a process of elimination. The identity of the second example, found shortly afterward, was instantly apparent as well. No additional specimens from natural populations are known (April, 2005).

This hybrid has been cultivated with ease in marine shellfish hatcheries (D. Leighton; J. McMullen, pers. comm.). High fertilization rates and excellent survival of early juvenile stages has been achieved, often as successfully as with con-specific crosses. It is clear, therefore, that other mechanisms are at work to explain its extreme rarity in natural populations. Possibly most likely are differences in habitat preference: *H. rufescens* being a cold water "northern" species (or deeper water species in the southern portion of its distribution, i.e. south of Point Conception), while *H. fulgens* is found in much warmer waters, being the most "southern" of the West Coast species. In Southern California and Baja California, Mexico, where on occasion both species are found, *H. fulgens* will normally be distributed in warmer, very shallow water (<6-8 m), while *H. rufescens* occurs in depths usually over 15 m. This difference in vertical zone distribution may normally prevent the two species from interbreeding. It may also be that they normally do not spawn at the same time.

2) ***Haliotis walallensis* x *H. sorenseni*.**

It is difficult to know why some of these hybrid forms are so rare while others are far more common. In marine shellfish hatcheries, as stated earlier, certain crosses are produced very successfully with high survival rates – sometimes displaying a type of "hybrid vigor" and having lower mortality in the early stages of development than con-specific crosses. Though this is true of several of the rarest crosses, *H. rufescens* x *H*. *fulgens* for example, it is not known whether it is the case with this hybrid as it has never been cultured in a hatchery. A possible reason for this hybrid's extreme rarity may be the fact that *H. walallensis* is normally found in the type of ecological niche generally preferred by *H. kamtschatkana assimilis* and *H. rufescens* (referred to here as "Northern/Cold Water"), while *H. sorenseni* is one of the more "Southern" species which exist primarily at the warmer water Southern California Channel Islands along with *H. fulgens* and *H. corrugata*. Thus, though on occasion the parent species may occupy a similar habitat, this may occur infrequently. This is supported by much investigation done by Owen and his commercial diver co-workers, with no specimens of *H. walallensis* being found in areas where *H. sorenseni* was distributed. As stated earlier, this hybrid has not been produced in a marine shellfish hatchery, thus nothing is known as to the ease or difficulty the parent species might have in crossbreeding. A very detailed description of this unique specimen is given in the earlier paper on Eastern Pacific Hybridization (Owen et al. 1971).

3) ***Haliotis corrugata* x *H. kamtschatkana assimilis.***

The first (smaller) specimen of this hybrid is a classic example of a perfect and equal mixing of the sculptural details of two species. The earlier stages of growth (to about 60 mm) strongly resemble *H. corrugata*, while the latter details of sculpture and strongly sloping columella clearly resemble *H. kamtschatkana assimilis* (the second specimen also demonstrates this for similar and additional parameters). It also demonstrates very well, as did *H. rufescens* x *fulgens* earlier in this discussion, how the "process of elimination" can be useful in hybrid identification. Each of the other hybrids of *H. corrugata* is well established and understood based on the examination of from 10 to 47 specimens (with the exception of the cross with *H. cracherodii*, which is unique). These two specimens resemble none of the other hybrids of *H. corrugata,* and strongly demonstrate *H. kamtschatkana assimilis* as the other parent species. For these reasons, this pair of hybrid specimens fit perfectly into the "slot" for *H. corrugata* x *H. kamtschatkana assimilis*, and are extremely easy to identify for anyone with a reasonable amount of knowledge of the West Coast *Haliotis* species and their hybrids.

## ACKNOWLEDGEMENTS

I would like to thank David Leighton, Stephen Browning, and Tom Grace, for their constructive review of the manuscript, and for providing helpful comments. I also want to thank Bob McMillen, who provided many of the shell specimens used in this study.

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**Continued from page 103**

Kool, Hugo H. Two new western Pacific deep water species of *Nassarius* (Gastropoda: Prosobranchia: Nassariidae): *Nassarius herosae* sp. Nov. and *Nassarius vanpeli* sp. nov. Gloria Maris 44 (3-4): 46-54, June

***Tonna berthae*** **Vos, 2005 [Pl. 2, fig. 6]**
Type locality: Natal, South Africa
Distribution: east coast of South Africa, at least from East London to Durban
Size: to 89+mm

Vos, Chris. A new species of *Tonna* Br nnich, 1772 (Gastropoda: Tonnidae) from South African waters. Gloria Maris 44 (1-2): 10-17, April

***Tonna oentoengi*** **Vos, 2005 [Pl. 2, fig. 7]**
Type locality: Arafura Sea
Distribution: from Indonesia southwards to Western Australia
Size: to 114mm

Vos, Chris. A new species of *Tonna* Br nnich, 1772 (Gastropoda: Tonnidae) from Indonesian and Western Australian waters. Gloria Maris 44 (1-2): 16-23, April

***Bistolida stolida uvongoensis*** **Massier, 2004**
Type locality: Uvongo/Shelly Beach, South Africa
Distribution: east to south coast bof South Africa
Size: up to 30mm **[Pl. 2, fig. 8]**

Massier, Werner. Description of a new subspecies of Bistolida stolida (Linnaeus, 1758) (Gastropoda: Cypraeidae). Schriften zur Malakozoologie, Heft 21: 35-38.

***Marginella fishhoekensis*** **Massier, 2004**
Type locality: Fishhoek, False Bay, South Africa
Distribution: only known from False Bay, 12- 20 m
Size: to 29mm **[Pl. 2, fig. 9]**

Massier, Werner. Descriptions of new Marginellidae species from South Africa. (Gastropoda: Marginellidae). Schriften zur Malakozoologie, Heft 21: 21-28. Dec. 30.

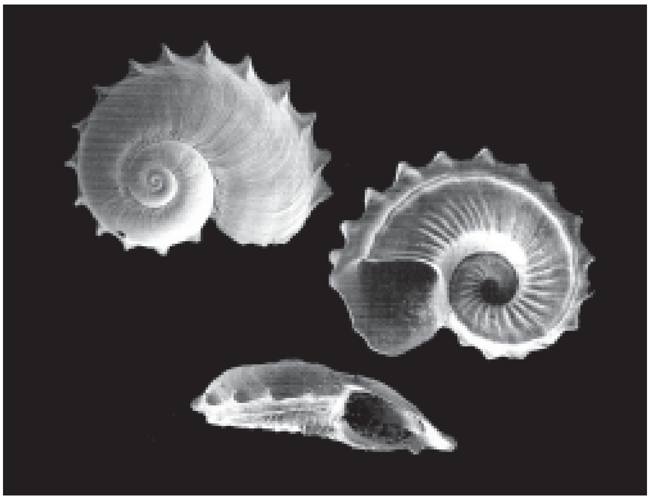
***Cysticus mosaica*** **Wakefield & McCleery, 2005**
Type locality: Makemo, Tuamotus **[Pl. 2, fig. 10]**
Distribution: known only from type locality
Size: to 1.5mm

***Cysticus nebulosa*** **Wakefield & McCleery, 2005**
Type locality: Faaite Atoll, Tuamotus **[Pl. 2, fig. 11]**
Distribution: known only from type locality
Size: to 1.58mm

***Cystiscus carinifer*** **Wakefield & McCleery, 2005**
Type locality: Tahanea, Tuamotus **[Pl. 2, fig. 12]**
Distribution: Tahanea and Makemo Atolls, Vanuatu
Size: to 1.55mm

see also black and white plate 3, figs. 23-25, pg. 104

Wakefield, Andrew and Tony McCleery. Three new species of *Cysticus* Stimpson, 1865 (Gastropodae: Cystiscidae) from the Tuamotu Archipelago. Novapex 6 (1-2): 19-30, 10 March



## Above

***Discopsis irregularis*** **Rolan & Rubio, 2005**
Type locality: Barra do Dande, Bengo, Angola, 0-2m
Distribution: Congo and Angola
Size: 2mm (diameter)

***Discopsis liliae*** **Rolan & Rubio, 2002**
Type locality: Miamia, Ghana, 30-50m
Distrbution: Senegal to Angola, but not in the Sao Tome and Principe Archipelago
Size: 2mm (diameter)

Rolan, E. and E. Rubio. The Family Tornidae (Gastropoda: Rissoidae) in the East Atlantic. Supplement to Resenas Malacologica, SEM, 2002

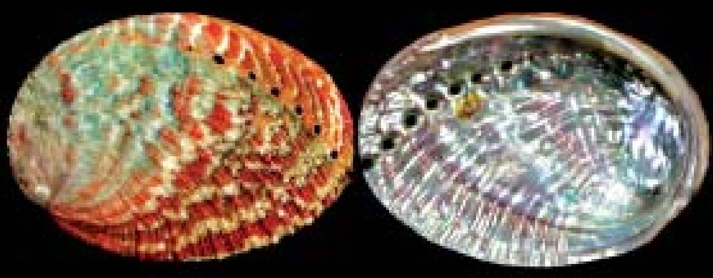
***Cypraea hungerfordi lovetha***
**Poppe, Tagaro & Buijse, 2005**
Type locality , off DipologAliguay Island, Philippines
Distribution: central Philippines, 50-150m
Size: to 36.8mm **[Pl. 3, fig 13]**

Poppe, Guido T., Sheila Tagaro and Jan Buijse. A New Subspecies of *Cypraea hungerfordi* from Aliguay Island, The Philippines. Visaya 4: 24-29, dated April, but released in June

**Continued on page 123**

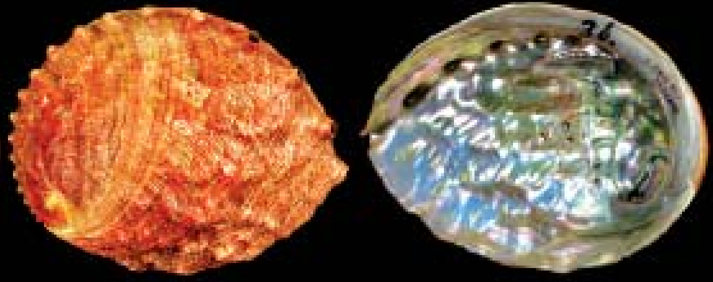
130.4 mm Baja California, Mexico. 20-25 m

174.5 mm Santa Cruz Island. 30 m



119.7 mm Point Conception. 20-25 m

*Haliotis walallensis*



177.1 mm Anacapa Island. 30 m

*Haliotis sorenseni*

Parent Species (above)

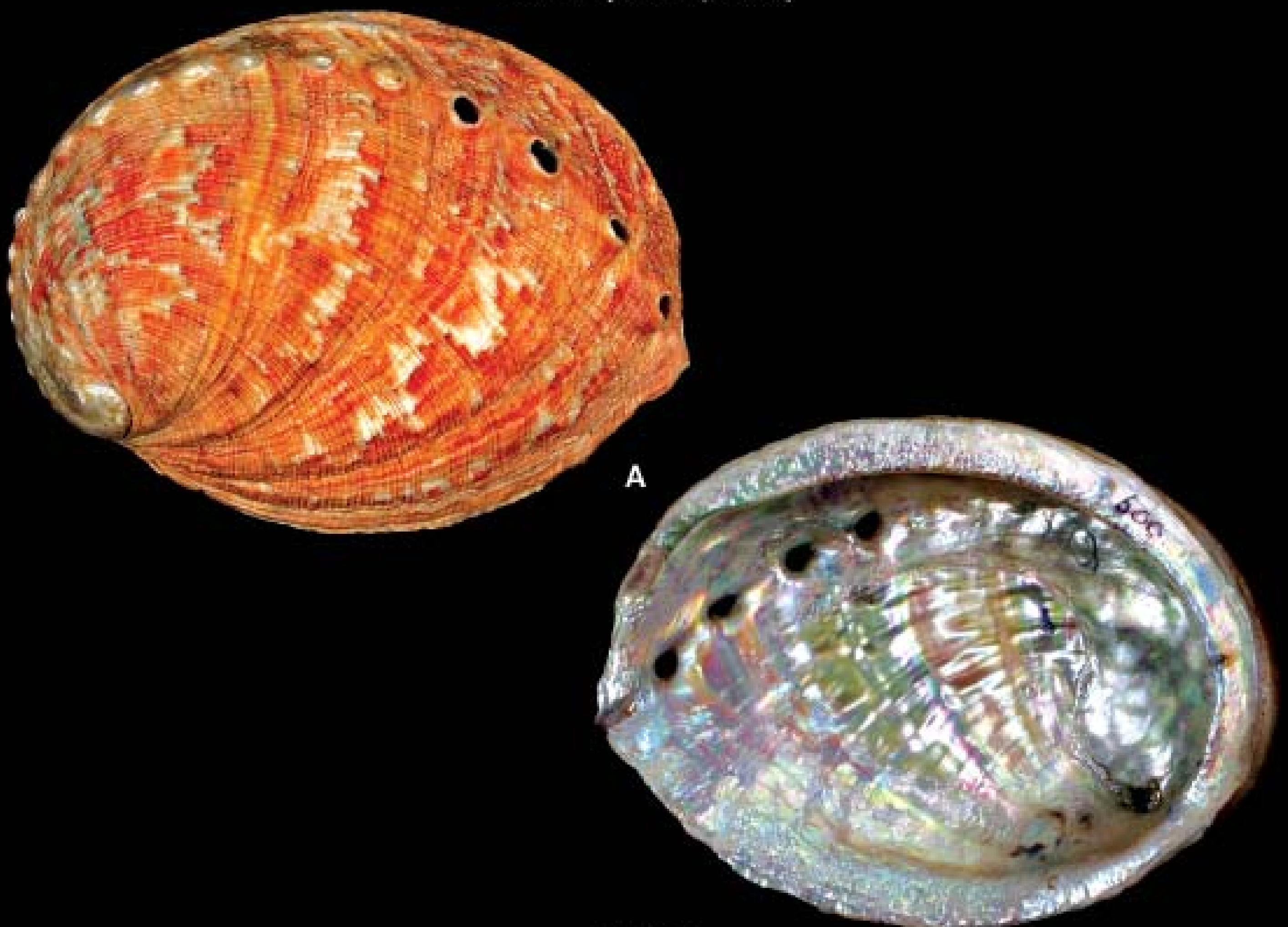
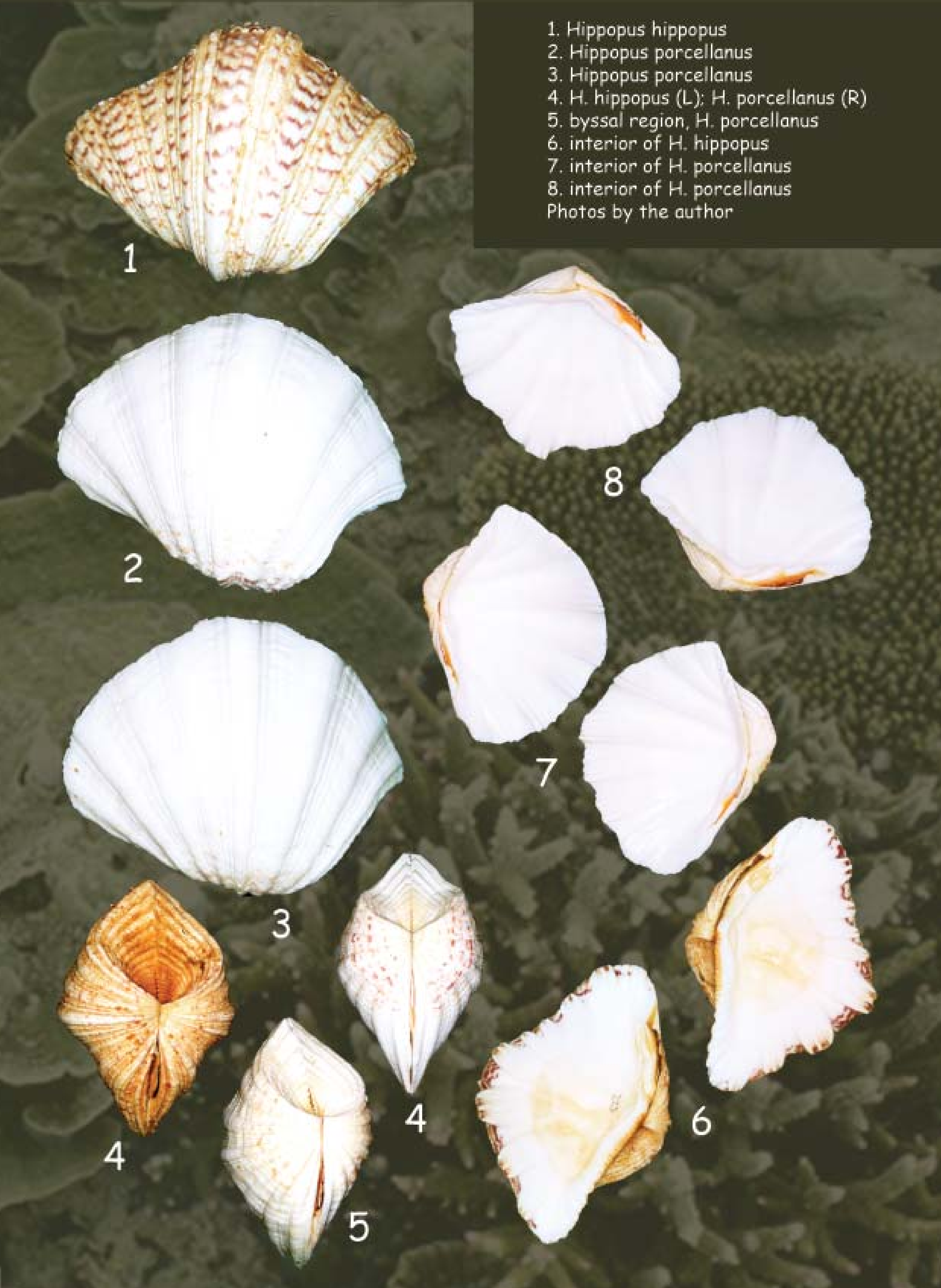


**Plate 3**

A : *Haliotis walallensis* x *H. sorenseni.* Only known specimen. 156.5 mm
Near Gull Rock, Santa Cruz Island, California. Found in commercial shell pile. August, 1968.




1. Hippopus hippopus
2. Hippopus porcellanus
3. Hippopus porcellanus
4. H. hippopus (L); H. porcellanus (R)
5. byssal region, H. porcellanus
6. interior of H. hippopus
7. interior of H. porcellanus
8. interior of H. porcellanus

Photos by the author

# A RARE SPECIES: *HIPPOPUS PORCELLANUS* (Rosewater,1982)

**Dr. Michele Dardano**

**(See color page 116)**

In his interesting book, “Giant clams”,Daniel Knopp describes nine species belonging to the family Tridacnidae. Seven of them belong to the genus *Tridacna*, two to the genus *Hippopus*. At first sight, *Hippopus* differs from *Tridacna* by having strong teeth on the byssal orifice.These teeth are clearly visible in *Hippopus*, but absent in *Tridacna* (there are sometimes small folds or ridges at the umbonal area).

The commmoner of the two species is *Hippopus hippopus* (Lynnaeus, 1758 - photo # 1);the other one, *Hippopus porcellanus* (Rosewater, 1982 - photos # 2-3) is one of the rarest species among the Tridacnidae. At first sight, it’s not difficult to separate *H. porcellanus* from its congeneric.*Hippopus hippopus* is more symmetric and has a clearly rhombic contour, while, in *Hippopus porcellanus*, the contour is just slightly rhombic. As to the external sculpture, the shell of *H. porcellanus* is smooth, unlike *H. hippopus* which shows numerous scales; moreover, in *H. hippopus*, the folds are much stronger and show a prominent, central, major fold; in *H. porcellanus* the folds are rounded.

The interstices and the external color are different,too.*Hippopus hippopus* shows typical red horizontal bands, while *H. porcellanus* has a white shell with some traces of red shading rapidly off into yellow at the umbonal area.The umbonal area shows also a yellow color, as well as the teeth on the byssal orifice, but, in mature specimens, these colors often dissapear.
Other differences are in the hinge and in the byssal region, that is stronger, larger, more rounded in *Hippopus hippopus*, whereas in *H. porcellanus* it’s ovoidal and more elongate (photos # 4-5).

Internally, both *H. hippopus* and *H. porcellanus* shows groups of ribs:up to three in *Hippopus hippopus*, four in *Hippopus porcellanus* (photos # 6-7).

# SMALL OBERVATIONS

**Willem Krommenhoek**

When walking over the foreshore during low tide, we can observe how, with each step, the sand around our foot looks lighter as it turns instantaneously dry. We are inclined to think that the weight of our body ha pressed the sand particles together. But if this was the case there would be less space left for the water to between the sand grains and the water would have come to the surface next to our foot. So, there is only one conclusion left: the body pressure did not compress the sand, but instead had it expanded! This sounds against all reason, but we can explain. In the wet foreshore the sand particles are piled up in the densest possible way, leaving a minimum of space for the water between the sand grains. Each alteration in this situation will therefore increase the space between the sand grains, resulting in a lowering of the water level. A man's foot will certainly disturb this densest piling up of the grains, increasing the volume between them and, consequently, lower the water level. This is the reason for th lighter spot around the foot. After lifting the foot capillary action brings water to the surface again, the grains return to their densest piling up and the surplus water is brought to the surface. This interpretation was presented to the meeting of the British Association in Aberdeen in 1885 by Osborn Reynolds.

In the backshore trhe beach is usually composed of dry sand and shell debris. After an extremely high tide, a gale or after rain, the sand is wet and will dry up during the next sunny period. Once dry and i8n the prese3nce of wind, the sand grains are blown away until they meet an obstacle. However, beneath a valve or a stone the drying takes more time, so the still wet sand grains stick together, forming a mini pyramid until this little pyramid itself is target of sand abrasion and grows thinner and thinner until it collapses under the weight of the shell or stone and the whole story will start over again. (Fig. 1)

**Fig. 1**

Another process which can be obse3ved on the backshore is the pattern in which sand grains transported by air, come to a halt around small object on the beach. There is a deposition of sand before trhe object, but not in contact with it, and deposition in the wind-fre area behind the object, in the form of a tail figure. There is also a sorting of grains, the coarse ones facing the wind, the fine ones the side. (Fig. 2)

**Fig. 2**

On the dry backshore we can also observe the wind transport of sand grains in some detail. The first thing we notice is that only from an air speed of 5 m/s (18 k/h) on, grains are lifte and rolled. With increasing wind, sand grains are lifted up to 1 m in height, and a few may even kae a height which you can feel in your face. Fine dust can be lifted much higher and transported over long distances. This process leads to sorting: the fine material eventually will come to rest at a different place than the coarser particles.

Careful observation shows that sand grains falling back to earth carry so much more energy that they can make another particle jump when hit, a process known as saltation and visualized in the figure below. This process was described in 1941 by R.A. Bagnold. Notice that wind is blowing from left to right in the Figure 3.

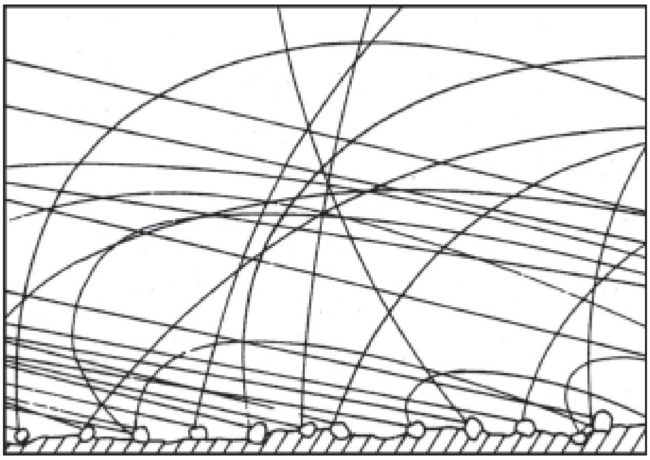


**Fig. 3**

# Population density and morphometry of *Polymita muscarum* Lea, 1834(Mollusca: Gastropoda) in Playa Blanca, Rafael Freyre municipality, Holgu n, Cuba.

**Alejandro Fern ndez Vel zquez [1], Vicente Berovides lvarez [2] y Bernardo Reyes Tur [3].**

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3 Dpto. de Biolog a, Universidad de Oriente, Santiago de Cuba, Cuba.

**ABSTRACT**

A population of *Polymita muscarum* in a coastal thorny scrub in Playa Blanca, Holguin, was studied in fixed plots and visited monthly from October of 1989 to September of 1990. The objective was to describe temporal changes of the density and morphometry of adults and juveniles and to elucidate the possible causes of the changes of the variables studied. The adult density at the end of the reproductive period decreased with culmination of the life cycle; the juveniles were not detected between September and November of 1989, a period when theoretically they were expected to be seen. The cause of the delay in the reproductive cycle was related to the effects of the drought, one of the negative impacts of the climatic changes that affect land snails. The size of adult shells varied between limits reported for this species in the coastal area. The growth rhythm of the shell in juvenile forms had a little variation in most of the months, due to high percentage of active juvenile individuals; the low growth rhythm detected in May could be a consequence of a high percentage of dormant individuals in April. A decreasimg trend of the median weight of the adult individuals could be caused by the winter conditions and drought effects.. A high percentage of dormant individuals was evidenced in response to lower temperatures and low humidity in the environment.

Key words: Mollusca, *Polymita muscarum*, Ecology, density, morphometry.

## INTRODUCTION

*Polymita muscarum* is exclusive of Holgu n, Las Tunas and Camag ey. Their populations are located from Key Guajaba (Camag ey) to the municipality of Frank Pais in Holgu n, and different aspects on biology, geographical distribution and systematic are well-known. This species is considered vulnerable according to the approaches of the UICN (Bidart *et al*., 1995, Bidart *et a*l., 1997) and the studies of populations in coastal areas constitutes a necessity and will focus its attention on the temporary variation of the density and the morphometry of a population of *Polymita muscarum* Lea, 1834, in the Blanca Playa locality, supplementimg a previous work on its bioecological variables studied by Fern ndez *et. al*., (1999).

## MATERIALS AND METHODS

The habitat was a small patch of vegetation (100 X 300 m) in the coastal thorny scrub, according to the classification criterion given by Capote and Beraza n (1984), with low height (mean value 123.9 cm and coefficient of variation 23.2%), some emergent trees and as a consequence high heatstroke. The majority of plant species better represented were bushes, such as: *Randia aculeata* L., *Erytroxylon havanensis* Jacq, *Pisonia aculeata* L., *Zanthoxylum fagara* L. Sargent, *Lantana camara* L., *Jacquinia aculeata* (L.) Mez., *J. brevifolia* (Griseb.) Urb., *Oplonia* sp., *Caesalpinia vesicaria* L., *Eugenia axillaris*, *Erithalis fruticosa* L., *Exostema caribaeum* (Jacq.) R & S, *Colubrina arborescens* (Miller) Sarg., *Capparis flexuosa* L., *Securidaca elliptica* Turcz, as well as *Dichrostachys cinerea* (L.) Wrigh. & Arn. and *Leucaena leucocephala* (Lam.) de Wlt.. Some lianas occurs there, such as: *Stigmaphyllon sagraeanum* A. Juss, *Triopteris rigida* Sw and *Smilax havanensis* Jacq.

During 12 months, between October 1989 to September 1990, data was obtained. This period was influenced by nine cold fronts (weak 7, moderate 1, and dissipated 1) related directly with the rains. The first cold front occurred very late , December 3, 1989. Here were marked 3 fixed plots of 36 m and were visited monthly , between the first and fifth day of each month. Data of the following variables were obtained: population density, shell diameter (Sd) [measured with a Caliper (precision 0.05 mm)], age class (adult or juvenile) in relationships with the presence or absence of the lip on the aperture of the shell, the individuals' weight by means of a balance was obtained (precision 0.01 g) and physiologic state (active or dormant, without or with epiphragm respectively).

## RESULTS AND DISCUSSIONS

Total population density (adults + juvenile) - the minimum values of population density of *Polymita muscarum* in October (2.92 ind/m ), November of 1989 (2.17 ind/m ) and February of 1990 (2.64 ind/m ) were detected. The maximum values in June (4.05 ind/m ), July (4.11 ind/m ),August (4.58 ind/m ) and September 1990 (4.94 ind/m ). From December 1989 to May 1990 about 3 ind/m the density were characterized (Table I). This population had comparatively the highest value of population density known within the genus, therefore its significance could constitute an important area for its conservation.

The total population density in *P. muscarum* was high (2.17 to 4.94 ind/m ) with relationship to other species: *P. picta roseolimbata*, range 0.9-4.3 ind/m and mean value 2 ind/m in bushes habitat and smaller in the forest

(1.5 to 1.7 indiv. /m ) (Vald s *et. al*., 1986; Berovides, 1987); *P. picta nigrolimbata* 0.1-1.1 ind/m and mean value 0.45 ind/m (Bidart *et al*., 1989); *P. venusta* with mean value 0.7 ind/m (Reyes-Tur & Fern ndez, 2000); *P. sulphurosa* with mean value 0.1 ind/m and range 0.08-0.84 ind/m , (Fern ndez *e al*., 1998) and *P. brocheri* with range 0.04-0.12 (Maceira, 2000).

**Density of juvenile**

Into the plots between October and November of 1989 the juvenile individuals were not detected, and it was very low in December (0.06 ind/m ), but increased abruptly in January 1990 (1.69 ind/m ) and relatively stable was maintained in the successive months until reaching maximum values between June to September 1990 (2.39 to 2.86 ind/m ) (Table I). [**See page 123**]

The absence of juvenile individuals in October and November 1989, was due to the reproductive retard by cause of climatic effects, specifically, the drought and late enter of cold fronts were the main causes; the results obtained by us were so far than those expected according of the other authors explained (D az-Pifferer, 1962; Bidart *et al*., 1998) had been explained.

**Density of adult**

The density of adult individuals was high between October 1989 to January 1990 (2.14 to 2.97 ind/m ), but from February until August 1990 diminished, with some variations observed (1.22 to 1.72 ind/m ). The adults in September 1990 were more numerous, because of the transformation of juveniles (sub adults) to adults. Two differ stages were identified: 1. September to January, when the biggest values of density were detected (2.14 to 2.97 ind/m ) and 2. between February to August, with densities values (1.5 to 1.72 ind/m ) smaller than first (1).

The reduction of the density of adults began in February and was probably caused by the culmination of the reproductive cycle. This fact has been observed in laboratory conditions, occurring after the egg production (Reyes-Tur and Fern ndez, 1998); on the other hand, in the population of Playa Blanca many empty shells on the ground were observed, it happened after the reproductive period increased, and suggests the death of most of the adults that were reproducing.

The empty shells of adult individuals in the plots with maximum values were accumulated in January and February 1990, really with the end of the reproductive period of the species, it is observed. The reproductive period occurs between September to February (Reyes-Tur and Fern ndez, 1998; Bidart *et al*., 1998). The mean density of adults (mean, 1.98 ind/m , C.V, 28.65%; limits, 1.62 and 2.33) and juvenile (mean, 1.55 ind/m , C.V, 65.95%; limits 0.91 and 2.20) they don't differ statistically (t = 1.27; p> 0.05). Here a dynamic equilibrium of the population density between both age classes was observed.

**Morphometrics**

The mean values of the maximum diameter in juveniles from December 1989 to September of 1990 increased, when the adult state was reached, with some small fluctuations in the rhythm of growth in evidence, because in most of the months (December, January, February, May, August, September) 100% of the animals were active. In May a low growth rhythm was detected as a consequence of the high percentage (92%) of juvenile individuals which had been dormant in a condition in the previous month, and it diminished the speed of growth of the shell (Table II). [**See page 123**]

**Weight**

The mean weight of the adult animal (shell + soft body) with maximum values between October 1989 and January 1990, this population had reached, as well as, similar case in May and September 1990 occurred (1.0 to 0.94 g) which there were coincidence with the wet seasonal. The lowest weight values in the months of February, March and April of 1990 (0.76 to 0.81 g) were evidenced, it was caused by effects of the winter period, cold and dry conditions, and the most of adults individuals were hibernating (The winter lethargy).

**CONCLUSIONS**

Most of the changes of density and the population's mophometrics had narrow relationship with the retard of the reproductive cycle, it was caused by the effects of the drought, one of the negative factors of the climatic changes that affect the mollusks.

**ACKNOWLEDGMENTS**

To Ernesto Chang Berm dez (Meteorological Group, CITMA, Holgu n) because climatologic information given. Thanks to anonymous reviewers and David Ortiz, all of the Havana University because they given opinions for improve the initial version of the manuscript. By all mean, to Tom Rice as always! with his help, many thanks.

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**Continued on page 124**


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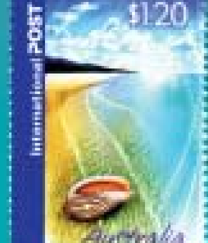
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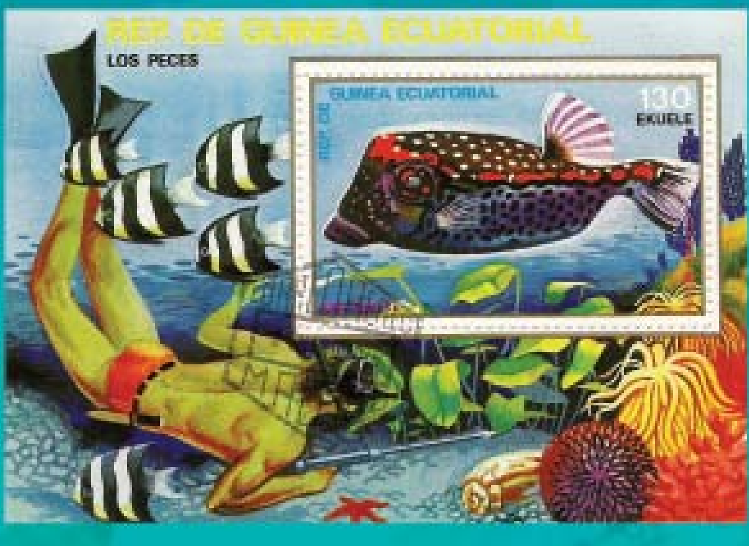
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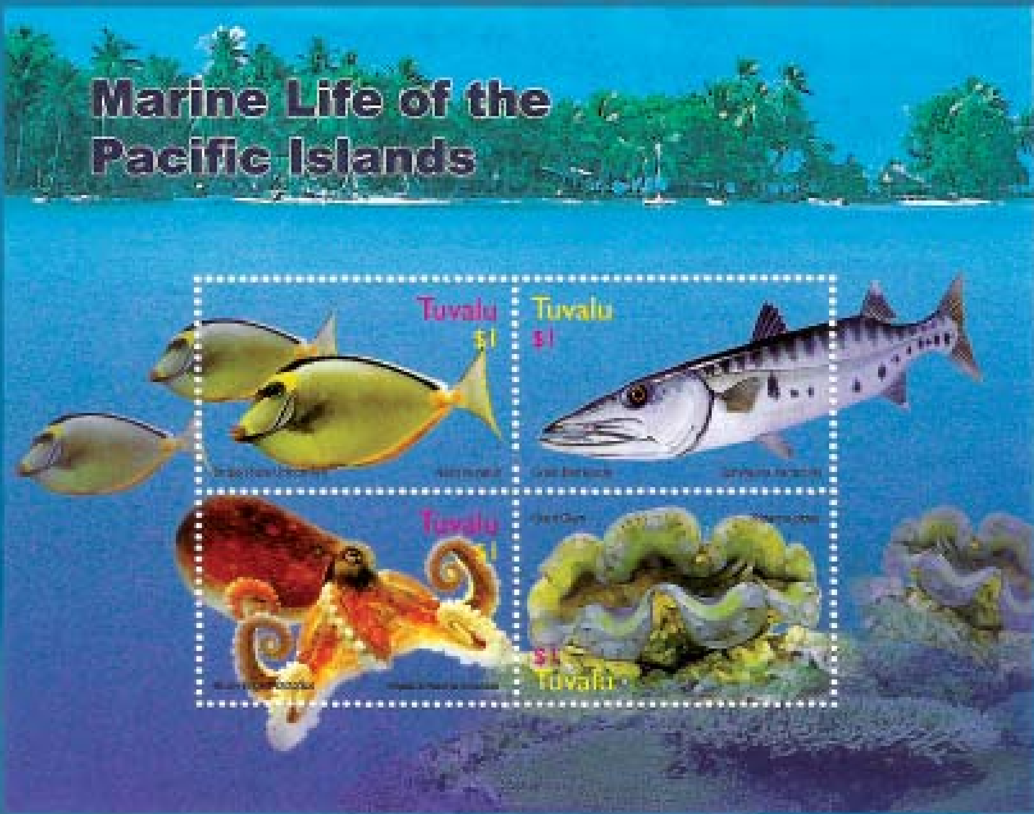


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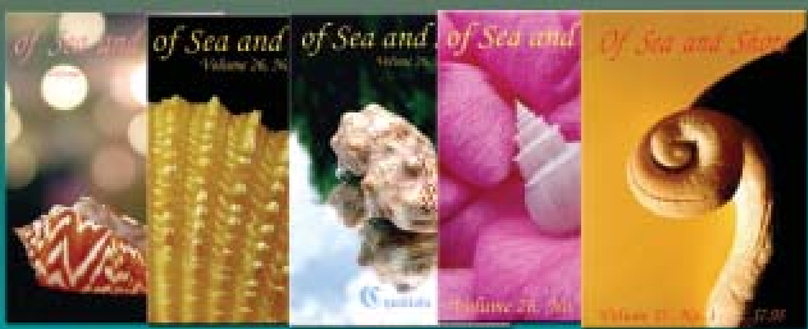

**Continued from page 114**

***Zoila friendii marina* Kostin, 2005 [Pl. 3, fig 14]**
Type locality: Kalbarri, Western Australia
Distribution: from the Jurien Bay/Cervantes area northwards across the Abrolhos Islands to the Kalbarri area, 25-45m on sponges
Size: 80-104mm

Kostin, Andrew. Naming the northern *Zoila friendii* Gray (Mollusca: Gastropoda: Cypraeidae). Visaya 4:30-39, dated April, but released in June

***Rostellariella lorenzi* Morrison, 2005 [Pl. 3, fig 15]**
Type locality: Arafura Sea
Distribution: off northwestern Australia, Indonesian trawlers, 400-500m
Size: to 99+mm

Morrison, Hugh M. Description of *Rostellariella lorenzi* spec. nov. from the Arafura Sea area of Eastern Indoi-nesia (Gastropoda: Stromboidea: Rostellariidae). Visaya 4: 15-23. dated April, but released in June

***Dentarene rosadoi* Bozzetti & Ferrario, 2005**
Type locality: Sofala Banks, off central Mozambique
Distribution: type locality, dredged 120-160m
Size: to 9.9mm **[Pl. 3, fig 16]**

Bozzetti, Luigi and Marco Ferrario. Three new species and a subspecies from the Southwestern Indian Ocean (Gastropoda: Prosobranchia: Turbinidae, Tonnidae, Buccinidae, Conidae). Visaya 4: 51-58, dated April, but released in June

***Perotrochus tosatoi***
**Anseeuw, Goto & Abdi, 2005 [Pl. 4, fig 17]**
Type locality: French Guiana, between Kourou and Cayenne, nets 200 m
Distribution: type locality only thus far
Size: height to 69mm

Anseeuw, Patrick, Yoshihiro Goto and Mahmoud Abdi. Description of a new Pleurotomariid (Gastropoda: Pleurotomariidae) from French Guiana: *Perotrochus tosatoi*. Visaya 4: 4-14. April. (issued in June)

***Conus escondidai* Poppe & Tagaro, 2005**
Type locality: off Dipolog, Aliguay Island, Mindanao, the Philippines **[Pl. 4, fig 18]**
Distribution: type locality, dredged 50-150m
Size: 51+mm

Poppe, Guido T. and Sheila Tagaro. A New *Conus* from Aliguay Island, The Philippines. Visaya 4: 40-44. dated April, but released in June

***Tonna hardyi* Bozzetti & Ferrario, 2005**
Type locality: Toliara, south-western Madagascar
Distribution: type locality, shallow on coraReef
Size: to 57.5mm **[Pl. 4, fig 19]**

***Conus betulinus rufoluteus***
**Bozzetti & Ferrario, 2005**
Type locality: Toliara, southwestern Madagascar
Distribution: type locality, shallow water inside coral reef **[Pl. 4, fig 20]**
Size: to 104mm

***Pisania rosadoi* Bozzetti & Ferrario, 2005**
Type locality: Sofala Banks, off central Mozambique
Distribution: type locality, dredged 120-160m
Size: 22+mm **[Pl. 4, fig 21]**

Bozzetti, Luigi and Marco Ferrario. Three new species and a subspecies from the Southwestern Indian Ocean (Gastropoda: Prosobranchia: Turbinidae, Tonnidae, Buccinidae, Conidae). Visaya 4: 51-58, dated April, but released in June

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**Below**

***Lilliconus wallacei* Lorenz & Morrison, 2004**
Type locality: near Pulau Kapoposang, Indonesia
Distribution: type locality and near Taka Bulango and sw Sulawesi, all in Indonesia
Size: to 7.7mm

Lorenz, Felix and Hugh Morrison. The genus Lilliconus G. Raybaudi Massilia (Gastropoda: Conidae) in the Western Pacific, with the description of Lilliconus wallacei sp. nov. Schriften zur Malakozoologie, Heft 21: 29-34. Dec. 30.

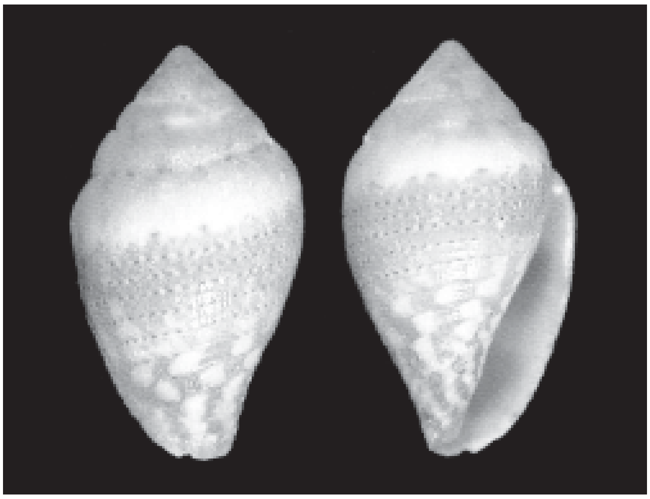

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**Table I.** Population density (ind/m²) of *Polymita muscarum* in Playa Blanca, Holguín.

| Month/ Year | Density | | |
|---|---|---|---|
| | Adults | Juvenile | Total |
| October/1989 | 2.92 | 0.00 | 2.92 |
| November/1989 | 2.17 | 0.00 | 2.17 |
| December/1989 | 2.97 | 0.06 | 3.03 |
| January /1990 | 2.14 | 1.69 | 3.83 |
| February/1990 | 1.50 | 1.14 | 2.64 |
| March/1990 | 1.61 | 1.78 | 3.39 |
| April/1990 | 1.22 | 1.92 | 3.14 |
| May /1990 | 1.64 | 1.92 | 3.55 |
| June/1990 | 1.61 | 2.44 | 4.05 |
| July/1990 | 1.72 | 2.39 | 4.11 |
| August /1990 | 1.72 | 2.86 | 4.58 |
| September/1990 | 2.50 | 2.44 | 4.94 |

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**Table II**. Mean values (X, mm) of the shell size measured in *Polymita muscarum*. N, sample; C.V., variation coefficient.

| Months | Año | N | X | C.V. | Mean Increase (mm) |
|---|---|---|---|---|---|
| December | 1989 | 52 | 5.20 | 30.72 | - |
| January | 1990 | 54 | 6.18 | 22.32 | 0.89 |
| February | 1990 | 110 | 6.86 | 16.10 | 0.68 |
| March | 1990 | 70 | 7.47 | 15.44 | 0.61 |
| April | 1990 | 52 | 8.46 | 21.22 | 0.99 |
| May | 1990 | 85 | 8.64 | 18.76 | 0.18 |
| June | 1990 | 104 | 9.65 | 17.30 | 0.99 |
| July | 1990 | 75 | 10.49 | 15.35 | 0.84 |
| August | 1990 | 114 | 11.62 | 13.21 | 1.13 |
| September | 1990 | 101 | 12.07 | 10.23 | 1.54 |

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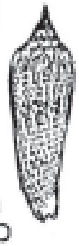

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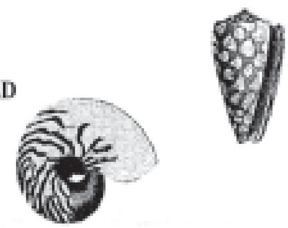

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# A LITTLE KNOWN *HALIOTIS* SUBSPECIES FROM GUADALUPE ISLAND, LOWER CALIFORNIA, MEXICO: A RE-EXAMINATION AND PHOTO STUDY OF *H. FULGENS GUADALUPENSIS* TALMADGE, 1964.

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**(See color pages 129 - 131)**

***Haliotis fulgens guadalupensis* Talmadge, 1964.**

## ABSTRACT

Twenty-four specimens of *H. fulgens guadalupensis*, a poorly-known and somewhat contentious ssp. of *H. fulgens* Philippi, 1845, are illustrated with high-resolution color photography. Several specimens of *H. fulgens fulgens* and *H. fulgens turveri* Bartsch, 1942, are illustrated for comparison. Factors for the justification/validity of the ssp., including its different shell morphology and isolation from the nominate race, are presented.

## INTRODUCTION

Seven species of *Haliotis* are known to occur on the Pacific Coast of North America. In addition, five ssp. have been described – only one of which has received much attention in the literature and is widely considered valid: *H. kamtschatkana assimilis* Dall, 1878, which occurs from central California to northern Baja California, Mexico.

Three of the remaining four are endemic to Guadalupe Island, Baja California Mexico. Two of these have been reviewed in earlier articles in "*Of Sea and Shore*": *Haliotis corrugata oweni* Talmadge, 1966 (Vol. 25, No. 4), and *H. cracherodii californiensis* Swainson, 1822 (Vol. 26, No. 1). The present work will focus on *H. fulgens guadalupensis*, described by R. R. Talmadge in 1964, and a subspecies I feel particularly familiar with, having worked closely with Talmadge during the period that he was writing the description. Much additional knowledge was gained during a 10 day collecting trip that I spent at the island in 1965. This voyage, sponsored by the LACM, deepened our knowledge of Guadalupe Island *Haliotis* substantially, and led to the description of *H. corrugata oweni*. Finally, *H. fulgens turveri* Bartsch, 1942, was reviewed in "*Of Sea and Shore*" (Vol. 27, No. 1).

## MATERIAL AND METHODS

**Abbreviations of collections:** BOC: Buzz Owen collection; LACM: Los Angeles County Museum of Natural History.

**Material examined:**
***Haliotis fulgens guadalupensis*:** Upwards of 2000 total specimens of this subspecies have been examined between 1964 and 2005. Approximately half of these were live-taken during the collecting trip sponsored by the LACM in October, 1965, and were from areas in or close to the West Anchorage. An additional 75-100 specimens were collected by divers from Scripps Institute of Oceanography at Melpomene Cove, at the south end of the island in 1960, and >800 specimens were taken by Mexican commercial divers working for the Fed. Reg. de Sociedades Cooperativas de la Industria Pesquera, Baja California, F.C.L., in 1998. All these latter specimens were taken from the "weather" (west) side of the island.

***Haliotis fulgens fulgens*:** Several hundred thousand specimens of the nominate race have been examined between 1949 and 200**5**. These specimens represent populations found between Punta Abreojos, Lower California, Mexico, and Santa Rosa Island, California.

***Haliotis fulgens turveri*:** Approximately 1000 specimens of this little-known subspecies have been examined between 1954 and 2005. The majority (~650) were harvested by divers working for a small Mexican commercial fishery at Santa Margarita Island, which lies at the southern-most extreme of Magdalena Bay, with the remainder coming from the same general area.

Shell specimens used for the photo plates were selected to show excellent details of sculpture, and then cleaned with a hand wire brush and an X-Acto knife. Photography was accomplished with a Canon G6 digital camera, and the resultant images processed with an iMac computer using Adobe Photoshop version 8.

## RESULTS

*Haliotis fulgens guadalupensis*, though clearly separable as a population from mainland populations of *H. f. fulgens,* might be considered the "least different" of the three subspecies endemic to Guadalupe Island. The differences in shell morphology which separate *H. cracherodii californiensis* (from *H. cracherodii cracherodii* Leach, 1814), and *H. corrugata oweni* (from *H. corrugata corrugata* Wood, 1828), are much stronger and more discernable – even to a novice Haliotiphile. As a population, the spiral ribbing of *H. fulgens guadalupensis* tends to be narrower and/or more deeply-etched into the shell – but not as dramatically so as the often wide and deeply-etched ribbing of *H. fulgens turveri*, and the differences in shell proportions cited by Talmadge in his original description, appear less accurate when studying recently collected material, than in the group of specimens available for study before 1965 (see "Discussion"). However, one parameter does serve to strongly differentiate a large group of mature specimens from specimens of *H. fulgens fulgens*, or *H. fulgens turveri*: **a**n iridescent deep blue/purple color often present in the interior nacre, which might be described as "violet/purple", "gun-metal", or "metallic blue", in character. This is very different and should not be confused with the more turquoise blue and green reflections seen in most mature specimens of the other two races of *H. fulgens* (Plate 1**,** rows 1 and 2). Again, studied as a population, this difference becomes very noticeable – the larger amount of material available for study, the more clearly this will be observed. Another very visible difference makes a large percentage of shell specimens of *H. fulgens guadalupensis* easy to recognize**:** the peculiar and often severe incrustation found on the dorsum, particularly the small spots of red coral, which frequently will cover over half of the exterior surface (Plates 1-3). This particular characteristic obviously has nothing to do with *H. fulgens guadalupensis* being described as a subspecies, however.

These differences become more apparent in direct proportion to the size of the study group being examined. When over 500 specimens of each of the three ssp. are available for study, the differences in the isolated Guadalupe Island population become very clear and obvious.

## DISCUSSION

As noted earlier, the material available for study when Talmadge described *H. fulgens guadalupensis* (1964), was collected almost entirely by divers working for Scripps Institute of Oceanography. The date of collection of this material was 30 Jan. 1960. Most of these specimens were quite mature, and were taken from populations that had not been previously heavily harvested by Mexican commercial *Haliotis* divers. It was these specimens that Talmadge used to calculate the shell proportions given in the original description of 1964. The specimens Owen collected during the LACM expedition of 1965, came from the West Anchorage, and were very similar in proportions and morphology to the specimens Talmadge studied. In contrast, the very large number of specimens (>600) taken in 1998-1999, tended to have shell proportions that were less inflated and appeared quite similar in this parameter to mainland specimens of *H. fulgens fulgens*. It was obvious that a large percentage were much less mature, faster-growing specimens than those that Talmadge had worked with when he wrote his description. These most recent specimens very clearly represented what could be called a "re-growth" population. As a group, it was still very evident that these examples represented the Guadalupe Island subspecies however: the odd violet/purple iridescence in the interior nacre was very noticeable in the more mature specimens, as was the tendency towards narrower, more sharply-etched spiral ribbing (the peculiar marine incrustation, unique to Guadalupe Island, was also present, but as stated earlier, has nothing to do with its subspecies status.) As is clearly, and especially, the case with the other two Guadalupe Island subspecies (*H. corrugata oweni* and *H. cracherodii californiensis*), *H. fulgens guadalupensis* represents a somewhat "stunted" race, and individuals are very often mature at a size of 150 mm or less (as noted earlier, this was especially true with specimens taken before October, 1965). Thus far, the largest shell measured by the author, out of 2000+ shells examined, is 186.1 mm, and was taken in April, 1960, from a surge channel containing a small number of very large specimens. This was in front of the "Weather Station" at the south end of the island, and was clearly an area where conditions were optimal for fast growth and large size (Conrad Limbaugh, pers. comm.).

The odd, metallic-purple/violet coloration in the interior nacreous deposits (almost a "stain"), may be due to the particular type of volcanic rock the animals live and graze upon, while consuming algae, which is apparently unique to Guadalupe Island (Rodey Batiza, pers. comm.). The vertical cliffs of the island often are streaked with brilliant colors due to the particular mineral content of this volcanic rock. As the animals consume algae on the substrate they are attached to, they are constantly grazing on the surface to keep it **"**clean**"** and free of marine growth and deposits (forming the "scar" on the rock where they attach, which is familiar to anyone who has harvested this mollusk). As they do this, tiny flakes of this material are probably ingested into their gut, and perhaps after many years of doing this, the mature animals develop this odd metallic coloration. This might prove an interesting area for further study.

## ACKNOWLEDGMENTS

I would like to thank David Leighton, Stephen Browning, and Tom Grace, for reviewing the manuscript and offering useful comments and suggestions. I am grateful for the information Rodey Batiza shared with me about the unique volcanic composition of Guadalupe Island. I also wish to thank Francisco Fonseca and Abel P rez Serrano for their invaluable help in obtaining specimens from Guadalupe Island and Magdalena Bay, and for sharing their knowledge of the distribution of these southern populations of *H. fulgens* ssp. with me.

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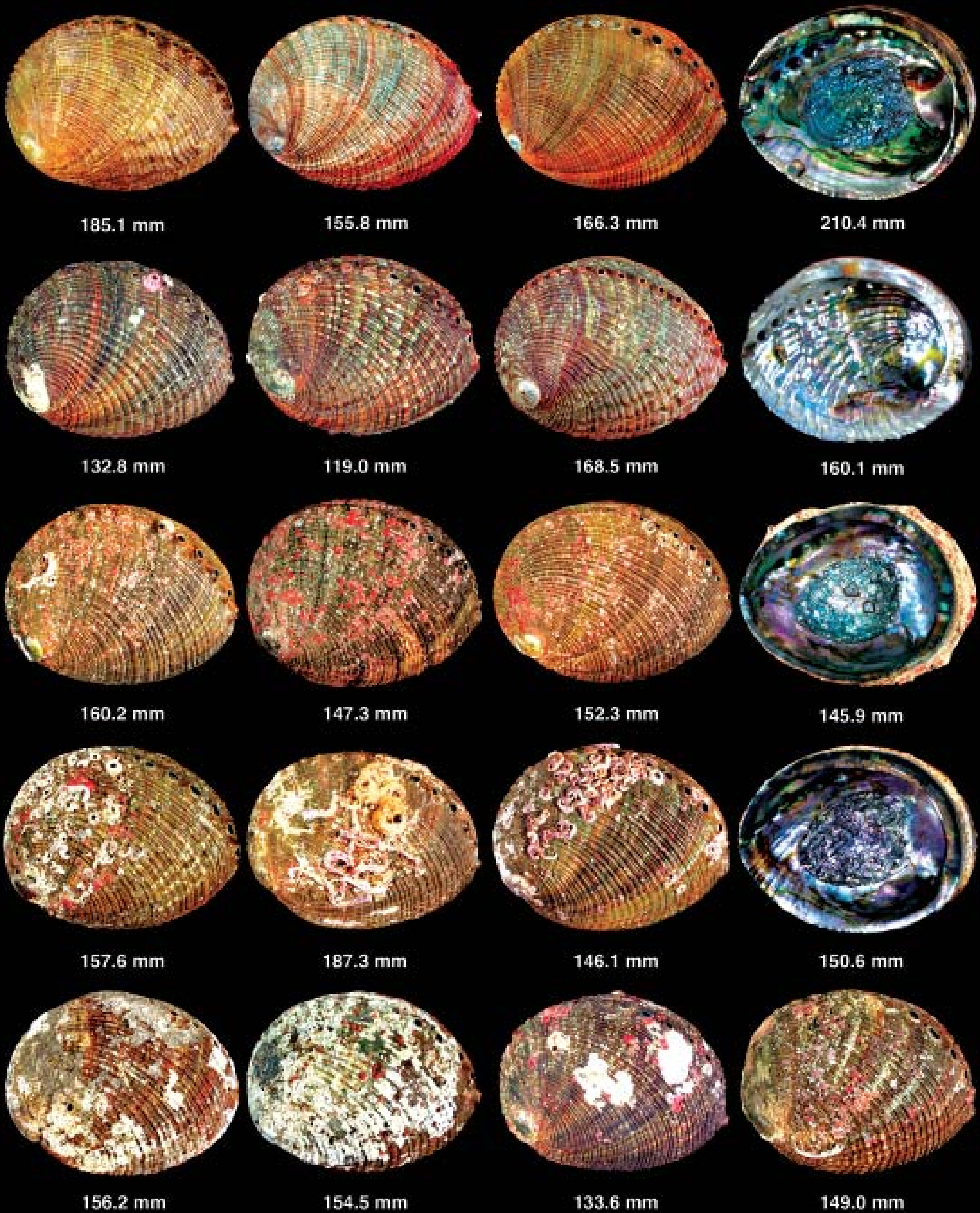



**Plate 1**

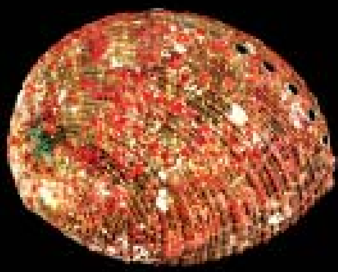
Top Row: *Haliotis fulgens fulgens.* La Jolla, to Johnson's Lee, Santa Rosa Is., California. 5-10 m.
2nd Row: *Haliotis fulgens turveri.* Santa Margarita Is., Magdalena Bay, Baja California, Mexico. 5-10 m.
Bottom 3 Rows: *H. fulgens guadalupensis.* Near West Anchorage, Guadalupe Is., Baja California, Mexico. 5-10 m.

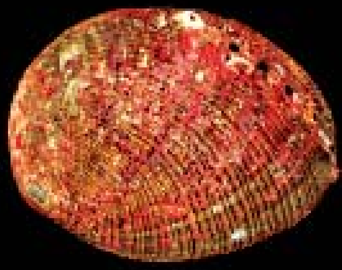

163.5 mm


153.0 mm


147.8 mm

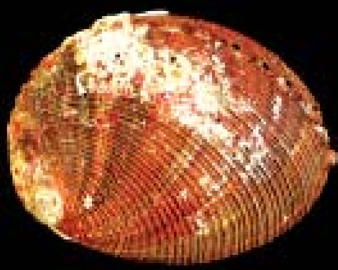

146.5 mm


156.6 mm


142.8 mm

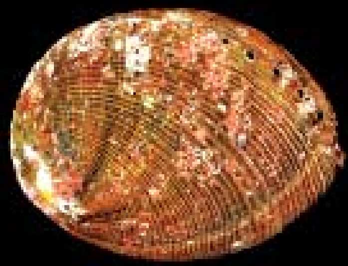

141.7 mm

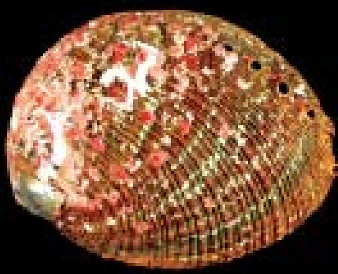

168.2 mm


166.0 mm

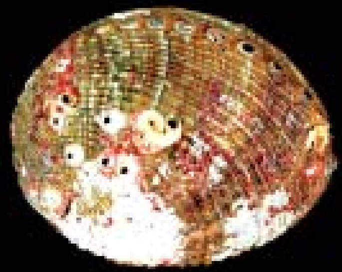

132.6 mm


134.8 mm

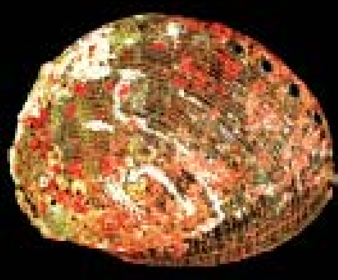

149.6 mm


126.9 mm


119.0 mm


157.2 mm


152.1 mm


156.1 mm


168.5 mm


151.2 mm

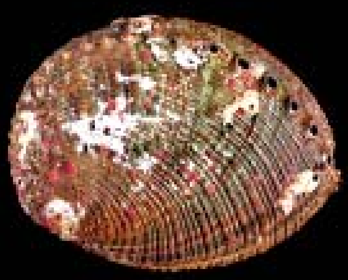
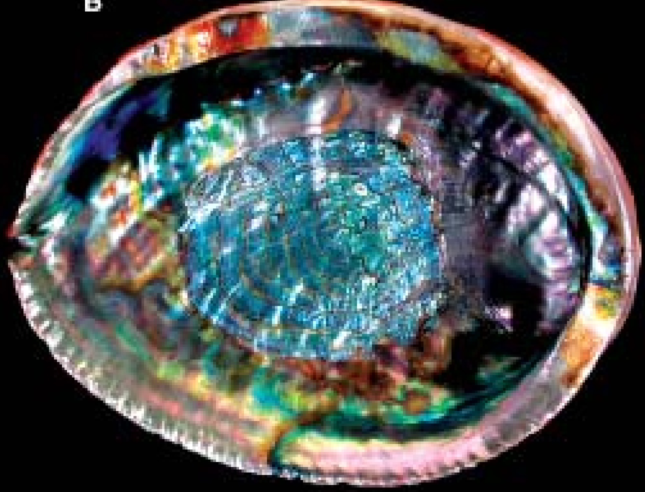

160.1 mm

**Plate 2**

All 5 Rows: *Haliotis fulgens guadalupensis.* Near West Anchorage, Guadalupe Is., Baja California, Mexico. 5-10 m.

A

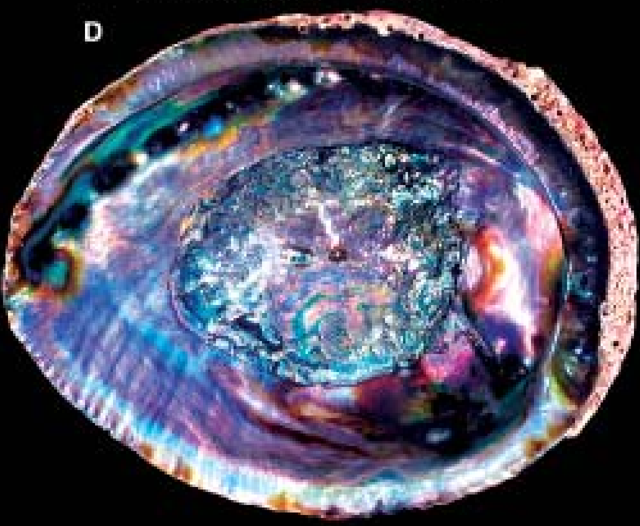
B



Sta. Rosa Is., Calif. 155.1 mm. La Jolla, Calif. 192.4 mm.

C

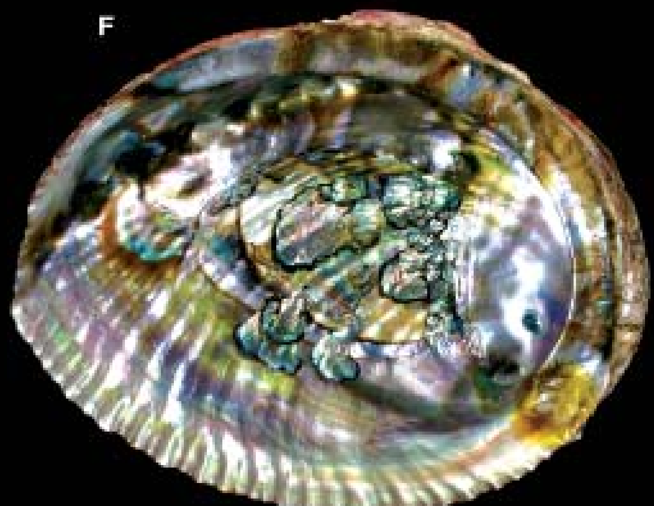
D



140.7 mm. West Anchorage, Guadalupe Is., Mexico. 146.5 mm.

E

F



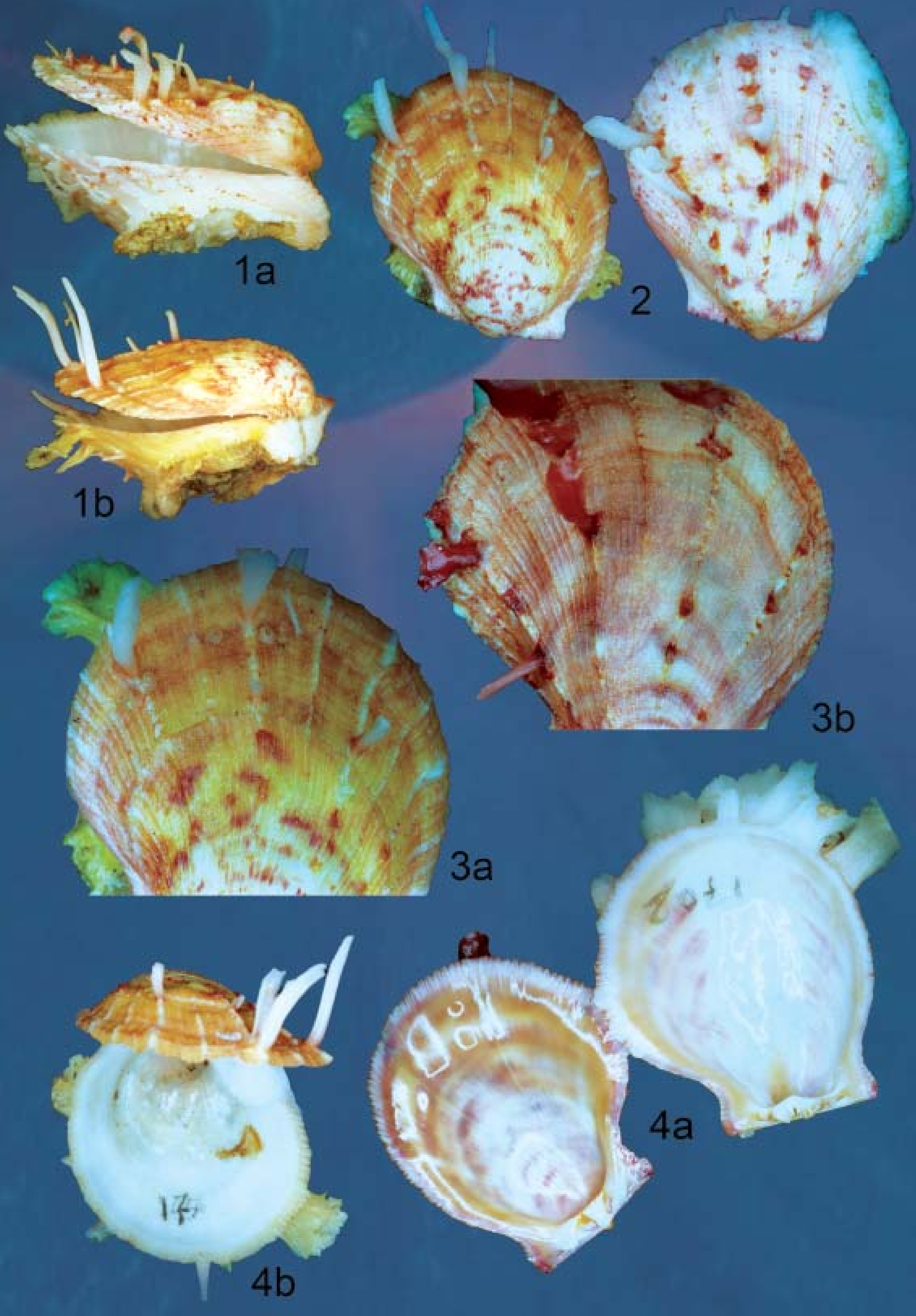
160.2 mm. Sta. Margarita Is., Magdalena Bay, Mexico. 151.3 mm.

Plate 3

A and B: *Haliotis fulgens fulgens* Philippi, 1845

C and D: *Haliotis fulgens guadalupensis* Talmadge, 1964.

E and F: *Haliotis fulgens turveri* Bartsch, 1942.


1a
2
1b
3b
3a
4a
4b

# Further Comments on Recently Described Spondylidae

**Dr. Michele Dardano**

**(See color pages 132, 135, 136)**

It is well known that the Spondylidae are a very difficult family to identify because they always show a great interspecific and intraspecific variability. That's why it is necessary to see many adult specimens of each species. Unfortunately, this is virtually impossible for rare and/or recently described species of the Sponfylidae.

With reference to my article published in of Sea and Shore (Vol. 26, #2), I believe it is necessary to clear up some points:

(1) The specimen pictured in Photo #3 is not *Spondylus deforgesi* Lamprell and Healy, 1001, but is *Spondylus orstomi* Lamprell and Healy, 2001, another recently described *Spondylus*, small and very similar to *S. deforgesi*. The differences between these two species are shown in the following table:

TABLE

Moreover, the two species show a different profile. Also for *Spondylus orstomi*, in my opinion, the distribution is wider, including the Philippines. I received this specimen years ago, from a well known shell dealer, Phil Clover.

(2) The species figured in Photos #7 & #8 is not *Spondylus heidkeae* Lamprell and Healy, 2001, but *Spondylus microlepos* Lamarck, 1819. According to Lamark's description of *S. microlepos*: "Spondylus teste utrinque rubre, longitudinaliter striata ert costata; costis 5-6 squamiferis, squamis ligulatis, truncates, exiguis" which translates: "shell red on both sides, longitudinally striated and ribbed; 5/6 spined ribs; frew truncated, tongue-like spines". Unfortunately, LaMARK DIDN'T FIGURE *Spondylus microlepos* and his description doesn't fit the Holotype of *S. microlepos*, housed in the Museum d'Historie Naturelle de la Ville de Geneve. On the contrary, Lamarck's description fits very well *Spondylus heidkeae* Lamprell and Healy, 2001 (Fig. #5). In fact, this species is readily identified by the distinctive series of minor ribs on both valves (Figs. 6, 7 and 8), though Lamarck didn't mention them, the red color with some white patches, the red spines sometimes showing dark blotches at the base (Fig. 9) and the minor ribs towards the umbones, the crests of which are dark colored (Fig. 10). The specvimen figured comes from Bbrolhos Islands (Western Australia). According to the original description of the species, the shell height is about 45tmm, but, in my opinion, the species grows much larger and stronger: the specimen in Fig. 5 measures about 70mm, while Fig. 11 shows a juvenile specimen of 50mm.

(3) After receiving another specimen of *Spondylus microlepos*, I compared it with the species figured in Figs. 7 and 8 in my previous article. The two specimens are very similar (Figs. 12 and 13): ovate-elongate, left valve much more concave than right valve, numerous radial ribs, which bear short, densely imbricated sharp or nodulous spines; interstices with densely striated minor ribs. Color very variable: brown, yellow, white, with some orange at the umbonal area. Spines white, occasionally purple or brown. Internally white, margin showing a color similar to external. Areas of attachment large. This species also comes from th Abrolhos Islands and shows cross-bars across the margins near the auricles. This descviption should, in my opinion, replace the original by Lamarck. I believe this specvies is very difgfirent from *Spondylus heidkeae* both externally (profile, interstices, lack of the distinctive series of minor ribs near the umbones, color), and internally. Moreover, in my opinion, these species should not be confused with other ZSpondylidae coming from waters off Australia. In fact, the comparison between these species with *Spondylus anachaqntus* Mawe, 1823 and *Spondylus candidus* Lamarck, 1819 especially proved fruitless.

(4) *Spondylus rippingalei* Lamprell and Healy, 2001 is another recently described species (Fig. 14). Shell ovate, oblique; left valve convex, bearing many strong and weven, radial ribs, ornamented with short, nodulous, dense imbricating spines which become longer, stronger and overlapping at the margins. Interstices bearing a variable number of minor ribs and striae. Right valve much deeper than left valve, margin strongly crenulated, area of attachment large (Fig. 15). Color orange3, red or brown, with irregular concentric bands of orange, white and brown. Umbonal area white, ribs and spines white, sometimes covered with orange on both valves. Margin orange, red or brown, brown at the hinge. As pointed out by Lamprell and Healy, this species can be compared with another Recent species, *Spondylus maestrati* (which is smaller, measuring <40mm, while in *S. rippingalei* the shell height is about 70mm), and *Spondylus candidus* (Fig. 16 and 17) which show weak and uneven principal ribs and a different spinning and ornamentation. Moreover, *S. rippingalei* lacks the black pattern at the umbonal area, typical of *S. cancicdus.*

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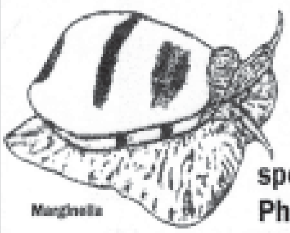
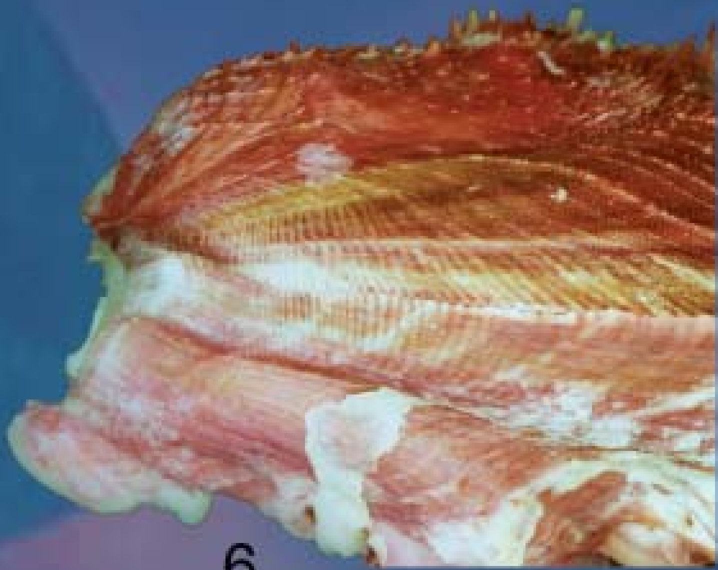

Marginella



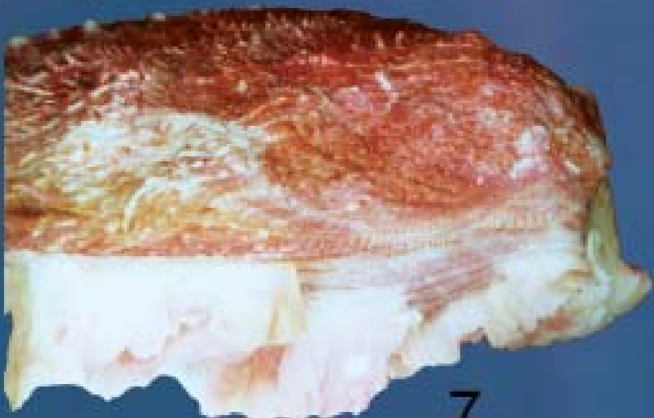




5



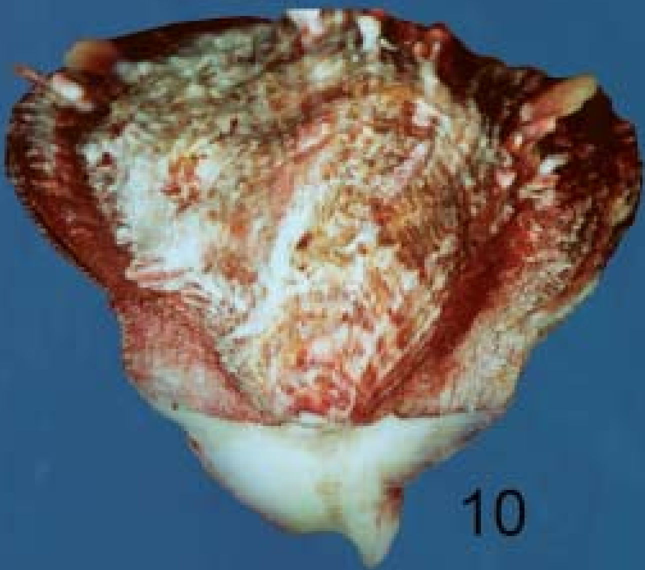
6



7

8

9



10


11
12
13
14
15
16
17


**Plate 1**

**All Rows:** ***Haliotis kamtschatkana assimilis/kamtschatkana*** **"Intergrades". Cambria to Pt. Estero, Calif. 20-25 m.**


**Plate 1**

**All Rows: *Haliotis kamtschatkana assimilis/kamtschatkana* "Intergrades". Cambria to Pt. Estero, Calif. 20-25 m.**

## The "Buzz" on Abalone

### THE "CAMBRIAN EXPLOSION" – A DESCRIPTION AND PHOTO STUDY OF AN ABNORMALLY LARGE POPULATION OF *HALIOTIS KAMTSCHATKANA ASSIMILIS/KAMTSCHATKANA* INTERGRADES WHICH EXISTED FROM 1961-1968 IN SAN LUIS OBISPO COUNTY, CALIFORNIA.

(See color pages 137, 138, 141)

This will be an informally written report describing an intriguing event that took place in the Morro Bay area of Central California from the late 1950s to about 1968. It began with a serious ecological change which caused an apparent disruption of the usual ocean currents and temperature which lasted approximately two years: 1957 and 1958. During this period, the sea temperature was very warm, and the usual heavy growth of brown algae (kelp) that generally grows abundantly in the cold (10-12 degrees C) spring and summer seas, didn't appear. The local *Haliotis rufescens* Swainson, 1822, populations became severely food depleted and ceased growing normally. Thus, commercial abalone divers were unable to harvest sufficient numbers of legal-sized abalone to eek out a living. Many divers living in the Morro Bay area left the fishery and took up other work. This condition persisted for over two years, and many adult abalone lost tissue size dramatically, stopped producing gonadal tissue (gametogenesis), and didn't spawn. The usual abundance of red and brown algae, the preferred *Haliotis* food source, ceased to exist, and the area became like a barren wasteland (D. Gallagher, S. Pearce, G. Bickford, K.W. Cox, pers. comm.). In 1959, this situation abruptly changed, the cold-water temperature returned, and extremely rapid growth of large, brown algal forms ensued, especially *Nereocystis leutkeana*, the large "Bull" kelp which is the prime food for the *Haliotis* species of this area (with the possible exception of *H. cracherodii* Leach, 1814). The animals which survived the two-year warm water blight started growing extremely rapidly – both shell and animal, developed gonadal tissue and spawned profusely within a few months (in late 1959, and again in mid 1960). Many of the divers who had left the fishery returned in 1961 to discover that very large numbers of sub-legal-sized animals had rapidly grown and become legal size. Huge landings of red abalones were suddenly commonplace in the Morro Bay fishery! I would guess by now that many who are reading this will be wondering: "What does this have to do with a so-called 'Cambrian Explosion' of *H. kamtschatkana* ssp??" Patience fellow *Haliotis* freaks, that is coming! At depths greater than 15 m (50 feet) or so, occasional specimens of *H. kamtschatkana* ssp. could be observed by divers who were harvesting the much larger red abalone (*H. rufescens*). They were of little interest to the great majority of commercial *Haliotis* divers, as they were too small (usually <125 mm) and not very common. Not being regulated by a size limit in the early 1960's, occasional specimens would be taken by divers who were attracted to their often bright and vivid coloration. It was about this time (1960-1961) that I first started "working" the Morro Bay area commercially, and almost immediately noticed these small *Haliotis* and started paying close attention to them. I knew they were considered an uncommon and desirable species to shell collectors, and I wanted to add some to my rapidly growing collection. I remember that most I observed were "older" specimens, and it was unusual to find shells that weren't damaged by erosion and/or boring or encrusting organisms on their exterior surfaces. There seemed to be very few young, fast-growing specimens of the kind shell collectors (like yours truly) would find worth collecting. What I didn't realize at the time was that the "no kelp/warm sea temperatures" conditions that had existed in the late 1950s, had affected more than the large red abalone: it had had a profound effect on this species (and very probably other algae grazing mollusks as well!). So, it was in about the fall of 1962 when I first started noticing the incredible phenomenon that was starting to occur throughout many areas outside of approximately 15 m depth: small sub-adult (50-75 mm) *H. kamtschatkana* ssp. were starting to move out of the protection of crevices, where they were too small and hidden to be noticed previously. Careful examination of these animals, reinforced with knowledge gained a few years later, clearly indicated they were two to three years old. Closer to shore, in shallower water (~8-12 m), many juvenile specimens of *H. rufescens* began to become apparent, protected in crevices, with occasional 75 to 80 mm specimens starting to move out into more "open" bottom. This was happening in areas where virtually all older, legal-sized animals had been harvested. It was becoming clear that both species of *Haliotis* were undergoing "population explosions" of juveniles and sub-adults approximately 2-3 years of age. It was also apparent that these small animals were the result of spawnings that had occurred and coincided with the radical transformation that had taken place with the return of cold water and copious algal growth of 1959! From 1962 to 1965, the numbers of these fast-growing, small, young adult *H. kamtschatkana* ssp. increased, and by 1964-1965, many were measuring 100 to 125+ mm. All were clearly the fast-growing, thin-shelled "new growth" animals from the extraordinarily successful recruitment events that had resulted from the spawnings of 1959 and 1960. The few older animals that were mixed in with this population were very obvious thick-shelled, mature, badly eroded and/or encrusted, often almost senile, specimens. It was evident from the extremely bright and varied coloration of the thin and fast-growing shells of this population, that their diet was rich in species of red algae, in addition to the brown alga *Nereocystis leutkeana*, as the "genetic" chevron-like color patterns were heavily blended with intense shades of red. This contrasts with the dull pale blue-green colors which are so often observed in specimens from Southern California and Baja California, Mexico – the result of a diet of almost entirely brown algae. Plates 1-3 illustrate examples of these wonderful and brightly colored specimens of the "Cambrian Explosion" – so named as the small town of Cambria, near the Hearst Castle at San Simeon, is near the center of the area where this brief population explosion occurred. And a population explosion it was! During the years 1963-1965 especially, literally thousands could be observed during 4-5 hours of diving commercially for the larger red abalone. Unfortunately, in 1968, the sea otter, *Enhydra lutris*, encroached into this area of the California coastline, and decimated both the red abalone fishery, and all exposed animals (over ~35-40 mm), of this beautiful little species. To my knowledge, virtually none have been taken from this area since few, if any, commercial abalone (*Haliotis*) divers of that time collected these small *Haliotis.* Thus, those illustrated on these plates may represent a large percentage of the specimens that exist in collections. As the Cambria area is located approximately in the center between the areas where the southern subspecies (*H. kamtschatkana assimilis* Dall, 1878) and northern subspecies (*H. k. kamtschatkana* Jonas, 1845) are distributed, it explains why this population could be described as "intermediate" between the northern and southern forms. As these specimens demonstrate, indeed it is!

**Final thought:** The two classic definitions used by malacologists to describe the requirements for "subspecies" are: "different shell morphology" and "isolation of the two populations". Therefore, some students of *Haliotis* may suggest that due to the "mixing" of the two subspecies discussed herein, it is inaccurate to describe them as subspecies, but this is not the author's opinion. While it is beyond the scope of this report to explore this possibility, two similar situations, which appear to be nearly exact parallels, exist in Australia: *H. r. rubra/H. rubra conicopora*, and *H. s. scalaris/H. scalaris emmae,* and in New Zealand with *H. v. virginea/H. virginea crispata* (though it has been suggested in earlier reports that *H. virginea crispata* is invalid - Geiger, 2000; Jones and Owen, 2004). It is the authors present opinion that: 1) Due to the tremendous distance between the southern and northern limits of the two subspecies (>4150 km – Sitka, Alaska to central Baja California, Mexico), and because other gaps of unknown distance exist within this range (virtually unknown in the state of Oregon for example [K. Hiersche, pers. comm.]), and that 2) because the taxon "*assimilis*" has been in extremely common usage for an extended period of time, in the literature and to a large number of Haliotiphiles and collectors of west coast shells, the name is best left alone.

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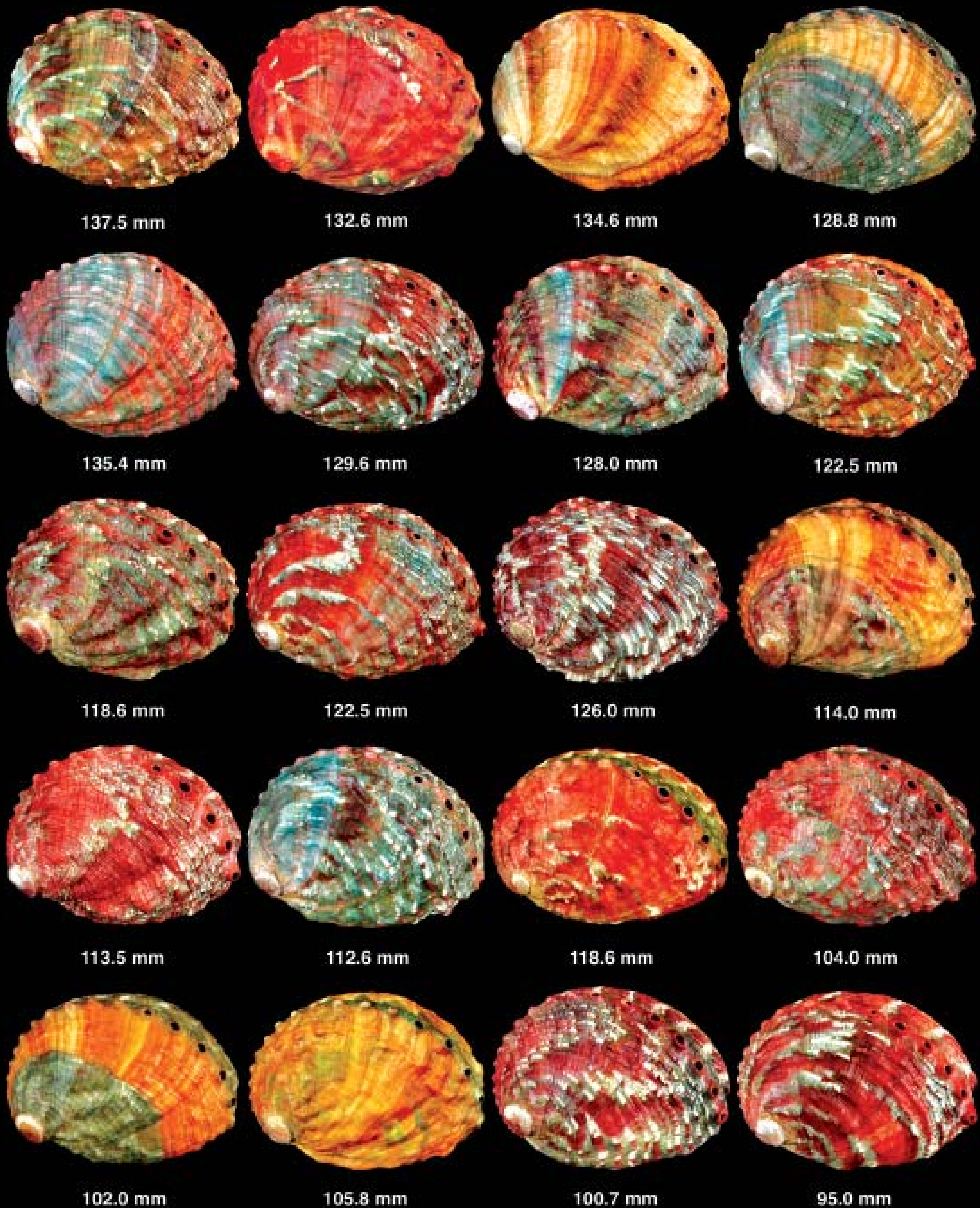
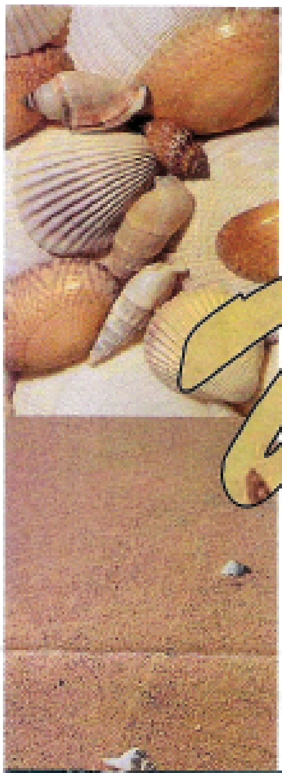



Plate 3

All Rows: *Haliotis kamtschatkana assimilis/kamtschatkana* "Intergrades". Cambria to Pt. Estero, Calif. 20-25 m.



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*Phenacovolva tokioi* – The Philippines, Malapascua Island. 18 m deep. Photo Philippe Poppe. 2005.