

A Brief Review of an Iconography of the *Haliotis* Species and Subspecies of Australia and New Zealand – Including Notes on Current Largest Recorded Specimens *

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INTRODUCTION

Approximately 82 species, subspecies, and forms of genus *Haliotis* are currently known to occur worldwide, and are distributed throughout much of the world, from as far north as central Alaska, to the subantarctic islands of New Zealand (Geiger, 1998; Geiger and Owen, 2012). Of this number, approximately 26% (21) are found in Australian waters, including 16 which are endemic to the continent. An additional seven taxa are endemic to New Zealand. They range in size from small warm water species seldom exceeding 40 mm in greatest diameter, to giant forms found in the cold waters of South Australia, which can exceed 240 mm in size. Included amongst these are some of the most diverse and strikingly beautiful species found in family Haliotidae.

The main purpose of this study is to illustrate these taxa with numerous color photo-plates, and provide some basic information, which will be helpful in facilitating a better understanding of Australian and New Zealand abalone. A second reason for this work is to present what the authors believe is the most accurate and thorough appraisal of this area's existing taxa (species and subspecies) presented to date. With one exception, all past publications we have reviewed inevitably contain errors in the analysis and identification of these taxa and

their distribution, most often due to insufficient material being available for study. To reach some of the conclusions in this report, in excess of 3-4 million commercial shells (conservative estimate) have been examined in shell dumps in South Australia (SA) and Western Australia (WA), and many years have been spent examining other collections of Australian *Haliotis*, as well as interviewing numerous commercial divers and processors. This latter activity has brought to light several different hybrid forms that are also presented herein.

MATERIALS AND METHODS

Abbreviations of Collections: **RKC:** Robert Kershaw Collection; **BOC:** Buzz Owen Collection; **PLC:** Pat Lakeman Collection; **MPC:** Mark Payne Collection; **TWC:** Thora Whitehead Collection; **ICC:** Ian Clare Collection; **ARC:** Arjay Raffety Collection; **JRC:** Jenny Raven Collection; **TGC:** Tom Grace Collection; **DDC:** Dwayne Dinucci Collection; **NHMUK:** Natural History Museum United Kingdom.

Shells used in this study were selected to be in excellent condition to best illustrate details of sculpture and color. They were then hand-cleaned with small tools (such as an "Xacto" knife) and brushes to remove marine encrustations, and moistened with a light

* ***Editor's Note:*** The complete iconography with over 70 color plates will be published as a Supplement or Special Edition of *The Festivus* and will be made available for purchase.

application of mineral oil to bring out natural color patterns. Excess oil was then removed from shell surfaces with a soft absorbent “terry-cloth”-type towel, to prevent glare when photographed. Shells were photographed using Canon G6 and A650 digital cameras, having resolutions of 7.1 and 12.1 megapixels respectively. Resulting images were then processed using Adobe Photoshop Version 11 on an iMac computer.

RESULTS AND DISCUSSION

The species and subspecies endemic to Australia will be treated first, followed by non-endemic taxa, and lastly the *Haliotis* of New Zealand. All are illustrated with two 8.5x11.5 inch photo plates, arranged so that both are visible simultaneously. Each pair will contain the following: 1) Photos of thirteen shells, one often being the largest recorded example (“World Record”). In most cases, this specimen is listed in “*Abalone Worldwide Haliotidae*” (Geiger & Owen, 2012). When the World Record shell is not available for inclusion, a very large specimen close to the same size is illustrated. 2) A brief overview of each form, covering its present known distribution, description of the shell, and a brief comment on other points of possible interest. 3) A map with a highlighted area illustrating where the species or subspecies is found. We feel that illustrating 13 shells, to show variations in color and sculpture is adequate to provide an understanding of each taxon. The New Zealand subspecies of *H. virginea* will each be treated with a third photo plate containing 12 additional specimens. We felt that several of these subspecies are so uncommon that, as we were fortunate enough to have access to a fairly large amount of material, it would deepen ones knowledge to illustrate additional specimens.

Contentious Taxa: Four difficult, problematical taxa exist in eastern Australia, with two being described in 1869 (*H. brazieri* by G. F. Angas, and *H. hargravesi* by J. C. Cox),

and two in 1927 (*H. melculus* and *H. ethologus*, both by T. Iredale). The first pair is found in New South Wales (NSW) from the Coff’s Harbour area, south to about Eden. The second pair occurs in Queensland (QLD) from about Brisbane, north to the Keppel Islands area. The two “pairs” are isolated from each other by about 425 km of sandy coastline devoid of rocky habitats. All are rare to extremely rare, with the northern pair (*H. melculus* and its form *ethologus*) being by far the rarest. Both northern and southern pairs are characterized by one of each having strong spiral ribs, with the other possessing weak to absent ribs. In the northern pair, the ribbed form (*H. melculus* form *ethologus*) is by far the most common, with the form lacking ribs (*H. melculus*) being extremely rare. The opposite situation exists with the southern pair: the ribbed form (*H. brazieri* form *hargravesi*) being much less common than the smooth form (*H. brazieri*). In addition, the ribbed form of the northern pair (*H. melculus* form *ethologus*) has much narrower ribs (often 11-15 between spire and line through tremata) than the ribbed form of the southern pair (*H. brazieri* form *hargravesi*), which averages only 7-8 ribs. (The latter taxa probably has the widest ribbing of any *Haliotis*.) The northern pair reach a much larger size (often in excess of 50 mm [largest known 67.5 mm]), while the southern two seldom exceed 40 mm [largest known 51.0 mm]). The northern taxa also have a sculptural feature consisting of a raised node on each of numerous very fine, folded ridges/lamellae. This feature has yet to be noted on the southern pair (this difference may be observed on Plates 1a, 1b, 2a, 2b, 8a, 8b, 9a and 9b). Prior to 2009 it was conjectured that all four of these taxa might have represented the same species but subsequent inspection of animals (see below) revealed there are indeed two different species being observed (one north, one south) and both happen to demonstrate ribbed and non-ribbed polymorphic forms. It is our opinion that each “pair” of taxa consists of a single species exhibiting polymorphism, with a ribbed and smooth form. (A similar situation exists with

several other *Haliotis* species, most notably *H. clathrata* with its form *tomricei* Patamakanthin, 2002, and *H. ovina ovina* and its form *patamakanthini* Dekker, Regter, & Gras, 2001. Additionally, *Haliotis supertexta* Lischke, 1870, and *H. queketti* Smith, 1910, exhibit similar ribbed and smooth forms.) This problem was finally resolved in August, 2009, when the first living specimen of *H. melculus* was taken near Brisbane, QLD. Close examination of this animal showed it to be vastly different than specimens of the southern pair of taxa; the QLD specimen having a smooth central area between the margins of the epipodium with the southern pair having bulbous swollen tentacles/papillae in this region. These swollen structures were consistent with numerous specimens examined over the years and were not caused by the effects of preservation.

Subspecies: Though the definition of what constitutes a “subspecies” is somewhat contentious (Geiger, 1998; Geiger & Owen, 2012), the definition we subscribe to is two or more populations of a given species that are geographically isolated, and differ in shell morphology. However, in several instances in the literature, subspecies of long standing and wide acceptance whose distributions overlap (converge) where the two meet, are also accepted (Geiger, 1998; Owen, 2003; 2004a; 2004b; Geiger & Owen, 2012). Three examples of the latter (with convergence) are found in Australia, with one occurring in New Zealand, while four examples of the first (with complete isolation) are found in New Zealand on distant offshore islands and the mainland. These will all be treated similarly to full species (photo plates, text, map, etc.)

Hybrids: Four Australian species are known to hybridize with one another creating four distinct hybrids (for the purpose of this discussion, the four species/subspecies are each considered single taxa). All are very rare to extremely rare (Owen and Kershaw, 2002), one cross being known from but a single specimen (Owen and

Kershaw, 2004). It is unlikely that any of these hybrids would be known were it not for a commercial fishery, in existence since approximately 1960, which has made it possible to examine vast amounts of material – literally millions of shells in commercial shell “dumps”, in addition to live specimens in natural populations. The Australian hybrids are classic examples of hybridization between two *Haliotis* species in that virtually all characteristics that clearly and distinctly separate two species are intermediate in the hybrid. This is not only true of the shell, but also of many characteristics of the animal as well, especially the epipodium (Owen et. al., 1971). None of the hybrids could be mistaken for either parent species, yet all clearly exhibit characteristics of both (see also Literature Cited). Hybridization is not known to occur between species of *Haliotis* found in New Zealand.

Commercial Fishery: A number of the larger species are fished commercially, and supply fresh and canned abalone meat to various world markets – especially in Asia. Both subspecies of *H. rubra* are taken in addition to *H. laevigata*. They are known by the following common names due to the color of the animal’s pigment: *H. rubra rubra*, “Black Lip”, *H. rubra conicopora*, “Brown Lip”, and *H. laevigata*, “Green Lip” abalone. One of the smaller species, *H. roei*, is also taken commercially in WA. These fisheries exist in the colder waters of SA, WA, Victoria (VIC), Southern NSW, and Tasmania (TAS). Diving in many of these areas is quite hazardous, as ocean conditions are often very rough, and sometimes divers have to protect themselves with a cage-like structure due to the threat of being attacked by the Great White Shark, commonly found on the south Australian coast.

Tables 1-3: Two tables are included to show the relative degree of scarcity of all Australian taxa in the various Australian states. The numbers used are not precise but are just given to provide

a general idea of a taxa's frequency in different parts of the continent. A third table treats the NZ taxa in a similar manner.

Complete List of Australian Species and Subspecies:

A) ENDEMIC TAXA: (listed alphabetically):

- 1) *Haliotis brazieri* Angas, 1869. **Plates:** 1a & 1b. **Distribution:** NSW.
- 2) *H. brazieri* form *hargravesi* Cox, 1869. **Plates:** 2a & 2b. **Distribution:** NSW. (see: "Contentious Taxa", pg. 4).
- 3) *H. coccoradiata* Reeve, 1846. **Plates:** 3a & 3b. **Distribution:** NSW, VIC.
- 4) *H. cyclobates* Péron, 1816. **Plates:** 4a & 4b. **Distribution:** SA.
- 5) *H. diversicolor squamata* Reeve, 1846. **Plates:** 5a & 5b. **Distribution:** (Northern Territory) NT, WA.
- 6) *H. elegans* Philippi, 1844. **Plates:** 6a & 6b. **Distribution:** WA.
- 7) *H. laevigata* Donovan, 1808. **Plates:** 7a & 7b. **Distribution:** SA, WA.
- 8) *H. melculus* Iredale, 1927. **Plates:** 8a & 8b. **Distribution:** QLD.
- 9) *H. melculus* form *ethologus* Iredale, 1927. **Plates:** 9a & 9b. **Distribution:** QLD. (see: "Contentious Taxa", pg. 4).
- 10) *H. roei* J. Gray, 1826. **Plates:** 10a & 10b. **Distribution:** WA, SA.
- 11) *H. rubiginosa* Reeve, 1846. **Plates:** 11a & 11b. **Distribution:** Lord Howe Island, NSW.
- 12) *H. rubra conicopora* Péron, 1816. **Plates:** 12a & 12b. **Distribution:** WA.
- 13) *H. r. rubra/H. rubra conicopora* ("intergrade")*. **Plates:** 13a & 13b. **Distribution:** Elliston/Streaky Bay, SA.
- 14) *H. rubra rubra* Leach, 1814. **Plates:** 14a & 14b. **Distribution:** SA, VIC, NSW, TAS.
- 15) *H. scalaris emmae* Reeve, 1846. **Plates:** 15a & 15b. **Distribution:** SA, VIC, TAS.
- 16) *H. scalaris scalaris* Leach, 1814. **Plates:** 16a & 16b. **Distribution:** WA.
- 17) *H. semplicata* Menke, 1843. **Plates:** 17a & 17b. **Distribution:** WA.

* (Listed as a "Taxon", but actually an odd, semi-isolated population quite different from either "parent" taxa).

B) NON-ENDEMIC TAXA: (listed alphabetically):

- 18) *H. asinina* Linnaeus, 1758. **Plates:** 18a & 18b. **Distribution:** WA, NT.
- 19) *H. clathrata* Reeve, 1846. **Plates:** 19a & 19b. **Distribution:** WA, NT, QLD.
- 20) *H. dissona* Iredale, 1929. **Plates:** 20a & 20b. **Distribution:** QLD.
- 21) *H. ovina ovina* Gmelin, 1791. **Plates:** 21a & 21b. **Distribution:** WA, NT, QLD.
- 22) *H. varia* Linnaeus, 1758. **Plates:** 22a & 22b. **Distribution:** WA, NT, QLD.

Complete List of New Zealand Species and Subspecies: (all are endemic)

ENDEMIC TAXA : (listed alphabetically).

- 23) *Haliotis australis* Gmelin, 1791. **Plates:** 23a & 23b. **Distribution:** N. & S. Island; Stewart Island, Chatham Islands.
- 24) *Haliotis iris* Gmelin, 1791. **Plates:** 24a & 24b. **Distribution:** N. & S. Island; Chatham Islands.
- 25) *Haliotis virginea crispata* J. Gould, 1847. **Plates:** 25a, 25b, & 25c. **Distribution:** N. Island.
- 26) *Haliotis virginea huttoni* Filhol, 1880. **Plates:** 26a, 26b, & 26c. **Distribution:** Campbell and Auckland Islands.
- 27) *Haliotis virginea morioria* Powell, 1938. **Plates:** 27a, 27b, & 28c. **Distribution:** Chatham Islands.
- 28) *Haliotis virginea stewartae* Jones & Owen, 2004. **Plates:** 28a, 28b, & 28c. **Distribution:** Bounty & Antipodes Islands.
- 29) *Haliotis virginea virginea* Gmelin, 1791. **Plates:** 29a, 29b, & 29c. **Distribution:** N. & S. Island; Stewart Island.

LIST OF HYBRID HALIOTIS (Australia)

- 30) *Haliotis rubra rubra* x *H. laevigata*. **Plate:** 30. **Distribution:** Port Lincoln, SA, to VIC; TAS.
- 31) *Haliotis rubra conicopora* x *H. laevigata*. **Plate:** 31. **Distribution:** Esperance to Albany, WA.
- 32) *Haliotis r. rubra/rubra conicopora* ("intergrade") x *H. laevigata*. **Plate:** 32. **Distribution:** Elliston/Streaky Bay, SA.
- 33) *Haliotis laevigata* x *H. roei*. **Plates:** 33a & 33b. **Distribution:** WA to SA
- 34) *Haliotis rubra rubra* (or) *rubra conicopora* x *H. roei*. **Plates:** 34a & 34b. **Distribution:** WA to SA.
- 35) *Haliotis scalaris scalaris* x *H. laevigata* (unique). **Plate:** 35. **Locality:** Esperance, WA.

Table 1
AUSTRALIAN ENDEMIC TAXA

TAXON	AUSTRALIAN STATE							PLATE NO.
	QLD	NSW	VIC	SA	WA	NT	TAS	
<i>H. brazieri</i>	---	R	---	---	---	---	---	1a; 1b
<i>H. brazieri hargravesi</i>	---	ER	---	---	---	---	---	2a; 2b
<i>H. coccoradiata</i>	---	C	R	---	---	---	---	3a; 3b
<i>H. cyclobates</i>	---	---	R	C	C	---	---	4a; 4b
<i>H. diversicolor squamata</i>	---	---	---	---	C	C	---	5a; 5b
<i>H. elegans</i>	---	---	---	---	S	---	---	6a; 6b
<i>H. laevigata</i>	---	---	VC	VC	VC	---	C	7a; 7b
<i>H. melculus = ethologus</i>	ER	---	---	---	---	---	---	8a; 8b
<i>H. roei</i>	---	---	R	VC	VC	---	---	9a; 9b
<i>H. rubiginosa</i>	---	S	---	---	---	---	---	10a; 10b
<i>H. rubra conicopora</i>	---	---	---	---	VC	---	---	11a; 11b
<i>H. rubra conicopora "Intergrade"</i>	---	---	---	VC	---	---	---	12a; 12b
<i>H. rubra rubra</i>	---	VC	VC	VC	---	---	VC	13a; 13b
<i>H. scalaris emmae</i>	---	---	VC	VC	---	---	C	14a; 14b
<i>H. scalaris scalaris</i>	---	---	---	---	C	---	---	15a; 15b
<i>H. semiplicata</i>	---	---	---	S	S	---	---	16a; 16b

Table 1: Distribution of Taxa vs. Rarity in Australian States

ER: Extremely Rare (est. 20 specimens)

R: Rare (est. 100 specimens)

S: Scarce (est. 100-500 specimens)

C: Common (500-1000 specimens)

VC: Very Common (Fished Commercially)

(est.) = estimated total observed by authors

Table 2
AUSTRALIAN NON-ENDEMIC TAXA

TAXON	AUSTRALIAN STATE							PLATE NO.
	QLD	NSW	VIC	SA	WA	NT	TAS	
<i>H. asinina</i>	C	---	---	---	C	C	---	17a; 17b
<i>H. clathrata</i>	S	---	---	---	S	S	---	18a; 18b
<i>H. dissona</i>	ER	---	---	---	---	---	---	19a; 19b
<i>H. ovina</i>	C	---	---	---	S	S	---	20a; 20b
<i>H. varia</i>	C	---	---	---	C	C	---	21a; 21b

Table 2: Distribution of Taxa vs. Rarity in Australian States

ER: Extremely Rare (est. 20 specimens)

R: Rare (est. 100 specimens)

S: Scarce (est. 100-500 specimens)

C: Common (500-1000 specimens)

VC: Very Common (Fished Commercially)

(est.) = estimated total observed by authors

Table 3
NEW ZEALAND TAXA

TAXON	LOCALITY						PLATE NO.
	North Isl.	South Isl.	Stewart Isl.	Chatham Isl.	Campbell/Auckland Isl.	Antipodes/Bounty Isl.	
<i>H. australis</i>	C	C	C	C	---	---	22a; 22b
<i>H. iris</i>	VC	VC	VC	VC	---	---	23a; 23b
<i>H. virginea virginea</i>	C	C	C	---	---	---	28a; 28b; 28
<i>H. virginea crispata</i>	C	---	---	---	---	---	24a; 24b; 29
<i>H. virginea huttoni</i>	---	---	---	---	S	---	25a; 25b; 31
<i>H. virginea morioria</i>	---	---	---	S	---	---	26a; 26b; 30
<i>H. virginea stewartae</i>	---	---	---	---	---	S	27a; 27b; 32

Table 3: Distribution of Taxa vs. Rarity in New Zealand

ER: Extremely Rare (est. 20 specimens)

R: Rare (est. 100 specimens)

S: Scarce (est. 100-500 specimens)

C: Common (500-1000 specimens)

VC: Very Common (Fished Commercially)

(est.) = estimated total observed by authors

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ABOUT THE AUTHORS

Buzz Owen became interested in abalones in 1949, and has pursued the study of the family Haliotidae to this day. He began sport diving for the mollusk that year, and began a close examination of commercial *Haliotis* shell dumps as well. This searching of many tons of shells led to the discovery of several hybrid crosses, and began a seven year career of commercial abalone diving, to attempt to find living hybrids for confirmation. A paper on that subject was published by the Los Angeles County Museum of Natural History in 1971. He also worked in a commercial shellfish hatchery for 14 years, culturing several different hybrids, including a four-species hybrid, crossing gametes of two hybrids of dissimilar parentage. In 1979–1980, he worked on a project funded by the *Organization of American States*, investigating the feasibility of placing the red abalone (*H. rufescens*) into Chilean waters. About 1985 he began pursuing a growing interest in worldwide *Haliotis* species, aided by long-time enthusiast Katherine “Kit” Stewart. In 2002, he began writing for *Of Sea and Shore* magazine, which published over 50 of his

papers. He has described three species and four subspecies new to science. He is currently listed as the *Haliotis* specialist/expert of Guido and Philippe Poppe’s *Conchology, Inc.*, and was recently honored by being selected to be associate taxonomic editor of Haliotidae for the Muséum national d’Histoire naturelle, Paris, France. He continues to actively expand his collection of world wide *Haliotis*, which includes all described species and subspecies, plus the extremely rare hybrids - a number of which are found only in his collection.

Bob Kershaw began diving for abalone commercially in 1969 and continued until 1997 when a diving injury ended his career (he still holds a permit and quota shares in the fishery). His interest in Worldwide Haliotidae was awakening about this time, and he traveled to California to attend the third World *Haliotis* Seminar being held in Monterey, California. There he met Buzz Owen and was exposed to large collections of worldwide *Haliotis*. From this experience, his interest turned into a passion and started his quest to assemble as complete a collection of the world’s species and subspecies as possible. He contacted shell dealers, other collectors, and found several shell auctions as well. Additionally, he travelled to distant parts of Australia to connect with commercial abalone divers, processors, and examine many tons of commercial shell, looking for gem quality specimens and hybrids. He worked with Owen and co-authored two papers exploring hybridization of Australian *Haliotis*, and stays in touch with his commercial contacts who continue to save rare material for him. Today, he is as aggressive as ever pursuing additional shells for his collection which is without doubt the most complete grouping of Australian *Haliotis* extant. In 2011, he travelled to Niue Island and discovered a new subspecies of abalone which was described as *Haliotis jacnensis kershawi* Owen, 2012 (In Geiger & Owen, 2012).

REFERENCES

- Angas, G. F. 1869.** Descriptions of Twelve New Species of Land and Marine Shells from Australia and the Solomon Islands. *Proceedings of the Zoological Society* 4:45-49, pl. 2.
- Cox, J. C. 1869.** On a New Species of *Haliotis* from New South Wales. *Proceedings of the Zoological Society* 4:49.
- Donovan, E. 1808.** The New Cyclopaedia or Universal Dictionary of Arts and Sciences (1802-1820). (not seen)
- Filhol, H. 1880.** Mollusques marins vivants sur les cotes de l'iles Campbell. *Compte Rendus des Séances Hebdomadaires de l'Academie des Sciences*, Paris, 51: 1094-1095.
- Geiger, D. L. 1998.** Recent Genera and Species of the family Haliotidae Rafinesque, 1815 (Gastropoda: Vetigastropoda). *The Nautilus* 111(3):85-116.
- Geiger, D. L. & Owen, B. 2012.** *Abalone: Worldwide Haliotidae. Conchbooks*, Hackenheim, Germany. 361 pp., 92 pls.
- Gmelin, J. H. 1791.** Systema Naturae Per Regna Tria Naturae, 13th edition. T1, Pars VI: 3021-3910.
- Gould, A. A. 1847.** Descriptions of New Shells Collected by the U.S. Exploring Expedition under Capt. Wilkes. *Proceedings of the Boston Society of Natural History* 2: 251-253.
- Iredale, T. 1927.** Colundra Shells. *Australian Zoologist* 4: 331-336.
- Jones, M. & B. Owen 2004.** Description of *Haliotis virginea stewartae* New Subspecies from Subantarctic Islands of New Zealand. *Of Sea and Shore* 26:2: 81-85; 87.
- Leach, W. E. 1814.** The Zoological Miscellany Vol. 1. *McMillan*, London. 144 pp.
- Lischke, C. E. 1870.** Diagnose neuer Meeresconchylien von Japan. *Malacologische Blätter* 17:23-25.
- Menke, K. T. 1843.** Molluscorum Novae Hollandiae. *Libraria Aulica Hahniana Hannoverae*. 46 pp.
- Péron, F. 1816.** Voyages de Découvertes aux Terres Australes. *Imprimerie Impériale*, Paris.
- Owen, B., J. J. H. McLean & R. J. Meyer 1971.** Hybridization in Eastern Pacific Abalones (*Haliotis*). *Bulletin of the Los Angeles County Museum of Natural History*. Science: No. 9.
- Owen, B & R. Kershaw 2002.** Hybridization in the South and Western Australian Abalones (Genus *Haliotis*): A Photo Study and Guide to the Identification of Shell Specimens. *Of Sea and Shore* 25:1: 55-66.
- Owen, B. & R. Kershaw 2004.** A New Hybrid *Haliotis* from Western Australia. *Of Sea and Shore* 26:1: 50-53.
- Owen, B. 2004a.** Proposed Revisions to *Haliotis diversicolor* Reeve, 1846, and Validation of *Haliotis supertexta* Lischke, 1870. *Of Sea and Shore* 26:2: 99-103; 105.
- Owen, B. 2004b.** The *Haliotis brazieri* Angas, 1869, Complex of Eastern Australia: A Review and Photo study of a Contentious Group of Taxa. *Of Sea and Shore* 26:3: 166-172.
- Owen, B. 2006.** The *Haliotis* subspecies of South and West Australia, Part 1: *H. rubra rubra* Leach, 1814, and *H. rubra conicopora* Péron, 1816. A Brief Description and Photo Study. *Of Sea and Shore* 27:3: 148-152.
- Owen, B. 2007.** The *Haliotis* subspecies of South and West Australia, Part 2: *H. scalaris scalaris* Leach, 1814, and *H. scalaris emmae* Reeve, 1846. A Brief Description and Photo Study. *Of Sea and Shore* 27:4: 276-281.
- Philippi, R. A. 1845.** Diagnoses Testaceorum Quorundam Novorum. *Zeitschrift für Malakozoologie* 3: 147-152.
- Powell, A. W. B. 1938.** Additions to the Recent Molluscan Fauna of New Zealand. *Records of the Auckland Institute and Museum* 2: 165-170.
- Reeve, L. 1846b.** Monograph of the Genus *Haliotis*. 22 pp., 17 pls.
- Smith, E. A. 1910.** On South African Marine Mollusca with Description of New Species. *Annals of the Natal Museum* 2: 175-219, 2 pls.

***Editor's Note:** The following nine plates are a small subset of the authors' plates from the complete iconography with over 70 color plates which will be published as a Supplement or Special Edition of *The Festivus* and will be made available for purchase.

PLATE 1a

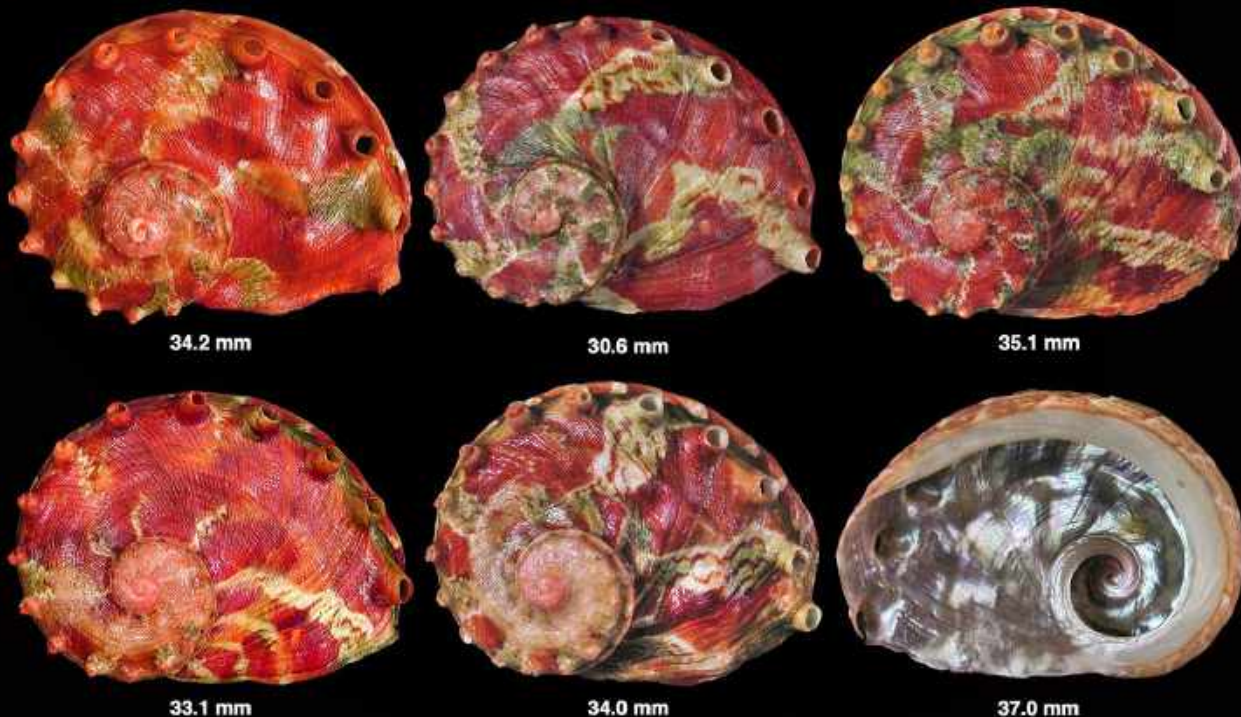
Haliotis brazieri Angas, 1869

Distribution: Northern NSW, south to approximately the Victoria border. Found under small rocks and rubble in 8-25 m.

Description: Shell circular, small, seldom over 45 mm; brightly colored with red, green, cream, and purple. Interior nacre silver, and highly reflective. Spiral ribbing absent or extremely weak. 4-5 highly raised tremata. Usual adult size 35-40 mm.

Largest Specimen Measured: 51.6 mm (RKC).

Other: Far more common than the *hargravesi* form. Shells with the morphology of both forms (ribbed and smooth) exist. In the southern part of its range, often found close to *H. coccoradiata*, but seldom under same rocks and rubble.



All specimens live-taken between Coff's Harbour and Eden, NSW. 15-25 m depth.

PLATE 2b

Haliotis brazieri form *hargravesi*
Cox, 1869

Coff's Harbour, NSW, to near VIC
Extremely Rare



A



29.3 mm



29.1 mm



30.2 mm



28.6 mm



29.8 mm



28.6 mm

A: *Haliotis brazieri* form *hargravesi*. Large specimen. 41 mm. Coff's Harbour, NSW, Australia.
Bottom 2 Rows: *H. brazieri* form *hargravesi*. Coff's Harbour to Sydney, NSW. 20-30 m depth.

PLATE 7a

Haliotis laevis Donovan, 1808.

Distribution: Central VIC to Geographe Bay, WA, including offshore islands; north coast of TAS. Found on open bottom, and on ledges and boulders. Prefers areas without dense bottom algae growth. Usually found in 10-30 m.

Description: Shell somewhat round, strongly inflated; often "bulbous" at spire. Color variable; bluish white to greenish brown, sometimes orange. Usually has strong prosocline ray development, sometimes of a "zig-zag" pattern. Interior nacre bright, with reflections of greenish yellow and pink. Spiral ribbing very weak to absent. Open holes generally number 8 to 12. Usual adult size 160-180 mm.

Largest Specimen Measured: 230.0 mm (RKC).

Other: Hybridizes with *H. rubra rubra*, *H. rubra conicopora*, and *H. roei*, but all are uncommon. Most prized of the commercial species, and commands the highest market price. Called the "Green Lip" abalone due to the green color of the epipodium and primary animal pigment.



166.3 mm



130.0 mm



161.5 mm



198.0 mm



152.0 mm



179.0 mm

All specimens taken between Port Lincoln, SA, and Esperance, WA. 10-25 m depth.



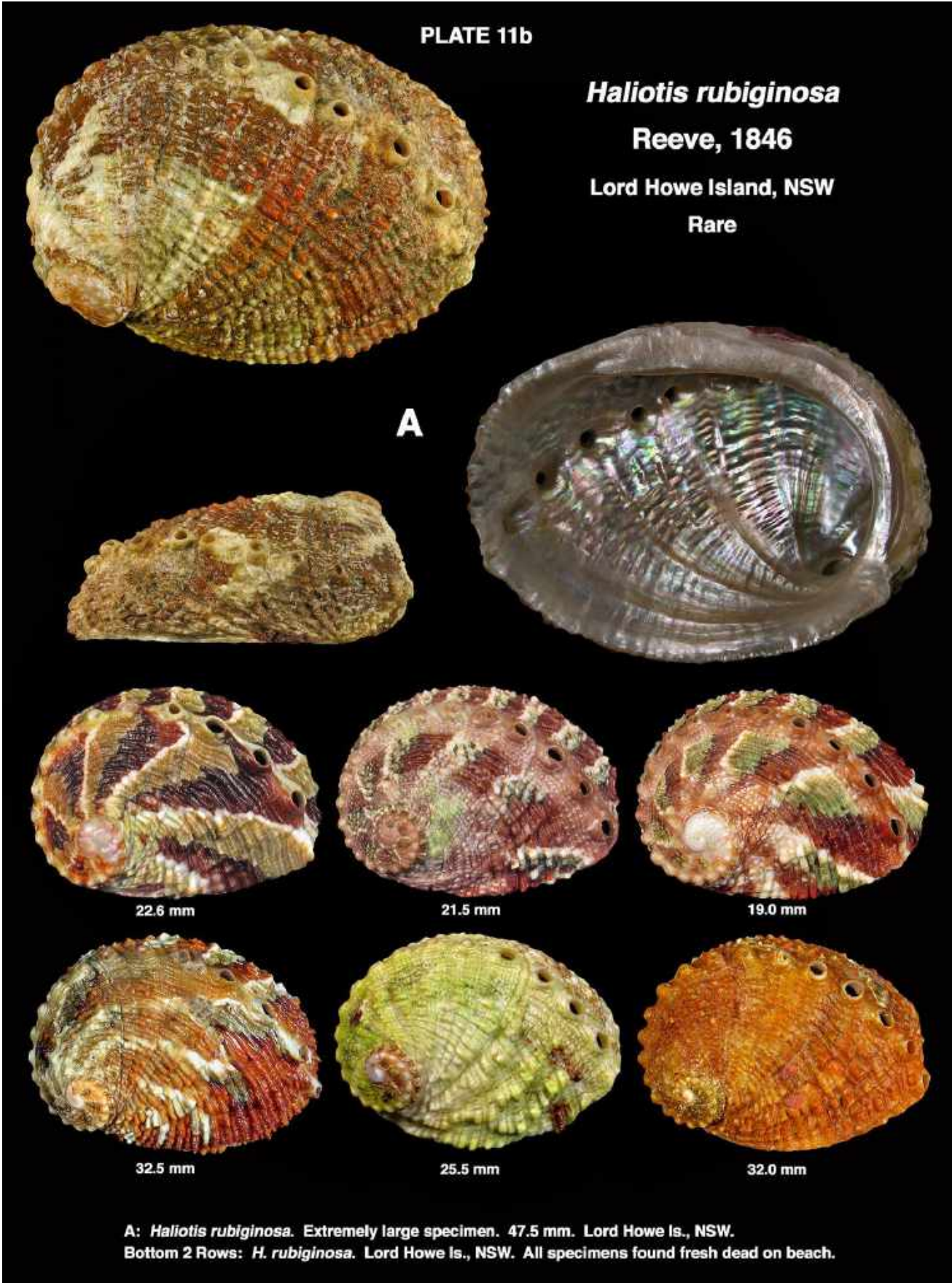




PLATE 15b

Haliotis scalaris emmae

Reeve, 1846

SA, VIC, TAS

Very Common



A



83.6 mm



79.8 mm



81.1 mm



69.5 mm



82.7 mm



67.5 mm

A: *Haliotis scalaris emmae*. Largest specimen measured. 125.3 mm. TAS.
Bottom 2 Rows: *H. scalaris emmae*. TAS. 5-15 m depth.

PLATE 16a

Haliotis scalaris scalaris Leach, 1814.

Distribution: Found from Ceduna, SA, to Carnarvon, WA, mostly well hidden (crevice protected) under rocks and ledges, often in areas of dense algae growth. Occurs in the Intertidal zone out to a depth of 40 m.

Description: Shell very round and flat, with elevated spire located well towards center of shell. Has a single extremely prominent, very rounded, raised, and scaly rib in central dorsum, running length of shell. Between rib and spire, many sharp raised cross-lamellae occur. Usually has strong, whitish, prosocline ray development. Color dark brown to orange - occasionally light green (rare). Also may be lighter brown to beige (tan). Interior nacre often extremely brilliant and reflective - almost like liquid silver, with large central rib and cross-lamellae strongly visible. Spiral ribbing extremely weak or absent, in marked contrast to *H. scalaris emmae* which has strong spiral ribs. Has 4-7 highly raised tapered holes. Average adult size 80-95 mm.

Largest Specimen Measured: 125.1 mm (RKC).

Other: Not taken commercially.



73.5 mm



81.6 mm



78.8 mm



60.0 mm



63.4 mm



76.6 mm

All specimens live-taken between Ceduna and Fremantle, WA. 10-15 m depth.

The 5 *H. virginea virginea* subspecies of NZ

PLATE 26c. *Hallotis virginea crispata* A. Gould, 1847.



64.5 mm



59.5 mm



55.1 mm



61.8 mm



33.0 mm



29.2 mm



33.8 mm



37.3 mm



37.8 mm



43.2 mm



34.2 mm



33.0 mm

All Rows: *Hallotis virginea crispata*. NE coast of North Island, NZ. 3-10 m depth.