

NO. 5. — *Observations on the Species of the Genus PARTULA Fér., with a Bibliographical Catalogue of all the Species.* By WILLIAM DELL HARTMAN, M. D.

THE genus *Partula*, proposed by Baron Férussac, in 1819, at the present time embraces numerous species, encumbered by synonyms and manuscript names. This catalogue has been prepared with a view to indicate the former, as well as to eliminate and define the status of the latter, hoping in the future to be enabled to indicate a full and correct synonymical catalogue of the genus, together with a new arrangement of the species. Prior to his decease, the late William Harper Pease was engaged in the preparation of a monograph of the genus *Partula*, in which he designed describing and figuring all his new species. In anticipation of this work, he freely distributed his manuscript and published species amongst institutions and private collections. Since that time the names of many of the former have been incorporated into printed catalogues, thereby creating confusion in synonymy, and hence it was deemed proper to notice all such in these pages. The large collection of Mr. Pease having, by purchase, passed into the possession of the Museum of Comparative Zoölogy, Cambridge, through the favor of Professor Agassiz of that institution I have been enabled to trace his published and manuscript species with a considerable degree of accuracy. I have also been favored by Andrew Garrett, Esq., of Huaheine, (who collected for Mr. Pease, and was familiar with all his species,) with all the species and varieties of Mr. Pease from the islands the maps of which accompany this paper. In the year 1864, the Rev. P. P. Carpenter published in the proceedings of the Zoölogical Society a catalogue of *Partulæ* with synonyms, chiefly those of Mr. Pease, which contains numerous incorrect determinations. Mr. Gloyne has also published a partial list of *Partulæ* in the Quarterly Journal of Conchology, which contains several synonymical inaccuracies. In the proceedings of the Zoölogical Society for 1871, the late William H. Pease published a catalogue of the Polynesian *Partulæ*, numbering over sixty species. In this list he has omitted twenty-seven species, which embraced all his manuscript, together with a few of his published species. These omissions, it

is to be supposed, he regarded at that time as obsolete, or synonyms of known species.

Dr. Pfeiffer, in Vol. VIII. of his *Monographia Heliceorum Viventium*, has enumerated one hundred and four species, but marks thirteen species of Mr. Pease as unknown to him. This is surprising, as the species of Mr. Pease, both manuscript and published, were freely distributed over Germany long before this publication, through the Museum Godeffroy and private channels. The institution named has published a partial list of *Partulæ*, embracing some of the manuscript species of Mr. Pease. Dr. Pätel in his catalogue has also enumerated about thirty-six species of *Partula*. Mr. Pease designated about eighty species and varieties of *Partula* by descriptions, figures, and manuscript names, many of which, however, are synonyms of known species.

The stations of *Partula*, as published by Mr. Pease and Dr. Pfeiffer, in many instances are incorrect or entirely omitted. These omissions and inaccuracies are often very embarrassing, but in some instances they are attributable to the shells having been collected by missionaries, mariners, and others, who carried them from one island to another until their identity of station was lost or forgotten; and in this manner species belonging to Tahiti or the Marquesas have been erroneously accredited to the Sandwich or other islands. In the present catalogue, Mr. Garrett vouches for the correctness of all the stations to which his name is attached.

So far as known, the genus is confined to the Pacific Islands. They have never been found at the Sandwich group, or New Caledonia; its western limit is New Guinea, and they are not found in New Zealand or Australia. North of the equator, they are found at the Pelew Islands, and as far north as Guam in the Ladrone Islands. The New Hebrides and Solomon's Island have afforded a few species almost unknown to collections in this country. The metropolis of the genus is situated in the Polynesian Islands, but few species being found in the islands of other groups. Of these the island of Raiatea, having a length of fourteen miles and a breadth of three to four miles, is principal: about thirty species and varieties are accredited to this island alone. "The different species are confined to small areas, or restricted to single valleys, each of which has its specific centre, and the range of many species is quite circumscribed. When a species has migrated to an adjoining valley, it has retained all the specific characters belonging to its ancestors at the centre of distribution. Certain species and varieties are confined to separate valleys. *P. Hebe* Pse. will be found in one

valley, while *P. globosa* Pse. Mss. = *Hebe* var. will be found in a remote valley. *P. hyalina* Brod. and *P. faba* Mart. range through all parts of the islands where they occur. The island of Bora-bora, eighteen or twenty miles northwest from Raiatea, should, from its size as compared with other islands, produce five or six species. On the contrary, it produces but a solitary species, *P. lutea* Less., which is remarkably uniform in its specific character, and widely distributed over the island. *P. hyalina* Brod. has the widest range of any other species inhabiting the Polynesian Islands; it has spread over Tahiti, and is abundant at the Austral group, over three hundred miles south of the former island. It is also found at Mangaia, one of Cook's Islands, five hundred miles southwest of Tahiti. The Polynesian group, in which the greatest number of species occurs, comprises eight islands, six of which are inhabited by more than half of the known species of the genus. The distance of these islands from each other is from ten to ninety miles. The former distance is between Tahiti and Moorea, and the latter separates Moorea from Huaheine. Tahaa and Huaheine are only three or four miles apart, but are enclosed in the same encircling reef, and may be regarded as one island separated into two by more or less shallow water. Tahaa is inhabited by two or three species comprising two or three distinct types, which are also represented on Raiatea, but not elsewhere. Bora-bora is ten miles from Tahaa, and, as before mentioned, possesses but a single species. Notwithstanding the short distance between the several islands, and the constant intercourse of the inhabitants for hundreds of years, not a single instance has come to my knowledge of a species having been introduced from one island to another." *

Hybrids are common amongst some species, and rare with others. They even occur between arboreal and ground species. As to the amount of fertility existing amongst hybrids, we possess no certain data, but to these intermediate forms is to be ascribed the embarrassment which so often besets the conchologist in the determination of species. As was to be expected, the hybrids in my collection are chiefly *the result of the union of proximate species*. I possess three which partake of the mingled characters of *P. crassilabris* Pse. and *P. bella* Pse. Mss. = *Hebe* var.; one between *P. affinis* Pse. and *P. rubescens* Rve. = *Otaheitana* var.; two between *P. radiata* Pse. Mss. and *P. faba* Mart.; several between *P. virginea* Pse. Mss. and *P. amanda* Garr. Mss. = *faba* var.; three between *P. virginea* Pse. and *P. dubia* Garr. Mss.; two between *P. virginea* Pse. Mss. and *P. dentifera* Pse.,

* Garrett in litt.

several between *P. Garrettii* Pse. and *P. Thalia* Garr. Mss. ; two between *P. faba* Mart. and some unknown species ; besides a few others which I cannot locate.

Like many other Terrestrial Mollusks, *Partulæ* are known as Viviparous Hermaphrodites, and on this account they may differ from bisexual animals, in producing hybrids more or less fertile ; and we may hazard the conjecture that some varieties of *Partula* originally may have resulted from fertile hybrids, being the first step in the formation of a race, afterwards intensified and rendered permanent by confinement to the food and climatic influences of one station, and to having been bred in and in, in such positions, for a long period. With respect to the mutation of species of Mollusca caused by food and station alone, we have a striking instance in the *Achatinellas* of the Sandwich Islands, a genus in many respects analogous to *Partula*. It often happens that "the gravid females are washed by heavy rains from a favored position to drier levels, where after a few generations the progeny become depauperated, and so stunted in size as to be mistaken for distinct species." The distribution of the different species of *Partula* throughout the Pacific islands in some instances is not correctly ascertained ; and before we can pronounce with certainty on the stations occupied by some species, we must await a more thorough exploration of these islands, the conchology of which has not been accurately observed.

Andrew Garrett, Esq., of Huaheine, who has resided and collected for many years in the Polynesian Islands, contends "that, as the different varieties of *Partula* are found in limited areas, all those exhibiting slight but constant differences should in most cases be acknowledged as distinct species." To this end he has kindly prepared the accompanying maps to illustrate their distribution. The names underlined on the maps indicate their metropolis or specific centre. A double line marks the locality of a ground species. *Partulæ*, like *Trochomorpha*, *Nanina*, *Helicina*, *Succinea*, and some other Terrestrial Mollusks in tropical countries, are divided into Arboreal and Terrestrial species. The former being found during the dry season gummed to the leaves and bark of trees, while the latter are found at all times under decayed wood and leaves. "The character of the animals affords but little aid in the determination of species. In those of *P. arguta* Pse., *P. turgida* Pse., *P. annectens* Pse., and *P. gracilis* Pse., the exudation of mucus is much more viscid and tenacious than in other species. The ocular tentacles in these are longer and more slender, and the colors of the soft parts as seen through the pellucid shells are more variegated, than in the solid

species. . . . The animals of the arboreal species are lighter-colored than the terrestrial. The color of the animals in all the solid species varies from a pale cinereous, through all the intermediate shades of black, to dusky slate, while the thin-shelled species before mentioned are more or less of a luteous color." * The shells of many species of *Partula* vary in size, weight, and coloration. When numbers of these apparent varieties are compared, aided by a microscopic examination of the surface of the shell, their specific identity is obvious. Some *Partulæ* may readily be mistaken for small *Bulimi*, especially that division of the genus in which the pillar tooth is absent, and the lip not broadly reflected, and concave, as in *P. rosea* Brod. In other species the lip is widely reflected, thick, and flat, often with a large pillar tooth within, which gives the aperture an auricular appearance, as seen in *P. auriculata* Brod., constituting two natural divisions of the genus, the *Auriform* and *Buliminoid*, which are divisible into sub-groups.

Partulæ differ from *Bulimi* in having the columella broadly reflected and compressed at base, leaving an umbilicus of variable size, whilst a few are imperforate, or narrowly umbilicate, and many species constantly exhibit a small tubercle on the columella. The spiral striæ of the surface together with the embryonic fovea of the apex of the shell are found in all the species. Some species are constant in form and color, and also in the presence or absence in the adult of a denticle on the columella and a pillar tooth, whilst other species are more variable, especially as regards the latter feature. In *P. spadicea* Rve., only one specimen in fifty has a pillar tooth, while in others the tooth is not absent in several hundred specimens. The same variation is observable in sinistral *Partulæ*. *P. Mooreana* nobis is both sinistral and dentate in fifteen hundred examples. *P. Otaheitana* Brug. and varieties exhibit a majority of reversed examples, while *P. vexillum* Pse. has one in fifty and *P. affinis* Pse. only shows one in several hundred.†

In sinistral examples, the whorls are either excessively drawn out, as in *P. bulimoides* Less., *P. rubescens* Rve., and *P. perversa* Pse. Mss. = *Otaheitana* Brug.; or they are closely rolled together, as in *P. crassa* Pse. Mss. and *P. brevicula* Pse. Mss. = *P. Otaheitana* vars.

In the auriform division of the genus the lip of the immature shell is at first concave, the outer margin in the early stages partaking of the color of the epidermis. This concavity and coloration disappears as the

* Garrett in litt.

† I possess a sinistral example of *Patula Cooperi* W. G. Binn., from Colorado, selected from bushels of dextral specimens.

nacreous deposit increases with age, the thick flat labium and elevated pillar tooth always indicating maturity.

The mature reflected lip of *Partula* always exhibits numerous interrupted microscopic lines, running in the direction of the peritreme. In all thin-shelled species the surface is more thickly crowded by the waved spiral striæ, common to all the species, than in the heavy and thick-shelled varieties: in the latter, they are not so conspicuous, partly owing to the decussation of the more coarse oblique lines of growth.

The shells of the same species of *Partula* often vary in color. Albinism is often present; but the species vary through all the shades of dark bay to pale or reddish chestnut, greenish yellow, rufous, hyaline, and white.

The colors, which are deposited by glands on the margin of the mantle, are not found in the embryo, but after extrusion and exposure to light and heat the colors appear; and owing to the latter influences, the arboreal species are more beautifully marked than the terrestrial. The colors of the shell are arranged in streaks, rays, or bands, the latter varying in number and width, while the former follow the direction of the whorls, becoming wider as the shell increases. Like *Achatinella*, some species possess a white sutural line beneath the whorls of the spire, and the uniform dark purple or rose tint of the apical whorl is a marked feature in the coloration of many species. In the embryonic shell the fine spiral striæ of the epidermis at the apex (when viewed by a glass) are seen to consist of spiral rows of foveæ, or separate depressions in the epidermis, which occupy the first one and a half or two whorls (the usual number they possess when extruded from the oviduct). After birth the foveæ are discontinued; but we see in their stead the fine spiral waved striæ common to all the species, the embryonic foveæ always remaining at the apex of the shell, constituting a generic feature common to all *Partulæ* with which I am acquainted. In *Partula*, as in some species of *Helix*, *Bulimus*, *Achatinella*, and many viviparous fresh-water genera, as *Paludina* and *Lanistes*, we meet with what are termed sinistral or reversed individuals. We can only conjecture as to the cause of this departure from the more usual conformation; but it may be owing to a reversal of the vital forces acting during the segmentation of the yolk of the egg in the early stages of the formation of the embryo. The eggs of the common garden slug (which are almost transparent, and afford good material for observation) a short time after deposition exhibit the germinal vesicle (which lies in the midst of the yolk) rising to the upper part, where a distinct rotation may be seen; after which it under-

goes segmentation, and the germ appears. The rotary motion, which is probably due to ciliary or vital action, consists of two or three turns in one direction and the same number in a reversed one; and in this reversed vital action during segmentation of the yolk of the egg may lie the secret of sinistral or reversed shells. Several years ago I received from Mr. Garrett a number of species of *Partula* in alcohol. These I presented to William G. Binney, Esq., of Burlington, New Jersey, well known to scientists for his work on the anatomy and lingual dentition of Terrestrial Mollusks; and his observations on *Partula* are reported in the Proceedings of the Academy of Natural Sciences, Philadelphia, for April, 1873, which may be epitomized in this place as follows: "In the examination of the animals of twenty-three species of *Partula* he not only found the external characters to agree generically, but the peculiarity of the lingual dentition was constantly exhibited. Nothing remarkable was observed in the nervous, respiratory, or alimentary systems." "The jaw differs in the different species in the more or less attenuation of the ends, and also in the number of plates of which it is composed. The lingual membrane is broad, and the denticles vary in size and number in the different species, as in other Terrestrial Geophila. Excepting that some of the membranes had narrower teeth than others, he found no difference in them. The Genitalia differed somewhat in the different species, illustrations of which accompany the paper. Férussac's observations concerning their viviparous character were confirmed, but he had overlooked the fact that the animal possessed the two inferior tentacles."

Through the kindness of Professor Dall I have received some *Partulæ* in alcohol from the Smithsonian Institution, some of which I have submitted to a microscopical examination of the jaw and lingual dentition. I find the number of plates in the jaw on each side of the median line varies in the same species, as well as in the different species, agreeing in this respect with other terrestrial Geophila. For example, in *P. subangulata* Pse. Mss. = *P. faba* Mart. var., the formula was $\frac{3}{4}\frac{2}{6}$, $\frac{5}{4}\frac{3}{6}$, $\frac{4}{4}\frac{0}{6}$, $\frac{4}{3}\frac{0}{2}$, $\frac{4}{2}\frac{0}{2}$. In *P. obesa* Pse. Mss. = *P. auriculata* Brod. var., the formula was $\frac{3}{3}\frac{5}{8}$, $\frac{3}{4}\frac{2}{2}$, $\frac{3}{3}\frac{6}{8}$, $\frac{2}{3}\frac{6}{2}$, $\frac{3}{3}\frac{6}{8}$, $\frac{3}{3}\frac{6}{5}$, $\frac{3}{4}\frac{6}{4}$. Of *P. vexillum* Pse., *P. Ganymedes* Pse., and *P. inflata* Rve., I possess but one specimen each. In *P. vexillum* the formula was $\frac{3}{3}\frac{0}{0}$; in *P. Ganymedes*, $\frac{2}{3}\frac{2}{6}$; and in *P. inflata*, $\frac{2}{3}\frac{5}{1}$. The form of the teeth and dental formula in *P. Ganymedes* and *P. inflata* are similar, the only difference being in the number of rows on each membrane. The shape of all the jaws agreed with the figure of Mr. Binney. Whether the number of plates in the jaw or the

number of denticles on the lingual membrane depends on the age of the individual, I am not prepared to affirm. The shells, however, from which my examples were taken were all mature, which is always indicated by the thick, flat, and fully expanded lip. In the examination of the lingual membranes, not only of *Partula*, but of all other *Gasteropods*, it is noticeable that the denticles of the anterior extremity of the lingual membrane are always more stout and prominent, gradually diminishing in size towards the posterior part, where for several rows the denticles become almost obsolete, presenting at last a mere rudimentary appearance. In preparing a lingual membrane for a slide it may be observed that the denticles at the anterior extremity always separate more readily from the membrane. This, taken in connection with their gradual diminution in size, has suggested the query in my mind whether the wear and loss of the anterior denticles were supplied by a constant renewal of those from behind. From the continued presence of rudimentary denticles in varying stages of growth on the posterior part of the lingual membrane of all *Gasteropodous Mollusks*, whether terrestrial, fluviatile, or marine, which I have examined, it would seem probable that the mode of growth is such as I have indicated.

To Andrew Garrett, Esq., of Huaheine, who for many years has collected in the various islands of the Pacific, I am under many obligations for specimens and information in reference to the stations and distribution of *Partulæ*, together with other facts of his personal observation embodied in this paper. To the Conchological Department of the Museum of Comparative Zoölogy, so ably represented by Prof. Charles E. Hamlin, I am indebted for the opportunity of examining the collection of *Partulæ* belonging to the late William Harper Pease, and also for his kindness in selecting a suite from the duplicates in the Museum. To the personal friendship of Professor Baird, seconded by his efficient assistant, Professor Dall, I owe many thanks for the opportunity afforded me of examining the collection of *Partulæ* contained in the Smithsonian Institution. To Edgar A. Smith, F. Z. S., Assistant Conchologist in the British Museum, I am under obligations for his kindness in comparing my specimens with types in the Museum, and for valuable information pertaining to the same.

For specimens I am indebted to many friends, among whom I may mention A. D. Brown, Esq., of Princeton, New Jersey; Robert Damon, Esq., of Weymouth, England; Mr. Robert F. Geale, formerly with Hugh Cuming; G. B. Sowerby, Jr., Esq., of London; and Dr. Schmeltz, of the Museum Godeffroy, Hamburg.

To Mr. Geo. W. Tryon, Jr., Curator of the Conchological Department of the Academy of Natural Sciences, Philadelphia, I am especially obliged for his uniform courtesy in aiding me in the examination of books and specimens belonging to the Academy.

GENUS **PARTULA** FERUSSAC. 1819.

Helix Müll. — *Otis* Humph. — *Auris* Chem. — *Bulimus* Brug. — *Volute* Dill. — *Partulus* Beck. — *Partula* Pfr., W. H. Pease, O. Semper, W. G. Binney.

[All species marked with a dagger are embraced in my collection — Species are printed in SMALL CAPITALS; synonyms, in *Italics*.]

P. ABBREVIATA MOUSS., J. C., xvii. p. 339, pl. 15, f. 7, 1869. Island Tutuila, Gräffe.

† P. *abbreviata* Pse. Mss. (non Mouss.), Mus. Godeff. Cat., v. p. 91, 1874. Island Raiatea, Garr. = P. *Thalia*.

† P. ACTOR Albers, (*Partulus*) Helicien, p. 87, 1850. Belcher Island.

P. *adusta* Garr. Mss. in litt. Tahiti, Garr.

† P. *affinis* Pse., A. J. C., iii. p. 224, 1867, Tahiti, Garr. = *lignaria*. This shell is variable in size and color; it is often confounded with small dextral examples of P. *Otaheitana*; some are more elongate than others, while a few are almost globose. In the Pease collection, a few of the latter were labelled by him P. *bacca*, Pse. Mss. The pillar tooth is often absent, and the shell is usually smaller in size than depauperated examples of P. *Otaheitana*, of a dark bay or rufous color, often with darker oblique striae, and occasionally with a dark-brown band at the periphery. The surface is always smooth, looking as though it had been oiled. All specimens of P. *rufa* from correspondents = P. *affinis*; the former is said to occur in the Caroline Islands.

† P. ALABASTRINA Pfr. (*Bulimus*), P. Z. S., p. 39, 1856. Fiji Islands, Geale. Solomon's Island, Cox.

† P. *alternata* Pse. Mss., Moorea, Garr. = P. *suturalis* Pfr.

† P. *amabilis* Pfr. (*Bulimus*), P. Z. S., p. 38, 1850. Tutuila and Anaa Islands, Tahiti, Garr. = P. *Otaheitana* var.

P. *amanda* Garr. Mss., Tahaa, Garr. = P. *faba* var.

† P. ANNECTENS Pse. (Bul.), P. Z. S., p. 671, 1864. Huaheine, Garr.

† P. *approximata* Pse., Mus. Godeff. Cat., v. p. 207, 1874. Raiatea, Garr.

† P. ARGUTA Pse. (Bul.), P. Z. S., p. 670, 1864. Huaheine, Garr.

† P. ASSIMILIS Pse., A. J. C., p. 230, pl. 15, f. 28, 29, 1867. Raratonga, Garr. This shell may prove to be a local variety of P. *varia*.

† P. ATTENUATA Pse., P. Z. S., p. 672, 1864. Raiatea, Tahiti, Garr.

P. *Australis* Brug. (Bul.), Encyc. Meth., i. No. 83, 1792. = P. *faba*.

† *P. auriculata* Brod., P. Z. S., p. 33, 1832; also Conch. Icon. Mon. Part., pl. 2, f. 11^a, 11^b, 1849. Tahiti, Garr.

P. bella Pse. Mss., Pätel Cat., p. 104, 1873. Raiatea, Garr = *P. Hebe* var. This shell has been widely distributed as *P. bella* Pse. Mss. The true *P. bella* Pse. is claimed for the next species.

† *P. bella* Pse. Mss. In Coll. A. N. S. Phila. ex auctore = *P. Amanda* Garr. Mss. = *P. faba* var., Raiatea. This shell was deposited in the A. N. S. by Mr. Pease, long anterior to the date of Pätel's Catalogue.

† *P. biangulata* Pse. Mss., Coll. Pse. = *P. faba* var.

† *P. bicolor* Garr. Mss. in litt. Huaheine, Garr. = *P. varia* var.

† *P. bicolor* Pse., P. Z. S., p. 473, 1871; also A. J. C., vii. p. 26, pl. 9, f. 4, 1872. Gual.

† *P. bilineata* Pse., A. J. C., ii. p. 201; id., iii. p. 81, pl. 1, f. 10, 1866-1867. Tahaa, Garr.

† *P. Brazieri* Pse., A. J. C., vii. p. 27, pl. 9, f. 5, 1872. Island Tutuila, Brazier; specimens in A. N. S. Phila. ex auctore = *P. Turneri*.

† *P. brumalis* Rve., Conch. Icon. Mon. Part., species 2, pl. 1, f. 2, 1849. Ponape; = *P. Guamensis*.

† *P. brevicula* Pse. Mss., Coll. Pse. = a short sinistral *P. Otaheitana*, Tahiti.

† *P. brunnea* Pse. Mss., Coll. Pse. = a dark elongated variety of *P. faba*.

† *P. bulimoides* Less., Voy. Coq., p. 326, 1829. I have no hesitation in pronouncing *upolensis*, *canalis*, *semi-lineata*, and *conica* varieties of this species.

† *P. caledonica* Pfr. (Bul.), P. Z. S., p. 387, 1861. New Hebrides. = Pfeifferi = *P. Macgillivrayi*. So far as I have been able to secure specimens of these species, it would seem that the two former are slender or depauperated varieties of the latter.

† *P. calistoma* Smeltz, Mus. Godeff. Cat., v. p. 507, 1874 = *callifera*.

† *P. calypso* O. Semper, J. C., xiii. p. 417, pl. 12, f. 5, 1863. Pelelilu. This shell, together with *P. Thetis* and *P. Leucothoe*, are all from one island; the figures are all of one type, differing only in size and coloration.

† *P. canalis* Mouss., J. C., xiii. p. 132, 1869. Tulare, Upolu, Garr. = *Bulimoides*, yellow sinistral variety.

† *P. callifera* Pfr., P. Z. S., p. 333, 1856. Raiatea, Garr.

P. Cepolensis Mouss. Mss., Pätel, Cat., p. 83 = *Upolensis*.

† *P. carterensis* Quoy et Gaim, (Helix), Voy. Astro., ii. p. 117, pl. 9, f. 10, 11, 1830. Specimens of *P. spadicea* are sometimes confounded with this species. *P. carterensis* is more solid and slender, the spiral striæ are almost obsolete, and more widely separated than *P. spadicea* and varieties. In the former, the denticle on the columella is absent, while in the latter it is always present.

† *P. castanea* Garr. Mss. in litt. Faaloo valley, N. E. coast of Raiatea, Garr. = *P. terrestris*.

† *P. citrina* Pse., A. J. C., ii. p. 195, 1866. Raiatea, Garr. = *P. faba* var.

† *P. cinerea* Albers, Moll. Blat., p. 98, 1857. Solomon's Island, Dr. Cox. The spiral striæ in this shell are more regular, less waved and crowded than in *P. spadicea* and varieties, some examples of which it resembles.

† *P. CLARA* Pse., P. Z. S., p. 671, 1864. Tahiti, Garr. In the Smithsonian collection this species is regarded as = *P. hyalina*; it is doubtless a good species. Mr. Garrett informs me that it seems to be rapidly disappearing from the island of Tahiti.

† *P. cognata* Pse. Mss., Mus. Godeff. Cat., v. p. 92, 1874. Huaheine, Garr. = *P. rosea* var.

† *P. COMPACTA* Pse., A. J. C., ii. p. 200; Id. iii. p. 81, pl. 1, f. 9, 1866-67. Raiatea, Garr. This shell possesses the keyhole aperture of *P. auriculata*; it is a good species.

† *P. COMPRESSA* Pfr. Mss. (Bul.), Mus. Cuming, Conch. Icon. Mon. Part., species 20, pl. 4, f. 20, 1850, Fiji Islands, coll. Taylor. This shell is very rare in collections.

† *P. CONCINNA* Pse., A. J. C., vii. p. 196, 1872. Tanna, New Hebrides. Mr. Pease remarks, "This shell is the type of *P. repanda*"; it resembles it in contour, but is less than half the size of *P. repanda*.

† *P. conica* Gould, Proceedings Boston Soc. Nat. Hist., p. 196, 1848. Rarkaa and Samoa Islands, Gould. Upolu, Garr. Tulare, Navigator's Islands, Cox = *P. bulimoides*.

P. Cookiana Mouss. Mss., p. 28, f. 28, 29. Raratonga (Garr. in litt.) = *P. assimilis*?

† *P. Cori* Angas, Cox, Cat. Land Shells of Solomon's Island, p. 46, 1868. Ysabel and Solomon's Island, Dr. Cox. I have been unable to find any notice of this shell except in the catalogue of Dr. Cox. Specimens labelled *P. Cori* from several correspondents = *P. grisea*; those from Dr. Cox = *P. micans*.

† *P. CRASSILABRIS* Pse., A. J. C., ii. p. 199; Id. iii. p. 81, pl. 1, f. 6, 1866, 1867. Raiatea, Garr.

† *P. crassa* Pse. Mss., Mus. Godeff. Cat., v. p. 92, 1874 = a sinistral short heavy specimen of *P. Otaheitana*. Tahiti.

P. crassiuscula Garr. Mss. in litt. in Mus. Godeff. Pacific Isls., Garr.

† *P. decorticata* Pse. Mss., Coll. Pse. Raiatea = *P. dentifera* denuded of epidermis.

† *P. DECUSSATULA* Pfr., P. Z. S., p. 131, 1850. Con. Icon. Mon. Part., species 24, pl. 4, f. 23, 1849. Dominique, Marquesas, Garr. Samoa, Pse. Navigator's Isls., Dr. Cox.

† *P. DENTIFERA* Pfr., P. Z. S., p. 85, 1852. Raiatea, Garr. Solomon's Island, Dr. Cox.

P. diminuta C. B. Adams, Ann. Lyc. Nat. Hist., v. p. 81, 1850. Society Islands. I have been unable to identify this shell. It would seem that the types in the Adams collection are lost. From the description I am inclined to believe it a variety of that protean species *P. Otaheitana*.

† *P. DUBIA* Garr. Mss. in litt. Tahaa, Garr. = *fabia dentate* var.*

† *P. elongata* Pse., A. J. C., ii. p. 196; Id. iii. p. 81, pl. 1, f. 2, 1866-67. Moorea, Garr. = *P. spadicea* var.

* Andrew Garrett, of Huaheine, will describe the Mss. species of Mr. Pease and himself which are marked as good species in this catalogue.

P. Erhelii Morelet, J. C., iv. p. 371, pl. 12, f. 7, 8, 1853. Moorea = simulans ?

† *P. EXPANSA* Pse., A. J. C., vii. p. 26, pl. 9, f. 3, 1871. Tutuila, Brazier, type in A. N. S. ex auctore. An examination of the animal and embryo of this species is necessary to establish its claim to a place in the genus *Partula*.

P. extensa Pse., P. Z. S., p. 473, 1871. This is an error in name for *P. expansa*. See Pfr. Mon. Helic., viii. p. 204.

† *P. FABA* Martyn (Limax), Universal Conch., ii. p. 67, central figs., 1784. Raiatea, Garr.

† *P. fasciata* Pse., A. J. C., ii. p. 202, 1866. Marquesas, Garr. = *P. Ganymedes* small var.

† *P. FILOSA* Pfr., P. Z. S., p. 262, 1851. Tahiti, Garr. Navigator's Isls., Cox.

† *P. FORMOSA* Pse. Mss., Coll. Pse. Raiatea, Garr. This shell is common in collections, and by Cuming was considered to = *P. dentifera*. It is a much larger and finer colored shell than *P. dentifera*, from which it is doubtless distinct. The latter is always much smaller, of a greenish-yellow color, with a yellow apex, while *P. formosa* is always pale reddish, or orange red, with a dark red apex.

† *P. FUSCA* Pse., A. J. C., ii. p. 193, 1866. Raiatea, Garr. The types of *P. fusca* in the Museum of Comparative Zoölogy are young, immature shells, and = *P. ovalis* and *P. lugubris*, as generally found in collections. When large quantities of the above species are compared with *P. protea* Pse., they may be arranged in the following order, from the junior to the adult shell: *P. lugubris* = *P. ovalis* = *P. protea* = *P. fusca*. Some well-grown *P. fusca* are as large as examples of *P. faba*, which they somewhat resemble. In the Smithsonian collection, *P. fusca* is marked as equalling *P. faba*. This, however, is an error, as *P. faba* is arboreal, while *P. fusca* is terrestrial. These varieties of *P. fusca* are all terrestrial, and all inhabit the island of Raiatea.

† *P. GANYMEDES* Pfr. (Bul.), P. Z. S., p. 39, 1850; also Conch. Icon. Mon. Part., species 16, pl. 3, f. 16, 1846. Dominique, Marquesas, Garr.

† *P. GARRETTII* Pse., P. Z. S., p. 672, 1864. Raiatea, Garr.

† *P. GIBBA* Fér., Prod., p. 66, No. 3, 1822; also Conch. Icon. Mon. Part., species 15, f. 15^a, 15^b. Island Guam.

† *P. globosa* Pse. Mss., Coll. Pse., Mus. Godeff. Cat., v. p. 207. Raiatea, Garr. = *P. Hebe* var.

† *P. GLUTINOSA* Pfr., P. Z. S., p. 85, 1852. Navigator's Islands, Solomon's Island, Cox.

† *P. gonocheila* Pfr. (Bul.), Zeit. fur Malacol., p. 82, 1847; also Conch. Icon. Mon. Part., species 19, pl. 4, f. 19, 1850 = *P. Ganymedes*. I possess a shell said to be from Dominique, the exact counterpart of Reeve's figure, color included. This shell does not agree with specimens of *P. gonocheila* in the British Museum, or with the figure of *P. gonocheila* in Chemnitz. I am at a loss to account for the discrepancy, unless it is to be found in a habit of Cuming, substituting what he considered better specimens for those already in the British Museum collection. My shells are certainly *P. Ganymedes*.

† *P. gracilis* Pse., A. J. C., ii. p. 197, iii. p. 81, pl. 1, f. 3, 1866-67 = *P. attenuata*.

† *P. gracilior* Pse. Mss., specimens in A. N. S. Isabel Island = *P. gracilis*.

† *P. GRISEA* Lesson (Bul.), Voy. Coquill., xiii. p. 325, pl. 13, f. 11, 1829. New Guinea. I often receive this shell from correspondents and others as *P. Coxii*. My shells all agree with the figure and description of *P. grisea*.

† *P. GUAMENSIS* Pfr. (Bul.), Phil. Abbild. und Beschreib. Conch., ii. p. 113, pl. 4, f. 9, 1821. Guam, Ladrone Islands. The spiral rows of foveæ at the apex of the shells of all *Partulæ*, both embryo and adult, are not visible on the embryos of this species sent to me from the Museum of Comparative Zoölogy, which, in the absence of an examination of the animal, leads me to doubt its being a true *Partula*.

† *P. HEBE* Pfr. (Bul.), r. Z. S., p. 39, 1846. Reeve, Mon. Part., species 25, pl. 4, f. 25, 1850. Raiatea, Garr.

† *P. HYALINA* Brod., P. Z. S., p. 32, 1832. Tahiti = *Mauguaia*, Garr. Rurutu, Le Cage. Tumaco, Cuming.

† *P. Huahinensis* Garr. Mss., Mus. Godeff. Cat., v. p. 92, 1874. Huaheine, Garr. = *P. varia* var.

† *P. IMPERFORATA* Pse. Mss., Mus. Godeff. Cat., v. pp. 92, 207, 1874. Raiatea, Garr.

† *P. INFLATA* Rve., P. Z. S., p. 197, 1842; also Rve., Mon. Part., species 3, f. 3^a, 3^b, 1849. Dominique, Marquesas, Garr.

† *P. Isabellina* Pfr. (Bul.), P. Z. S., p. 39, 1846. Rve., Mon. Part., species 10, f. 8^b, 1849 = *P. Otaheitana* var. Tahiti.

† *P. labiata* Pse. Mss., Mus. Godeff. Cat., v. p. 207, 1874 = *P. dentifera* Raiatea.

† *P. LÆVIGATA* Pfr., P. Z. S., p. 334, 1856.

P. Leucothoë O. Semp., J. C., xiii. p. 419, pl. 12, f. 5, 1865. Peleliu; see *P. Calypso*.

† *P. LIGNARIA* Pse., P. Z. S., p. 671, 1864. Tahiti, Garr. This shell very nearly approximates, if it is not identical with, *P. affinis*. I have arrived at this conclusion after the examination of a quart of each variety.

P. LINEATA Lesson (Bul.), Voy. Coquill., p. 324, pl. 7, f. 8, 9, 1826. Oualan, Friendly Islands. This species has been erroneously referred to *P. vexillum*. I regard it as differing from all others with which I am acquainted.

† *P. lilacina* Pfr. (Bul.), P. Z. S., p. 334, 1856. Bora-bora Isl. = *P. lutea*. Through the kindness of Edgar A. Smith, F. Z. S., of the British Museum, I have been enabled to establish the true position of this species. *P. lilacina* Pfr. is a highly colored specimen of *P. lutea* Less.; while *P. solidula* Rve., as figured in his Monograph of *Partula*, is a large and fully developed specimen of *P. lutea* without color.

† *P. lineolata* Pse., A. Z. C., iii. p. 224, 1867. Tahiti, Garr. = *P. filosa*. The type of *P. filosa* in the Brit. Mus. confirms the identity of *P. lineolata* with *P. filosa*.

† *P. LIRATA* Mouss., J. C., xviii. p. 126, 1870. Tavinnu, Viti Isles, Garr.

P. lugubris Pse., P. Z. S., p. 672, 1864. Raiatea, Garr. = *P. fusca* Jr.; see *P. fusca*.

† *P. LUTEA* Less., Voy. Coquill., p. 325, 1856. Bora-bora Isl., Garr.

† *P. MACGILLIVRAYI* Pfr., P. Z. S., p. 97, 1855. Annietium Isl., New Hebrides, Cox. This shell is described and figured from a large ventricose and weather-beaten example.

† *P. marginata* Garr. in litt. Tahaa, Garr. = *P. faba* var.

† *P. Mastersii* Pfr., P. Z. S., p. 110, 1857. Guam, Ladrone Islands, Dr. Masters = *P. gibba* var.

P. maura Grateloup, Actes Soc. Linn. Bordeaux, xi. pl. 12, f. 4, 1837 = *P. Otaheitana* original var.

† *P. MICANS* Pfr., P. Z. S., p. 138, 1852. Solomon's Isl., Dr. Cox. This is the smallest *Partula* known, being much less than *P. minuta* Pfr.

† *P. megastoma* Pse. Mss., Mus. Godeff. Cat., v. p. 92, 1874. Raiatea, Garr. = *P. callifera*.

† *P. microstoma* Pse. Mss., Coll. Pse. type = *P. vittata* Pse. without a pillar tooth.

† *P. MOOREANA* W. D. Hart., P. A. N. S., p. 229, 1880. Moorea, Garr. Coll. A. N. S. and Mus. Comp. Zoöl.

† *P. mucida* Pfr., P. Z. S., p. 98, 1855. The type of this shell in the British Museum = a large dark specimen of *P. varia*.

P. MINUTA Pfr., P. Z. S., p. 384, 1856. Admiralty Island. This species is more globose than any other described *Partula*.

P. NAVIGATORIA Pfr. Mss., Rve., Mon. Part., species 21, pl. 4, f. 21, 1849. Raiatea, Garr.

† *P. nitens* Pfr., P. Z. S., p. 293, 1854. New Hebrides, Taylor coll. This shell only differs from specimens of *P. affinis* in possessing a broad, light band, beginning at the base, and becoming narrower towards the apex; it has the form, button-like pillar tooth, and polished surface of *P. affinis*. A similar specimen occurred amongst the Pease duplicates of *P. affinis* from Tahiti.

† *P. NODOSA* Pfr., P. Z. S., p. 262, 1851. Tahiti, Samoa, Garr. Specimens of this shell in A. N. S. Phila. ex auctore from Tahiti = dark specimens of *P. trilineata* Pse. Some have a broad white band beneath the suture, which is extended to the base of the shell; others are dark fuscous, with a narrow white line beneath the suture; the latter agree with the figure of *P. nodosa* in Chemnitz.

† *P. nucleola* Pse. Mss., Mus. Godeff. Cat., v. p. 92, 1874. Coll. Pse. Moorea, Garr. This shell equals short depauperated specimens of *P. spadicea*.

P. OBESA Pse., A. J. C., iii. p. 223, pl. 15, f. 12, 1867. Islands Fortuna and Vavao, Gräff. The figure of Mr. Pease resembles a *Bulimus*; the type specimen in the Pease collection is lost.

† *P. OTAHEITANA* Brug., Ency. Method., i. p. 347, No. 84, 1792. Tahiti. The original description of this shell calls for "a heavy brown sinistral shell, oblong, ovate, perforate, aperture semioval, unidentate." Mr. Garrett informs me that this variety occurs near the old anchorage, and is probably the original type. Large quantities of this shell exhibit all the varieties merging into each other. Small dextral specimens are often confounded with *P. affinis*. On the other hand, large, well-developed sinistral specimens, with or without a dentile, as *P. Reeve-*

ana, *P. Isabellina*, and *P. Pacifica*, have been regarded as separate species. The sinistral forms have not been less fortunate in adding to the confusion in synonymy; they vary in size and color in an equal degree with the dextral. The synonyms of *P. Otaheitana* Brug. may be enumerated in the order of seniority as follows: *P. Otaheitana*, *P. Vanikorensis*, *P. maura*, *P. Tahulana*, *P. Isabellina*, *P. amabilis*, *P. rubescens*, *P. Reeveana*, *P. Pacifica*, *P. Tahitana*; manuscript species, *P. sinistrorsa*, *P. crassa*, *P. sinistralis*, *P. brevicula*, *P. perversa*, *P. turricula*, *Pse. Mss.* (non *Pse.* in A. J. C.).

† *P. ovalis* *Pse.*, A. J. C., ii. p. 194, 1866. Raiatea = *P. protea*. See *P. fusca*.

† *P. Pacifica* Pfr., P. Z. S., p. 125, 1854. This species probably = a large dextral *P. Otaheitana* without a pillar tooth.

† *P. pallida* *Pse.*, *Mss. Coll. Pse.* = a pale elongate variety of *P. faba*.

P. PEASII Cox, P. Z. S., p. 644, pl. 52, f. 2, 1871. Solomon's Island, Dr. Cox.

† *P. peraffinis* *Pse.*, *Mss. Mon. Helicien*, viii. p. 197 = *P. elongata* (Pfr.).

† *P. perversa* *Pse.*, *Mss. Coll. Pse.*, *Coll. Brit. Mus.* = *P. Otaheitana* sinistral.

† *P. perplexa* *Pse.*, *Mss. Coll. Pse.*, Huaheine = *P. varia* var. This is one of the most beautiful varieties of *P. varia*. I only detected five specimens in several quarts of *P. varia* from Huaheine.

P. PELLUCIDA *Pse.*, P. Z. S., p. 457 = 1871. Guadeleamar, Solomon's Island. "A small shell with a distinctly granular surface" (*Pse.*), possibly a *Bulimus*.

† *P. Pfeifferi* Cross, J. C., xix. p. 184, 1871. Vanna-Levu, Banks Island, New Hebrides = *P. Caledonica*.

† *P. pinguis* Garr., *Mss. in litt.* The form of aperture resembles *P. rustica*, but in size it approximates *P. Thalia*. It is a terrestrial species, and probably = *P. rustica*.

† *P. PLANILABRUM* *Pse.*, P. Z. S., p. 672, 1864. *Coll. Pse.* Tahaa, Garr.

† *P. PRODUCTA* *Pse.*, P. Z. S., p. 671, 1864. Tahiti, Garr. This is a terrestrial species, and may be confounded with dextral banded *P. Otaheitana* without a pillar tooth.

† *P. propinqua* *Pse.*, *Mss. Coll. Pse.*, Tahaa. Mr. Pease, in a label attached to this species, remarks: "I regard this and *P. subangulata* as only local varieties of *P. faba* from Tahaa," — an observation applicable to many other so-called species of *Partula*.

† *P. protea* *Pse.*, *Mss. Mus. Godeff. Cat.*, v. p. 92, 1874. Raiatea, Garr. = *P. fusca* var. See *P. fusca*.

† *P. pulchra* *Pse.*, *Mss. Mus. Godeff. Cat.*, v. p. 92, 1874. Huaheine, Garr. = *P. varia*, minor form.

† *P. purpurascens* Pfr., P. Z. S., p. 335, 1856 = *P. rosea*, purple variety.

† *P. RADIATA* *Pse.*, *Mss. Coll. Pse.*, *Coll. A. N. S.*, ex auctore. Raiatea, Garr. This is a good species; it has been widely distributed by Mr. Pease and others as *P. compressa* Pfr. The former possesses very coarse oblique striæ, widely reflected lip, with a keyhole aperture, a pillar tooth, and a slight carination at the periphery; while the latter is a smooth shell, with a slightly reflected lip, and the pillar tooth is absent.

† *P. radiolata* Pfr. (Bul.), P. Z. S., p. 39, 1849; also Rve. Mon. Part., species 6, pl. ii. f. 6^a, 6^b, 1850. Guam, Cuming. New Ireland, Dr. Cox.

† *P. Raiatensis* Garr. Mss. in litt. Raiatea, Garr. This shell = *P. dentifera*, with a rose apex. In two quarts of *P. dentifera* belonging to the duplicates of the Pease collection about one sixth of the number possessed the rose apex; they did not differ in other respects from *P. dentifera*.

† *P. Reeveana* Pfr., P. Z. S., p. 137, 1852. Solomon's Island, Dr. Cox. Large dextral specimens of *P. Otaheitana* from Tahiti, of a yellow color, red apex, and a pillar tooth, agree with types of *P. Reeveana* in the British Museum, and also with the figure of *P. Reeveana* in Chemnitz.

† *P. recta* Pse., A. J. C., iv. p. 155, pl. 12, f. 8, 1868. Mountains Mauui and Nukahiva, Marquesas = *P. repanda*. I possess a number of specimens of this species from the collection of the late William H. Pease. It is very variable in shape, color, and texture. Some specimens are yellowish-white, solid, and covered with a greenish epidermis, easily rubbed off, with a perpendicular aperture, and the inner margin of the aperture waved or roughened. This variety represents *P. recta* Pse.; others are pale yellow, white, or yellowish-white, often thin and inflated, with the aperture oblique or perpendicular, and slightly roughened; others, again, are pale red, with the basal half several shades deeper in color. These two latter varieties represent *P. repanda*. In one and a half pints of duplicates in the collection of William H. Pease, the specimens exhibited a perfect inosculation of these apparently dissimilar species.

† *P. recta* Pse. Mss., Raiatea, Garr. Coll. Pse. (non *P. recta* Pse. in A. J. C.). This shell is also synonymous with *P. Peaseana*, Garr. Mss. (non *Peasii*, Cox). = *P. labiata* Pse. Mss. in A. N. S., ex auctore, which latter = *P. dentifera* var.

P. Recluziana Petit, J. C., v. p. 170, pl. 7, f. 5, 1850 = *P. actor*.

† *P. REPANDA* Pfr., P. Z. C., p. 98, 1855. New Hebrides? Dr. Cox. Water-color drawings from types in the British Museum agree with specimens from Marquesas. See *P. recta* Pse. in A. J. C.

† *P. ROSEA* Brod., P. Z. S., p. 125, 1832. Huaheine, Garr.

† *P. rubescens* Rve., Mon. Part., No. 12, pl. 3, f. 12, 1850 = *P. Otaheitana* var.

† *P. robusta* Pse. Mss., Coll. Pse., Coll. Smithsonian, Raiatea, Garr. = *P. auriculata* var.

P. rufa Lesson (Bul.), Voy. Coquill., p. 324, 1830. Oualan, Caroline Islands. Since the publication of my Catalogue of the Genus *Partula* Fér. in May of this year, and while the present Bibliographic Catalogue was in press, Prof. von Martens has published in *Conchologia Mittheilung* for 1881 the description and figure of a *Partula* from the island of Ponape, which he has no doubt is *P. rufa* Less., and which he makes synonymous with *P. Guamensis* Pfr. The figures of his shell materially differ in size and form from *P. Guamensis* Pfr., and, in my opinion, approximate dextral examples of *P. Upolensis* Mouss. Mss., which = depauperated examples of *P. bulimoides* Less.; the smaller size, conic form, wide umbilicus, and violet color within, together with other characters enumerated,

seem more applicable to the latter than the former species. Unfortunately Lesson never published a figure of *P. rufa*.

† *P. rustica* Pse., A. J. C., ii. p. 199; id. p. 81, pl. 1, f. 5, 1866-67. Raiatea, Garr. = *P. crassilabris*. After examining large quantities of these two so-called species, I have arrived at the conclusion that they are one. Typical *P. crassilabris* is more rounded in form, while *P. rustica* is more elongate, and the columella is indented from without, giving the aperture an angular appearance. The colors agree, and large numbers of each exhibit the inosculation of the two varieties. They are both terrestrial, from the same island, and doubtless identical.

† *P. semilineata* Mouss., J. C., xvii. p. 337, 1869, Coll. Mus. Godeff. = *P. conica*, sinistral yellow var.

† *P. sinistrorsa* Pse. Mss., Mus. Godeff. Cat., v. p. 92, 1874. Tahiti, Garr. Coll. Pse. I have considered this shell to = *P. Otaheitana*, banded var. It certainly inosculates with the original brown *P. Otaheitana*, as we see examples of the latter with one or two dark bands.

† *P. sinistralis* Pse. Mss., Pâtel Cat., p. 104, 1873. Tahiti. Olim *P. sinistrorsa*?

† *P. simplaria* Morelet, J. C., iv. p. 370, pl. 11, f. 13, 14, 1853. Huaheine = *P. rosea* var.

† *P. simulans* Pse., A. J. C., vii. p. 202; id., iii. p. 81, pl. 1, f. 1, 1866-67. Moorea, Garr. = *P. spadicea* var.

† *P. solidula* Rve. Mon. Part., species 2, pl. 4, f. 22, 1850. Bora-bora, Garr. = *P. lutea* var.

† *P. solidula* Pse. Mss., Coll. Pse. (non Rve.). Raiatea = *P. approximata* banded var.

† *P. spadicea* Rve., Mon. Part., species 24, pl. 4, f. 24, 1850. Moorea, Garr. Marquesas, Rve. The synonyms of this species I arrange as follows: *P. tæniata*, *P. spadicea*, *P. elongata*, *P. simulans*, *P. striolata*, *P. nucleola*. A microscopic examination of the surface of these varieties exhibits it thickly crowded with waved spiral striæ, exceeding in this respect all other species. A small tubercle is present on the columella of all the varieties, and the junction of the lip with the body whorl presents the appearance of having been cut off obliquely outwards, leaving a sharp elevation, which is seldom surrounded by callus. Large quantities from Moorea exhibit all these varieties, merging into each other. All the varieties exhibit translucent or horn-colored specimens with dark bands of greater or less width, which equal *P. tæniata*.

† *P. strigata* Pse., A. J. C., iv. p. 155, pl. 12, f. 7, 1863; also Rve. Mon. Part., pl. 3, f. 17. Marquesas? Rve. Huaheine, Garr. Coll. Pse., Coll. A. N. S., ex auctore = *P. varia* var.

† *P. strigosa* Pfr., P. Z. S., p. 384, 1856. Admiralty Island, Pfr., Moorea = *P. suturalis* Pfr.

† *P. striolata* Pse., A. J. C., ii. p. 197; id., p. 81, pl. 1, f. 4, 1866-67 = *P. spadicea* var. Moorea.

† *P. STENOSTOMA* Pfr., P. Z. S., 97, 1855. Moorea.

† *P. STOLIDA* Pse., A. J. C., ii. p. 198, 1868. Raiatea, Garr. This shell is

sometimes confounded with *P. affinis*. It is larger than the latter, of a light bay color, and is terrestrial.

† *P. suturalis* Pse. Mss. (non Pfr.) = *P. planilabrum*, dark var. Tahaa, Garr.

† *P. SUTURALIS* Pfr., *P. Z. S.*, p. 98, 1855. Moorea.

† *P. subangulata* Pse., *J. C.*, 3d series, p. 458, 1871. Tahaa, Garr. = *P. faba* var., Coll. Pse., Coll. Smithsonian.

† *P. SUB-GONOCHEILA* Mouss., *J. C.*, xix. p. 14, pl. 3, f. 4, 1871. Fortuna and Vavao, Gräff.

P. Tahitana Brug. (Gould), *Conch. U. S. Explor. Exped.*, i. p. 84, 1849-50 = *P. Otaheitana*.

P. Tahulana Anton, *Ant. Verz.*, p. 40, No. 1470, 1839 = *P. Otaheitana*.

† *P. TÆNIATA*, Mörch (Bul.), *Cat. Con. Kierulf*, p. 29, pl. 1, f. 5, 1840. Fiji Islands, Mörch, Moorea Coll., Pse. Specimens of this shell from Mr. Geale are translucent, with dark bands. I possess numerous similar shells from Moorea. Mörch says: "My shell, together with *P. faba*, was purchased of a whale-fisher, who gave the locality as Fiji Islands."

† *P. terrestris* Pse. Mss., Coll. Pse., Pätel Cat., p. 104, 1873. Raiatea, Garr. = *P. approximata*.

P. Thetis O. Semp., *J. C.*, xiii. p. 419, pl. 12, f. 6, 1865. Peleliu. See *P. Calypso*.

P. Thersites Pfr. (Bul.), *Symbola*, ii. p. 52, 1846. Dominique, Tiawata, Marquesas, Garr. = *P. inflata*.

† *P. THALIA* Garr., Mss. in litt., Raiatea, Garr. = *P. Peasii* Garr. Mss. (non *P. Peasii* Cox) = *P. abbreviata* Pse., Mss. (non Mousson). This shell has been distributed as *P. abbreviata* Pse., Mss. It is a good species.

P. torosus Beck (Partulus), Beck's Index, p. 87, No. 6, 1837 = *P. lineata*?

† *P. trilineata* Pse., *A. J. C.*, ii. p. 195; id. iii. p. 81, pl. 1, f. 1, 1866, 1867. Tahiti, Garr. = *P. nodosa*.

† *P. TURRICULA* Pse., *A. J. C.*, p. 196, 1872. New Hebrides. Mr. Pease observes that "this shell is smooth, without any trace of transverse striæ." Under a low power the spiral rows of embryonic foveæ at the apex of the shells of all Partulæ (and which, after extrusion, are continued as spiral striæ) in this species, are continued as spiral rows of foveæ over the whole surface, differing in this respect from all other Partulæ with which I am acquainted.

† *P. turricula* Pse., Mss. Coll. Pse. = *P. Otaheitana* var. *rubescens*. Tahiti.

P. TURGIDA Pse. (Bul.), *P. Z. S.*, p. 670, 1864. Raiatea, Garr. Mr. Pease remarks: "This shell resembles *P. arguta* and *P. annectens*." It is a rare species.

† *P. Turneri* Pfr., *P. Z. S.*, p. 140, 1860. Erromango Island, New Hebrides, Turner = *P. Macgillivrayi*. The former has been described from a fresh specimen, while the latter was described and figured from an old and weather-beaten specimen, unusually inflated. See *P. Brazieri*.

† *P. UMBILICATA* Pse., *A. J. C.*, ii. p. 200; id., iii. p. 81, pl. 1, f. 7, 1866, 1867. Tahaa, Garr.

† *P. Upolensis* Mouss. Mss., Pätel. Cat., p. 104, 1873. Upolu Coll., A. N. S.

= *P. bulimoides*. I possess this shell from the Museum Godeffroy. It = a small, dark *P. bulimoides*. In Europe the typical *P. bulimoides* is called *P. canals*, the small dark variety *P. Upolensis*, the sinistral greenish-yellow variety *P. conica*. These, however, are only varieties of one species, and are all embraced in Dr. Gould's description of *P. conica* "interdum sinistrorsa flavida vel castanea." Like *P. repanda*, they are found only on mountains.

† *P. VARIA* Brod., *P. Z. S.*, p. 125, 1832. Huaheine, Garr. The following synonyms of this species are enumerated in the order of seniority: *P. mucida*, *P. assimilis*, *P. strigata*; manuscript species, *P. pulchra*, *P. Cookiana*, *P. perplexa*, *P. Huaheinensis*, *P. bicolor*, Garr. (non *Pse.*).

P. Vanicorensis Quoy et Gaim (*Helix*), *Voy. Astrolabe*, ii. p. 115, pl. 9, f. 12-17, 1830. The original description and figure of this shell agree with dextral specimens of *P. Otaheitana*, without a denticle. In collections it is sometimes represented by *P. affinis*, and in others by *P. Otaheitana*. Dr. Gould says, "It only differs from *P. Otaheitana* in the lighter color of the animal."

† *P. variabilis* *Pse.*, *A. J. C.*, ii. p. 203; id., p. 81, pl. 1, f. 13-15, 1866-67. Raiatea, Garr. = *P. Navigatoria*. This shell is the true *P. Navigatoria* Pfr., agreeing with Reeve's figure and description, as well as with the types of *P. Navigatoria* in the British Museum. Dr. Pfeiffer says, "My *Navigatoria* in the British Museum was by Cuming confounded with another shell." From a number of specimens in the Pease collection, labelled "*P. Navigatoria* Pfr., from the British Museum," I infer that *P. protea* is the shell alluded to by Pfeiffer. The possession of these doubtless led Mr. Pease to redescribe this shell.

† *P. ventrosa* Garr., *Mss. in Litt.* Raiatea, Garr. = *P. Hebe* var.

† *P. ventricosa* *Pse.*, *Mss. Coll. Pse.*, Tahaa = *P. faba* var. (Anthony).

† *P. vexillum* *Pse.*, *A. J. C.*, ii. p. 198; id., iii. p. 81, pl. 1, f. 8, 1866-67. Moorea, Garr. Reeve figures this shell for *P. lineata* Lesson; others confound it with *P. elongata* *Pse.* It = *P. stenostoma* Pfr. See Pfeiffer's *Novitates Conchologicae*.

† *P. VITTATA* *Pse.*, *A. J. C.*, ii. p. 194, 1866. Raiatea, Garr.

† *P. VIRGINEA* *Pse.* *Mss.*, *Coll. Pse.* Tahaa, Garr.

† *P. VIRGULATA* *Pse.*, *J. C.*, 3d series, x. p. 401, 1870. Raratonga, Garr.

† *P. zebrina* Gould, *Proc. Bost. Soc. Nat. Hist.*, vii. p. 196, 1842. Tutuila, Gould, Upolu, Garr., Belcher Island, *Coll. Taylor* = *P. actor*. Dr. Gould's type of this shell is preserved in the collection of the New York State Museum of Natural History and also in the Smithsonian collection. The figures of this shell in "Expeditionary Mollusks" are dissimilar; figure 80 is probably an error; figure 81, containing the animal, is the true *P. zebrina*.

The following species and varieties, so far as known, are Terrestrial ; all others are Arboreal.

<i>P. approximata</i> Pse.	<i>P. protea</i> Pse. Mss.
<i>P. castanea</i> Garr. Mss.	<i>P. producta</i> Pse.
<i>P. crassilabris</i> Pse.	<i>P. radiata</i> Pse. Mss.
<i>P. fusca</i> Pse.	<i>P. robusta</i> Pse. Mss.
<i>P. lugubris</i> Pse. Mss.	<i>P. rustica</i> Pse.
<i>P. microstoma</i> Pse. Mss.	<i>P. solidula</i> Pse. Mss., non Reeve.
<i>P. Navigatoria</i> Pfr.	<i>P. stolidula</i> Pse.
<i>P. ovalis</i> Pse. Mss.	<i>P. terrestris</i> Pse. Mss.
<i>P. pinguis</i> Garr. Mss.	<i>P. variabilis</i> Pse.
<i>P. planilabrum</i> Pse.	<i>P. vittata</i> Pse.

SPURIOUS SPECIES OF PARTULA.

<i>P. arcuatus</i> Mighls. = <i>Achatinella auriculata</i> Fér.
<i>P. auriculata</i> Pfr. = <i>Tornatella</i> .
<i>P. Batavia</i> Grat. (Bul.) = <i>Amphidromus</i> .
<i>P. decussata</i> Pfr. = (Bul.).
<i>P. densilineata</i> Rve. = <i>Achatinella radiata</i> Gould.
<i>P. Dumartroy</i> Soul. = <i>Achatinella auriculata</i> Fér.
<i>P. fragilis</i> Ferr. = <i>Bul. rubens</i> Muhl.
<i>P. flavescens</i> King. = <i>Bul.</i>
<i>P. labrella</i> Grat. = <i>Bul. virgatus</i> Jay.
<i>P. major</i> Desh. = <i>Bul. fulvicans</i> Pfr.
<i>P. Maximilliana</i> Pot et Michd. = <i>Bul.</i>
<i>P. pusilla</i> Gould = (<i>Auriculella</i>).
<i>P. pudica</i> Fér. = <i>Bul.</i>
<i>P. Solomonis</i> Pfr. = (Bul.).
<i>P. unidentata</i> Sowb. = (Bul.).
<i>P. virgulata</i> Mighls. = (<i>Achatinella</i>).

Observations on the Duplicates of the Genus PARTULA Fér., contained in the Museum of Comparative Zoölogy, Cambridge, Mass., formerly belonging to the Collection of the late William H. Pease.
By WILLIAM DELL HARTMAN, M. D.

SINCE the completion of my Bibliographic Catalogue of the Genus *Partula*, through the kindness of Prof. Alexander Agassiz of the Museum of Comparative Zoölogy, I have been favored with all the duplicates of *Partula* belonging to the institution, amounting to two bushels. An inspection of this vast amount of material has afforded me a rare opportunity of observing the relative abundance and variation of a number of species, and the notes taken at the time I offer as a supplement confirmative of the conclusions arrived at in the paper above mentioned. The original labels belonging to the different parcels were often misplaced or absent. These omissions were of no moment, as a previous study of all the species enabled me to determine the specific status of each parcel.

P. varia and *P. rosea* Brod., together with *P. faba* Mart., were in the greatest abundance, and for relative numbers were present in the order mentioned.

P. varia Brod., represented by six quarts, exhibited all the varieties mentioned by authors, all of which, however, are included by Mr. Broderip under the expressive name of *P. varia*.

P. rosea Brod. was next in abundance, in which the elongated white variety = *P. cognata* Pse. Mss. largely predominated over the rose, purple, and party-colored varieties. From the great number of examples of these two species they would seem to be very abundant.

In four quarts of *P. faba* Mart. the white and oblique striated varieties predominated over the banded variety, which latter = Martyn's type.

P. dubia Garr. Mss. was represented by two quarts. The specimens are all somewhat smaller than typical *P. faba*, always dentate, and occasionally one exhibits the brown bands of *P. faba* var. *Amanda* Garr. Mss.

P. formosa Pse. Mss., *P. lugubris* Pse., *P. Garrettii* Pse., and *P. Thalia* Garr. Mss. were next in abundance and in the order mentioned. *P. Thalia* and *P. formosa* are doubtless good species, although Mr. Cuming regarded the latter as a variety of *P. dentifera* Pfr.

P. Thalia Garr. Mss., in two quarts, was very uniform in size and color.

P. compacta Pse., in two quarts, was also uniform as to size and color. It is a much larger and heavier shell than *P. auriculata* Brod., with a heavy flat lip, and, like *P. Thalia*, it is a well-marked species.

P. auriculata Brod., in one quart, exhibited the light, unicolored, and banded varieties in about equal numbers.

P. compacta Pse., *P. Thalia* Garr. Mss., and *P. auriculata* Brod., all possess, in a greater or less degree, the "keyhole aperture," which Mr. Broderip regarded as especially characterizing *P. auriculata*. They form a group of very nearly allied species. In *P. Garrettii* Pse., about one third of the examples exhibited the shell with a brown-colored base.

A number of depauperated examples were also present in the parcel, beside several hybrids between *P. Garrettii* Pse. and *P. Thalia* Garr. Mss. These possessed the brown base of *P. Garrettii*, with the form and aperture of *P. Thalia*, but were only half the size. I received a number of the same from Mr. Garrett.

P. crassilabris Pse. and *P. rustica* Pse. were each represented by about one quart of specimens. For the most part the former were smaller and more globose than the latter. Both parcels presented numerous depauperated examples. When compared in quantity, they are seen to merge into each other by easy grades; only the extremes in form represent the two species of Mr. Pease. They are both terrestrial, and inhabit the same island, their variation being due to station and food plants. Two examples of *P. pinguis* Garr. Mss. were found in the lot of *P. rustica*. The former is doubtless only a well-fed specimen of the latter.

P. lignaria Pse. and *P. affinis* Pse. were each represented by a quart of examples; a few of each were banded. The variety *P. lignaria* as a rule is a trifle larger and darker in color, and presents more banded examples, than *P. affinis*. All the adult shells of both varieties (with few exceptions) are dentate, and both exhibit, to a greater or less extent, dark oblique striæ on the body whorl.

The parcel *P. affinis* Pse. was labelled "Faarumaia Valley, Tahiti"; about fifty examples to the quart were banded. Several albinos were present, two of which showed traces of dark bands, and a few pale examples occurred with a bright brown band continued beneath the suture to the apex. One example was found the counterpart of my specimens of *P. nitens* Pfr. from the Taylor collection, said to be from New Hebrides; and three similar banded examples were found in the lot of *P. lignaria*.

I regard these as varieties of one species ; they all possess a small elevation on the columella, with a round button-shaped pillar tooth. They vary in size somewhat, but the dark oblique striae exist, to a greater or less degree, in nearly all examples. The surface in fresh shells is always polished, looking as though oiled.

From all the examples of *P. rufa* Less., *P. nitens* Pfr., *P. lignaria* Pse., and *P. affinis* Pse., which I have seen, I am inclined to consider them varieties of one species.

P. glutinosa Pfr., in one quart, was uniform in size and color ; and so was *P. virgulata* Pse. in the same amount from Raratonga. *P. elongata*, *P. simulans*, *P. striolata*, and *P. nucleola* Pse., from the island of Moorea, were present in several pints, and doubtless belong to one species, only varying in size and color, the two last being only depauperated examples of the first. Under the microscope all exhibit the thickly crowded waved spiral striae, and all the varieties show the translucent and banded examples which = *P. tæniata* Mörch. *P. elongata* Pse., in half a pint, shows the most numerous banded examples. There were present numerous pale yellow elongated specimens, which dealers send out as *P. spadicea* Rve. In the parcel of *P. simulans* Pse., the banded examples equalled ten per cent.

P. nucleola Pse. Mss. exhibited several very dark opaque examples.

All the above varieties from Moorea possess to a greater or less degree the dark oblique striae, the elevation on the columella, the sharp oblique juncture of the labium with the body whorl, and the thickly crowded spiral striae of the surface of the shell. The latter feature is seen in no other species except *P. Mooreana* nobis, from the same island.

P. Hebe Pfr., in half a pint, exhibited nearly all the examples entirely denuded of epidermis, and without a rose apex, the specimens being entirely white and solid. These represent the typical *P. Hebe*.

P. bella Pse. Mss. = *P. rosea* var. (according to Mr. Garrett). In almost a pint, the shells possessed a rose apex and were thinner than typical *P. Hebe*. The epidermis of some of the heavier examples was thin and readily separated from the shell. Many of the more mature specimens were without epidermis. They only differ from *P. Hebe* in possessing the rose apex, and the lot exhibited the easy grade by which the latter merges into the former. A few specimens of *P. globosa* Garr. Mss. and *P. ventrosa* Pse. Mss. were found in the parcel. These varieties are more stout and heavy than ordinary examples of *P. bella*. They possess a heavy and more adherent epidermis, with little or no color at the apex. All the varieties from *P. Hebe* to *P. ventrosa* present

an elongated pillar tooth similar in shape, and all have a slight denticiform process on the columella. I possess a typical *P. Hebe* from Mr. Garrett, in which the color of the apex is centred in the pillar tooth, and another in which the whole shell is a pale rose color. These are all varieties of one species resulting from station and food plants.

Since the above was written Mr. G. W. Tryon has called my attention to four specimens of *Partula* in the collection of the Academy of Natural Sciences received a long time ago from Mr. Pease, and labelled by him *P. bella* Pse. The examples = *P. Amanda* Garr. Mss. = *P. faba* var. This it would seem is the true *P. bella* Pse. Mss., so named long anterior to the date of *P. bella* Pse. = *P. Hebe* var. in Pätel's catalogue.

P. hyalina Brod., in half a pint, was uniform in size, some being thinner and more hyaline than others, probably the result of food and age.

P. lugubris Pse. In a three-pint lot, many examples exhibited the usual white peripheral band; a few almost white examples with a black band were also present. In the adult shell it is noticeable that these bands are often concealed by the overlapping of the fifth whorl. I possess a series of examples of this species which seems to point to the fact that it and *P. fusca*, as usually found in collections, are young and immature shells, the synonymy being such as I have indicated in my Bibliographical Catalogue of the genus.

P. Guamensis Pfr. In two quarts several light-colored examples occurred possessing a narrow brown line at the periphery. Judging from the figure of *P. obesa* Pse. (no locality being given), I suggest the probability that the latter = a depauperated specimen of the former. Some examples of *P. Guamensis* are quite large, while others are much smaller than Reeve's figures. I have not been able to find the type specimen of *P. obesa* Pse. in the Pease collection, and suppose it to have been lost, as some of his types were broken in transit between Honolulu and Boston.

I think, when the animals of *P. Guamensis*, *P. bulimoides*, *P. obesa*, and *P. expansa* are examined, they will be eliminated from the genus *Partula*.

P. dentifera Pfr., in two quarts, was very uniform in size, color, and contour. It is a much smaller shell than *P. formosa* Pse. Mss., with a greenish yellow epidermis and yellow apex. About one sixth of the specimens exhibited a rose apex = *P. Raiatensis* Garr. Mss. The variety styled *P. decorticata* Pse. Mss. consists of individuals of *P. dentifera*, in which the epidermis has been denuded by the animals licking the shells of each other after hibernation has ended.

P. trilineata Pse. = *P. nodosa* Pfr., in a half-pint, were all banded and possessed a pillar tooth, except three, which were entirely dark fuscous with a narrow white sutural line; the latter = *P. nodosa* Pfr. type. *P. vexillum* Pse., in a small parcel, exhibited the dark and striated examples with or without bands (= *P. alternata* Pse.), exceeding in numbers the horn-colored shell with narrow brown bands = *P. stenostoma* Pfr. type. These two species of Mr. Pease seem to inosculate. I have received from Mr. Garrett a few very dark examples of *P. alternata* Pse., and he informs me that one in fifty examples of *P. vexillum* Pse. is sinistral.

P. citrina Pse. was present in a small lot. Mr. Pease was of the opinion that this species would eventually prove to be a variety of *P. faba*. In a recent letter from Mr. Garrett, he reiterates his opinion, previously expressed, that *P. citrina* is a good species. In the collection of Mr. Pease, kindly loaned for my inspection by the Museum of Comparative Zoölogy, a few examples were marked *P. pallida* Pse. Mss. These = elongated examples of *P. faba*, which latter is disposed to be somewhat protean, of which *P. citrina* is probably another variety, or, as Mr. Pease suggests, it may be a hybrid.

P. approximata Pse., in a small lot, exhibited one banded to twenty-five unicolored examples. My opinion in regard to this species is the same as expressed in my Bibliographic Catalogue of the genus.

P. imperforata Pse. Mss., in a pint lot, was very uniform in size and color; about half a dozen were banded. It is a larger, heavier, and more inflated shell than *P. virginea* Pse. Mss., and the surface is more roughened by oblique striæ. This shell has been supposed to = *P. solidula* Pse. Mss. (non Reeve). The type examples of *P. solidula* Pse. Mss. in the Pease collection = banded specimens of *P. approximata* Pse. Mss.

In one quart of *P. protea* Pse. the light and striated examples predominated in numbers over the dark and banded varieties. Well fed and fully developed examples approximate *P. faba* in size and form. The colors are often rusty red with a darker base, or uniformly rusty red with a broad light zone at the periphery. This last variety represents type examples from Mr. Garrett and the Museum Godeffroy. In the Smithsonian collection this shell is labelled (probably by Carpenter) *P. faba* Martyn var. The latter, however, is arboreal, while the former is terrestrial. See *P. fusca* Pse. in my Bibliographic Catalogue.

Of *P. Otaheitana* Brug. there were about two quarts; nearly all the examples were sinistral. The type or original unicolored variety was

exceeded in number by the banded variety = *P. sinistrorsa* Pse. Mss. All the latter were sinistral, and very few of the former were dextral. From the small number of dextral, as compared with the large number of sinistral examples in the lot, it would seem that the sinistral form in this species is the rule and not the exception, as obtains in some other species of *Partula*.

P. bilineata Pse., in a half-pint of examples, was shown to be a distinct and beautiful species.

P. radiata Pse. Mss. In one quart of this species about twenty banded specimens occurred which = Mr. Pease's type. The light-colored and striated examples, which Mr. Pease distributed as *P. compressa* Pfr., predominated. This shell and *P. approximata* Pse. possess the keyhole aperture, with a slight carina at the periphery. The latter feature varies in different examples. I can see no difference in these two varieties of terrestrial shells from Raiatea, except that in *P. radiata* the oblique lines of growth are more coarse than in *P. approximata*, and the latter is somewhat darker in color, which in some of the varying species of *Partula* (more especially in the terrestrial varieties) is often referable to station and food plants.

P. lineata Pse. = *P. filosa* Pfr. In one pint of this species from Tahiti, the specimens were all dentate and uniform in size; some were lighter in color than others, but all in a greater or less degree exhibited the ash-colored filiform lines characteristic of the species.

P. repanda Pfr. was represented by one and a half pints. This parcel was labelled by Mr. Pease "*P. recta* Pse. Mountains Nukahiva, Marquesas." The variety *P. repanda* Pfr. predominated in numbers over the variety *P. recta*. Dr. Pfeiffer, in his description of *P. repanda*, quotes New Hebrides as the station for the species, but his localities for *Partula* are so often incorrect or entirely omitted, that I have very grave doubts of the correctness of this one. My examples agree with the types of *P. repanda* Pfr. in the British Museum. For a farther exposition of the two varieties, see *P. recta* Pse. in my Bibliographic Catalogue of the Genus *Partula*.

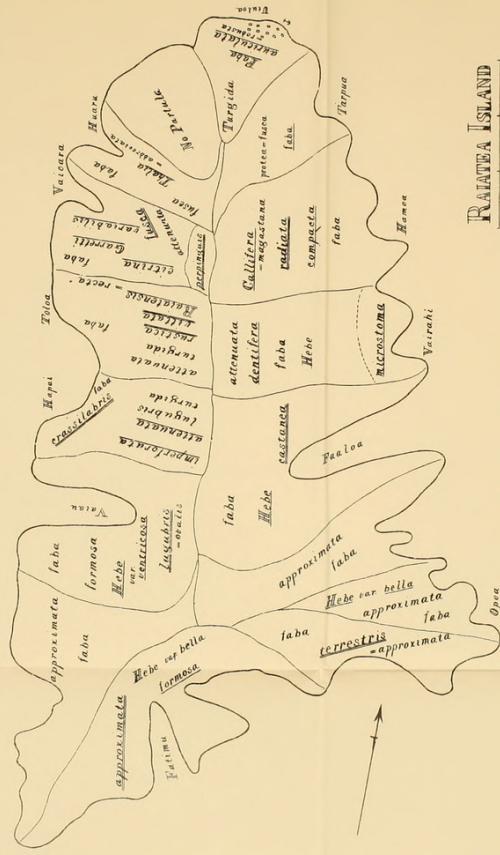
A circular diagram illustrating the geographical distribution of various species of the genus *Amblystoma*. The circle is divided into segments, each labeled with a species name and its distribution area. The segments are:

- Amblystoma* hyalina (labeled *hyalina* and *rubescens*)
- Amblystoma* lineolata (labeled *lineolata*)
- Amblystoma* attenuata (labeled *attenuata*)
- Amblystoma* ligata (labeled *ligata*)
- Amblystoma* erosa (labeled *erosa*)
- Amblystoma* producta (labeled *producta*)
- Amblystoma* sinuata (labeled *sinuata*)
- Amblystoma* hyalina (labeled *hyalina* and *rubescens*)
- Amblystoma* attenuata (labeled *attenuata*)
- Amblystoma* affinis (labeled *affinis*)
- Amblystoma* rubescens (labeled *rubescens*)
- Amblystoma* hyalina (labeled *hyalina* and *rubescens*)

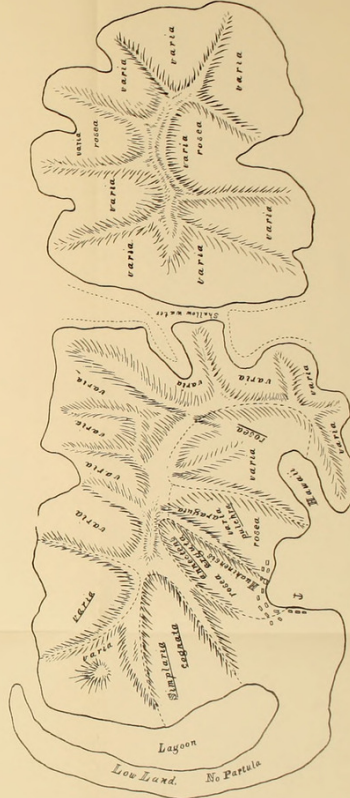
A dashed line separates the *rubescens* and *hyalina* labels from the *attenuata* label. An arrow points from the *rubescens* label towards the top left.

40 miles long —

40 miles long



Scale of 3 miles



Scale 2 miles



Hartman, William Dell. 1881. "Observations on the species of the genus *Partula* Fér., with a bibliographical catalogue of all the species." *Bulletin of the Museum of Comparative Zoology at Harvard College* 9(5), 171–196.

View This Item Online: <https://www.biodiversitylibrary.org/item/30066>

Permalink: <https://www.biodiversitylibrary.org/partpdf/304444>

Holding Institution

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

Sponsored by

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

Copyright & Reuse

Copyright Status: NOT_IN_COPYRIGHT

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.