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THE DISTRIBUTION OF OAHUAN SPECIES OF AMASTRA.

BY HENRY A. PILSBRY.

The genus *Amastra*, comprising dull ground-snails of Achatinellid type, is found throughout the Hawaiian group from Kauai to Hawaii, but is rather sparingly developed on the two terminal islands, reaching its maximum in the intermediate islands, where special groups have been differentiated. In this intermediate region there have been two main centers of evolution, the one composed of Maui, Molokai and Lanai, the other of the single island Oahu. Common to these two centers are the group *Cyclamastra* (represented by small umbilicate species, like *A. umbilicata*, now mostly extinct), and its derivative *Pterodiscus*.

The two centers are roughly comparable topographically. Oahu consists of two mountain ranges, a western (Waianae range) and a much longer northeastern or Main Range, separated by a lower tract, not forested, and supporting no Amastræ. In the other center, Molokai + Maui represent the Main Range of Oahu, Lanai the Waianae range; only there has been subsidence isolating the component ranges. This may seem an idle analogy; but it was suggested by the facts of molluscan distribution. Lanai by its Amastræ holds such a relation to Molokai as the Waianae range to the western end of the main range; while Molokai, west Maui and east Maui are almost as closely related in their Amastræ as corresponding segments of the Main Range of Oahu, if this was broken by dropping out a few valleys in two places.

Omitting a few species of which the exact locality is unknown, and

for the time ignoring the numerous "varieties" or subspecies, Oahu has 28 species of *Amastra* in the Main Range, 15 in the Waianae Range. Such a proportion seems natural in view of the comparative magnitude of the two ranges. The species fall naturally into five series, which may be called the *umbilicata* series, the *undata*, the *cornea*, the *inflata* and the *spirizona* series.

The *undata* series belongs to the Main Range, especially its eastern half, where it is developed in a great variety of forms. Two of the fourteen species have been found in the Waianae range, one of them, *Amastra albolabris* unchanged, and another represented in the Waianae Range by two varieties of *A. reticulata*, not very different from the presumably parent form of the species in the main range.

The *inflata* series is also wide-spread in the Main Range, but one variable species, *Amastra rubens*, has several varieties in the Waianae range, and one Waianae species, *A. porcus*, is distinct from any in the Main range, though probably related to *A. tristis*.

The small *cornea* series has three species, one of them fossil, in the Waianae Range, and one very rare species, *A. æmulator* Pils., has recently been turned up in the Main Range.

The *spirizona* series comprises seven species in the Waianae Range. *Amastra porphyrea* Nc. is found also in the Main Range, where there is moreover a distinct but related species, *A. porphyrostoma*. *A. spirizona* of Waianae has several varieties in the Main Range—*nigrolabris*, *chlorotica*—and one derivative species, *A. turritella*. The last is the only form which has extended into the eastern end of the Main Range.

In dealing with groups of closely related species in limited areas there cannot be much chance of error in holding that the region of greatest variety and abundance of strictly localized specific forms has been the center of differentiation of those forms. If so, it may be seen that the *undata* and *inflata* series had their rise in the Main Range and the *cornea* and *spirizona* series in the Waianae Range.

To evolve so large a variety of species, many of them strongly individualized, the two ranges must have existed as separate tracts for a long time. It favors this view that fossil forms are found in both ranges. Whether the separation was by water, or by a land surface unfavorable to forest-snails, we have at present no means of

knowing. This long period of separate evolution we further infer, was followed by a brief period of union during which forests extended from the Waianae mountains across the valley to the western part of the Main Range. This connection must have been quite recent, within the life of existing species, for in several cases the same species is found in both ranges. A few forms have been specifically differentiated since the migration, or possibly they may have died out in the original area. At the present time the forests have receded up the mountains, and no migration from range to range is possible. Moreover, there has doubtless been extinction of many forms which once inhabited the lower region.

Most of the migrating species are exceptionally virile forms, shown by their rather wide distribution and tendency to form varieties in their home ranges. Such are *A. spirizona*, *A. rubens*, *A. reticulata*,[1] *A. crassilabrum*.

In the following list of Oahuan Amastræ the Main Range species are given in the left, Waianae species in the right column. A few species of unknown habitat and some named varieties are omitted as unessential.[2] The new names for the latest discoveries of Messrs. Thaanum and Spalding and Dr. Cooke will be defined in the next number of the Manual of Conchology. Names of fossil species are prefixed thus †.

Forms which are believed to have originated in the Main Range are printed in Roman type; those of Waianae origin in *Italics*.

Main Range.	Waianae Range.
(*Series of A. umbilicata.*)	
Sola.	
† Antiqua (Ewa)	? *Heliciformis* Thwing.[3]

[1] *Amastra reticulata* was first named from the derivative migrant in the Waianae Range, instead of from the descendants of the parent stock in the Main Range, a circumstance which might lead to an erroneous idea regarding the origin of the several forms.

[2] *Achatinella elongata* Newc., an Oahuan species, has been omitted for want of a knowledge of the apical sculpture to fix its systematic position. It may be a sinistral member of the *spirizona* group, related to *A. tenuispira*, or it may possibly prove to belong to the group of *A. soror*.

[3] Mr. Thwing has figured as *Amastra heliciformis* Ancey a shell resembling *Amastra agglutinans* Newc., of Maui. It can hardly be Mr. Ancey's species, which belongs to *Pterodiscus* (see Manual of Conchology, pl. 36, figs. 1, 2, 3), and is much more depressed than Thwing's figure. See Occasional Papers B. P. B. Museum, III, no. 1, pl. 3, fig. 17.

Main Range.	Waianae Range.
† Extincta (loc. uncertain).	
† Hartmani (loc. uncertain).	
(Series of A. undata.)	
Textilis.	
Gulickiana.	
Spaldingi.	
† Caputadamantis.	
Pellucida.	
Irwiniana.	
Davisiana.	
Thaanumi.	
Reticulata orientalis.	Reticulata.
Reticulata errans.	Reticulata dispersa.
Cookei.	
Transversalis.	
Albolabris.	Albolabris.
† Vetusta.	
Undata.	
Badia.	
(Series of A. cornea.)	
	Cornea.
	† *Subcornea.*
Æmulator	*Crassilabrum.*
(Series of A. inflata.)	
Rubens kahana.	Rubens.
Rubens infelix.	Rubens corneiformis.
Rubens seminigra.	Rubens castanea.
Tenuilabris.	
Tenuilabris rubicunda.	
Luctuosa.	
Decorticata.	
Inflata.	
Rubida.	
Elliptica.	
Tristis.	Porcus.
(Series of A. spirizona.)	
	Frosti.
Turritella.	*Tenuispira.*
Spirizona acuta.	

Main Range.	Waianae Range.
Spirizona nigrolabris.	*Spirizona.*
Spirizona chlorotica.	
	Intermedia.
Porphyrea.	*Porphyrea.*
Porphyrostoma.	*Cylindrica.*
	Variegata.

THE LAND MOLLUSCA OF SAN MATEO POINT, CALIFORNIA.

BY HARRY EDSON.

San Mateo Point is a heavily-wooded knoll containing about one and one-half acres of ground, on the San Francisco bay coast midway between San Mateo and Burlingame. It is practically an island as far as the land mollusca are concerned, being entirely surrounded by water and salt marsh with the exception of a wagon road that during the rainy season, the only time the snails travel in California, is covered with water most of the time, so that there has been no very recent addition to the molluscan fauna, which is rather large considering the area of the collecting ground, and that the nearest place any molluscs are found is over three miles away with the town of San Mateo and the salt marsh intervening.

List of Species.

Epiphragmophora arrosa, Gould, found in large numbers on the western or bay side exposure. I was unable to find any on the opposite side.

This species showed a very great variation, running from a very dark shell with no superior color band to a light-colored shell with dark band, also an albino form some without any band and others banded, one of the latter had a bright orange band.

Epiphragmophora nickliniana, Lea. This shell was found rather sparingly, buried under the debris in some small water channels running from the center of the point.

Circinaria vancouverensis, Lea, a few specimens found on the west side.

Circinaria duranti, Newc., found on a little hill in the center of the point that the Indians had evidently used as a place to hold clam bakes.