Cypraea chinensis Gmelin, 1791 (Gastropoda) in Hawaii

BY

CRAWFORD N. CATE

Conchological Club of Southern California
Los Angeles 7, California

(Plates 8, 9)

After a careful study of specimens of Cypraea chinensis Gmelin, 1791 (synonyms: C. variolaria Lamarck, 1810; C. cruenta Dillwyn, 1817), in various collections throughout the United States and of pertinent literature, with particular attention to the visible morphological variations in its several allopatric subspecies, I am convinced that a separable population of this species exists in the Hawaiian Islands, because of the outstanding differences noted in this Polynesian race.

Melvill & Standen (1915) were the first to recognize the divergence of the Hawaiian race from the typical species and they singled out their semipellucid specimen, giving it the name Cypraea variolaria amiges. Since they based their subspecies upon a single dead specimen from a doubtful locality, this name has subsequently disappeared into synonymy through a lack of recognition of its existence. Cypraea chinensis is of rare enough occurrence in Hawaii that until recently not enough live-taken specimens have been known to make such an identification possible. However, during the past few years several specimens have been collected in Hawaii, and it seems appropriate, with the additional information now available, to validate the early subspecies, to illustrate it (probably for the first time), and to discuss the distinguishing morphological characters and ecological environment that so clearly separate it from the other races of the species.

Although they did not know the exact locality of their new subspecies, Melvill & Standen made an excellent inference that it was probably from the Hawaiian Archipelago. They based their conclusion upon the fact that the new form stood in the same relationship to typical Cypraea chinensis as did certain other Hawaiian forms to their respective typical species; to cite only one of their examples, such as C. helvola hawaiiensis does to C. helvola helvola. Their explanation referred mostly to a similarity in pellucidity and coloration, but a careful reading of their description of the subspecies makes it certain that the form they were describing is indeed the form found today in Hawaii.

The authors of the new subspecies acknowledged the help of Mr. J. Kidson Taylor in calling to their attention that the shell they named Cypraea variolaria var. amiges was allied to C. chinensis. About a year later, Taylor (1916) noted enough differences in Japanese specimens to describe them as still another subspecies of C. chinensis, namely, C. variolaria (= C. chinensis) var. splendens. The description of Taylor's holotype could apply equally to that of C. c. amiges and tends to ally it with the Hawaiian race. I have seen Japanese specimens of both the amiges form and the chinensis s. s. form, leading me to the conclusion that Japan may be the area where the two subspecies overlap. Therefore, since the name amiges for this race has nearly a full year's priority and since the typical amiges form seems restricted to Hawaii, Taylor's C. c. splendens must go into the synonymy of C. c. amiges.

Cypraea chinensis amiges (see Plate 9, Figs. 1a, 1b, 2a, and 2b, Table 1) is a noticeably shorter, broader shell than C. c. chinensis (see Plate 9, Figs. 3a, 3b, 4a, and 4b, Table 2), with its width almost invariably 70 percent as great as its length; Melvill & Standen used the term "broadened" to point out this important feature. The shell, however, is more than "normally

shaped", as they expressed it. Its unusual breadth and produced marginal callus, reaching near to the highest point on the dorsum, give the shell a somewhat flat, squat appearance, whereas C. c. chinensis is a more cylindrically oblong shell, usually much less heavily callused along its margins and of a lighter porcellaneous texture. The marginal callus, covering a large area of the dorsal surface, is very thickly marked with large spots of a deep violet color; it covers at least half of the swollen base in the columellar area, and all of the base formed by the horizontally flattened lip. In the typical species a broadening of the right and left portions of the base is more noticeable. The white teeth, bold and strong on the lip (16 in number), short and very fine on the columella (18 in number) have brilliant orange-red interstices, while those of C. c. chinensis, bordering on a longer and straighter aperture, seem larger and less crowded. Also, Philippine specimens appear to have more teeth. The columellar teeth of C. c. amiges extend as strong concave ridges across the very broad, prominent white fossula. Irregularly rounded lacunae, of the same creamy color as the background of the shell, show through the straw-colored layer of the narrowed dorsum. Not having the dorsal surface area so narrowed by the marginal callus, the straw-colored pattern of the typical C. chinensis covers a larger area; it is also more irregular and scattered. These features, plus the narrow, sharply recurved aperture constitute the greatest morphological changes evident in this Hawaiian subspecies. A character common to all the races of C. chinensis is the faint mantle line traversing the right dorsum near its summit. It is interesting to note, however, that in the case of the East African C. c. violacea there are some instances where the mantle line is exceedingly faint or does not appear to exist at all. This would seem to be more of an exception than a rule for this subspecies.

As a result of the careful observations of Clifton S. Weaver, I am able to include here a detailed description of the animal of Cypraea chinensis amiges, from one of the specimens he collected in Kailua Bay.

The mantle of the animal is blood-red, with darker, almost brownish spots spreading out over the sides, and white, frosty-appearing spots along the margins. The papillae are bumpy, stalk-like, and about 4 mm. in length. Numbering approximately 35 on either side, they are off-white in color, shading to a pale salmon. The eyestalks are a pale golden-yellow, with the siphon a paler orange-yellow, becoming white at its tip. The ventral surface of the foot is more or less white, ornamented with red-brown lines; the base of the foot is off-white, evenly tinted with red-brown.

Cypraea chinensis amiges prefers living in a deep-water habitat, its present known benthic range in Hawaii being from 30 to 60 feet. The specimens taken in the shallower depths were collected at Waikiki and Makua, on the south

Table 1

Measurements (in millimeters) and Collecting Data of Specimens of *Cypraea chinensis amiges* Melvill & Standen, 1915, Used in this Study.

	Length	Width	Height	Dentition Lip	Dentition Columella	Locality	Collecting Depth, feet	Collector	Notes
Hypotype 1	29.1	19.5	15.5	18	17	Makua, Oahu	35	T. Richert	
Hypotype 2	32.7	23.9	16.8	15	17	Mokolea Rock, Kailua Bay, Oahu	55	C. S. Weaver	[1]
Hypotype 3	33.0	23.7	17.0	15	18	Mokolea Rock, Kailua Bay, Oahu	50	C. S. Weaver	[2]
Hypotype 4	33.2	24.7	17.1	16	19	Makua, Oahu	60	C. S. Weaver	[3]
Hypotype 5	37.0	25.5	18.7	17	17	Waikiki, Oahu	35	J. Lucas	[4]
Hypotype 6	37.7	26.8	19.8	16	18	Makua, Oahu	35	R. Lee	[5]
Hypotype 7	38.9	26.4	20.0	18	17	Makua, Oahu	35	T. Richert	[6]

[1] under basalt boulder, 20 Jan. 1962. [2] under lava rock, 13 Jan. 1962. [3] edge of underwater lava island, June 1957 [4] under coral slab [5] under lava rock [6] April 1958

Table 2

Measurements (in millimeters) and Dentition of Specimens
of *Cypraea chinensis chinensis* GMELIN, 1791, Obtained from Moro Collectors and Used in this Study.

	Length	Width	Height	Dentition Lip	Dentition Columella	Date	Locality
Hypotype 1	23.3	12.7	10.1	18	17	1962	Siasi Island, Sulu Archipelago
Hypotype 2	26.6	14.3	10.2	18	17		
Hypotype 3	27.7	14.9	11.9	17	16		
Hypotype 4	30.6	16.6	13.4	18	18		
Hypotype 5	30.7	17.0	13.6	19	18		
Hypotype 6	30.9	17.4	13.8	18	18		
Hypotype 7	31.2	17.9	13.6	19	20		
Hypotype 8	34.7	18.8	15.0	20	19		
Hypotype 9	36.0	19.8	15.7	20	18		
Hypotype 10	37.1	21.0	16.3	19	19		
Hypotype 11	42.1	23.5	18.5	21	18		

Hypotypes 10 and 11 are illustrated on Plate 9

shore of Oahu, while two specimens were collected on the northeast shore of the island (within 100 yards of one another, and a day apart) in 55 to 60 feet of water (Kailua Bay). The Waikiki specimen was taken from under a coral ledge. It is not known how the Makua specimens were taken, but this collecting area is noted for its dead coral heads and lava outcroppings, with portions of the bottom clear and barren except for an occasional sparse growth of eelgrass. (Underwater photographs taken by Roland Gray confirm this condition.) The substrate adjacent to the Mokulua Islands where the Kailua Bay specimens were taken consists of basalt and coral ledges and slabs.

The ecology of some of the other races of Cypraea chinensis is quite different. For the most part they are reef-dwellers or are at least shallow water species and are far less rare than in Hawaii. In Mozambique and Zanzibar, for example, C. c. violacea is collected in such quantities that dealers have it in their shops by the boxful. At Siasi Island in the Sulu Archipelago, C. c. chinensis is taken in reasonably plentiful numbers by native collectors in shallow water. In Hawaii, on the other hand, C. c. amiges is known from a total of only about 16 specimens, of which seven have been loaned to me for this study through the kindness of several Hawaiian collectors. The Hawaiian race (as C. cruenta Gmelin) is reported by Ostergaard (1928) in the Hawaiian Pleistocene as rare.

Schilder (1938) lists the living range of Cypraea chinensis chinensis Gmelin, 1791, as "N. E. Malaysia to Japan, Hawaii, Palmyra Island, New Caledonia, N. W. Australia and S. W. Java." It is my belief that Hawaii should be excluded from the range of the typical species, as the subspecies discussed in this paper can be differentiated and is an apparently isolated race, ecologically as well as morphologically. Further research will be required to determine to what extent its range goes beyond the immediate vicinity of Oahu. I note with interest that some of the typical morphological characters of C. c. amiges are sometimes (but not always) seen in

Explanation of Plate 8

Cypraea chinensis amiges MELVILL & STANDEN, 1915

Ventral and dorsal aspects of typical specimens.

Figures 1a and 1b: Hypotype 3. Figures 2a and 2b: Hypotype 2. Figures 3a and 3b: Hypotype 4.
(All figures x 1.5)

Figure 1a

Figure 2a

Figure 3a

Figure 1b

Figure 2b

Figure 3b

Kodachromes by A. BLAKER