

The Hawaiian Tun Shells

SPENCER TINKER¹

INTRODUCTION

THIS ARTICLE is a brief presentation of information on the Hawaiian tun shell fauna (Doliidae), including synoptic keys, descriptions and illustrations of the different species, and notes on their ecology and distribution.

Included in this paper are two species which the author believes to be previously unknown from the Hawaiian Islands. These species are the spotted tun shell, *Tonna dolium* Linnaeus, and the oil jar or channeled tun shell, *Tonna canaliculata* Linnaeus. No prior records of the occurrence of these species in Hawaiian waters are known. None of the local private collections seen or the several collections in the Bernice P. Bishop Museum and in the United States National Museum included any specimens from Hawaiian waters. It is somewhat astonishing that two species of mollusks of this size should not be represented in any of these Hawaiian collections, some of which are very large and quite complete.

The Doliidae, or tun shells, as the group is often called, is a small group, old and well established, and its members are quite easily recognized by the characters which they present. Of these characters the most significant are the large, light, ventricose shells with spiral ribs and furrows. In distribution the Doliidae is an Indo-Pacific group and all of its species, with the exception of *Tonna perdx* Linnaeus, are found within that area.

THE HAWAIIAN DOLIID FAUNA

Species: The Hawaiian doliid fauna is a small one consisting of but five species which represent about one-fourth of those now known. Of these five species, four are Indo-Pacific in their distribution and one, *Tonna perdx* Lin-

naeus, is circumtropical. The following species are known from the Hawaiian Islands:

- Tonna perdx* Linnaeus, the partridge tun
- Tonna melanostoma* Jay, the black-lipped tun
- Tonna dolium* Linnaeus, the spotted tun
- Tonna canaliculata* Linnaeus, the channeled tun, and
- Malea pomum* Linnaeus, the apple tun.

Ecology: Although the Hawaiian Islands border the Indo-Pacific faunal area and draw the major portion of their shore line fauna from this region, the Indo-Pacific species are not as well represented in Hawaiian waters as in the more centrally located areas of the region. This apparent dearth of species is probably due to the facts that the Hawaiian Islands lie on the extreme northern edge of this region, have a somewhat different ecological picture, and that the shore lines of the Hawaiian Islands have not been adequately explored beyond the depths comfortable for ordinary diving. In Hawaiian waters, at least, the members of this family appear to be uncommon in depths of less than 40 or 50 feet, although occasional specimens of *T. perdx* L. are found in depths of less than 10 feet. At depths beyond 75 feet the number of individuals of *T. perdx* L., *T. dolium* L., and *Malea pomum* L. increases considerably and it is beyond this depth that the two additional new records have been obtained.

Not only does the Hawaiian doliid fauna become more abundant with increasing depth, but it is not uniformly distributed along the shore line: it appears to be more abundant in particular areas. One such area where both species and specimens are especially abundant exists along the southwestern shore of Oahu, and it is from this locality that the two new records were obtained. The reason for the abundance of these species in certain areas is unknown, but it should be noted that the area

¹Director of the Aquarium, University of Hawaii. Manuscript received December 6, 1948.

mentioned is one in which no well-defined reef exists. It is, moreover, the point on the island of Oahu which is nearest to deep water, the remaining parts of the island shore line being separated from deeper waters by an insular shelf some miles in width.

Distribution: The distribution of the species in the Hawaiian Islands is not well known, but it can be said with some degree of assurance that the species previously known from this area are distributed from Hawaii northwestward to Ocean or Kure Islands, inasmuch as specimens are on record from several points along this chain. The range of the two species here newly recorded is unknown and their present scarcity will make their true distribution in the Hawaiian Islands unknown for many years.

Family DOLIIDAE

Shells large, ovate, thin, hard, with large ventricose body whorls, spirally ribbed, without longitudinal sculpture; aperture very large; spire short and small; umbilicated; anterior canal present, but short; outer lip simple; operculum absent in adult, thin and corneous in young; length, 2 to 9 inches.

The mollusks which inhabit these shells are fascinating to watch for they are large and muscular creatures and active in their habits. The foot is large and fleshy and when expanded is more than twice the diameter of the aperture. The head bears a pair of elongated tentacles which are expanded basally and have eyes near their proximal end. The head bears in addition a long, large, cylindrical, tube-like proboscis which is extensible and very flexible and which ends in a kind of rosette. When undisturbed the mollusk glides rapidly along. The proboscis is held in a forward, slightly raised position forming a gentle S-shaped curve with the free end directed downward, and is waved slowly from side to side.

Key to the Genera and Species of Hawaiian Doliidae

1. Shells light in weight, thin, hard; outer lip simple; body whorl large; aper-

ture very wide (Genus *Tonna*)..... 2
 Shells heavier; outer lip strongly dentate; body whorl less expanded; aperture considerably reduced, approximately four times as long as wide
*Malea pomum* Linnaeus.

- 2(1). Outer surface of shell marked by a regular recurring color pattern..... 3

Outer surface of shell variously pigmented without a regular recurring color pattern, blotched and streaked with various shades of black, brown, and yellow 4

- 3(2). Outer lip of shell crenate; outer surface of shell white in color, marked upon the ridges by quadrate brown spots; spiral ridges well developed, approximately as wide as the interspaces.....*Tonna dolium* Linnaeus.

Outer lip without crenations; outer surface of shell brownish in color, usually covered by a network of white lines consisting of regular narrow spiral lines which follow the grooves and which are connected by short, irregular, longitudinal lines crossing the ribs; spiral ribs present, but poorly developed.....
*Tonna perdix* Linnaeus.

- 4(2). Inner and outer lip of aperture marked with black; spiral grooves on outer surface of shell marked with black; ribs on outer surface of shell arched*Tonna melanostoma* Jay.

Inner and outer lip of aperture not marked with black; spiral grooves on surface not marked with darker lines; ribs on outer surface of shell nearly flat.....*Tonna canaliculata* Linnaeus.

Genus TONNA Bruennich

Shells large, ovate, thin, hard, with greatly inflated body whorls; surface of shell spirally furrowed and ribbed, without longitudinal sculpture; spire low; aperture large; outer lip simple, with or without crenations; columellar lip broadly expanded; umbilicated, open or closed; operculum absent in adult, present in young.

This genus includes about 21 species of which approximately one-third are fossils. Four species are known from the Hawaiian Islands.

Tonna perdix Linnaeus

Description: Shell ovate, thin, large, hard; whorls about six in number; body whorl greatly inflated centrally, encircled by approximately 20 very low, wide, contiguous, spiral ribs; spire not appreciably depressed, longer than in other species; aperture large, somewhat oblique; outer lip simple, thickened, without crenations; columella arched somewhat, but not twisted; color usually reddish-brown, marked by a reticulated pattern of white lines; inner margin of lips white; length, 2 to 6 inches.

This species differs from all other members of the family in its longer spire and more oblique aperture.

The color of this species is not uniform, nor is it enduring. Specimens are known which lack the usual color pattern and, instead, exhibit a nearly uniform coloration over the entire outer surface of the shell. The coloration does not seem to be permanent, for many specimens in collections seem to become progressively lighter with age. This fading appears to be increased by exposure to light.

Ecology: This species is by far the most common in Hawaiian waters, being apparently at least twice as abundant as all other species combined. It ranges in depth from less than 10 feet to well over 100 feet and is much more common at the greater depths.

Distribution: Circumtropical, including the Hawaiian Islands.

Tonna melanostoma Jay

Description: Shell ovate, large, thin, hard; whorls about seven in number; body whorl greatly inflated centrally, encircled by 18 to 20 well-defined convex ribs with or without smaller intervening ridges; spire moderately well developed, proportionately shorter than *T. perdix*; aperture large, emarginate basally; outer lip simple, crenate, not thickened; columella expanded, reasonably straight, somewhat twisted, calloused; color of exterior white, yellow, brown, and black, darker in older specimens, grooves darker than intervening ridges; color pattern

irregular but forming poorly defined longitudinal bands of brown, yellow, and white; outer lip marked by black; inner lip marked by black area which becomes large, dark, and shining in older specimens; length, 2 to 9 inches.

Ecology: This species is second to *T. perdix* in abundance in Hawaiian waters. It does not seem to invade the shallower areas along the shore line as does *T. perdix* although specimens are not unknown in this area.

This species, like all other shells of this family, is attacked by hermit crabs, including in particular *Dardanus asper* deHaan, the most common of the larger hermit crabs; *Dardanus punctulatus* (Olivier), a large red species measuring as much as 12 inches in length; and another large, white, unidentified species.

Distribution: Indo-Pacific area including the Hawaiian Islands.

Tonna dolium (Linnaeus)

Description: Shell ovate, large, thin, hard; whorls about six in number; body whorl greatly swollen centrally, encircled by 12 to 16 well-defined spiral ribs which are separated by grooves of the same width with or without a smaller median spiral ridge in each groove; aperture large; outer lip simple, crenate, not thickened; spire normal, with sutures slightly depressed; columella reasonably straight, somewhat twisted; color white or bluish-white, marked by quadrate brown spots upon the ridges, these spots being separated by a distance equal to their width; color of grooves darker than intervening ridges; length, 3 to 5 inches.

Ecology: This species is fourth among the tun shells in abundance in Hawaiian waters. It is a rare form and is known only from those specimens mentioned below, all from the same locality. These specimens were procured by Fernando Leonida, a fisherman who operates a set of wire fish traps along the southwest shore of Oahu, and were taken from these wire traps at the outer edge of the reef platform at depths of approximately 15 fathoms. At the time of their capture, all of the specimens were occupied by various species of hermit crabs, a fact which accounts for the presence of the shells



PLATE I. HAWAIIAN TUN SHELLS

Top row: Left, *Tonna canaliculata* Linnaeus. Center and right, *Tonna melanostoma* Jay.
 Second row: *Tonna dolium* (Linnaeus).
 Third row: *Malea pomum* Linnaeus.
 Bottom row: *Tonna perdix* Linnaeus.

in the fish traps. The shells were covered over the outside and about the aperture by a large and fairly common species of sea anemone, *Calliactis armillatas* Verrill (Sagartidae). Although many of the specimens are not in perfect condition, the characteristics of all of them show well enough to permit identification.

Distribution: Indo-Pacific area and the Hawaiian Islands. The occurrence of this species in Hawaiian waters is believed to be unrecorded. A series of more than 25 specimens from the southwestern shore of Oahu has been studied. The Hawaiian specimens from this locality have been distributed to permit their widest use and may now be observed in the following collections: the United States National Museum in Washington, D. C., the Science Museum of the California Academy of Sciences in San Francisco, and in the collections of the Bernice P. Bishop Museum, Ditlev Thaanum, Dr. C. M. Burgess, Dr. Vernon Smith, Arthur Wriston, Charles Allen, and the author, all of Honolulu.

Tonna canaliculata Linnaeus

Description: Shell ovate, large, thin, hard, greatly expanded; whorls about seven in number; body whorl greatly expanded centrally, encircled by about 19 broad, closely set, flat, spiral ribs, separated by comparatively narrow and shallow interspaces, marked at the sutures by a deep channel; columella reasonably straight, but slightly twisted; lip simple; color tawny yellow exteriorly, ribs lighter in color, grooves darker, body whorl becoming increasingly darker toward the lip; length, 3 to 5 inches.

Ecology: This species is the rarest of the tun shells in Hawaiian waters, being known in this locality from a single specimen. It is apparently entirely absent in shallow water and very rare at depths of less than 100 feet. The single specimen was occupied by a hermit crab which had carried it into a wire fish trap at a depth of about 15 fathoms.

Distribution: Indo-Pacific area including the Hawaiian Islands. The occurrence of this species in Hawaiian waters is based upon a single specimen from the southwestern shore of Oahu in

the collection of the author. This is believed to be the first record of this species from the Hawaiian Islands.

Genus MALEA Valenciennes

Shell ovate, thin, hard, relatively heavier; whorls less expanded; umbilicated; outer lip simple, outwardly reflected, dentate; aperture reduced.

A single species is known from the Hawaiian Islands.

Malea pomum Linnaeus

Description: Shell ovate, comparatively thin and hard but less so than in genus *Tonna*; whorls about six in number; body whorl moderately large and expanded, but less than in *Tonna*, encircled by about 12 well-defined, low, spiral ribs; spire short; sutures not depressed; outer lip dentate within, reflected flatly outward, somewhat thickened; columellar lip denticulate or wrinkled; columella very slightly excavated at the base; color white, marked with amber of varying intensity and arranged so as to appear spotted with white upon the ridges; lips white; length, 1 to 3 inches.

Ecology: This species is the smallest tun shell in Hawaiian waters and the third most abundant, being exceeded in numbers by *T. perdix* and *T. melanostoma*. It is most abundant at depths approaching 100 feet but is occasionally taken in shallower water. It is apparently not as readily sought out by hermit crabs as are the larger species possibly because the dentition of the shell reduces the aperture and restricts movement, or because the shell is heavier to carry and less easily trimmed at the lip to fit the needs of the crabs.

Distribution: Indo-Pacific area from the Red Sea to eastern Polynesia and the Hawaiian Islands.

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