REFLECTIONS UPON *PUSTULARIA MAUIENSIS* AND RELATED TAXA

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Abstract: An idea mentioned in Schilder & Schilder (1971) that *Pustularia mauiensis* is not a valid species but rather a subspecies of *Pustularia bistrinotata* is discussed after comparing diagnostic characters of *P. mauiensis* and other species of the genus *Pustularia*. *P. mauiensis* and *P. bistrinotata* are closely related and the only diagnostic character separating between them at a specific level is the dorsal sulcus, which is absent in shells of the former. So the Schilders' approach makes sense but deserves an additional comparative study of large batches of shells. *P. mauiensis* is close to *P. globulus* too and can be treated as a subspecies of the latter if one disregards small rudimentary granules in shells of *mauiensis*.
Key words: Mollusca, Gastropoda, Cypraeidae, *Pustularia mauiensis*, *Pustularia bistrinotata*, intraspecific variation.

Comparison of conchological diagnostic characters of *Pustularia cicercula* and *Pustularia margarita* discussed in the previous article published in this issue (Triton 17:26-28) initiated several questions regarding other taxa of the genus. In this paper diagnostic characters of *Pustularia mauiensis* (Burgess, 1967)—Figs. 1-12 are discussed.

C. mauiensis is described as a new endemic Hawaiian species although in Schilder & Schilder (1971) it is listed as a subspecies of *Pustularia bistrinotata* Schilder & Schilder, 1937. Why? The Schilders did not published explanations of their decision and in order to try answering this question one has to compare diagnostic characters of related species with the original description of *mauiensis*; this is possible using the data of Table 1.

Table 1
Diagnostic characters of *P. mauiensis* and three related taxa

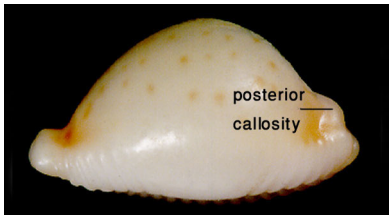
species → diagnostic characters ↓	*mauiensis*	*cicercula*	*globulus*	*bistrinotata*
inflated and globular, sometimes humped posteriorly	**V**	**V**	**V**	**V**
typically adorned with granules or tiny discrete elevations, some of which are pigmented, and which are larger, darker and more prominent near the lateral margins and extremities of the shell	**V**	**V**	no	**V**
3 paired brown dorsal blotches, one pair just above the spire, the second on the mid-dorsum, and the third above the anterior process, and up to 4 faint brown terminal spots. In *mauiensis* found in about 75% of shells.	**V**	**no**	**no**	**V**
dorsum may be colored from light beige to tan or pale lemon-pulp yellow	**V**	**V**	**V**	**V**
dorsal sulcus visible	no	**V**	no	**V**
up to four blotches may be visible on the base, at the marginal extremities near the anterior and posterior canal; in *mauiensis* were found in about 4% of shells	**V**	no	**V**	**V**
the extremities are rostrated	**V**	**V**	**V**	**V**
the aperture is narrow, slightly curved to the left posteriorly	**V**	**V**	**V**	**V**
there is a posterior callosity, which may be low to high	**V**	no	**V**	**V**
the spire blotch present	no	**V**	no	no
the teeth in the mid-columella may be shorter, obsolete or absent	**V**	no	**V**	**V**
there is a labial marginal callus in the middle mostly	**V**	**V**	**V**	**V**

Shells of *mauiensis* are inflated, globular, and sometimes humped posteriorly; they may be adorned with small granules or tiny discrete elevations, some of which are pigmented, and these are larger, darker and more prominent near the lateral margins and extremities of the shell; in about 75% of shells three paired brown dorsal blotches may be visible and up to four faint brown terminal spots; dorsum may be colored from almost white to

brown; up to four blotches may be sometimes visible on the base; the extremities are rostrated; the aperture is narrow, and may be slightly curved to the left posteriorly; there is the posterior callosity, which may be low to high; there is a labial marginal callus in the middle mostly recognizable by touch; there are fins on both lips of the base, which are in fact the continuation of the teeth.

In other words, almost all shell characters typical to the related taxa of the genus can be found in *P. mauiensis.*


1. *P. mauiensis*, brownish dorsum



2. *P. mauiensis* whitish dorsum


3. *P. mauiensis*, blotches at extremities


4. Teeth absent in the middle


5. *P. mauiensis*


6. Three pair of dorsal blotches


7. Dorsal blotches


8. Dorsal spots and blotches

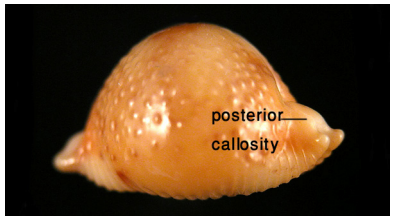

9. White unspotted base


10. One basal spot



11-12. *P. mauiensis,* two pairs of spots on the white base





13-15. *P. bistrinotata*




16-18. *P. bistrinotata*, two basal blotches (left); beige dorsum

Pictures of *P. mauiensis* are by W. Thorsson.

P. cicercula differs from *mauiensis* and the two other taxa by the absence of the posterior callosity and dorsal and basal blotches, and by the presence of the spire blotch; the extremities in shells of this species are distinctly more rostrated and it seems to be separable from *P. mauiensis* at a specific level.
P. globulus differs from *mauiensis* by the completely smooth dorsum without any blotches although shells of *globulus* are rarely found in which there are basal blotches and dorsal blotches at the extremities. If one thinks about the specific level the only difference between *globulus* and *mauiensis* consists of the total absence of the dorsal granules in all shells of the former (although the dorsal granulations in *Pustularia* seem to be not a character of the specific rank) and perhaps their more symmetrical elliptical shape. So *mauiensis* can perhaps be treated as a subspecies of *P. globulus*.
The difference between *P. bistrinotata*—Figs. 13-18—and *mauiensis* consists of the presence of the dorsal sulcus in the former. Besides, in *mauiensis* central columellar teeth are mostly short and not extending onto the base, and there is often a funnel-like depression right to the spire. The shell shape of *mauiensis* resembles that of *bistrinotata.* The dorsal sulcus seems to be never used in the genus *Pustularia* as the main diagnostic character of a specific rank.
As can be seen in Table 1, almost all diagnostic shell characters of *P. mauiensis* can be attributed to categories "more-less" and "mostly"; such diagnostic characters are usually not suitable for separating a taxon at a specific level. Some of them seem to be rudimentary (the dorsal and basal blotches and granulations) and there is an impression that conchologically this taxon is not yet established completely.
Shells of *mauiensis* are smaller than shells of typical *bistrinotata* and *globulus* from the Central Pacific Ocean and variation of their characters resemble intermediate zones with mixed characters between several subspecies. This phenomenon can be explained differently:
- By the unique and stormy geological history of the Hawaiian Islands and near-by areas.
- By special weather conditions with hurricanes sometimes destroying completely whole populations of molluscs.
- By the substantial isolation of the islands from other areas of tropical Pacific Ocean.
- By a certain geographical connection of the islands with northern Polynesia.

P. mauiensis is close to *P. globulus*, which is widely distributed in the Indo-Pacific region (from the Gulf of Aqaba and Mozambique in the West to Polynesia in the East but not in the Hawaiian Islands) and can be treated as its subspecies.
On the other hand, this taxon seems to be so close to *P. bistrinotata*, which is widely distributed in the tropical Pacific Ocean and partly the eastern Indian Ocean but not in the Hawaiian Islands, that it can be treated as a subspecies of the latter, as it is listed (but not explained) by the Schilders—*P. bistrinotata mauiensis*.
Anyway, one can understand the Schilders' doubts regarding the specific rank of *mauiensis*.
For C.M. Burgess there were no doubts that *mauiensis* is a valid species and he made no attempts to prove that conchologically although he was very strict discussing other *Pustularia* taxa.
A question regarding the true taxonomic identity of *mauiensis* is still open and perhaps can be answered by a comparative study of large batches of shells. As with all other species, one who consider that *mauiensis* deserves a specific rank should supply the evidence.

Acknowledgements
I would like to thank W. Thorsson (USA) for allowing to use the pictures of *P. mauiensis.*

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