

**Notes on *Theba pisana* ustulata (Lowe, 1852),
the land-snail of the Salvages Islands**

by

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As a member of an international team working on the fauna, flora and geology of the Atlantic Islands (Canary Islands, Madeira, etc.) I had the opportunity to join a Spanish-Swedish expedition to the Salvages Islands in April 1968. The leader of this expedition was E.R. Sventenius, a Swedish botanist from Tenerife (Canaries).

The Salvages Islands (Ilhas Selvagens), which are situated at 30°N. and 16°W. between Madeira and the Canaries, consist of a group of three islands and several rocky islets and reefs. The islands are uninhabited, but are regularly visited by fishermen from Madeira and the Canary Islands. All three islands were visited during our expedition (fig. 1):

1) Ilha Selvagem Pequena = Gran Piton = Great Piton.

We landed on this island on April 6 and were forced to stay on for three days because of the at that time prevailing bad weather conditions. The island is ca. 2 km long and has an irregular rocky coast; the interior is sandy. The whole of the island is thinly covered with low herbaceous vegetation. There is a low hill, called Pico de Veadó (alt. 48 m) at the northern end of the island.

2) Ilhéu de Fora = La Salvajita = Little Piton.

On April 9 we landed with much trouble on this small island, which is only 17 m high and was described by Wollaston (1878) as "altogether and hopelessly inaccessible". This island is also sandy with a capricious rocky coast. A characteristic species of the vegetation of this island is the endemic *Euphorbia anachoreta* Svent. Because of the tide we could only remain on this island for 2½ hours.

3) Ilha Selvagem Grande = Great Salvages Island.

This island was visited on the 10th of April. In contrast to the other islands, this one constitutes a table-land emerging high above the sea and bordered by very steep cliffs. In spite of the fact, that this island is the most extensive and highest of the three (highest point 182 m at Pico da Atalaia) it is at the same time also the least interesting, because of the comparatively heavy disturbing influence

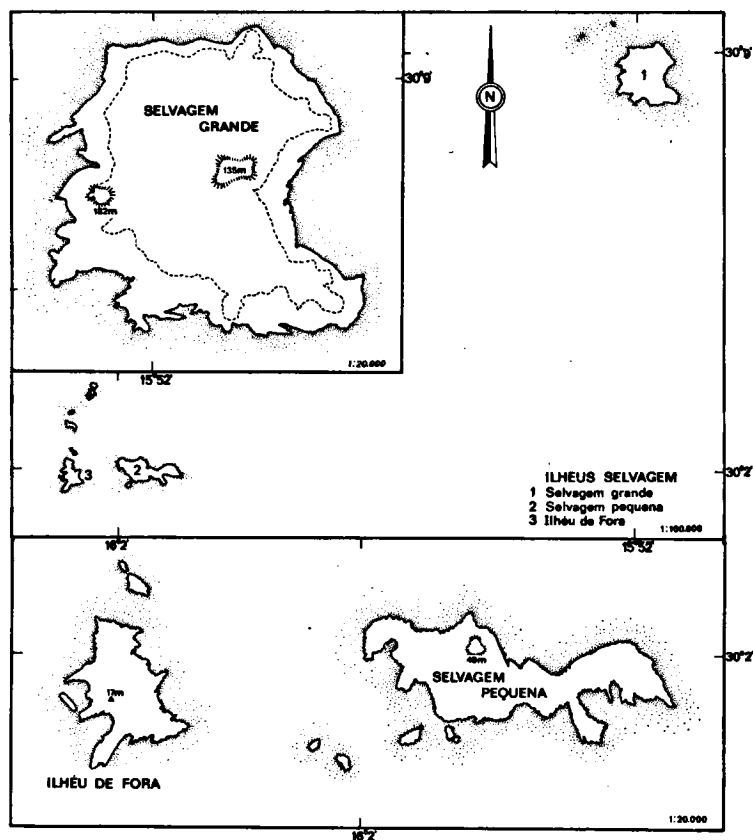


Fig. 1. Map of the Salvages Islands. Main map 1: 100.000, maps of individual islands 1: 20.000.

of man. This is apparent by the occurrence of some introduced plants like *Nicotiana* and *Mesembryanthemum*.

The only land-snail, found on all three islands, is:

Theba pisana ustulata (Lowe, 1852)

- 1774 *Helix pisana* Müller, O.F., Verm. terr. fluv. 2: 60. Havniae, Lipsiae.
Locus typicus: Italy.
- 1852 *Helix ustulata* Lowe, R.T., Brief diagnostic notices of new Maderan land shells. Ann. Mag. Nat. Hist. (2) 9: 114. London. [*Theba*]. Locus typicus: Salvages Islands. Types in British Museum (Natural History).
- 1853 *Helix Mac-Andrewiana* Pfeiffer, L., Diagnosen neuer Heliceen. Zeitschr. Malakozool. 10: 53. Cassel. Locus typicus: Great Salvages Island. Types in British Museum (Natural History).
- 1853 *Helix Mac Andrewiana* Pfr. — Pfeiffer, L., Monographia Heliceorum viventium etc. 3: 625. Lipsiae.
- 1854 *Helix ustulata* — Lowe, R.T., Catalogus Molluscorum Pneumonatorum Insularum Maderensium. Proc. Zool. Soc. London 22: 171. London. [*Theba*].
- 1854 *Helix Macandrewiana* — Reeve, L.A., Conchologia Iconica, Vol. VII, containing a monograph of the genus *Helix*: Plate CLVII, species 1030. London.
- 1867 *Helix Mac-Andrewiana* Pfeiffer — Paiva, Barone de Castello de —, Monographia molluscorum terrestrium, fluvialium, lacustrum insularium Maderensium: 71. Olisipone (Lisbon).
- 1878 *Helix pisana* — Wollaston, T.V., Testacea Atlantica: 292-293. London. [*Euparypha*].
- 1887 *Helix MacAndrewiana* Pfr. — Tryon, G.W., Manual of Conchology (2) 3, Helicidae: Vol. I: 224. Philadelphia. [Section *Xerophila*; Subsection *Euparypha*].
- 1887 *Xerophila Macandrewiana* Pfr. — ibidem: reference to plates: 307.
- 1889 *Helix Mac Andrewiana* Pfr. — Paetel, F., Catalog der Conchylien-Sammlung (ed. 4) 2: 152. [Subsect. *Euparypha*].
- 1894 *Helix macandrewiana* Pfr. — Pilsbry, H.A., Manual of Conchology (2) 9: 335-336. Philadelphia. [*Euparypha*].
- 1912 *Helix pisana* Müller var. *subconica* Monterosato — Taylor, J.W., Monograph of the land and freshwater Mollusca of the British Isles: 379-380. Leeds. [Sub-genus *Euparypha*].
- 1920 *Euparypha macandrewiana* — Hesse in Rossmässler, Iconogr., N.F., 23: 234. (fide Germain, non vidi).
- 1934 *Euparypha pisana* Müller Var. *ustulata* Lowe — Germain, L., L'Euparypha pisana Müller des archipels de l'Océan atlantique central et sa variété *ustulata* Pfeiffer des Iles Salvages. Bull. Soc. Zool. Fr. 59: 316-326.

Hundreds of bleached empty shells of this species were found on the island of Selvagem Pequena (Great Piton); the whole of the island is littered with them. Living specimens, however, were only

found in two places; the first under the top of the hill under stones and the second in one spot of the flat part of the island. Here between rocks and stones specimens of *Scilla madeirensis* Mnzs. var. *meliadora* Svent. were abundant. We could only find juvenile specimens of the snail.

The island of Fora (Little Piton) too is littered with empty shells and here too we could only find a few juvenile living specimens.

On the island of Selvagem Grande the species is much less common than on the two other islands; it was found mainly under stones in the upland plain. Here the very few living specimens we found were also juvenile. The bulk of the material has been deposited in the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands; duplicates have been distributed to several other collections.

In 1878 Wollaston (p. 291) wrote: "one can hardly believe that the densely clothed cone (of Great Piton), if carefully searched, would not be found to harbour something equally curious in the way of terrestrial molluscs". However, in my opinion one can be practically sure that no other land-snails than this single species occur on the Salvages Islands.

TAXONOMIC POSITION

Initially this form from the Salvages Islands was described as a separate species; first by Lowe in 1852 (*H. ustulata*) and one year later by Pfeiffer (*H. Mac-Andrewiana*). Wollaston (1878) was of the opinion, that the specimens did have some peculiar characters, but that, according to him, these characters are not more peculiar than those of certain other "varieties" of *Theba pisana*. He therefore considered this form to belong to *Theba pisana* without implying taxonomic or nomenclatural consequences. He mentions that there are two well-marked forms, one of which is pure white and the other coloured. Finally Germain (1934) considered this snail to be a "variety" of *Theba pisana*. He moreover distinguished two forms based on colour differences: a "forme unicolore" and a "forme colorée".

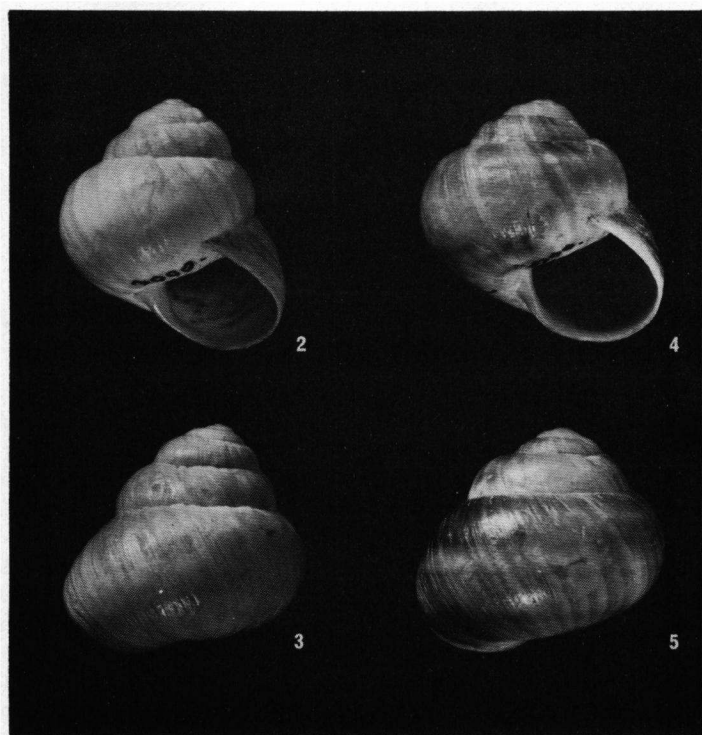
To consider this form a separate species, a subspecies of *Theba pisana*, or merely as *Theba pisana*, depends on the importance and the value we attach to the characters, that distinguish the populations from the Salvages Islands from other populations of *Theba pisana*. The shells are illustrated in figs. 2-9.

Two characters seem to be of special diagnostic value:

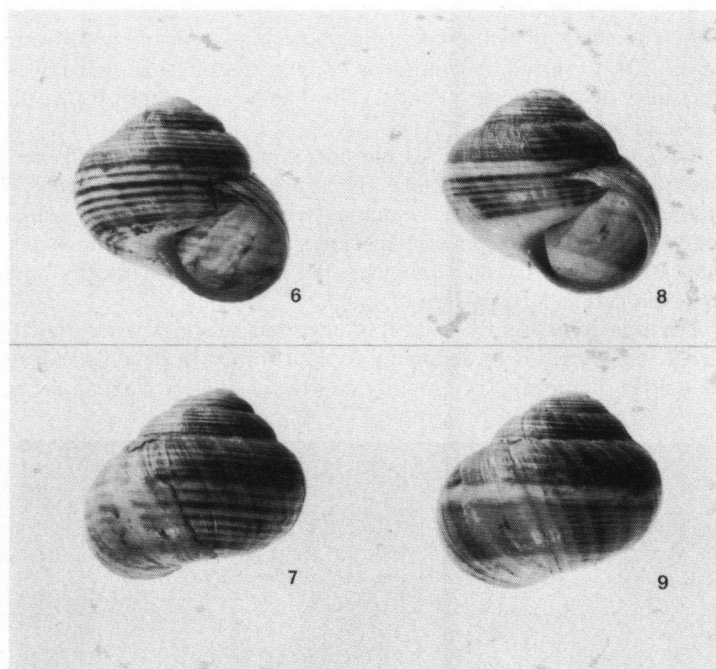
1) The shell of living specimens shows a pattern of spiral bands (up to 30), traversed by numerous, closely spaced, fine, radial lines, especially on the upper whorls. The bands are deeply brownish-purple to pink.

The colour intensity varies considerably, so that the shell has a somewhat maculate appearance. This must have induced Lowe to choose the name *ustulata*, which is very illustrative. The colour intensity also varies from one specimen to another; sometimes pigment is absent altogether and the shell is white with mostly very vague indications of a pattern of spots.

The transition from very deeply coloured to white is so gradual, that it seems useless to distinguish colour-forms. In dead specimens the colour disappears very rapidly and the shell is strongly corroded



Figs. 2-5. Adult specimens of *Theba pisana ustulata* (Lowe) from Great Piton.



Figs. 6-9. Juvenile specimens of *Theba pisana ustulata* (Lowe) from Great Piton.

by wind and water, leaving hardly any trace of the original colour pattern and sculpture.

2) Taking the populations as a whole it is evident that shells from the Salvages Islands are more spherical than those of other populations.

In order to assess the quantitative differences three populations from the Salvages Islands were compared with a population of *Theba pisana* from Orzola, Lanzarote, Canary Islands, and a population from Arinaga, Gran Canaria. The latter was referred to as *Theba pisana alboranensis* (Webb & Berthelot) by Odhner (1931: 103). Height and diameter were measured and the shell-index (height/diameter) and standard deviation (σ) calculated. Measurements are in mm.

population	number of specimens measured	height			diameter			shell-index					
		min.	max.	mean - σ	min.	max.	mean σ	min.	max.	mean σ			
Selvagem Pequena	100	15.5	21.5	18.4	1.8	16.0	21.7	19.0	1.3	0.86	1.12	0.97	0.05
Ilh��u de Fora	50	13.5	20.0	15.8	1.3	14.3	19.0	16.6	1.0	0.85	1.06	0.95	0.05
Selvagem Grande	25	15.5	19.2	17.0	1.0	16.6	21.9	19.2	1.1	0.82	0.97	0.88	0.04
Arinaga	20	9.0	12.9	10.1	1.0	9.9	15.0	11.6	1.2	0.80	0.95	0.87	0.04
Orzola	50	13.1	17.4	14.9	1.1	16.9	21.7	18.9	1.1	0.69	0.90	0.78	0.05

TABLE 1

From the table it appears that there are great differences in shell-index between the populations from the Salvages and from Orzola. The average shell-index of the populations from the Salvages Islands is considerably higher than that of the populations from Orzola. In other words, the shells from the Salvages Islands are more spherical than those from Orzola.

The sample from Arinaga, however, also shows a high shell-index, very similar to that from Selvagem Grande. In this case the specimens are much smaller and belong to the subspecies mentioned above. Considering these size differences only, one cannot include the populations from the Salvages Islands in this subspecies.

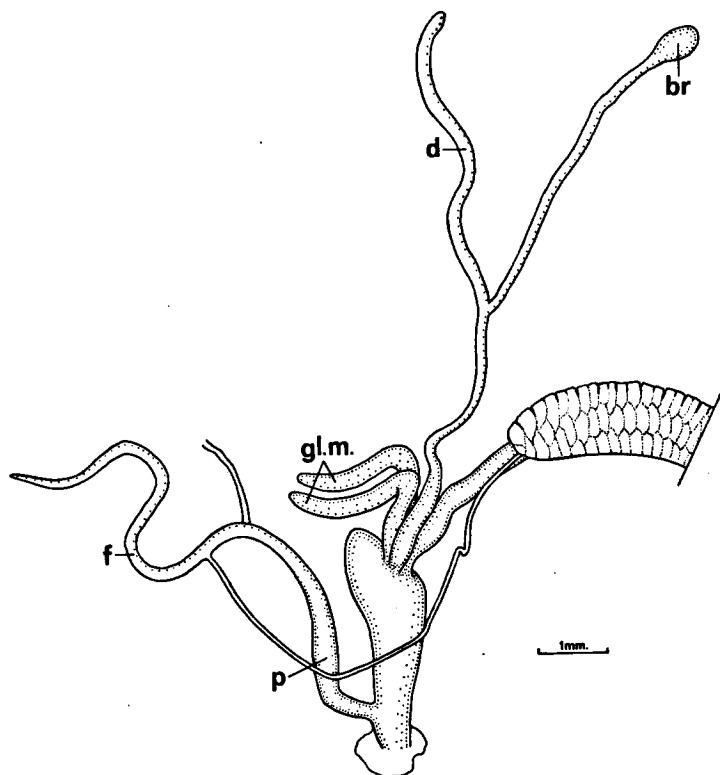


Fig. 10. Genitalia of juv. *Theba pisana ustulata* (Lowe), Great Piton. For explanation of letters see fig. 11.

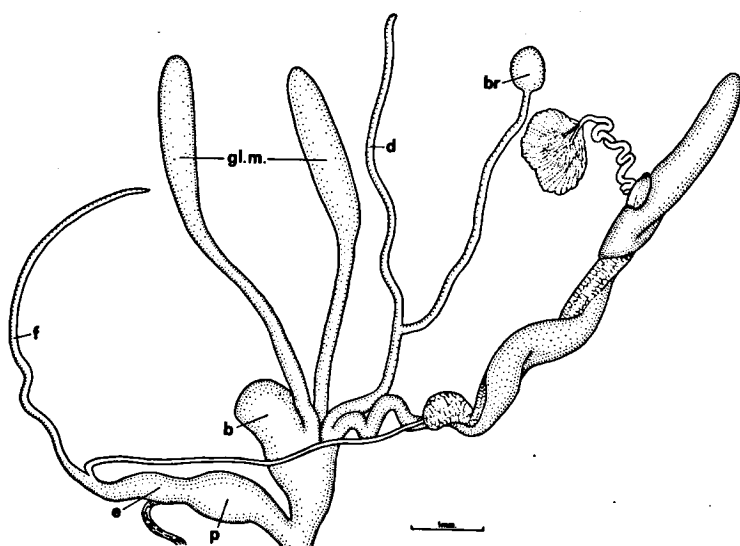


Fig. 11. Genitalia of *Theba pisana* (Müll.), Orzola, Lanzarote, Canary Islands. Abbreviations: b = bursa hastae, br = bursa receptaculi seminis, d = diverticulum, e = epiphallus, f = flagellum, gl.m = glandulae mucosae, p = penis.

Confining comparison to the population from Orzola, only a small overlap appears to exist between these populations. Overlap percentages are:

Orzola – Selvagem Grande	22%
Orzola – Ilhéu de Fora	8%
Orzola – Selvagem Pequena	3%

The populations from the Salvages also differ amongst themselves considerably. Thus, a number of specimens from Selvagem Pequena and Ilhéu de Fora have a shell-index of one or more than one. Percentages are 32% and 18% respectively. Such specimens were not found in the population of Selvagem Grande. Overlap percentages are:

Selvagem Pequena	– Ilhéu de Fora	68%
Selvagem Pequena	– Selvagem Grande	28%
Selvagem Grande	– Ilhéu de Fora	42%

Only a few juvenile specimens were available for the study of the reproductive system (fig. 10). The latter was compared with the

reproductive system of specimens from the population of Orzola (fig. 11). Only qualitative characters could be considered because of the immature stage of the specimens from the Salvages Islands. From the drawings we can see that there are no essential differences in the genital anatomy of these specimens. Both possess two glandulae mucosae, a small, round bursa receptaculi seminis, a diverticulum, and a relatively long flagellum.

The specimens examined by Germain (1934), however, did not possess a flagellum. He regards this as typical for *Theba pisana*. When we compare data of several authors there seem to be considerable differences. Jaeckel (1962) mentions "Flagellum meist vorhanden". According to Schmidt (1855), Schuberth (1892) and Taylor (1912) there is no flagellum. Adam (1960) writes "généralement dépourvu de flagellum", while Giusti (1970) figures a short flagellum. The diverticulum can also be either present or absent.

It is of course not surprising that the characters of the reproductive system of a species, of which the shell is polymorphic to such a degree, are subject to considerable variation too. It might be promising to make a study of this variation throughout the range of this species.

With regard to the question whether we must consider this form a separate species, a subspecies of *Theba pisana*, or merely *Theba pisana*, the following considerations are decisive. Are the phenotypic expressions of the genetic differences sufficiently conspicuous to use them as diagnostic characters, and, if so, are these characters of sufficient importance to justify taxonomic and nomenclatural consequences?

In my opinion the differences in shape and colour of the shell provide sufficient arguments not to call this form merely *Theba pisana*. Obviously, however, this form is closely related to *Theba pisana*. To consider such a form a species or a subspecies is not only a matter of taste but of practice too. In this respect I fully agree with Mayr (1969: 197), who writes: "It is preferable for various reasons to treat allopatric populations of doubtful rank as subspecies. The use of trinomials conveys two important pieces of information: (1) closest relationship and (2) allopatry. To treat such allopatric forms as separate species has few practical advantages".

On all these grounds I reached the conclusion that the form from the Salvages Islands should be referred to as *Theba pisana ustulata* (Lowe, 1852).



Fig. 12. Piece of sandstone with *Theba pisana ustulata* (Lowe) from Great Piton; length 80 mm.

ZOOGEOGRAPHICAL CONSIDERATIONS

Theba pisana is a very polymorphic species with a wide range. This range is mainly natural, while furthermore it is certain that the species has been introduced by man in several areas, often even intentionally. In several areas the species gives rise to well-defined subspecies, not only on islands but also on the continent.

With regard to the Salvages Islands, introduction by man can be excluded. This opinion is supported by a piece of sandstone with specimens of *Theba pisana ustulata*, found on Great Piton (fig. 12). This was examined by Prof. Dr. G. Müller, Laboratorium für Sedimentforschung, Heidelberg, Germany. He communicated me the following (translated from the German): "Reserving results of other C-14 datings, the following can be said about the age of the piece of sandstone from Great Piton. On Fuerteventura (Canary Islands) calcareous-arenites occur on 3-18 m above sea-level. The age of these arenites has been determined by C-14 datings. In these arenites *Theba pisana* occurs. According to their C-14 content the age is 30.000 ± 5000 years (10 determinations). Analogous to Fuerteventura the same age can be accepted for the piece of sandstone

from Great Piton, presupposing the Salvages Islands did not show vertical movements with respect to the Canary Islands during the Pleistocene".

How the species reached the Salvages Islands is still open to discussion. Even maximum lowering of the sea-level during the Ice Age does not permit the existence of a land-bridge between the Salvages and the continent or other archipelagos.

From the fact that this species has a wide range and is easily transported by man, it appears that it has a broad ecological tolerance and consequently ample possibilities for passive transport. In order to get more information about these possibilities a study should be made on e.g. ecological tolerance of the species (shells with or without epiphragm, eggs) for sea-water, wind-force required to transport the eggs over long distances, etc.

As long as we do not know more about this, it is impossible to draw conclusions about the relations (e.g., land-bridges) that might have existed between the Salvages and the continent or other archipelagos on the ground of the distribution pattern of this species. From this point of view the occurrence of a subspecies on the Salvages Islands does not provide grounds for speculations.

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SAMENVATTING

Op de Salvages-eilanden (Ilhas Selvagens), tussen Madeira en de Canarische Eilanden in de oostelijke Atlantische Oceaan gelegen, blijkt slechts één soort landmollusk voor te komen, wat op een expeditie naar deze betrekkelijk onherbergzame en onbewoonde eilanden in 1968 geconstateerd kon worden. Deze landslak is een vorm van *Theba pisana* (Müll.). Aan de hand van overvloedig materiaal van schelpen en slechts enkele anatomische gegevens van niet volgroeide exemplaren kon vastgesteld worden dat deze vorm als een geografisch ras of ondersoort van *Theba pisana* beschouwd dient te worden. Anatomisch zijn er eigenlijk geen verschillen met populaties van elders; de schelpen verschillen iets in kleurpatroon van schelpen van elders en zijn ook wat boller. Oorspronkelijk was deze subspecies beschreven als een afzonderlijke soort: *Helix ustulata* Lowe, 1852. De correcte naam is dus nu *Theba pisana ustulata* (Lowe, 1852).