



## Illustration of *Trochus solaris* Linnaeus, 1764 (Gastropoda, Xenophoridae) and designation of a lectotype

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### ABSTRACT

**Linnaeus (1758, 1764) did not illustrate his described Mollusca species. Also, *Trochus solaris* Linnaeus, 1764, type species of *Stellaria* Möller, 1832, was not illustrated in his work. Linnaeus originally referred to two drawings in older books with illustrations of the species and to a shell he donated to the collection of the Queen. The shell of *Trochus solaris* donated by Linnaeus is illustrated here for the first time; it is preserved at the Uppsala University and is herein designated as the lectotype to stabilise the identity of this name.**

Key words – Xenophoridae, *Stellaria*, *Stellaria solaris*, subsequent type designation

### INTRODUCTION

The taxonomical status of the species in the genus *Stellaria* Möller, 1832 was reviewed by Nappo et al. (2022). These authors introduced two new genera in the family: *Aspidophoreas* Nappo, Bini & Santucci, 2022 and *Ponderiana* Nappo, Bini & Santucci, 2022. Prior to their work, *Stellaria* included several living and fossil species which show considerable



morphological variation. The authors only retained *Trochus solaris* Linnaeus, 1764 and *Stellaria solaris paucispinosa* Kosuge & Nomoto, 1972 in *Stellaria*. Nappo et al. (2022) did not illustrate the shell of *Trochus solaris* Linnaeus, 1764 present in Uppsala, Sweden, nor did they mention that it was seen for their study.

### TAXONOMY

Superfamily Stromboidea Rafinesque, 1815

Family Xenophoridae Troschel, 1852 (1840)

Genus *Stellaria* Möller, 1832

Type species *Trochus solaris* Linnaeus, 1764, type by monotypy

Synonymy:

Phoridae J. E. Gray, 1840: 119 (not Phoridae Curtis, 1833 [Diptera])

Onustidae H. Adams & A. Adams, 1854: 361

**Diagnosis.** – “Shells medium sized to large, rather depressed, brown in colour, with slightly convex whorls and convex base, widely umbilicate, with long and thin tubular digitations around the peripheral flange. Shell sculpture composed of numerous opisthocline granulated spiral cords, intersecting with faint growth lines. Basal sculpture composed of strong granulose colabral ribs, intersecting with spiral ribs close to the umbilicus. Attachments present only in the first two to four whorls. Smooth multispiral protoconch of around four whorls. Operculum thin, yellow, sides nearly straight, external surface smooth except for concentric growth lines and closely spaced radial striae” (Nappo et al., 2022).

**Remarks.** – Irwin et al. (2021) placed the family Xenophoridae in the superfamily Stromboidea, based on molecular research. The genus *Stellaria* is directly recognizable by the hollow, tubular, digitations perpendicularly attached to the peripheral flange. The shells of this genus have thin walls and are light in weight. The hollow, tubular digitations contribute to this light weight, instead of solid digitations or cemented foreign objects like in other genera of the family.

**Included species.** – Living species: *Stellaria solaris* (Linnaeus, 1764) and *Stellaria paucispinosa* Kosuge & Nomoto, 1972. The latter was originally described as subspecies (Kosuge & Nomoto, 1972), it was later considered as synonym by Ponder (1983: 53) and Kreipl & Alf (1999), although Mienis (1980; 2001) showed it to be a subspecies. Nappo et al. (2022: 6) raised it to full species, which status as valid species was confirmed through genetics by (Tan et al., 2026).

***Stellaria solaris* (Linnaeus, 1764)**  
(Figs 1-4)



*Trochus solaris* Linnaeus, 1764: 645.

*Astraea polaris* Röding, 1798: 79.

*Xenophora (Stellaria) solaris* (Linnaeus, 1764) [in part] – Ponder, 1983: 50.

*Stellaria solaris* (Linnaeus, 1764) – Kreipl in Poppe, 2008: pl. 291 fig. 2a-c.

*Stellaria solaris* (Linnaeus, 1764) [in part] – Kreipl & Alf, 1999: 66, pl. 22 fig. 20, 20b.

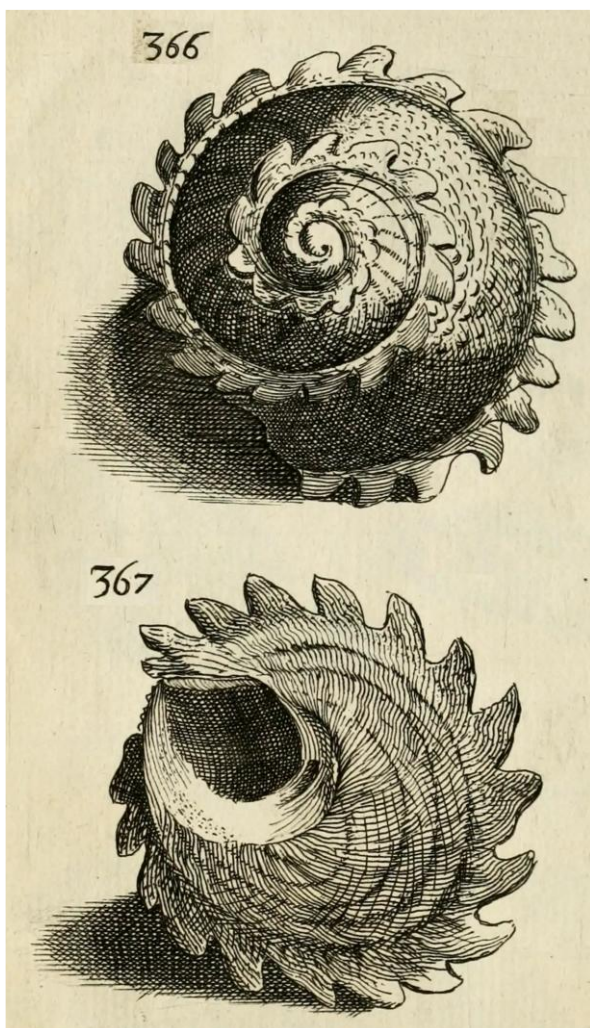
**Original description.** – *Trochus umbilicata convexo-conica, anfractibus radiatis, dentibus tubulosis, apertura semicordata* (first part).

Linnaeus refers to:

Bonan. recr. 3. t. 366, 367. Male [= Buonanni, 1684; Male (Latin) = poor]

Rumph. mus. t. 20. f. K. [= Rumphius, 1705]

The original drawings in Buonanni (1684: figs 366-367) are reversed (mirrored), here they are represented in normal view (Fig. 1). Linnaeus (1764: 645) indicated that they are poor fit for his new species *solaris*. This is correct as the figures represent not this species, but the New Zealand Turbinidae species *Astraea heliotropium* (Martyn, 1784).

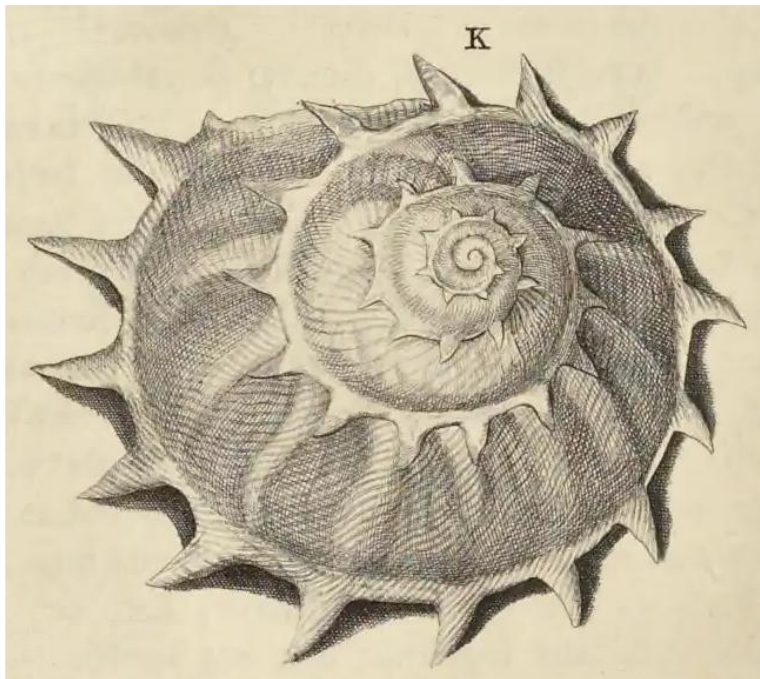


**Fig. 1. Figs 366-367 from Buonanni, 1684.**

Mirrored from original figures. Regarded as a poor representation of his *Trochus solaris* by Linnaeus, 1764.

It represents the species *Astraea heliotropium* (Martyn, 1784) (Turbinidae) from New Zealand. This shell represents a paralectotype of *Trochus solaris* Linnaeus, 1758.

The drawing in Rumphius is also in reverse, but clearly recognizable as *S. solaris*: sharp peripheral spines and the characteristic oblique ridges on the upper side of the shell.



**Fig. 2. Pl. 20 fig. K from Rumphius, 1705.** Mirrored from original figure. This shell represents a paralectotype of *Trochus solaris* Linnaeus, 1758.

**Types.** – There are three syntypes of *Trochus solaris*. The figured shell by Buonanni (1684) (Fig. 1), the shell figured by Rumphius (1705) (Fig. 2) and the shell in the collection of the University of Uppsala (Odhner, 1953; Wallin, 2001) (Figs 3-4), see below. There is no type specimen in the Linnaean Society collection in London (Dodge, 1958: 188). As not all three syntypes represent the same species, a lectotype designation is needed.

Linnaeus (1758) did not mention this species, but only later it was described as new species by him in 1764. Linnaeus apparently gave the shell from his collection to Queen Louisa Ulrica, as is written in the original description: “Hanc rariffimam testam e Mufeo proprio adjeci”, translated “I have added this extremely rare specimen from my own collection”. So probably Linnaeus obtained the shell after 1758, but before 1764 (Dodge, 1958: 188). The shell in possession of the Queen was later donated to what is now the Uppsala University Zoological Museum by Gustav IV Adolf (Wallin, 2001: 100). This shell (Figs 3-4), in the Linnaeus collection nr. 717, is herein designated lectotype.

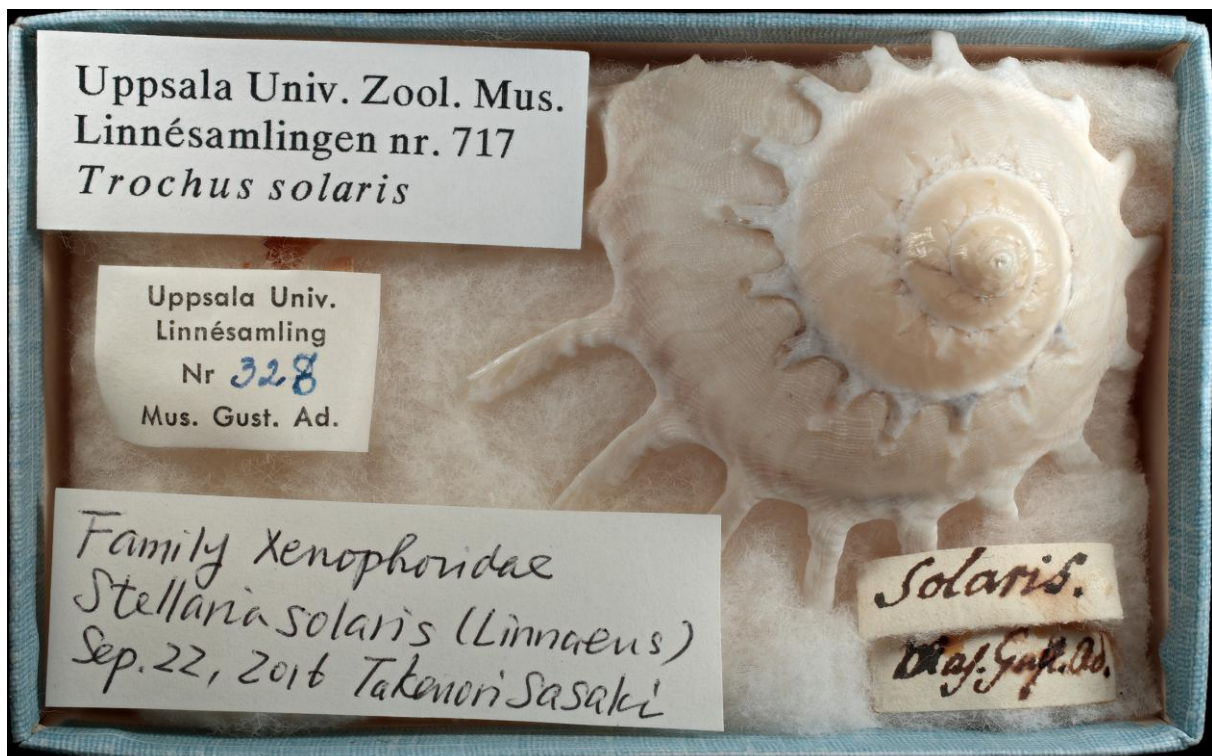
This shell was mentioned by Odhner (1953: 17, fig. 328) and by Wallin (2001: 100). Ponder (1983: 51) also noted this shell in the University of Uppsala collection and concluded that this specimen is the holotype. He mentions “The two figures cited by Linnaeus (1764) therefore, have no type status”. This clearly is an incorrect conclusion, as Linnaeus in his original description referred to both figures, so those figured shells belong also to the syntypes. Nappo et al. (2022: 2) apparently followed Ponder (1983) in incorrectly regarding the Uppsala specimen as the holotype. Ponder's (1983) action “This specimen is therefore, regarded as the holotype” cannot be considered as a lectotype designation by inference [ICZN art. 74.6], as it is clear from the original description that it was based on more than one specimen.



**Type locality.** – Linnaeus gives Java as type locality (Java, Indonesia).

**Distribution.** – Distributed in the Western Pacific, from Japan to eastern Thailand, the Philippines and Indonesia, in deep water.

**Comparison.** – This species is only comparable with *Stellaria paucispinosa* Kosuge & Nomoto, 1972 from the Indian ocean. *Stellaria paucispinosa* differs from *S. solaris* in the following features: The oblique cords on the upper surface are very strongly developed, corrugated and fewer in number; the colabrial cords at the base bear tubercles at the intersection with spiral ribs; the surface is ornamented with shell fragments from the initial whorl to the ante-penultimate or the penultimate whorl (only at the early whorls in *S. solaris*). The number of spinose projections around the periphery are fewer, in *S. paucispinosa* 10–13 (Kosuge & Nomoto, 1972), in *S. solaris* 14–20. *S. paucispinosa* is usually of smaller size (type material 46.7–93.0 mm). Specimens of *S. solaris* from the South China Sea (Vietnam) are usually much larger (to over 130 mm) than from Indonesia (usually 80–90 mm). Also, the color is different, *S. paucispinosa* is darker, light brown, often with 1–3 darker brown spirals on the upper half of the whorls, whereas *S. solaris* is light cream to yellowish-cream colored, with the colored spirals mostly lacking.



**Fig 3. *Stellaria solaris* (Linnaeus, 1758).** Lectotype herein designated, collection Uppsala University, Linnaeus collection nr. 717.



**Fig. 4. *Stellaria solaris* (Linnaeus, 1758).** Lectotype herein designated, collection Uppsala University, Linnaeus collection nr. 717.

*Stellaria paucispinosa* Kosuge & Nomoto, 1972

*Stellaria solaris paucispinosa* Kosuge & Nomoto, 1972: 4.

*Xenophora (Stellaria) solaris* (Linnaeus, 1764) [in part] – Ponder, 1983: 50, figs 6a, 10b, 13e, 29k-m.

*Stellaria solaris* (Linnaeus, 1764) [in part] – Kreipl & Alf, 1999: 66, pl. 22 fig. 20a, c.

**Original description.** – “The shell is low conical in shape and rather thin. The protoconch consists of about  $2\frac{1}{2}$  whorls which are glossy and almost smooth, with fine growth lines. Adult whorls are  $5\frac{1}{2}$  in number, earlier whorls to the ante-penultimate or the penultimate whorl are ornamented with the fragments of the other shells which is common character of the family Xenophoridae. The shell surface is sculptured with coarse spiral cords, which run down obliquely with irregular interspaces, and are crossed by somewhat corrugated growth lines. These undulating spiral cords produced into nodules below the sutures. Long spinous projections arise around the periphery and are ten to thirteen in number on the body whorl, The periphery of the body whorl is thickened and elevated. The base slightly concave and is sculptured further with radial cords which are granulated being crossed by spiral grooves. The umbilical area is widely perforate. The aperture is large and elliptical in shape, and is callused within and on half of the umbilical area ; the columellar lip is rather thick. The color is dull white with some pale orange-yellow with an orange brown callus.” from Kosuge & Nomoto, 1972: 4-5.

**Holotype.** – Holotype in Coral Museum, Tatsukushi, Tosa Shimizu City, Japan (Nappo et al., 2022). W 93 mm.

**Type locality.** – Gulf of Aden, off Aden, 85 m depth.



**Distribution.** – Indian Ocean, widely distributed in rather deep water. Gulf of Aden, off Aden (85 m) (Kosuge & Nomoto, 1972). Red Sea (36-229 m), Gulf of Oman (82 m), India (18-55 m), Sri Lanka (Mienis, 1980, 2001). All specimens from eastern Africa and the Red Sea to western Thailand in Ponder (1983: fig. 39) can be attributed to this species. Somalia, off Ras Hafun; Madagascar, off Tuléar; off Mozambique; South Africa, off Natal; 35-200 m (Nappo et al., 2022).

**Comparison.** – See *Stellaria solaris*.

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