

Foregut anatomy of the Turrinae (Gastropoda, Conoidea, Turridae)

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ABSTRACT. The foregut anatomy of 22 species of the subfamily Turrinae, belonging to 12 genera, is described. A cladistic analysis made based on the characters of anatomy of the digestive system and morphology of radular teeth. The main result of the analysis was the separation of the subfamily into two rather large groups, one of which is in turn subdivided into two subgroups. *Fusiturris similis*, *F. undatiruga*, *Cryptogemma corneus*, "*Turris*" *torta* and *Polystira formosissima* belong to the first group. In the second group the main subgroup include all species of genus *Gemmula* and *Gemmuloborsonia*. Besides anatomical differences, species belonging to different groups have a differing geographical distribution. The new data obtained as a result of last works allow to define the anatomical characteristics of other turrids subfamilies.

The aim of the present work was to study the anatomy of the remaining large subfamily, Turrinae. It is not, however, concluding, because the vast amount of data collected in many-year studies requires now a reconsideration and reanalyzing.

Material and methods

The subfamily Turrinae is considered to include 13 Recent genera (see below). The present study covers 12 of them. The study was mostly based on the material from the collections of Muséum national d'histoire naturelle, Paris (MNHN). The shells of studied species are shown in Figs. 1, 2. The shell illustrations are based either on actual specimens used for anatomical study or on specimens from the same sample.

The anatomy was studied on longitudinal serial sections of the foregut, cut at 10 µm and stained in Masson's triple stain. The radula was examined by SEM. In some cases, the results of hand dissections and the photos of some parts of sections were also used.

The character analysis was performed using PAUP version 3.1.1 [Swofford 1993].

Introduction

The family Turridae, one of the most diverse and species-rich in the Conoidea, becomes presently probably the best studied anatomically not only in the Conoidea but among all Neogastropoda [Kantor, 1990; Kantor et al., 1997; Kantor, Sysoev, 1991a; Leviten, 1970; Medinskaya, 1999; Simone, 1999; Sysoev, Kantor, 1987, 1988; Taylor, 1985, 1994; Taylor et al., 1993; etc.]. The interest of anatomy of the group is due to very high morphological diversity of many structures, primarily the foregut, whose evolution mainly determined the radiation of the group. However, despite numerous studies, the relationships of taxa within the family are often still unclear and require additional investigation.

At the moment, the anatomy of about 100 species of the family Turridae has been studied. The family includes 5 subfamilies with about 80 genera [Taylor et al., 1993; Kantor et al., 1997; Sysoev, Bouchet 1996].

A detailed study of foregut anatomy of the subfamily Crassispirinae [Kantor et al., 1997] allowed to obtain many new data which seemed to delimit clearly the subfamilies. However, the following work, on the subfamily Cochlespirinae [Medinskaya, 1999], revealed data which, on the one hand, permitted to clarify some details, but, on the other hand, have set new problems.

List of turrid species studied and their localities

- Decollidrillia nigra* Habe et Ito, 1965
R/V "Vityaz", 59th cruise, sta. 7498, 43°37,7'N, 147°00,7'E, 180 m.
- Cryptogemma corneus* (Okutani, 1966)
R/V "Vityaz", sta. 3578, 38°35'N, 142°53,3'E, 1660 m.
- Fusiturris similis* (Bivona, 1838)
R/V "Cryos", Balgim, sta. CP145, 35°57'N, 03°08'W, 373 m; R/V "Cryos", Balgim, sta. CP149, 35°47'N, 05°11'W, 377 m.
- Fusiturris undatiruga* (Bivona, 1832)
R/V "Cryos", Balgim, sta. DR75, 33°53'N, 08°15'W; Ilha de Luanda, prov. Luanda, Angola, 40-60 m.
- Gemmula cosmoi* (Sykes, 1930)
SW Madagascar, campagne crevettière 86, sta. 57, 22°26'S, 43°06'E, 460 m; SW Madagascar, "Mascareignes III", sta. 27, 22°21'S, 43°06'E, 450 m.
- Gemmula lordhoweensis* Kantor et Sysoev, 1991
R/V "Dmitry Mendeleev", sta. 1245, 30°24'S, 161°51'E, 1210 m, paratypes.
- Gemmula unedo* (Kiener, 1840)
SW Madagascar, campagne crevettière 86, sta. 58,