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1 History of knowledge and state of the art

Trochidae (here treated in the broad historical sense, Trochidae sensu lato, while explicitly recognizing that modern classifications partition several “traditional trochids” among multiple trochoidean families) have been central to the development of marine gastropod systematics because they combine high species richness, conspicuous shell diversity, and strong ecological coupling to rocky and reef habitats (Bouchet et al., 2017; Williams et al., 2008). In this chapter, “state of the art” denotes the current consensus and the dominant unresolved problems across taxonomy, character evolution, and applied ecology, emphasizing how changes in evidence bases (shells, anatomy, and molecules) repeatedly reshaped family limits and identification practice (Bouchet & Rocroi, 2005; Williams, 2012).

1.1 Historical overview of research on Trochidae

The earliest scientific treatments of trochids were embedded within Linnaean taxonomy, in which species hypotheses were anchored primarily in external morphology and concise diagnoses, with shells serving as the most accessible and preservable evidence (Linnaeus, 1758). This historically shell-led tradition is often termed conchology, defined here as the descriptive and classificatory study of molluscan shells, which dominated 18th–19th century practice and generated large, enduring nominal inventories for Trochoidea sensu lato (Linnaeus, 1758; Thiele, 1929–1935).

By the late 19th and early 20th centuries, “faunal synthesis” works and museum-based comparative series increasingly attempted supraspecific ordering, including family- and subfamily-level schemes that explicitly weighed shell characters such as spire shape, sculpture, and umbilical development across broad geographic collections (Thiele, 1929–1935). This period consolidated a pragmatic, morphology-first workflow, description, comparison, and synonymy, while also exposing the instability created by regional naming practices and incomplete access to earlier type material (ICZN, 1999; Thiele, 1929–1935).

A decisive expansion of character systems followed the routine incorporation of radular evidence, where the radula is the chitinous, conveyor-belt-like feeding ribbon bearing serial tooth rows, and the radular formula is the standardized notation summarizing the arrangement and counts of tooth types per transverse row (Hickman, 1980; Troschel, 1856–1863). Radular anatomy enabled explicit functional and phylogenetic hypotheses because tooth form is shaped by both diet and inherited developmental programs, requiring careful separation of homology from ecological convergence (Hickman, 1980; Troschel, 1856–1863).

From the mid-to-late 20th century, trochoidean systematics integrated broader soft-part anatomy and evolutionary reasoning, including critical reassessments of "grade-based" groupings among vetigastropods and increasing attention to character polarity and transformation (Haszprunar, 1988; Ponder & Lindberg, 1997). In Trochoidea, synthetic revisions used combined shell, radula, and anatomical evidence to stabilize suprageneric concepts and to articulate explicit diagnostic systems rather than relying on single-character typologies (Hickman & McLean, 1990; Haszprunar, 1988).

In parallel, applied ecological and fisheries research on large-bodied "trochid" grazers (in the historical sense, including taxa now frequently assigned outside Trochidae sensu stricto) generated quantitative demographic baselines and highlighted management vulnerabilities caused by shore-based harvesting (Foale & Day, 1997; Schmidt et al., 2002). For example, artisanal exploitation of Cittarium pica on Caribbean rocky shores was associated with mean densities of ~14 individuals m^{-2} at an unexploited site (approximately threefold higher than exploited sites), elevated total mortality at exploited sites ($Z \approx 4.05$–4.47 versus 1.47), and growth parameters of $k \approx 0.19$–0.28 yr^{-1} with $L\infty \approx 104$ mm, motivating minimum-size and seasonal-closure recommendations (Schmidt et al., 2002).