



Taxonomy of high-latitude Goniasteridae (Subantarctic & Antarctic): one new genus, and three new species with an overview and key to taxa

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Table of contents

Abstract	2
Introduction	2
Taxonomic history	2
Methods and material	3
Key to high-latitude Goniasteridae	3
Systematics	5
Goniasteridae Forbes, 1841	5
<i>Ceramaster</i> Verrill, 1899	5
<i>Ceramaster australis</i> H.E.S. Clark, 2001 in Clark & McKnight, 2001	6
<i>Ceramaster patagonicus</i> (Sladen, 1889)	8
<i>Chitonaster</i> Sladen, 1889	10
<i>Chitonaster cataphractus</i> Sladen, 1889	11
<i>Chitonaster felli</i> (H.E.S. Clark, 1971)	13
<i>Chitonaster johanna</i> e Koehler, 1908	15
<i>Chitonaster trangae</i> n. sp.	17
<i>Cladaster</i> Verrill, 1899	19
<i>Cladaster analogus</i> Fisher, 1940	19
<i>Enigmaster</i> McKnight & H.E.S. Clark, 1996	23
<i>Enigmaster scalaris</i> McKnight & H.E.S. Clark, 1996	23
<i>Eratosaster</i> nov. gen.	24
<i>Eratosaster jena</i> e nov. sp.	24
<i>Hippasteria</i> Gray, 1840	26
<i>Hippasteria falklandica</i> Fisher, 1940	27
<i>Hippasteria phrygiana</i> (Parelius, 1768)	27
<i>Lithosoma</i> Fisher, 1911	30
<i>Lithosoma novaezealandiae</i> McKnight, 1973	30
<i>Notioceramus</i> Fisher, 1940	32
<i>Notioceramus anomalous</i> Fisher, 1940	32
<i>Pergamaster</i> Koehler, 1920	34
<i>Pergamaster incertus</i> (Bell, 1908)	34
<i>Pergamaster triseriatus</i> H.E.S. Clark, 1962	37
<i>Pillsburiaster</i> Halpern, 1970	39
<i>Pillsburiaster aoteanus</i> McKnight, 1973	40
<i>Pillsburiaster calvus</i> n. sp.	41
<i>Pillsburiaster indutilus</i> McKnight, 2006	43
<i>Sphaeriodiscus</i> Fisher, 1910	44
<i>Sphaeriodiscus mirabilis</i> A.M. Clark, 1976	44
Summary of taxonomic changes/additions	46
Acknowledgments	46
References	47
APPENDIX I. Terminology used in the key	48

Abstract

A review of high-latitude Goniasteridae south of 50°S is presented, including a key to species, figures and taxonomic descriptions of all species with a brief taxonomic summary for all genera. Nineteen species in 11 genera are reviewed. *Eratostaster jena* **nov. gen** and sp., *Chitonaster trangae* **nov. sp.**, and *Pillsburiaster calvus* **nov. sp.** are described. Several taxa, including *Chitonaster*, have not been reviewed since their initial description and revision of the group has clarified taxonomic boundaries between species. The genus *Pentoplia* is a junior synonym of *Chitonaster*. Rarely encountered species, synonyms, and range extensions are reported for multiple species.

Key words: Goniasteridae, Asteroidea, Antarctic, subantarctic, Southern Ocean, taxonomy, New Zealand

Introduction

The Goniasteridae is a taxonomically diverse family of predominantly cold-water asteroids that are known primarily from continental shelf habitats in all of the world's oceans. Goniasterids are ecologically important members of the communities where they are found (e.g., Birkeland, 1974; Kreiger and Wing, 2002). The family Goniasteridae includes the most number of genera within the Asteroidea (Mah and Hansson, 2009) and yet diversity within the group is poorly known with many new taxa awaiting discovery (Mah, 2005).

Goniasterids are characterized primarily by their heavily calcified endoskeletons, which are expressed externally by well-developed marginal plate series and well-defined abactinal and actinal plates arrangements. The heavily calcified goniasterids are anomalous among the Antarctic asteroid fauna, which is dominated by taxa with decalcified skeletons (Fisher, 1940). Goniasterids were rarest among the asteroid taxa (*Notioceramus* and *Chitonaster*) surveyed from the South Shetland-Antarctic Peninsula region (Majon-Cabeza *et al.*, 2001).

Goniasterid biodiversity may play an important role as proxy taxa in understanding faunal shifts in conjunction with climate change. A surprising abundance of goniasterid taxa, including *Pentagonaster* (= *Buterminaster*, as synonymized by Mah, 2007) and *Tessellaster* have been recovered from shallow-water Eocene sediments on Seymour Island (Blake & Aronson, 1998, Blake & Zinsmeister, 1988) but are absent from the modern Antarctic, suggesting that environmental changes have influenced their historical distribution in the region. Most goniasterids possess relatively well-developed calcium carbonate skeletons, compared to other antarctic asteroid taxa, a characteristic that suggests they will be severely affected by changes in ocean chemistry (e.g., Gooding *et al.*, 2009; O'Donnell *et al.*, 2009; Wood *et al.*, 2008). This and other features of benthic faunas are part of considerations assessing the vulnerability of benthic Antarctic taxa to extinction (Peck, 2005).

Taxonomic history

Among the first goniasterid species collected from southern high-latitude regions were *Ceramaster patagonicus* and *Chitonaster cataphractus*, both described by Sladen (1889) aboard the H.M.S. *Challenger* followed by *Hippasteria hyadesi* (now *H. phrygiana*) described by Perrier (1891). Subsequent goniasterid taxa, including *Pergamaster* Koehler, 1920 and *Notioceramus* Fisher, 1940, were discovered in the mid to latter part of the 20th Century. Taxa present in sub-Antarctic waters, such as *Sphaeriodiscus mirabilis* A.M. Clark, 1976, *Lithosoma novaezealandiae* McKnight, 1973, *Cladaster analogous* Fisher, 1940 and *Pillsburiaster aoteanus* McKnight, 1973 have been among the most recently discovered members of the Goniasteridae. The two new species described below were collected from subantarctic waters.

A.M. Clark (1962) provided the first set of complete diagnostic key for asteroids of this region, including a taxonomic summary/key to the Goniasteridae. Bernasconi (1963) reviewed Argentinian goniasterids, which included several subantarctic (*Ceramaster* and *Hippasteria*) and Antarctic taxa (*Pergamaster*). H.E.S. Clark (1963) reviewed and summarized asteroids from the Ross Sea and elaborated on the only goniasterid known from the Ross Sea, *Pergamaster triseriatus*. McKnight (1973), Clark and McKnight (2001) and McKnight (2006) reviewed the New Zealand asteroid fauna, including several undescribed taxa and new records of subantarctic goniasterids.

This overview of the Goniasteridae was prompted by an assessment of the Antarctic asteroid fauna based on the discovery of new taxa and additional material in the USNM-USARP collections.