

# New records of brisingidan asteroids (Asteroidea: Brisingida) in eastern Canada

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*We report new geographical and bathymetric occurrence information for several species of brisingidan asteroids (Asteroidea: Brisingida) in eastern Canada. We recorded Brisinga costata, Freyella microspina and Novodinia americana in Newfoundland and Labrador (NL), extending the geographical ranges of these species northward. Brisinga costata and F. microspina occur up to 350 m shallower in NL than elsewhere in their published ranges, while N. americana occurs 567 m deeper. We also confirm the presence of Freyella elegans, a possibly cosmopolitan species found throughout the North Atlantic but not previously reported in Canadian waters.*

**Keywords:** *Brisinga costata*, *Freyella elegans*, *Freyella microspina*, *Novodinia americana*, Newfoundland and Labrador, Nova Scotia, bathyal, Echinodermata, sea star

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## INTRODUCTION

Brisingidan asteroids (Echinodermata: Asteroidea: Brisingida) are a predominately deep-sea (>200 m) class of echinoderms that occur worldwide. The distinctive morphology of brisingidans superficially resembles that of crinoids (Asteroidea: Crinoidea), as brisingidans have many (always more than five) long, spined arms that are often raised into the water column for suspension feeding (Downey, 1986; Emson & Young, 1994). Characteristic taxonomic features of brisingidans include a fused oral ring, crossed pedicellariae, and hourglass-shaped ambulacral ossicles (Clark & Downey, 1992). Although the Brisingida have been known since the mid to late 19th Century (Downey, 1986), they remain poorly understood due to their deep distributions and fragile bodies that are badly damaged on retrieval by trawls (Tyler *et al.*, 1984). Many species are known only from a small number of individuals or only from fragments, making estimates of their geographical and bathymetric ranges difficult.

Although there is a long history of trawling and fishing in eastern Canada, relatively little is known about non-commercial invertebrates such as asteroids in the region. Gale *et al.* (2014) recently studied species assemblages involving asteroids off Newfoundland and Labrador (NL) using a combination of field sampling and video data from remotely operated vehicles (ROVs). In addition, examination of samples obtained from routine fisheries surveys by Canada's Department of Fisheries and Oceans (DFO) has revealed new records of asteroid species for the region (e.g. Mah *et al.*, 2012). Here we report on new geographical and

bathymetric ranges for several species of brisingidan asteroids in NL: *Brisinga costata* Verrill, 1884, *Freyella microspina* Verrill, 1894, *Novodinia americana* (Verrill, 1880), and a new eastern Canada record for *Freyella elegans* (Verrill, 1884).

## MATERIALS AND METHODS

Asteroids were collected during routine fisheries surveys led by DFO, which were carried out over the NL shelf and slope including the Laurentian Channel, Grand Banks and into Labrador as far as 56°N. Specimens were collected by trawl between 2005 and 2011 at depths between 471 m and 1375 m. After collection, specimens were either preserved in ethanol or were frozen at -20°C. Specimens were photographed and the disc radius of most individuals was measured using imaging software ImageJ. Additional specimens and *in situ* images were collected in 2007 during surveys conducted by the remotely operated vehicle ROPOS along the Scotian Shelf and southern Newfoundland shelf at depths between 354 and 2243 m. Although identifying brisingidans from images is difficult and definitive identifications require examination of voucher specimens, records from the *in situ* images are included here to provide additional information on these poorly known species. To standardize identification, we determined several easily visible morphological features for each brisingidan species known to occur in our ROV survey range. Poor quality or ambiguous observations (i.e. identifying features not visible) were excluded. *Brisinga costata* (reported here as *B. cf. costata*, see Results below) was identified by the presence of distinct costae (raised ridges, Figure 2A) on arms, sometimes only visible as a darker orange section of arms; a lighter disc; and 6–8 thin arms, usually flat against substrate, that did not touch each other at connection to disc. *Freyella elegans* was identified by a disc clearly raised above plane of

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