



## Swimming deep-sea holothurians (Echinodermata: Holothuroidea) on the northern Mid-Atlantic Ridge\*

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### Abstract

The ability to swim was recorded in 17 of 32 species of deep-sea holothurians during the RRS *James Cook* ECOMAR cruise in 2010 to the Mid-Atlantic Ridge. Holothurians were observed, photographed, and video recorded using the ROV *Isis* at four sites around the Charlie-Gibbs Fracture Zone at approximate depths of 2,200–2,800 m. For eleven species swimming is reported for the first time. A number of swimming species were observed on rocks, cliffs and steep slopes with taluses. These habitats are unusual for deep-sea holothurians, which are traditionally common on flat areas with soft sediment rich in detritus. Three species were found exclusively on cliffs. Swimming may provide an advantage in cliff habitats that are inaccessible to most epibenthic deposit-feeders.

**Key words:** sea cucumbers, benthopelagic species, diversity, Northern Atlantic Ocean

### Introduction

Mid-ocean ridges remain one of the least studied environments in the ocean. They are characterised by remoteness, high relief, very complicated topography and complex current regimes. In the North Atlantic, the bathyal benthic ridge fauna has been less studied than those of open ocean seamounts (review in Mironov *et al.* 2006). In recent years, the bathyal fauna of the Mid-Atlantic Ridge was targeted by several expeditions onboard the RV *Akademik Mstislav Keldysh* (2003), *G.O. Sars* (2004) and the RRS *James Cook* (2007, 2009 and 2010) as part of two projects: MAR-ECO (a field project of the Census of Marine Life programme) (Bergstad & Godø 2003; Bergstad *et al.* 2008; www.mar-eco.no) and the UK-consortium project ECOMAR (www.oceanlab.abdn.ac.uk/ecomar). Among the goals of these projects was a better understanding of biodiversity and distribution patterns of benthic fauna on the Mid-Atlantic Ridge.

The most diverse component of megafauna on the ridge appears to be holothurians or sea-cucumbers (Echinodermata, Holothuroidea) (Gebruk 2008; Gebruk *et al.* 2010). Holothurians dominated the invertebrate biomass in the samples taken by ECOMAR in 2007 and 2009 (original data). In 2010 the ECOMAR cruise investigated four sites around the Charlie-Gibbs Fracture Zone (from 48 to 54°N) with the ROV *Isis*. Numerous observations documented by video and photo records were made