MOUTHPARTS OF THE DEEP-SEA ISOPOD BATHYNOMUS PELOR
(ISOPODA, CIROLANIDAE)

BY

MURRAY THOMSON1)

School of Biological Studies, The Heydon-Laurence Building A08, The University of Sydney, NSW 2006, Australia

ABSTRACT

The deep-sea isopod Bathynomus pelor is a carnivorous scavenger that feeds on infrequent food falls provided by fish or cetaceans dying and dropping from upper levels of the sea. In order to understand the microanatomy of the mouthparts that allow B. pelor to survive in its competitive environment, the mouthparts of the animal and their setae were studied using scanning electron microscopy. B. pelor was found to display a diverse and site-specific collection of setae on its mouthparts that are suited to obtaining mechanosensory and chemosensory information from food. Some setae such as the densely setulated pappose and plumose setae on the maxilliped are suited to the retention of small particles of food in the pre-oral cavity.

RÉSUMÉ

L’isopode d’eaux profondes Bathynomus pelor est un nécrophage carnivore qui se nourrit des rares chutes de nourriture fournies par les poissons ou les cétacés mourant et descendant des niveaux supérieurs de la mer. Afin de comprendre la micro-anatomie des pièces buccales qui permettent à B. pelor de survivre dans son environnement où la compétition est forte, les pièces buccales de l’animal et leurs soies ont été étudiés en microscopie électronique à balayage. On a mis en évidence que B. pelor présentait un ensemble de soies diverses et spécifiques au lieu sur ses appendices buccaux adaptés pour la réception de l’information mécano- et chimiosensorielle en provenance de la nourriture. Certaines soies comme les soies plumeuses simples et les soies plumeuses duveteuses, à sétules denses, situées sur le maxillipède sont adaptées à la rétention des petites particules de nourriture dans la cavité pré-orale.

INTRODUCTION

Isopods of the genus Bathynomus are important members of benthic ecosystems and are found at depths of 350-1800 m where light and food are restricted
Bathynomus species are regularly caught in baited traps and in hauls of fish and crabs; they are marine scavengers that prey on carrion as well as slow moving or injured animals (Briones-Fourzán & Lozano-Alvarez, 1991; Tso & Mok, 1991; Barradas-Ortiz et al., 2003). Indeed, Bathynomus species are known to eat a wide range of food items, including crustaceans, fish, cephalopods, decapods, sponges, echinoderms, nematodes, tunicates, ostracods, mammalian tissue, and plant material (Briones-Fourzán & Lozano-Alvarez, 1991; Thomson et al., 2009). The anatomical features of the genus Bathynomus that help these isopods go for long periods without food include a digestive system with a high capacity for storing food as well as a hepatopancreas and adipose tissue that can store high amounts of lipids (Steeves, 1969; Holthuis & Mikulka, 1972; Briones-Fourzán & Lozano-Alvarez, 1991; Barradas-Ortiz et al., 2003). The species Bathynomus pelor Bruce, 1986 lives off the coast of Western Australia and has been caught from oil rigs using remotely operated vehicles and baited traps (Thomson et al., 2009).

It has not been established how much of the diet of Bathynomus species is made up of smaller animals such as ostracods, that are in the 0.1-2 mm diameter range. It is well known that the anatomy of an animal’s mouthparts often shows the results of evolution to suit specific food types and feeding patterns, and some studies have been made on the mouthparts of crustaceans in an effort to understand the adaptations that have allowed them to survive in their environments (McGrouther, 1983; Coleman, 1989; Al-Zahaby et al., 2001). It has been proposed that crustaceans that feed on animal tissue, need incisors that have broad and sharp cutting edges for shearing off tissue and do not need large amounts of setae and/or complex arrangements of setules on the setae to capture small particles of food (Coleman, 1989; Mayer et al., 2008). In contrast, crustaceans that feed on smaller food particles need complex arrangements of setulated setae to capture the small particles of food, and herbivores need flattened molar surfaces, such as those that are made rasp-like by dense rows of robust cusps, to triturate plant material (Mayer et al., 2008).

As well as performing direct mechanical functions such as helping hold food in the mouthparts, crustacean setae house receptors for chemosensory and mechanosensory functions (Watling, 1989; Kaufmann, 1994; Garm, 2004a). Individual setae can be specialized to sense chemical or mechanical stimulation but studies on decapods suggest that the majority of setae are equipped with both receptor types and detect both chemical and mechanical stimuli (Altner et al., 1983; Schmidt & Gnatzy, 1984; Schmidt, 1989; Cate & Derby, 2001, 2002; Garm et al., 2003). Very little is known about the mouthpart setae in species of the genus Bathynomus (cf. Thomson et al., 2009); indeed, reports on the micro-anatomy of cirolanid isopod mouthparts using magnification powers of over 100× are rare