HISTOLOGICAL CHARACTERISTICS OF FAT BODIES IN THE Puerulus OF THE ROCK LOBSTER Jasus edwardsii (Hutton, 1875) (Decapoda, Palinuridae)

BY

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ABSTRACT

The histochemical characteristics of fat bodies in the hemocoel of the puerulus and the post-puerulus of the New Zealand rock lobster Jasus edwardsii were examined. Each fat body spread from the distal tip of the anterior and intermediate lobes of the hepatopancreas to the hemocoel between the branchiostegite wall and inner carapace wall. The fat bodies stained intensively blue with Nile blue and blue black with Sudan black B and were PAS positive, suggesting that they contained acidic lipid and polysaccharides. The fat bodies got smaller as the lobsters developed, particularly as they changed from transparent to pigmented puerulus. This reduction in size of fat body corresponded with increased lipid in the hepatopancreatic cells. These results suggest that the fat bodies are storage sites of nutrients which would provide a source of metabolic energy both for the active, long-distance swim by the puerulus and for subsequent developmental changes after settlement.

RÉSUMÉ


INTRODUCTION

Palinurid lobsters hatch near the coast and drift in offshore waters for several months as planktonic phyllosoma larvae. Final-stage phyllosomas metamorphose into adult-like pueruli offshore, and over several days to weeks swim...
back to the coast to settle (Phillips & Sastry, 1980). After settlement, the puerulus takes about one to several weeks (in the case of Jasus edwardsii (Hutton, 1875)) to moult to the post-puerulus juvenile (Booth & Stewart, 1993).

The mouthparts and foregut of the puerulus are morphologically much less developed than those of either the phyllosoma or the post-puerulus (Nishida et al., 1990; Wolfe & Felgenhauer, 1991). Furthermore, no feeding has been observed in cultured pueruli of species of Jasus (Kittaka, 1988; Kittaka et al., 1988; Kittaka, unpubl.), Palinurus elephas (Fabricius, 1787) (cf. Kittaka & Ikegami, 1988) or Panulirus japonicus (Von Siebold, 1824) (cf. Kittaka & Kimura, 1989). This suggests that there is little or no feeding by pueruli and that pueruli use stored energy during their movement to the coast and for developmental change.

There is a considerable literature on the distribution and function of lipid in decapod crustaceans (Loizzi, 1971; Chang & O’Connor, 1983; Al-Mohanna & Nott, 1987). However, most studies have focused on characteristics of lipid in the juvenile and adult stages, with little attention to the early life period. During a histological study of developmental changes in the hepatopancreas of the puerulus of the rock lobster J. edwardsii, fat bodies were found in the hemocoel associated with the hepatopancreas. This study examines the morphological and histochemical characteristics of these fat bodies and the changes that occur during the development of the puerulus and first-moult post-puerulus stages.

MATERIALS AND METHODS

Samples were collected in January, 1991, at Castlepoint on the southeast coast of the North Island, New Zealand, with crevice collectors (Booth & Tarring, 1986). Three different puerulus stages were examined. A newly settled puerulus is completely transparent except for the tips of the antennae and the eyes, and is termed here a “transparent puerulus”. The hepatopancreas then becomes white and the integument starts to become pigmented within one or two days after settlement. Pueruli became fully pigmented within several days, and are then termed “pigmented pueruli” (see Booth & Stewart, 1993). The first instar after the moult from the puerulus is termed the “post-puerulus”.

The specimens were collected during the day and within two hours the cephalothorax of each was fixed in 10% neutral formalin buffered with sodium phosphate (pH 7.2) or Bouin’s fluid. Five specimens were examined for each stage. Three specimens were dehydrated in ethanol and embedded in paraffin, and serial 5 μm sections were taken on a rotary microtome. Tissue sections were stained with Mayer’s hematoxylin and eosin, and Periodic acid-Schiff (PAS) of McManus (Lillie, 1948). The other two specimens were frozen, cut into 30–40 μm sections, and stained for lipids with Sudan black B and Nile blue. The stained sections were examined under a compound microscope.