JASUS EDWARDSII LARVAL RECRUITMENT OFF THE EAST COAST OF NEW ZEALAND

BY

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ABSTRACT

Geographic differences in levels of Jasus edwardsii puerulus settlement on the east coast of New Zealand during the 1980’s were associated with differences in abundance offshore of mid- and late-stage phyllosoma larvae and with water flow patterns. Levels of puerulus settlement on crevice collectors and abundance of phyllosomas in plankton samples were greatest off the North Island south of about East Cape. The pattern of phyllosoma abundance appeared to be determined by factors which included levels of local larval production and the oceanography. Phyllosomas occurred almost exclusively seaward of the continental slope while most pueruli were caught on the shelf. Some phyllosomas reached final stage about 12 months after the spring hatching, but often metamorphosis to the puerulus stage and settlement did not take place until the following summer to spring; this gives an oceanic development period of 12-24 months. Settlement seasons have been generally consistent over time scales of 1-3 decades. Most commonly, settlement is in winter, but the main settlement seasons vary according to locality, nearby sites having similar seasons except over particular stretches of coastline where seasons change radically. Reasons for the seasonal pattern in settlement are unknown. Year to year levels of settlement were correlated at widespread sites, showing that factors which drive larval recruitment may influence large areas in a similar way at the time.

RÉSUMÉ

Les différences géographiques dans les niveaux de sédentarisation des pueruli de Jasus edwardsii sur la côte est de Nouvelle-Zélande durant les années 1980 ont été associées aux différences d’abondance, au large, des larves de phyllosome aux stades moyens et tardifs et aux modèles de courants. Les niveaux de sédentarisation des pueruli sur les collecteurs de crevasses et l’abondance des phyllosomes dans les échantillons de plancton ont été les plus importantes au large de l’Île du Nord, au sud d’East Cape. Le modèle d’abondance des phyllosomes semble déterminé par des facteurs incluant les niveaux de production larvaire locale et l’océanographie. Les phyllosomes étaient présentes presque exclusivement au large de la pente continentale tandis que la plupart des pueruli étaient capturés sur le plateau continental. Certaines phyllosomes ont atteint le stade final environ 12 mois après l’éclosion de printemps, mais souvent la métamorphose en stade puerulus et la sédentarisation n’ont pas eu lieu avant l’été de l’année suivante; ceci donne une période de développement océanique de 12-24 mois. Les saisons de sédentarisation ont été généralement cohérentes sur des échelles de temps de 1-3 décennies. Plus communément, la sédentarisation se passe en hiver, mais les principales saisons de sédentarisation varient suivant la localité, des sites voisins ayant des saisons similaires excepté sur des étendues particulières de la côte, là où les saisons changent radicalement. Les causes du modèle saisonnier de sédentarisation sont inconnues. D’une année sur l’autre, les niveaux de sédentarisation étaient en corrélation avec des sites largement distribués: montrant que les facteurs qui régissent le recrutement larvaire peuvent agir sur de vastes zones, de façon analogue et au même moment.
INTRODUCTION

The red rock lobster, *Jasus edwardsii* (Hutton, 1875), is an Australasian species supporting one of New Zealand’s most valuable fisheries. In recent years, about 60% of the 3500-5500 t annual landings have come from the east coast (MAF Fisheries data), most from south of East Cape (see figs. 1 and 7 for localities). To manage this major resource, it is important to understand larval recruitment processes.

Shallow-water spiny (rock) lobsters spend months as phyllosoma larvae in waters tens to hundreds of kilometres offshore (Booth & Phillips, 1994). They return to shore as transparent pueruli, the settling stage. The puerulus resembles the juvenile in shape and is around 10 mm in carapace length (CL). It moults into the first moult postpuerulus juvenile a few days to weeks after settlement.

Phyllosomas appear suited to passive drift and in culture have shown limited ability to swim horizontally (J. Kittaka, Kitasato University, Sanriku, Japan, pers. comm.). This, together with the long period offshore, means that currents and eddies are important in the transport of larvae (Booth & Phillips, 1994).

*J. edwardsii* breed annually, with most egg-hatching in September and October (Booth & Stewart, 1992). There is geographic variation in larval production because size at onset of breeding, breeding female abundance, and egg-per-recruit vary with locality. Annual larval production is high in the east from East Cape to Motunau, in the south from Jackson Head to Foveaux Strait, and at the Chatham Islands; moderate in the east north of East Cape; and low elsewhere (Booth & Stewart, 1992).

Lesser (1978) grouped the approximately 15 phyllosoma instars (Kittaka et al., 1988) of *J. edwardsii* into 11 stages. Lesser found that off Castlepoint, mid-stage (Stages V-VII) and late-stage (Stages VIII-XI) phyllosomas (combined, ‘advanced larvae’), occurred from the edge of the continental shelf to the end of the 185 km transect. In more widespread sampling in 1987-88 (Booth & Stewart, 1992), advanced phyllosomas were far more abundant off the east coast of the North Island south of East Cape than off the east coast of the South Island and they were taken to almost 600 km from shore.

Settlement takes place to depths of at least 50 m, but on collectors off the North Island was highest at 10-12 m (Booth et al., 1991). Settlement takes place mainly at night and at all lunar phases (Booth & Stewart, 1993).

This paper describes patterns of abundance of *J. edwardsii* advanced phyllosoma larvae, and pueruli, on the east coast of New Zealand over the late 1970s to early 1990s. It investigates links between these and the broad-scale current patterns and associated eddy fields.

Flow patterns along east coast of New Zealand

New Zealand lies in a west to east oceanic drift (Heath, 1985) (fig. 1). The East Auckland Current is a small western boundary current of subtropical