



PELAGIC AND EARLY BENTHIC STAGES  
AS DETERMINANTS OF THE DISTRIBUTION AND ABUNDANCE  
OF THE ASCIDIAN  
PODOCLAVELLA MOLUCCENSIS SLUITER

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ABSTRACT

The colonial ascidian Podoclavella moluccensis Sluiter (Aplousobranchia: Clavelinidae) inhabits subtidal hard substrata in temperate and tropical Australian waters. Colony densities span more than two orders of magnitude between sites in St Vincent's Gulf and Investigator Strait, South Australia. This thesis investigates the role of pelagic and early benthic phases of the life history in determining the distribution and abundance of adult colonies.

P. moluccensis lends itself to an investigation of early life history stages because larvae are highly conspicuous. The size (4mm in length) and bright blue pigmentation of P. moluccensis larvae render them easily observable under water.

Population dynamics were examined at two sites; Edithburgh Jetty and Port Noarlunga Reef. Life history attributes differed between these sites. At Edithburgh, colony densities were the highest observed at any site and colonies were semelparous annuals. Densities at Port Noarlunga were approximately 7-fold lower than at Edithburgh and this population was perennial and iteroparous. Associated with these differences in life histories were differences in the population dynamics and the fecundity of colonies at each site. Fecundity was higher at Edithburgh, with a higher proportion of each colony brooding and significantly larger broods.

The number of recruits at each site showed a strong positive relationship with the size of the adult population. Recruitment at Edithburgh was an order of magnitude higher than at Port Noarlunga. A strong relationship between adult density and recruitment is to be expected given the short distances over which P. moluccensis larvae disperse.

Dispersal was quantified by following 270 larvae after their release from the parental colony. One hundred larvae were followed successfully to settlement. The distance that larvae dispersed from the parent colony was represented by a negative binomial function, following smoothing of the data. On average, larvae moved a little over two metres after swimming for less than two minutes. Estimated larval mortality was, on average, less than 11%.

Larvae did not settle at random on available substrata. They selected substrata at settlement on the basis of light, gravitational, and chemical cues (textural cues were not examined). Settling larvae showed a preference for substrata on which early post-settlement mortality was low. In a regression of settlement against recruitment, settlement explained 86% of the variation in the relationship. Hence, the number of settlers could be confidently inferred from estimates of recruitment.

Post-settlement mortality was dependent on substratum type. Overgrowth by neighbouring animals and the dislodgement of epifauna upon which larvae had settled were significant sources of post-settlement mortality. Juvenile colonies were shown not to survive high levels of artificial damage, indicating that predators were a potential source of mortality. Indeed, recruit survival and growth rate were significantly enhanced in crab enclosures. Crabs were not consuming recruits but rather 'trampling' them.

An interplay between adult population size, the distance of dispersal, and the availability of sites suitable for settlement adequately explain the distribution and abundance of adult colonies. These findings underscore the significance of early pelagic and benthic stages in determining the distribution and abundance of species which have dispersive larvae.

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