REPRODUCTION IN SAND DWELLING TALITRID AMPHIPODS: EVOLUTIONARY ADAPTATION FOR TERRESTRIAL LIFE

Within the Amphipoda reproductive potential can be evaluated by measuring a number of factors including longevity, egg size and brood production. Some previous workers have suggested that mean brood size (number of eggs) is related to habitat, decreasing from marine through supralittoral to terrestrial amphipods. Supralittoral talitrids include two ecomorphological groups (Bousfield, 1982) - the beach fleas with well described patterns of reproduction and the beach hoppers investigated here.

Brood characteristics were measured for three species of sandhoppers from Maine, USA (*Platorchestia platensis*, *Talorchestia megalophthalma* and *Talorchestia longicornis*) and two species from New Zealand (*Talorchestia quoyana* and *Talorchestia cookii*). The results were combined with literature values to provide a comparison of 10 sandhoppers, ranging in body length from 2 to 21 mm (Williams, 1978; Morino, 1978; Venables, 1981; Van Senus, 1988). Some species, for example *P. capensis*, show a good correlation between brood size and female body length whilst others, including *P. platensis* and *T. quoyana*, are more variable. The combined results suggest no obvious relationship between average female length and brood size, which varied between 2 and 24 eggs.

For *T. quoyana* from New Zealand, females of 17 mm body length (minimum rostrum to telson distance when animal was straightened) had the highest brood numbers (mean = 24.0; SE = 2.0) and the egg size was large (mean = 1.33 mm maximum diameter, SE = 0.12). Brood mortality was low over the four developmental stages. Similar patterns were seen in other genera and species of supralittoral sandhopper. The overall reproductive potential of sandhoppers is less than subtidal amphipods (Fenwick, 1984) and aquatic gammarids (Steele and Steele, 1975). They are, however, within the range recorded for beach fleas and euterrestrial amphipods (Duncan, 1969; Wildish, 1979; Friend, 1980).

Recent studies on the physiological ecology of sandhoppers show they are well adapted for aerial existence and are able to withstand greater water loss during desiccation than many marine and terrestrial species (Marsden, 1989). The sand beach habitat is physically demanding and amphipods may be exposed to vigorous wave and tidal action. In addition, storm events cause massive and rapid substratum movements and overturn. Most sandhoppers have evolved a thick and tough cuticle to resist these crushing and abrasive events and as a result their cutaneous respiration is low. Mating strategies and behaviour patterns of sandhoppers most likely provide increased brood protection. The consistency of brood size between sandhoppers of a wide size range may indicate phylogenetic constraints on reproduction. The evolution of larger eggs allows the release of larger hatchlings which are more tolerant of desiccation in the strand line habitat.

The life history strategies of sandhoppers are well adapted for the biotic and physical factors operating within the sand beach ecosystems. Compared with other talitrids, sandhoppers have achieved a larger body size, have high resistance to desiccation and have complex behaviour patterns to avoid being displaced by the tide. It is concluded that sandhoppers have evolved reproductive strategies for exploiting sand beach habitats. These are not seen necessarily as an integral part of the colonisation of truly terrestrial habitats.

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