THE BIOCHEMICAL COMPOSITION OF NATURAL FOOD OF *PENAEUS ESCULENTUS* HASWELL (PENAEIDAE: DECAPODA)

The development of artificial diets for penaeid prawn aquaculture has been almost entirely an empirical process, largely driven by the need to provide a diet that gives good growth at minimum cost. Some of the early work was done by Kanazawa *et al.* (1970) and Deshimaru and Shigeno (1972) who formulated artificial diets for *Penaeus japonicus* based on the composition of the short-necked clam, *Tapes* (=*Venerupis*) *philippinarum*. *Penaeus japonicus* grows well on a diet of this clam, but it is not normally eaten in the wild. A more logical approach would be to formulate a diet based on the composition of the natural food of the prawn. Wassenberg and Hill (1987) studied the diet of juvenile *Penaeus esculentus* in seagrass beds and found that the main prey items were small gastropods, bivalves and Crustacea. We have analysed and compared these prey animals together with two commercial prawn feeds.

Materials and Methods

The most abundant known prey of juvenile *Penaeus esculentus* (i.e. 3 species of gastropod, 2 bivalves, 4 crustacea, a polychaete, and ripe and green seeds of *Zostera capricorni*) were collected from an intertidal seagrass (*Zostera capricorni*) bed in Moreton Bay, Queensland. Collections were made in September, February and May when juvenile *P. esculentus* were present. Proximate analyses (water content, ash, lipid, protein and carbohydrate), lipid class, fatty acid and amino acid analyses were carried out on each of the prey species and on 2 commercially produced prawn feeds, one formulated for *P. monodon* and the other for *P. japonicus*.

Results and Discussion

The natural diet contained high levels of ash from the shells and exoskeletons of the prey animals so comparisons with the commercial diets, which contained much lower levels of ash, have been made using the ash-free dry weights. Protein content of the prey animals ranged from 52–76% of ash-free dry weight, lipid 10–20% and carbohydrate 6–21%. *Zostera* seeds, which are eaten seasonally, contained 9% protein, 4% lipid and over 60% digestible carbohydrate. Using the % numerical composition data of the prey animals of the prawns (Wassenberg and Hill, 1987) and the weights and proximate analyses of representative animals, a profile of the natural diet of the prawns was calculated. The profile, expressed in terms of the ash-free dry weight, indicated that the natural diet of the prawns contained 66% protein, 13% lipid and 21% carbohydrate.

The protein contents of the commercial feeds were 51% and 77% of the ash free dry weight, 8% and 16% for lipid and 41% and 8% for carbohydrate. Amino acid composition was fairly uniform in all species and similar to the commercial feeds. Cholesterol was above 4% of ash-free dry weight; phospholipids ranged from 22–80% of total lipid. Saturated fatty acids were mostly less than 45% of total fatty acids and polyunsaturated fatty acids ranged from 24–56% of the total. The *Zostera* seeds contained no fatty acids with a carbon chain length greater than 18. The commercial feeds had a similar saturated fatty acid profile to the prey animals but differed in the mono- and polyunsaturated fatty acids with higher concentrations of C18:1w9 and C18:2w6 and with a lower concentration of C20:4w6, reflecting the presence of vegetable oils.

P. esculentus is a relatively slow growing prawn in both aquarium systems and in aquaculture ponds. The reason for this could be some response to environmental conditions in captivity or an unsuitable diet. The differences between the proximate and fatty acid profiles of the natural diet and the commercial feeds formulated for other penaeid species suggests that growth of *P. esculentus* may be improved by altering the formulation of the feed towards that of the natural diet.

Literature Cited

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