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Health & Welfare

Hermit crabs: Maturation diet for shrimp broodstock

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It may be possible to mimic their nutritional profile in artificial diets

Penaeus monodon broodstock feeding on hermit crabs.

In Vietnam, hatchery operators have used live hermit crabs to feed *Penaeus monodon* broodstock since around 1993. These anomuran crabs can be found in large numbers in rock pools along rocky shores or on sandy seagrass beds. Crabs are physically removed undamaged from their borrowed shells, which requires some skill. When large numbers of crabs are needed, the shells are broken and immersed in a seawater basin, where the crabs will crawl out of their damaged shells and can be easily collected. The “naked” crabs are then placed in maturation tanks for shrimp broodstock to feed on. On average, a healthy broodstock shrimp can consume 8 to 10 hermit crabs a day. The proportion of fatty acids of the omega-3 and omega-6 families in maturation diets has attracted much research interest. Here I discuss the use of hermit crabs and the fatty acid profile of hermit crabs collected locally in southeast Queensland, Australia.

Advantages of hermit crabs

Although there could be some risk of disease transfer (hermit crabs are crustaceans), the use of hermit crabs as maturation diet for shrimp broodstock has interesting advantages.

Complete maturation diet

Although a mixture of fresh or frozen seafood – such as squid, bivalves and chopped shrimp – is often used to feed shrimp broodstock in commercial hatcheries, feeding only with hermit crabs (which have a rich fatty acid profile, probably close to the requirements for reproduction of shrimp broodstock) appears to be sufficient and usually results in better survivorship and spawning performance of *P. monodon* broodstock, as evidenced in Vietnamese shrimp hatcheries. Similar results have also been ob-tained with *P. merguiensis* broodstock.

Water quality maintained

Hermit crabs placed in maturation tanks are alive until consumed by shrimp broodstock, and this facilitates maintaining acceptable water quality. There are no leaching problems because the nutrients are well encapsulated in the crab’s body. Hermit crabs may be very suitable as shrimp broodstock feed

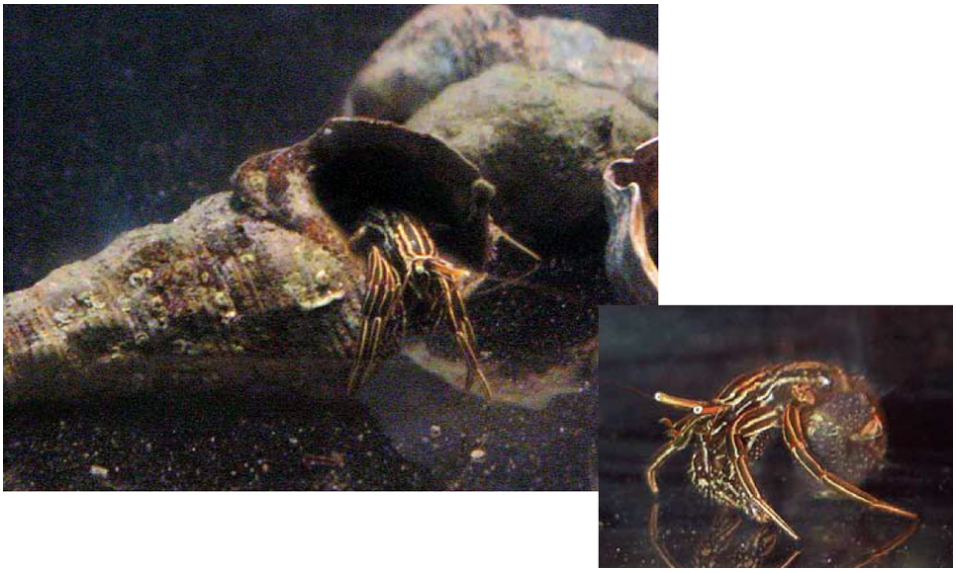
in recirculating maturation systems.

Economic value

In Vietnam, a 5-liter bucket of hermit crabs (including shells) could earn a collector up to U.S. $3 to $4. This is an important socioeconomic consideration, as most people engaged in hermit crab collection are generally poor.

Omega-3 and omega-6 fatty acids

Hermit crabs from southeast Queensland (Australia) had a crude protein content of 52 percent (dry matter) and their fatty acid profile showed high levels of omega-6 (omega-3:omega-6 ratio of 1.96, Table 1). This ratio is significantly lower than those reported for common fresh-frozen squid, (*Loligo chinensis)* (12.6); green mussel, (*Perna canalicutus)* (10.3) and pipi, (*Plebidonax deltoides)* (7.0). It is interesting hatchery operators in southeast Queensland use pipi, mussel and squid in order of preference to feed *P. monodon* broodstock. Marsden et al. (1997) reported that a moist artificial diet (a mixture of frozen fresh seafood and other essential nutrients and called BIARC) improved spawn quality of *P. monodon* compared with the squid-mussel control diet. The omega-3:omega-6 ratio of this moist diet was lower (3.1 to 4.8) relative to the control diet (21.4 to 28.9). It is possible that a lower omega-3:omega-6 ratio (as in the hermit crabs 1.96), or even lower, may further improve maturation performance.



Hatchery operators remove hermit crabs from their shells before feeding them to shrimp broodstock.

Table 1. Fatty acid profile of hermit crabs, *Pagurirus sp.*

Fatty Acid	Dry Matter mg/g	% Total Fatty Acid	Fatty Acid	Dry Matter mg/g	% Total Fatty Acid
14	3.4	5.02	20:1n-7	0.2	0.30
15	0.5	0.74	20:1n-9	0.1	0.15
16	19.3	28.51	20:2n-6	0.4	0.59
16:1n-7	9.5	14.03	20:3n-3	0.2	0.30
17	0.3	0.44	20:4n-3	0.3	0.44
18	2.4	3.55	20:4n-6	4.6	6.79
18:1n-7	2.9	4.28	20:5n-3	8.5	12.56
18:1n-9	4.1	6.06	22	0.2	0.30
18:2n-6	2.6	3.84	22:4n-6	0.1	0.15
18:3n-3	2.3	3.40	22:5n-3	0.6	0.89
18:4n-3	2.1	3.10	22:5n-6	0.3	0.44
19	0.7	1.03	22:6n-3	1.7	2.51
20	0.3	0.44	24:1n-9	0.1	0.15

Other fatty acids

The content of other fatty acids may also play an important role in triggering ovarian maturation of shrimp broodstock. Compared with the BIARC moist artificial diet and a mixture of fresh squids and mussels, hermit crabs have higher levels of 16, 16:1 omega-7, 20:4 omega-6, 20:5 omega-3 and 22:5 omega-3; but lower levels of 22:6 omega-3. Previous studies on different species have documented high proportion of 20:5 omega-3 in ovarian lipids, whereas arachidonic acid (20:4 omega-6) is an important precursor of prostaglandins (Harrison 1990). High proportions of 16 and 16:1 omega-7 may also be important.

Conclusion

Hopefully, these preliminary observations will attract the attention of shrimp researchers and lead to research that improves broodstock maturation diets. While mass-culturing hermit crabs may not be practical, it may be possible to mimic their nutritional profile in artificial maturation diets for shrimp broodstock.

Note: Cited references are available from the author.

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