

Comparison of reproductive performance and offspring quality of giant freshwater prawn (*Macrobrachium rosenbergii*) broodstock from different regions

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Abstract: An experiment was conducted to compare the reproductive performance and offspring quality of *Macrobrachium rosenbergii* broodstock from four different sources: (1) Vietnam wild; (2) Vietnam pond-cultured; (3) Hawaii pond-cultured and (4) China pond-cultured *M. rosenbergii* females were individually followed for 180 days in three 1200-l fresh water recirculation systems and fed a commercial diet. Ovarian development, moulting and spawning events were checked daily. In addition a number of egg and larval quality parameters were determined. The breeding frequency, fecundity, egg laying success rate, egg dimensions and egg hatchability were not significantly different between animals from the four different sources. However, there were significant differences in terms of offspring quality between the different broodstock sources. Individual dry weight, larval development rate, time to reach the postlarval stage, postlarval survival and tolerance to ammonia toxicity were all better in the offspring originating from China pond-reared and Vietnam pond-reared broodstock sources compared to those originating from Vietnam wild and Hawaii pond-reared sources. Moreover, offspring quality from Chinese and Vietnamese pond-reared broodstock proved more stable in terms of ammonia tolerance over three consecutive reproduction cycles. In general, the pond-reared broodstock from China and from Vietnam resulted in better offspring quality than the Hawaii pond-reared and Vietnam wild broodstock. These results indicate that broodstock sourcing deserves proper attention in hatchery operations of *M. rosenbergii*. It furthermore proves that domesticated (pond-reared) animals are not necessarily inferior as breeders compared to wild-sourced animals. The results may also point out the potential to selectively breed stocks with improved characteristics adapted to the local culture environment. © 2009.

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References:

1. Amrit, N.B., Yen, P.T., Comparison of larval performance between Thai and Vietnamese giant freshwater prawn, *Macrobrachium rosenbergii* (de Man): a preliminary study (2003) *Aquaculture Research*, 34, pp. 1453-1458
2. Armstrong, D.A., Chippendale, D., Knight, A.W., Colt, J.E., Interaction of ionized and un-ionized ammonia on short-term survival and growth of prawn larvae, *Macrobrachium rosenbergii* (1978) *Biological Bulletin*, 154, pp. 15-31
3. Browdy, C.L., Hadani, A., Samocha, T.M., Loya, Y., The reproductive performance of wild and pondreared *Penaeus semisulcatus* De Haan (1986) *Aquaculture*, 59, pp. 251-258
4. Burnside, M.C., Avault, J.J.W., Perry, W.G., Comparison of a wild and a domestic strain of channel catfish grown in brackish water (1975) *Progressive Fish Culturist*, 37, pp. 52-54
5. Cavalli, R.O., Scardua, M.P., Wasielesky Jr., W., Reproductive performance of different sized wild and pond-reared *Penaeus paulensis* females (1997) *Journal of the World Aquaculture Society*, 28, pp. 260-267
6. Cavalli, R.O., Lavens, P., Sorgeloos, P., Performance of *Macrobrachium rosenbergii* broodstock fed diets with different fatty acid composition (1999) *Aquaculture*, 179, pp. 387-402
7. Cavalli, R.O., Berghe, E.V., Lavens, P., Thuy, N.T.T., Mathieu, W., Sorgeloos, P., Ammonia toxicity as a criterion for the evaluation of larvae quality in the prawn *Macrobrachium rosenbergii* (2000) *Comparative Biochemistry and Physiology*, 125, pp. 333-343
8. Cavalli, R.O., Menschaert, G., Lavens, P., Sorgeloos, P., Maturation performance, offspring quality and lipid composition of *Macrobrachium rosenbergii* females fed increasing levels of dietary phospholipids (2000) *Aquaculture International*, 8, pp. 41-58
9. Cavalli, R.O., Lavens, P., Sorgeloos, P., Reproductive performance of *Macrobrachium rosenbergii* female in captivity (2001) *Journal of the World Aquaculture Society*, 32 (1), pp. 60-67
10. Chang, C.F., Shih, T.W., Reproductive cycle of ovarian development and vitellogenin profile in the freshwater prawn, *Macrobrachium rosenbergii* (1995) *Invertebrate Reproduction and Development*, 27, pp. 11-20
11. Costa, H.H., Wanninayaka, T.B., Food feeding and fecundity of the giant freshwater prawn *Macrobrachium rosenbergii* from natural habitats in Sri Lanka pp (1986) *The first Asian Fisheries Forum*, pp. 555-558. , Maclean J.L., Dizon L.B., and

Hosillos L.V. (Eds), Asian Fisheries Society, Manila, Philippines

12. Damrongphol, P., Eangchuan, N., Poolsanguan, B., Spawning cycle and oocyte maturation in laboratory-maintained giant freshwater prawns (*Macrobrachium rosenbergii*) (1991) *Aquaculture*, 95, pp. 347-357
13. Dhert, P., Lim, L.C., Lavens, P., Chao, T.M., Chou, R., Sorgeloos, P., Effect of dietary essential fatty acids on egg quality and larviculture success of the greasy grouper (*Epinephelus tauvina* F.): preliminary results (1991) Larvi '91. Gent, Belgium, August 27-30, 1991, 15, pp. 58-62. , Lavens P., et al. (Ed), EAS Special Publication
14. Hedgecock, D., Stelmach, D.J., Nelson, K., Lindenfelser, M.E., Malecha, S.R., Genetic divergence and biogeography of natural populations of *Macrobrachium rosenbergii* (1979) *Proceedings of the World Mariculture Society*, 10, pp. 873-879
15. Ling, S.W., The general biology and development of *Macrobrachium rosenbergii* (1969) *FAO Fisheries Report*, 3, pp. 589-606
16. Ling, S.W., Merican, A.B.O., Notes on the life and habits of the adults and larval stages of *Macrobrachium rosenbergii* (de Man) (1961) *FAO/IPFC Proceedings*, 9, pp. 55-661
17. Maclean, M.H., Brown, J.H., Larval growth comparison of *Macrobrachium rosenbergii* (de Man) and *M. nipponense* (de Haan) (1991) *Aquaculture*, 95, pp. 251-255
18. Maddox, M.B., Manzi, J.J., The effects of algal supplements on static system culture of *Macrobrachium rosenbergii* (de Man) larvae (1976) *Proceedings of the World Mariculture Society*, 7, pp. 677-698
19. Menasveta, P., Piyatiratitivorakul, S., Rungsupa, S., Moree, N., Fast, A.W., Gonadal maturation and reproductive performance of giant tiger prawn (*Penaeus monodon* Fabricius) from the Andaman Sea and pond-reared sources in Thailand (1993) *Aquaculture*, 116, pp. 191-198
20. Menasveta, P., Sangpradub, S., Piyatiratitivorakul, S., Fast, A.W., Effect of broodstock size and source on ovarian maturation and spawning of *Penaeus monodon* Fabricius from the Gulf of Thailand (1994) *Journal of the World Aquaculture Society*, 25, pp. 41-49
21. New, M.B., History and global status of freshwater prawn farming (2000) *Freshwater prawn culture: the farming of Macrobrachium rosenbergii*, pp. 1-11. , New M.B., and Valenti W.C. (Eds), Oxford, England, Blackwell Science
22. New, M.B., Commercial freshwater prawn farming around the world (2000) *Freshwater prawn culture: the farming of Macrobrachium rosenbergii*, pp. 290-325. , New M.B., and Valenti W.C. (Eds), Blackwell Science, Oxford, England
23. Nguenga, D., Teugels, G.G., Ollevier, F., Fertilization, hatching, survival and growth rates in reciprocal crosses of two strains of an African catfish *Heterobranchus longifilis* Valenciennes 1840 under controlled hatchery conditions (2000) *Aquaculture Research*, 31, pp. 565-573
24. Palacios, E., Ibarra, A.M., Racotta, I.S., Tissue biochemical composition in relation to multiple spawning in wild and pond-reared *Penaeus vannamei* broodstock (2000) *Aquaculture*, 185, pp. 353-371
25. Phuong, N.T., Hai, T.N., Hien, T.T.T., Bui, T.V., Huong, D.T.T., Son, V.N., Morooka, Y., Wilder, M.N., Current status of freshwater prawn culture in Vietnam and the development and transfer of seed production technology (2006) *Review Article Fisheries Science*, 72, pp. 1-12
26. Preston, N.P., Brennan, D.C., Crocos, P.J., Comparative costs of postlarval production from wild or domesticated Kuruma shrimp, *Penaeus japonicus* (Bate), broodstock (1999) *Aquaculture Research*, 30, pp. 191-197
27. Racotta, I.S., Palacios, E., Ibarra, A.M., Shrimp larval quality in relation to broodstock condition (2003) *Aquaculture*, 227, pp. 107-130
28. Rao, K.J., Reproductive biology of the giant freshwater prawn *Macrobrachium rosenbergii* (de Man) from Lake Kulleru (Andhra Pradesh) (1991) *Indian Journal of Animal Sciences*, 61, pp. 780-787
29. Thang, N.V., (1995) *Giant Freshwater Prawn Farming*, , Agriculture Publishing House (in Vietnamese), 15 pp

30. Thanh, N.M., Ponzoni, R.W., Nguyen, H.N., Vu, N.T., Barnes, A., Mather, P.B., Evaluation of growth performance in a diallel cross of three strains of giant freshwater prawn (*Macrobrachium rosenbergii*) in Vietnam (2009) *Aquaculture*, 287, pp. 75-83
31. Uno, Y., Kwon, C.S., Larval development of *Macrobrachium rosenbergii* (de Man) reared in the laboratory (1969) *Journal of the Tokyo University of Fisheries*, 55, pp. 179-190
32. Wickins, J.F., Beard, T.W., Observations on the breeding and growth of the giant freshwater prawn *Macrobrachium rosenbergii* (de Man) in the laboratory (1974) *Aquaculture*, 3, pp. 159-174
33. Wilder, M.N., Yang, W.J., Huong, D.T.T., Maeda, M., (1999) Reproductive mechanisms in the giant freshwater prawn, *Macrobrachium rosenbergii* and cooperative research to improve seed production technology in the Mekong delta region of Vietnam, UJNR Technical Report No 28