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SEA RANCHING OF COMMERCIALLY IMPORTANT BLUE SWIMMING CRAB *PORTUNUS PELAGICUS* (LINNAEUS, 1758) IN PARANGIPETTAI COAST

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ABSTRACT
The blue swimming crab *Portunus pelagicus* is one of the commercially important crab along Parangipettai coast and has a great demand for their esteemed sea food delicacy and also the value of fishery they support. Due to their high demand in local and foreign markets, they are heavily exploited from the Parangipettai coast. The depletion of crab resources along the coast has necessitated an urgent need for enhancing crab population. The promotion of sea ranching is one of the possible conservative measure to avoid depletion of sources and restore the overexploited species. Hence, in the present study an attempt has been made to release the laboratory reared crab seeds to some identified areas to restore the decreased population. They were two different types of berried females were reared for crab seed production that are laboratory produced and wild collected berried females. The Hatching success was more in wild collected berried females (75%) when compared to the laboratory produced berried females (70%). The larval duration was more in laboratory produced (25.2 days) when compare to the wild collected (24.6 days). The survival rate was high in wild collected (4.0%) than in laboratory produced berried females (3.4%). The crab seeds produced in the laboratory was finally released in three locations of the Parangipettai coast.

KEYWORDS: Conservation, Crab fishery, Exploitation, Sustainable development, Seed production, Hatchery technology.

INTRODUCTION

India is one of the major contributors of marine crustaceans in the world market (Anon, 1982). Among the crustaceans the crab rank third after shrimp and lobster for its esteemed seafood delicacy and also the value of fishery they support (Mohammed Saved and Rajeev Rahavan, 2001). The crab fishery in India is fast developing and there is a vast scope for the crab meat both national and international markets (Manisseri Mary and Radhakrishnan, 2003; Dinakaran and Soundarapandian, 2009). The crab species are not only consumed locally but also exported extensively to the US and European markets as pasteurized crabmeat products (Camacho and Apya, 2001; Ramano and Zeng, 2008). Most of the edible crabs caught from marine brackish water environments belonging to the family Portunidae. In seas around India, five genera of Portunid crabs have been reported (*Scylla*, *Portunus*, *Charybdis*, *Lupocyclus* and *Thalamita*). In recent times the blue swimming crabs (*P. pelagicus* and *P. sanguinolentus*) are fished in large quantities from all the seas in India and finally sold as a processed food (Dinakaran and Soundarapandian, 2009). John Samuel *et al.*, (2004) was recorded the total annual crab landing were 79,445.6kg in Parangipettai coast, but the recent survey shows that the exploitation of crab sources rapidly increasing as double to the above mentioned. The increased demand for the crabs in different markets and the depletion of resources along the coast has necessitated an urgent need for enhancing crab population. In this juncture, sea ranching is one of the right choice to increase the population. In recent years, stock enhancement and sea ranching have been recognized for their potential of increasing and sustaining coastal fisheries (Oshima, 1984; Bartley, 1999; Liao, 1999, 2002). Hence in the present study an attempt has been made to release the laboratory reared crab seeds to some identificated areas to restore the decreased population. This will enhance the incomes of fishing villages as well as to supply the crabs so as to meet the market demand in environment friendly way.

MATERIALS AND METHODS

In Ist experiment the healthy live similar sized crabs of both matured males (105-110mm) and females (98-104mm) of *P. pelagicus* were collected from the Parangipettai (Lat. 11° 29'N and Long. 79° 46'E) landing centre and brought to the laboratory. In the laboratory they were immediately immersed in a prophylactic dip of 200ppm formalin for 30min (Parado Estepa Emilia *et al.*, 2002). They were acclimatized to the laboratory conditions. After acclimatization the males and females were allowed to mate. After mating the fertilized eggs are extruded through the gonophores present in the sternites of the sixth thoracic segments of third pair of legs and these eggs become attached to the smooth setae present in the endopodites of the pleopods in the abdominal flab. The egg mass segregated and carried on the abdominal flab is called as berry or sponge. The berried females were reared in the separate tanks for hatching. In experimental setup – II, the berried females were collected from natural resources with yellow colour eggs are maintained in separate tank for hatching. The physico chemical parameters maintained during the experimental period are

given in table I. During incubation period, the brooders were fed with oyster meat (*Crassostrea madrasensis*). At every morning left over feed and fecal matter from the tank were removed and half of the water was replaced with fresh sea water. Larvae hatched during the early hours of the day. The methodology for the larval rearing was followed as Soundarapandian *et al.* (2007). The developmental stages of the larvae were observed under binocular microscope and classified according to Shinkarenko (1979). Fecundity was calculated by weighing the female directly after extrusion and once again after eggs was hatched. From that the total egg mass was calculated as well as fecundity. The Hatching success is the total number of healthy larvae produced. This was calculated by the number of larvae per milliliter of water in a known volume of water.

RESULTS

FecundityThe fecundity rate of *P. pelagicus* was ranging between 9, 00,000 to 10, 60,000 eggs in wild collected berried females, whereas 8, 72,000 to 9, 48,000 eggs in laboratory produced berried females (Table II).

Incubation period

The berried females had similar incubation period for both the experimental setups (Table II).

Hatching success

The hatching success of freshly hatched I zoea was 70% for laboratory produced berried females, however 75% for the wild collected females (Table II).

Larval duration

The larval duration was 24.6 days for wild collected berried females and 25.2 days for laboratory produced berried females (Table II).

Survival rate

The survival rate was 3.4% for laboratory produced females and 4.0% for wild collected females (Table II).

Sea ranching

The laboratory reared crab seeds were released successfully in three locations of the Parangipettai coast. 1. Annan Kovil, 2.Mudasal odai and 3.Killai.

TABLE 1. Water quality parameters of the brooder.

Parameters	Optimum range
Salinity	33-35ppt
Temperature	28-31°C
Dissolved oxygen	5.0 to 6.0 mg L^{-1}
pH	7.5 to 8.0
Photoperiod	12/12h L/D

TABLE II. Fecundity, incubation period, hatching success, larval duration and survival rate of laboratory produced and wild collected berried females.

Parameters	Laboratory produced berried female	Wild collected berried female
Fecundity	8,72,000 - 9,48,000 eggs	9,00,000 - 10,60,000 eggs
Incubation period	6-7days	6-7days
Hatching success	70%	75%
Larval duration	25.2 days	24.6 days
Survival rate	3.4%	4.0%

DISCUSSION

Marine fisheries have played a pivotal role in ensuring food and nutritional security of the growing population, employment generation, enhanced income and foreign exchange earnings. The crustaceans have a special place in the fisheries sector which occupies a unique status in the national economy and provide employment opportunities and food and nutritional security to the growing population in the country. Crustacean fishery is fast developing in India and this fishery earns 60% of the foreign exchange with regard to seafood trade. The lucrative prospect of exporting crustaceans has led to unscrupulous extraction of ovigerous (egg-bearing female) forms. This has had considerable impact on fresh recruitment to existing stocks and a reduction in stock size in the wild. Various species of economically valuable crustaceans are fished along the entire coast of Tamil Nadu. Exploitation of crustacean resources along the Tamil Nadu coast are crabs, lobsters, and shrimps. Currently lobster resources are over-exploited and the state government has imposed a ban on fishing of lobsters weighing less than 250 gm. However, the fishermen do not abide by this rule in all fishing villages because a 150 gm

live lobster fetches them INR 200 to 300. Due to the reduction of lobster resources, the seafood industry has turned its focus to the exploitation of blue crabs.

In the crab fisheries, majority was contributed by the members of the family Portunidae in the Indian waters (Prasad and Thampi, 1952; Pillai and Nair, 1973; CMFRI, 1998, 2000). The marine crab fishery in India is mainly supported by *P. pelagicus* and *P. sanguinolentus*, and these two species are together contributing upto 90% of the crab landings in the country (Sukumaran and Neelakantan, 1996). Blue crabs are extensively fished in large quantities in mostly all the seas of India, Bangladesh, Southeast Asian countries and Arab countries (John Samuel *et al.,* 2004). Due to the high demand in local market, the species is exploited heavily from estuaries, inshore waters as well as off shore waters (Dinesh Babu *et al.,* 2008). In India the best potentials of crab resources are seen in the coasts of Tamil Nadu, Kerala and Karnataka and to certain extend in Maharashtra and

Gujarat. Tamil Nadu tops the list in crab landing all over India and the coastal belt from Tuticorin to Mallipattinam has been proven as the strongest potential of edible sea crabs (Sanil Kumar, 2000). Along the Tamil Nadu coast, two species of blue crabs are found, namely *P.pelagicus* and *P. sanguinolentus*. *P. pelagicus* is found along the entire coast, whereas *P. sanguinoletus* has a restricted distribution. *P. pelaguicus* fetches a higher price (INR 75–100 per kg) when compared to *P. sanguinolentus* (INR 30–40 per kg). The reason behind this, according to the seafood industry, is that the percentage meat content in *P.pelagicus* is higher than in *P. sanguinolentus*. *P. pelagicus* is found both in rocky and muddy regions in shallow waters (Joel and Raj, 1987), whereas *P. sanguinolentus* prefers muddy substratum and deeper waters. This might be due to the migration of ovigerous female to deeper waters (Batoy *et al.*, 1980).

At present, crab fishing is a major source of income for the artisanal sectors, especially in the Gulf of Mannar and Palk Bay regions, even though it is hampered by money lenders to whom some part of the money (10 %) goes from the daily catch. With increasing blue crab extraction, privately owned boiling units for crabs in major crab landing sites have been set up that advance money to fishermen to exploit more resources from the wild. Mostly, two species of blue crabs—*P. pelagicus* and *P. sanguinolentus*—are targeted by this industry for the extraction of meat. Apart from this a nation-based company is exporting nearly 500kgs of *P. pelagicus* and *P. sanguinolentus* daily. In this the large sized crabs (>100 g) were boiled and transported to Tuticorin, from there the processed frozen meat is being exported. The demand has been increasing for live and whole cooked crabs in different Asian and continental markets which has resulted in indiscriminate fishing activity and hence most of the wild resources are under heavy exploitation now (Savad and Raghavan, 2001). Though crab fishery is driven by stakeholders, the current focus is on income generated and not on sustainable harvest. If the current rate of exploitation continues, the crab fishery will face the same fate as that of the lobster fishery. Even the state government has not formulated any management plan to stem the decline of blue crab populations, or conserve or increase their stock in the wild. These crabs are mainly found in sea-grasses, coral reefs and rocky regions.

The contribution of crabs to all India marine fish catch was low in the early sixties amounting to 4,000 tonnes it increased steadily to 25,000 tonnes by the nineties due to expansion of trawl fisheries (Sukumaran and Neelakantan, 1996). The average annual crab landings during 1975-1981 from the Indian coast are 21,310 tonnes, forming 10.4% of the total crustacean landings (Kathirvel, 1983). Rao *et al.* (1973) have estimated the total crab resources of the Indian seas at 43,000 tonnes and nearly half of the estimated resources are at present being exploited. Out of 8 species of edible crabs listed by Rao *et al.* (1973), *S. serrata*, *P. pelagicus*, *P. sanguinolentus* have been the principle species in the exploited fishery along the coasts of the country. Crab landings along the Parangipettai coast was reported by Radhakrishnan (1979) and John Samuel *et al.* (2004). John Samuel *et al.* (2004) recorded 12 commercially important crabs, *viz., S. serrata, S. tranquebarica, P. pelagicus, P. sanguinolentus, P. gladiator, P. vigil, C. feriata, C. natator, C. lucifera, C. variegata, C. granulata* and *C. truncate.* The total annual crab landings of the Parangipettai cost were 79,445.6 kg. But in recent survey the total annual crab landing was rapidly increasing as double to the above mentioned. The differences in the crab landings in the past two decades are due to many reasons, including development of improved fishing craft and gear, importance of crab meat in the national and international markets and changes in the environmental parameters etc. Using of mechanized boats with more efficient gears as purse-seine and trawlers contributed much to the increase in fish landings. Therefore these resources are heavily fished without any thinking regarding the sustainability of these resources. Among this total landing the *P. pelagicus* and *P. sanguinolentus* constituted around 71% of the total landing forming a major crab fishery along the Parangipettai coast. Where us nearly 20% of crab's from this landing were brooded females. Among the female crabs caught in bottom set gill nets, ovigerous crabs of *P. pelagicus* (29.7-35%) and *P. sanguinolentus* (20.3-45.8%) were found to be dominant in the catch during the post-monsoon period and also considerable numbers of ovigerous crabs were caught during the other seasons along the entire coast(Murugan and Raveendra Durgekar, 2008). This fishery has been practiced from the 1950s and its stock size reduced after 2001 mainly because of juvenile and ovigerous female harvest (Radhakrishnan *et al.*, 2005).The collection of brooders from the sea are a matter of concern. This problem has to be addressed urgently.

There is no viable hatchery technology for crabs and lobsters; the only way of protecting the resources is by management. The increased demand for crabs in different markets and the depletion of resources along the coast has necessitated an urgent need for promoting conservation and management. Conservation and management of commercially important crustacean species like blue swimming crab is a biggest challenge. The promotion of sea ranching is one of the effective method for the conservation and management of over exploited species. Sea ranching is the possible conservative measure to avoid the depletion of sources, restock the overexploited species, increasing the crab landings and to make it available throughout the year. Muthiga (1986) recommended the release of juveniles, ovigerous females and recently moulted crabs as a way of preventing overfishing and bringing about sustainable harvesting. The large scale destruction of young crabs would obviously have adverse effect on the crab resources, so the size at maturity for these crabs should be studied and awareness programmes should stress the collection of mature adults, therefore a specific size for harvest is to be fixed. The conservation measures for catching young, undersized and berried crabs should be done by educating the fisherman through audiovisual aids. Awareness should be created among fisher folk to conserve the non-target species. If alive, they can be returned to the water, since most of the crabs can tolerate exposure to atmospheric air and they have the capability of regenerating lost swimming or chelate legs. Segregation of resources should be done in the crafts where they anchor so that they can release non-target species immediately. The fishing areas should be closed or the fishing effort should be minimized for certain period

of time or seasonal banning of the shipment of crabs should be done. Certain regulatory measures like, regulation of mesh size, regulation of fishing areas, ban of the destructive gears, promotion of artificial reefs effecting code of conduct for responsible fishing have to be implemented and enforcement of laws like fishing legal minimum size (across the broadest part of carapace) and protection of ovigerous crabs to ensure sustainable growth in this sector. The law breakers should be fined or punished.

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REFERENCES

Anon. (1982) Trends in Marine fish production in India 1981. *Mar. Fish. Inforn. Serv*. T & E Ser. 41, 1-32.

Bartley, D. M. (1999) Marine ranching: a global perspective. Howell, B. R., E. Moksness, and T. Svasand, editors. Stock enhancement and sea ranching. Oxford, England Fishing News Books. pp.79–90.

Batoy, C.B., Sarmago, J.F. and Pilapil, B.C. (1980) Breeding season, sexual maturity and fecundity of blue crab, *Portunus pelagicus* (L.) in selected coastal waters in Leyte and Vicinity, *Philippines. Ann. Trop. Res*. 9, 157–177.

Camacho, A.S. and Apya S.M. (2001) Research needs and data on production of Portunid crabs in the Philippines. *Asian. Fish. Sci*. 14(2), 243-245.

Annual Report (1998) CMFRI

Annual Report (2000) CMFRI

Dinakaran, G.K. and Soundarapandian, P. (2009) Mating behaviour and broodstock development of commercially important blue swimming crab, *Portunus sanguinolentus* (Herbst). *Indian J. Sci. and Tech*. 2 (4), 71-75.

Dinesh Babu, A.P., Shridhara, B. and Muniyappa, Y. (2008) Biology and exploitation of the blue swimmer crab *Portunus pelagicus* (Linnaeus, 1758), from South Karnataka coast, India. *Indian. J. Fish*. 55(3), 215-220.

Joel, D.R. and Raj, P.S.S. (1987) Marine crab fisheries around Pulicat. *Seafood Exp. J*. 19, 16–24.

John Samuel, N., Thirunavukkarasu, N., Soundarapandian, P., Shanmugam, A. and Kannupandi, T. (2004). Fishery potential of commercially important portunid crabs along Parangipettai coast. In: *Proceedings of Ocean Life Food & Medicine Expo*. 165-173.

Kathirvel, M. (1983) Crab resources and prospects for crab culture. Bull. *Cent. Mar. Fish. Res. Inst*. 34, 66-69.

Liao, I.C. (1999) How can stock enhancement and sea ranching help sustain and increase coastal fisheries? In "Stock enhancement and Sea ranching" (B.R. Howell, E.Moksness and Svasand, eds). Fishing news books, Blackwell, Oxford. 132-149.

Liao, I.C. (2002) Roles and contributions of fisheries science in Asia in the 21st century. In: Proceedings of International Commemorative Symposium, 70th Anniversary of the Japanese Society of Fisheries Science. Fish Sci. 68, 3-13.

Manisseri Mary, K. and Radhakrishnan, E.V. (2003) Marine crabs, in: Status of exploited marine fishery resources of India, edited by M Mohan Joseph and A.A. Jayaprakash (Central Marine Fisheries Research Institute, Kohi-682018, India). pp. 188-194.

Mohammed Saved A. and Rajeev Rahavan, P. (2001) Mud crab-culture and fattening techniques, status and prospects. *Seafood Exp. J*. 32(1), 25-29.

Murugan, A. and Ravindra Durgekar. (2008) Beyond the tsunami: Status of fisheries in Tamil Nadu, India: A snapshot of present and long-term trendes: UNDP/UNTRS, Chennai and ATREE, Bangalore, India. pp.75.

Muthiga, N.A. (1986) Edible crabs of Kenya. *Kenya Aquatic*. 3, 61–65.

Oshima, Y. (1984) Status of "fish farming and related technological development in the cultivation of aquatic resources in Japan. In: I.C. Liao and R. Hirano (eds.) proceedings of ROC-JAPAN Symposium on mariculture. Tungkang Mar. Lab. Conf. Proc. 1, 1-11.

Parado-Estepa, Emilia, D., Quinitia, Fe., Edward, T. and Rodriguez M. (2002) Seed production of the Crucifix crab Charybdis feriatus, Southeast Asian Fisheries Development Center, Tigbauan, Philippines.

Pillai, K.K. and Nair N.B. (1973) Observation on the breeding biology of some crabs from south west coast of India. *J. Mar. Biol. Ass. India*. 15(2), 574-770.

Prasad, R.R. and Thampi, P.R.S., (1952) An account of the fishery and fishing methods for Neptunus pelagicus near Mandapam. *J. Zool. Soc., India*. 4(2), 335-339.

Radhakrishnan, C.K. (1979) Studies on Portunid crabs of Porto Novo (Crustacea: Decapoda: Brachyura). Ph.D. Thesis, Annamalai University, India.

Radhakrishnan, E.V., Deshmukh, V.D., Manisseri, M.K., Rajamani M., Kizhakudan J.E. and Thangaraja, R. (2005) Status of major lobster fisheries in India. *New Zealand J.Mar. and Fresh.Res*. 39, 723–732.

Rao, P., M. Vedavyasa, M. Thomas and G. Sudhakara Rao. (1973) The crab fishery resources of India Proc. Symposium on living resources of the seas around India, CMFRI, Special publication. pp. 581-591.

Romano, N. and Zeng, C. (2008) Blue swimmer crabs, emerging species in Asia. Glo. *Aqua. Adv. 11* (3), 34–36.

Sanil Kumar, S. (2000) New horizons in sea crab meat processing. *Seafood Exp. J.* 31(8), 41-43.

Savad, A.M. and Raghavan, P.R. (2001) Mud crab-culture and fattening techniques, status and prospects. *Seafood Exp. J.* 32(11), 25-29.

Shinkarenko, L. (1979) Development of the larval stages of the Blue swimming crab Portunus pelagicus L. (Portunidae: Decapoda: Crustacea). *Aust. J. Mar. Fresh. Res*. 30, 484-503.

Soundarapandian, P., Tamizhazhagan, E. and John Samuel, N. (2007) Seed production of commercially important Blue swimming crab Portunus pelagicus (Linnaeus). *J. Fish.and Aqua.Sci.* 2(4), 302-309.

Sukumaran, K.K. and Neelakantan, B. (1996) Mortality and stock assessment of two marine portunid crabs, Portunus (Portunus) sanguinolentus (Herbst) and Portunus (Portunus) pelagicus (Linnaeus) along the southwest coast of India. *Indian J. Fish*. 43(3), 225–240.