Proc., Symp. on Advances and Priorities in Fisheries Technology, SOFT(I) and CIFT Cochin, 11-13 Feb : 276 (1998)

Live Storage of Mud Crab *Scylla serrata*

THANSEEM ISMAIL, J. SELVIN, JOSE STEPHEN, T.K. SRINIVASA GOPAL and CHINNAMMA GEORGE
Central Institute of Fisheries Technology, Cochin 682 029

Studies leading to development of an appropriate packaging system and optimum temperature for live storage of crab are described. Live crabs were packed in corrugated fibre board boxes between layers of saw dust, coconut husk fibre, wood shavings and cotton, sprinkled with sea water containing 0.5% citric acid and stored at different temperatures. The packing density was 400-500 kg/m^3, out of which 20% accounted for moist packing material. Moist saw dust was found to be the best packing material with no mortality up to 13 days. In the control, mortality occurred on 5th day. Optimum temperature of storage observed was 21-25°C. Moist fibre was the second best.

Key words: Mud crab, live storage, optimum temperature, mortality

Transport of live aquatic organisms is more than a century old (Norris *et. al.*, 1960). Demand for live finfish and shellfish is on the increase necessitating the development of appropriate technology for live transport on a priority basis. Shrimp, lobster, crab, oyster, mussel and clam have good potential for export in live form. Crabs account for about 8% (30,000 t) of the total crustacean landings in India. Of the commercially important crabs, mud crab, green crab and mangrove crab are widely traded live. Mud crab constitutes about 5% of the total crab landing. A recent estimate has indicated that 3500 t of mud crab (*Scylla serrata*) is available annually for exploitation (Kathirvel and Srinivasagam, 1997).

Export of live crab that commenced in 1982 in India is an important activity in Kerala, Tamil Nadu, Andhra Pradesh and West Bengal. During 1996-97, 1896 t mud crab worth Rs 230.4 million was exported from India.

Mud crab can live out of water for few hours. But, if the environmental factors like temperature and humidity are conducive they can live longer. Attempts to increase longevity by packing crab along with moisture retaining materials like sea weed (Vasudeo & Kewalramani, 1960) and, wet cotton and wood shavings (Anon., 1997) met with some success. The objective of this study was to develop appropriate packaging and work out the optimum temperature for live storage of crabs.

Materials and Methods

Live crab (*Scylla serrata*) was procured from a local culture pond. Claws of the crabs were tied together immediately after catch. Crabs were first washed in potable water and then dipped in brackish water of salinity 10 ppt for 30 min. They were

packed in corrugated fibreboard boxes of size 19.5 x 19.5 x 20 cm at a density 400-500 kg/m^3. The boxes had provision for aeration through 1 cm diameter holes at the top. The boxes were maintained at room temperature (28-32), 21-25, 18-20 and 15-17°C to study the optimum temperature for live storage of crabs.

Saw dust, wood shavings, coconut husk fibre and cotton were collected locally, sun dried and used as the packing media. Weight of each crab was recorded and tags were attached to identify each. The packing media were sprinkled with 0.5% citric acid solution in seawater to attain a moisture level of 60-70%. Crabs were arranged in layers between these moistened materials in separate boxes. The packing material comprised 20% of the gross weight. Number of crabs varied from 5 to 12 per layer depending on their individual weight. Control experiment was carried out without any packing material. All boxes were sealed using polypropylene self adhesive tape and kept in a chamber maintained at 21-25°C, the optimum temperature determined for storage of live crabs. Every day boxes were opened ensuring minimum exposure to atmosphere to observe mortality and measure individual weight.

Results and Discussion

Table 1 indicates the effect of temperature on the mortality of crabs. Temperature is an important factor in the live storage of crabs. At room temperature (28-32°C) crabs remained live for less than 24 h only, whereas at 21-25°C they lived for 144 h. Further lowering of temperature was detrimental and 100% mortality occurred by 24 h at 15-17°C. Therefore, it can be assumed that the optimum temperature for storage of live mud crab is 21-25°C. Therefore, the further experiments on the effect of packing medium was studied at this temperature only.

Table 1. Effect of temperature on the mortality (%) of crab in dry pack

Storage period, h	Temperature of storage, °C			
	28 - 32	21 - 25	18 - 20	15 - 17
24	50	nil	nil	100
48	100	nil	30	-
72	-	nil	70	-
120	-	nil	80	-
144	-	nil	100	-

Mortality rate in relation to packing medium is presented in Table 2. For the first 48 h there was no mortality in any box. 60% of the animals in cotton were found dead on the third day. By fifth day mortality was noticed in all boxes except in those packed with sawdust and fibre. All crabs in the box packed with cotton died in five days. Mortality rate increased from 6th day except in boxes containing sawdust and, by the 9th day all the control samples died. Crabs packed with wood shavings suffered 100% mortality by the 10th day. The first death recorded in fibre and saw dust was on 10th and 14th day respectively. Mortality rate showed sharp increase in fibre packed boxes from 10th day and reached 100% by 12th day. From 15th day onwards mortality in sawdust showed steady increase and by 19th day it reached 100%.

Table 2. Mortality in crabs in various packaging media (%)

Storage period, days	Control	Saw dust	Wood shavings	Cotton	Fibre
3	0	0	0	60	0
4	0	0	-	100	0
5	29	0	10	-	0
6	43	0	10	-	0
7	57	0	50	-	0
8	71	0	80	-	0
9	100	0	90	-	0
10	-	0	100	-	33
11	-	0	-	-	80
12	-	0	-	-	100
13	-	0	-	-	-
14	-	14	-	-	-
15	-	36	-	-	-
16	-	57	-	-	-
17	-	64	-	-	-
18	-	80	-	-	-
19	-	100	-	-	-

An average weight loss of 10%, varying from 2.14 to 15.66%, was recorded in crabs before death. Among the various experimental groups, crab in saw dust showed least weight loss compared with others. Other packaging media except fibre showed greater weight loss per day than control and the maximum was in crabs packed in cotton (Table 3).

Table 3. Average weight loss in crabs during storage

Experiment	Days alive	Initial weight, g	Final weight, g	Weight loss, g	Weight loss, %	Weight loss/day, %
Control	5-9	279.00	245.40	33.60	12.04	1.584
Sawdust	14-19	342.42	305.54	36.88	10.77	0.628
Wood shaving	5-10	361.67	318.41	43.26	12.00	1.671
Cotton	3-4	402.50	374.80	27.67	06.87	1.962
Fibre	10-12	375.00	325.00	50.00	13.33	1.212

Mortality of crabs can be reduced considerably if suitable environment is provided. Improvements in packaging and handling techniques also will significantly contribute to this. Wooden box, fibreboard box, waxed cardboard carton and polystyrene foam containers are the commonly used containers for live fish transport. The advantages of using corrugated fibreboard box are its low cost and shock absorbing ability. Insulation and shock absorbent properties can be increased by using polystyrene modular blocks or polystyrene boxes, which fit into fibreboard cases. Heavy duty

plastic liners are used in air transport to retain the insulation characteristics and to avoid leakage.

It has been reported that dehydration is fatal to crab (Gillespie and Burke, 1991). Use of moisture retaining and relatively non-degradable materials prevent dehydration to some extent. So locally available materials like saw dust, fibre, wood shavings and cotton were tried. Of these sawdust was found to be the most suitable one. On the other hand, by absorbing water, cotton became more compact and obstructed aeration. This may be the reason for high mortality in box packed with moist cotton. Saw dust was found to be the right choice not only because of its moisture retaining capacity and better aeration but is also less expensive and readily available.

The claws and legs of crab are tied tightly to avoid inflicting injury to the personnel handling them and also to reduce the stress due to their free movement.

Many specimens exhibited a tendency to regurgitate a black fluid, indicating that the animals were under stress. This fluid may cause irritation to live crabs as the death of a single crab resulted in increase of mortality in the survivors on subsequent days. The optimum temperature recommended is ideal for air lifting, as it is the usual aircraft temperature. It has been reported that crabs become moribund and die after loosing about 10% of their body weight (Gillespie and Burke, 1991). But in our experiment some of them survived even after loosing upto 15% of their body weight.

References

Anon (1997) *Transportation of Live Finfishes and Shellfishes.* CMFRI Special Publication No. 66. Central Marine Fisheries Research Institute, Cochin

Gillespie, N.C. & Burke, J.B. (1991) *Report on Seminar on the Mud Crab Culture and Trade.* BOBP REP/51, p. 207, Bay of Bengal Programme, Madras

Kathirvel, M. & Srinivasagam, S. (1997) *Fish and Fisheries,* Newsletter No. 13, Fisheries Technocrats Forum, Chennai

Norris, K.S., Brocato, F., Calandrino, F. & Mc Farland, W.N. (1960) *Calif. Fish Game,* **46**, 5

Vasudeo, R.B. & Kewalaramani, H.G. (1960) *Indian J. Fish.,* **7** (1), 169