International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.15, pp 358-364, 2017

# Catchin marine waters and fattening in land-based tanks of the ornate rock lobster(*Panulirus ornatus*) in the southern coast of South Sulawesi, Indonesia

**Musbir Musbir[1]*, Sudirman[2], Ridwan Bohari[3]**

**[1, 2, 3]Department of Fisheries, Faculty of Marine Science and Fisheries Hasanuddin University, Makassar, Indonesia**

**Abstract :** The rock lobster (*Panulirus ornatus*) fishery in southern part south Sulawesi is one of an important traditional and commercial fisheries in Indonesia. They are also among the most important natural resources of South Sulawesi coast. The purpose of the study was promoting catching of spiny lobster, *Panulirus ornatus* in marin e waters and fattening of small lobsters in tank system to reach a desired lobster market size of weightier than 200 g. The catch of lobster experimental fishing used bottom gillnet was conducted from December 2016 to February 2017 in southern coastal waters of Bulukumba by using ten bottom gillnet. The size of bottom was gillnet with 1000 m length, 1.5 m height, 4-6 inch in mesh size.The catch lobster species was determined and body weight from lobsters were recorded. The experimental fattening of lobster in cement tanks was conducted during six months from beginning of March to the beginning of September 2017. Lobsters collected from catch divided into three groups. The lobsters were fed twice daily with trash fish and shellfish 8 % of the body weight. A total of 324 spiny lobster were caught during three months belonged to the species *P. ornatus*. The weight size of the caught lobster individuals ranged from 85 to 3500.Lobsters grew from initial body weight of 155.5 ± 1.9 g to final body weight of 459.4 ± 7.6 g in Tank-1. from 203.13 ± 1.89 g 537.13 ± 7.61 g in Tank-2. from254.5 ± 4.34 g to 574.25 ± 25.2 g in Tank-3. Results suggest that after the fattening period of six months of lobster has potential for capture based fattening in tank culture systems along south coast Sulawesi.
**Keywords :** *ornate spiny lobster, bottom gillnet, Catch, Fattening.*

## Introduction

Lobsters are valuable seafood that command high prices in domestic and world markets. Spiny lobster are captured and exploited in over 90 countries (Phillips and Kittaka, 2000). The spiny lobster lives along the coast, inhabiting shallow waters and tends to shelter in rocky reefs and corals. The high price of lobsters (Petersen and Phuong 2010) has encouraged fishermen to aggressively exploit their resources with no concern over their long-term sustainability, and as a result, more small sized lobsters were caught.

The tropical lobster, *P. ornatus* is a high-value species from fishery production throughout South-East Asia, and more recently also from aquaculture (Jones 2010). The most production of lobster in South Sulawesi of Indonesia is from capture fisheries (Musbir et al., 2016) and also from aquaculture (Peterson et al., 2013) The lobster farming creates employment and provides an important source of income for communities in Vietnam, Indonesia and Australia (Jones, 2010) even *P.ornatus* farming creates employment and provides an important source of income for communities in Vietnam, (Petersen and Phuong, 2010).

The Ornate spiny lobster (*Panulirus ornatus*) is one of the most highly priced export commodities from Indonesia with high prices in various international markets. The lobster (*P.ornatus*) fishery in southern part south Sulawesi is one of an important traditional and commercial fisheries in Indonesia (Musbir et al., 2014). They are also among the most important natural resources of South Sulawesi coast (Musbir et al., 2016). The value of the catch from this fishery provides a major source of income for traditional inhabitants on coastal area.

Spiny lobster small size are abundantly available in near-shore waters along the South Sulawesi (Musbir *et al*, 2014). On the Bulukumba coast of the Flores Sea ,*Panulirus ornatus* is locally important fishery resources and its harvesting is exclusively a small-scale artisanal activity, developed mainly on the continental shelf . Traditionally, *P. ornatus* was captured in bottom gillnet (Musbir *et al*., 2016). Hence the presentstudy was conducted with the aim of promoting Catching of spiny lobster, *Panulirus ornatus* in southern coast Bulukumba, South Sulawesi Province, Indonesia and thenFattening of small lobsters in tank recirculation systemto reach a desired lobster market size of weightierthan 200 g.

## Material and Methods

### Study Area

The study was conducted from December 2016 to the beginning of September 2016 in southern coastal waters of Bulukumba, South Sulawesi, Indonesia. The lobster fishery takes place in this area due to the sea floor is sandy with rocks and coral reefs. Commercial fishing for lobster is carried out primarily in the shallow waters (3-30 m) an area between the barrier reef. Lobster fishing is done exclusively by free.

### Catch Lobster

The lobster caught methods of study was an experimental fishing with using bottom gillnet. The size of bottom gillnet was 1000 m length, 1.5 m height, 4-6 inch in mesh size. The netting twine was a monofilament with mesh size 6 inch. A ten fishing units used for each fishing gear.

There are currently 10 boats participating in the Bulukumba lobster fishery during this study. The majority of the fleet consists of wood but some of the fleet consists of plastic boats, which are made of glass-reinforced fiber. One particular characteristic of the lobster boats is the presence of holds in their hulls. The holes, facilitate water circulation and keep the lobsters inside alive and properly oxygenated the whole way from the fishing grounds to the gathering house where they are landed.

The gathering houses are located on beach and surrounded by water. The catch lobster species was determined according to with color contour in body segment (Holthuis, 199). body weight from lobsters were recorded.

### Fattening of lobster

The experimental fattening of spiny lobster *P. ornatus*in cement tanks was conducted during six months from beginning of March to the beginning of September 2017. Small size of *P. ornatus* were collected by the Fishermen then placed in large polythene bags with aerated seawater and transferred rapidly upon capture to the tanks to ensure the maintenance of good condition. The lobsters were placed in cement tanks each with a volume of 2 m length, 1 m width, and 1 m depth , and provided with artificial shelters (half PVC pipes). Three numbers of tanks were installed in the shore land of Bulukumba, South Sulawesi, Indonesia. The tanks were installed with marine water on the shore.

Based on their external appearance, healthy lobsters, showing good pigmentation and with all appendages and exoskeleton intact, were selected. The lobsters were placed tank culture under moist conditions.The lobster density was 4 specimens per $m^2$. A total of 24 lobsters were selected for stocking in the three tanks. Before stocking, body weight (BW) of all lobsters were recorded. Based on the body weight, the lobsters were divided into three size groups: animals weighing 150-170 g (Tank-1) and animals weighing 200-210 g (Tank-2). and animals weighing 250-260 g (Tank-3).Sea water of sourced offshore was used to maintain watertemperature, salinity, pH and other parameters reflectingthe ambient condition of the seawater. After filtering, the water passed directly to the tanks. The pH, water temperature, salinity and dissolved oxygen weremeasured daily.

The lobsterswere fed daily with finfish and shellfish at 8% of the body weight. The daily ration was divided into twoparts, 20% of feed was given in morning (07:00 hrs) and80% in evening (17:00 hrs).The tanks were siphoned daily and cleaned thoroughlyonce a week. They were covered with plastic corrugatedsheeting to avoid growth of filamentous green algae. The observation monthly were made of lobsters by using cast net to record for assessment of growth performance. The lobster were harvested in September 2017, after 180 days of fattening. After harvesting, body weight from lobsters were recorded for assessment of growth performance.

## Result and Discussion

### Catch of Lobster

A total of 324 spiny lobster were caught, from December 2016 to February 2017 belonged to the species *P. ornatus*. The weight size of the caught lobster (*P.ornatus)* individuals ranged from 98 to 2450 g in December 2016, with most of the individuals sized more than 1000 g; (Fig. 1).

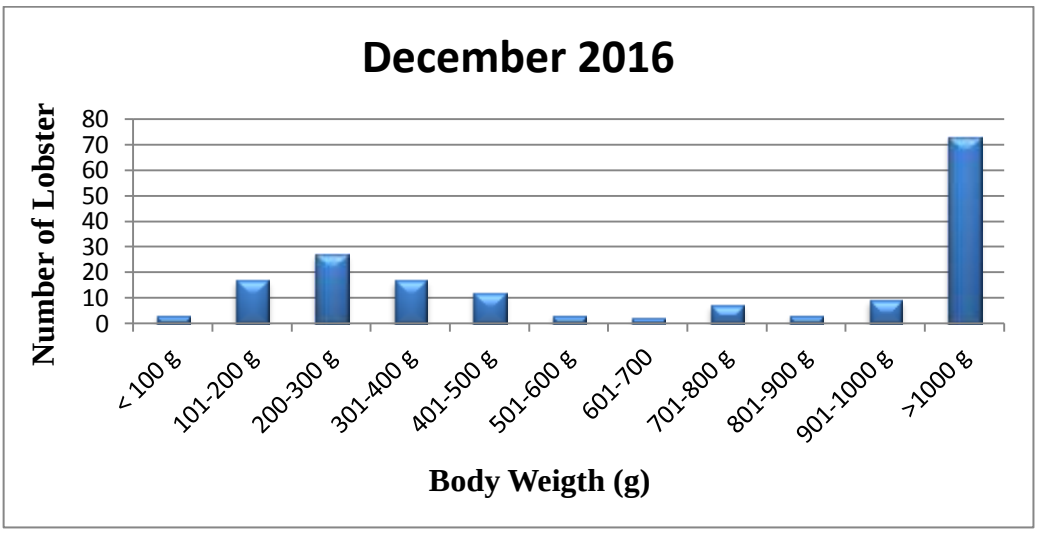


**Figure 1. Size-frequency distributions of *Panulirus ornatus* by body weight size classes during December 2016 in the southern part of Bulukumba Sea, South Sulawesi, Indonesia.**

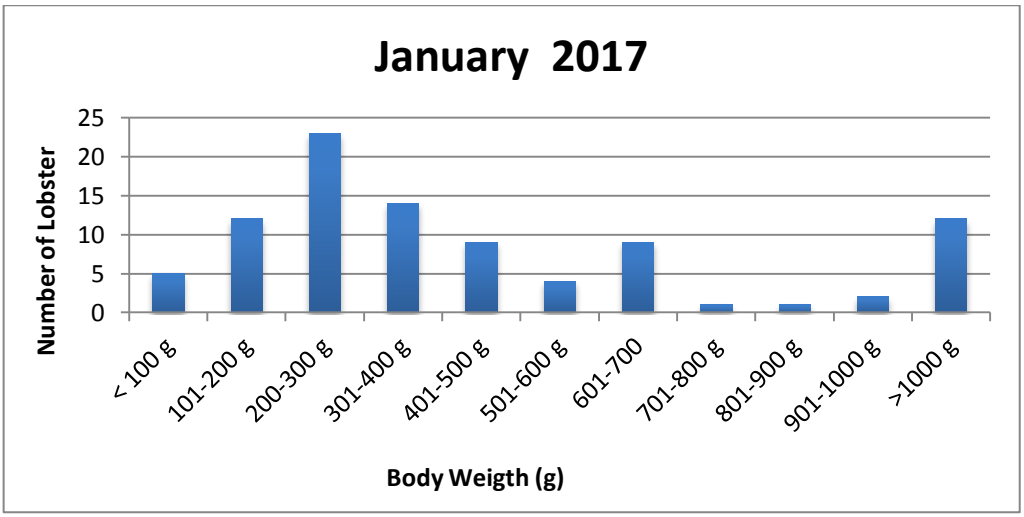


**Figure 2. Size-frequency distributions of *Panulirus ornatus* by body weight size classes duringJanuaryr2017in the southern part of Bulukumba Sea, South Sulawesi, Indonesia.**

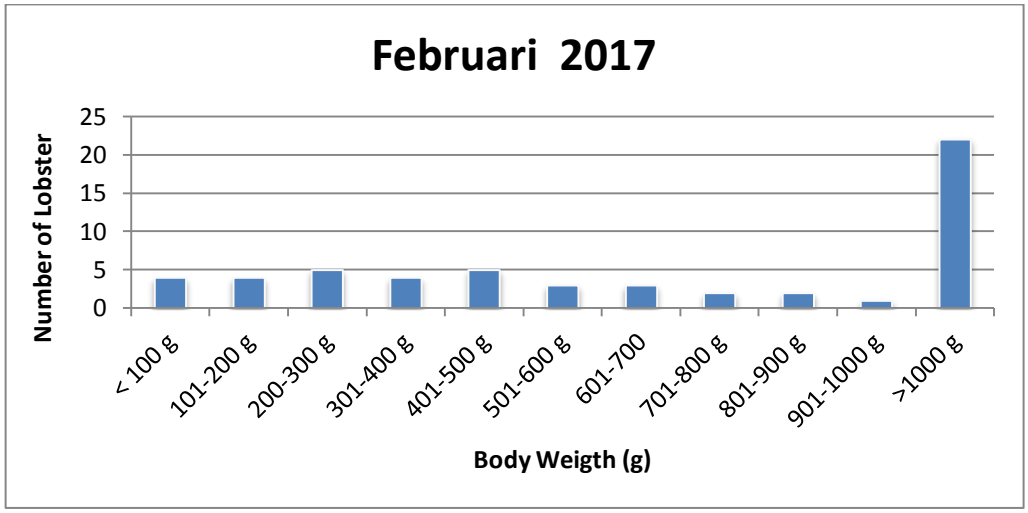


**Figure 3.Size-frequency distributions of *Panulirus ornatus* by body weight size classes during February 2017in the southern part of Bulukumba Sea, South Sulawesi, Indonesia.**

In January 2017, the caught lobster ranged from 85 to 2500 g, with most of the individuals sized more than 1000 g (Fig. 2). In February 2017, the specimen the caught lobster ranged from 105 to 3500 g, with most of the individuals sized more than 1000 g (Fig. 3).This study shows that *P. ornatus* are abundant in the Bulukumba marine bottoms and is caught in gillnets. Bottom gillnets are the main fishing method usedfor lobster catch in southern part of Bulukumba coast and are deployed in rocky and gravel-sandy areas.

Management regulation for lobster fisheries is needed for sustainable lobster utilization including closing fishing season during spawning, minimum legal size, gear restriction allowing only trap. More over(Raghavan, 2003) the reported thataugmenting the production of lobster through population enhancement, catch and fattening remain option for sustaining production of lobsters.

**Fattening of Lobster**

**Water Conditions**

The water condition including water temperature, salinity, dissolved oxygen and pH recordedfrom the tank during the fattening period were well withinthe optimum ranges recommended for lobster culture(Table 1). The optimal hydro-biological parameters reportedfor lobster farming are: temperature (26-33ºC), salinity(25-35‰), pH (6.8-8.5), dissolved oxygen (>3.5 ppm),(Philips *et al*.,1980; Van Olst *et al*., 1980; Kittaka, 1994).

**Table 1. Water condition in the fattening tanks recorded during the lobster fattening period.**

| Water Condition | Tank1 | Tank2 | Tank3 |
|---|---|---|---|
| Temperature (ºC) | 28.1-30.4 | 27.8-29.8 | 27.9-30.2 |
| Salinity (ppt) | 31.2-32.7 | 31.5-32.5 | 31.2-32.4 |
| Dissolved oxygen (ml l-1) | 5.2-7.2 | 5.4-7.4 | 4.8-6.9 |
| pH | 6.8-7.1 | 7.2-8.1 | 7.4-8.4 |

Anh and Jones (2015) report that water quality of tank systems for culture of *P. ornatus* including water temperature 26 ± 2.1 °C, Salinity 28 to 34 ppt, pH 7.3 to 8.5, Dissolved Oxygen 4 to 6 mg/L appeared to provide a suitable environment with survival and growth rate better. Temperature showed a trend with high values (30.4$^{o}$C) and low values (27.8$^{o}$C). The growth rate of lobsters is directly correlated with the temperature of their environment (Hartnoll 2001). An experiment was performed by Jones and Shank (2009) in which juvenile *P. ornatus* lobsters were grown in tanks that the growth was significantly affected by temperature ($P <$ 0.01) and maximal growth occurred at 25–31 °C.

Salinity was relatively constant at approximately 31.2-32.7 ppt with which corresponds to the marine water. Jones and Shank (2009) reported, juvenile lobsters for 91 days. for both survival and growth. Lowest survival occurred at 35 ppt, which was attributed to higher cannibalism at that salinity. Growth was highest at 35 ppt and progressively less at lower salinities. The concentration of dissolved oxygen with high values was 7.4 ml l-1 and low value was 5.2 ml l-1. The pH was high, ranging between 6.8-8.4.

**Growth**

Data on growth sub-adults of *P. ornatus* in the fattening tank system are given in Figure 4. Lobsters grew from initial body weight (IBW) of 155.5 ± 1.9 g to final body weight (FBW) of 459.4 ± 7.6 g in Tank-1 showing body weight increase of 303.9 ± 15.5 g in a fattening period of 360 days.Lobsters grew from initial body weight (IBW) of 203.13 ± 1.89 g to final body weight (FBW) of 537.13 ± 7.61 g in Tank-2 showing body weight increase of 334 ± 7.15 g in a fattening period of 360 days. Lobsters grew from initial body weight (IBW) of 254.5 ± 4.34 g to final body weight (FBW) of 574.25± 25.2 g in Tank-3 showing body weight increase of 319.75 ± 28.87 g in a fattening period of 180 days.

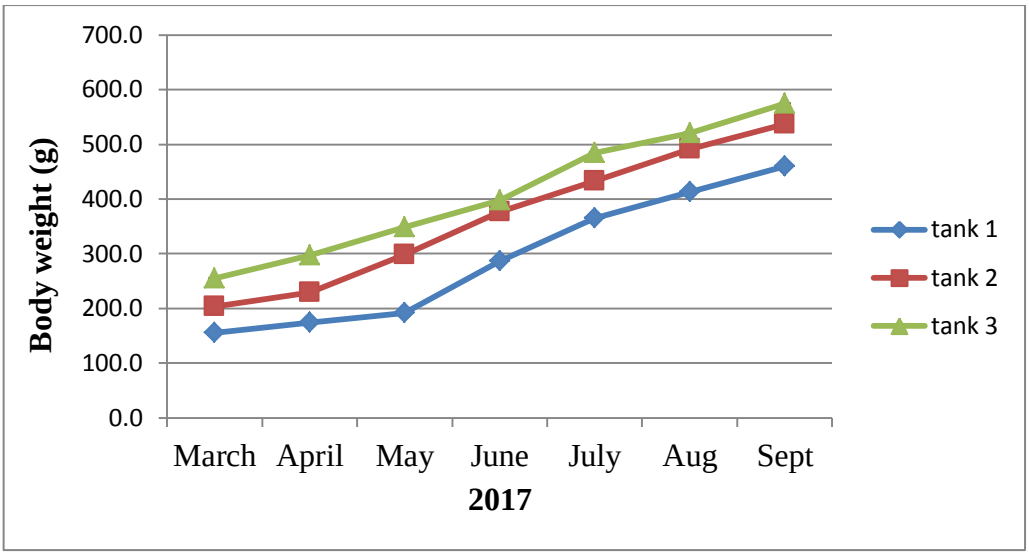


**Figure 4.Body weight growth of *P. ornatus* in tanks from March to September 2017.**

The growth of lobster (*P.ornatus*) reported by Hoang et al (2009) in the first 9 months was about 36–61 g/individual/month. The lobster *P.ornatus* growth of 79-81 g/individual/month has been reported by Du *et al*., (2004) . Jones and Shank (2009) reported on a density experiment for juvenile *P.ornatus*. Small lobsters (3.24 ± 0.09 g) were stocked at three densities (14, 29 and 43 lobsters/m2) within each of four 4,000 L fiberglass raceway tanks with flow-through seawater supply. After 272 days, and mean size for all lobsters was 225.3 g at harvest . Lobster survival was almost 100% for the six months of fattening. There was no lobster deaths occurred at tank-1. On the other hand there is one death in tank-2 and there are two deaths at Tank-3. This condition due to the size of the pra adult of lobster at the start of this experiment was bigger than the seed that are usually farmed and feeding practice adopted.Development of a lobster aquaculture sector depends on having a reliable supply of seed stock. *P. ornatus* seed for aquaculture are presently sourced from the wild because commercial-scale hatchery production is not available.

The present study demonstrated that good growth and survival of *P. ornatus* can be obtained in marine water tank. The study also provided information about potential survival rates, growth performance of lobsters. The results of the study suggest that *P. ornatus* is a potential lobster species for capture based fattening in marine water tank systems along Bulukumba coast. The study also support the technical feasibility of tank culture of *P.ornatus*,although further research will be necessary to maximize productivity.

Commercial viability of tank culture will necessitateeconomic assessment that accounts for the specificcapital and operating costs of tank culture as comparedwith sea-cage systems.Tank systems appeared to provide a suitable environment for culture of *P. ornatus* with survival and growth rate equivalent or better to that achieved in sea cages(Le Anh and Jones., 2015).

## Acknowledgements

The authors express their gratitude to the Directorate General of Higher Education, Republic of Indonesia, for the financial support provided to carry out the work. The authors are grateful to

The authors thanks Ansar and Idris for their help in field sampling activities. Commercial samples were obtained from catches of the fishermen in south coastal of Bulukumba Regency, South Sulawesi.

## References

1. Balkhair, M., Ali Al-Mashiki, and Mikhail Chesalin. 2012. Experimental Rearing of Spiny Lobster, Panulirus homarus(Palinuridae) in Land-Based Tanks at Mirbat Station (Sultanate of Oman) in 2009-2010. Agricultural and Marine Sciences, 17:33-43.
2. Hoang,D.H., Sang, H.M., Kien, N.T., and Bich, N.T.K., 2009. Culture of Panulirus ornatus lobster fed fish by-catch or co-cultured Perna viridis mussel in sea cages in Vietnam. ACIAR Proceedings No. 132, 118-125. Australian Centre for International Agricultural Research: Canberra.
3. Holthuis, L.B. 1991. Marine lobster of the world.An annotated and illustrated catalogue of species of interest to fisheries known to date.FAO Fish.Synop., 13(125): 1-292.
4. Du P.T., Hoang D.H., Du H.T. and Thi V.H. 2004. Combined culture of mussel: a tool for providing live feed and improving environmental quality for lobster aquaculture in Vietnam. In 'Spiny lobster ecology and exploitation in the South China Sea region: proceedings of a workshop held at the Institute of Oceanography, NhaTrang, Vietnam, July 2004', ed. by K.C. Williams. ACIAR Proceedings No. 120, 57–58. Australian Centre for International Agricultural Research: Canberra.
5. Le Anh, T.andJones, C., 2015. Preliminary assessment of tank based grow-out of tropical spiny lobsters(Panulirus ornatus) in Vietnam., in ACIAR PROCEEDINGS Spiny lobster aquaculture development in Indonesia, Vietnam and Australia. Proceedings of the InternationalLobster Aquaculture Symposium held in Lombok, Indonesia, 22–25 April 201487-88.
6. Kittaka, J. 1994. Culture of phyllosomas of spiny lobster and its application to studies of larval recruitment and aquaculture.Crustaceana, 66: 258-270.
7. Van Olst, J. Carlberg, J. M. and Hughes, J. T. 1980.Aquaculture.In : Cobb, J. S. and Phillip, B. F. (Eds.), Thebiology and management of lobsters. AcademicPress, New York, 11: 333-384.
8. Petersen E.H. Jones C. and Priyambodo B. 2013.Bioeconomics of spiny lobster farming in Indonesia. Asian Journal of Agriculture and Development 10: 25–39.
9. Jones C.M. (2010). Tropical rock lobster aquaculture development in Vietnam, Indonesia and Australia. Journal of the Marine Biological Association of India52(2): 304–315.
10. Jones, C. and Shanks, S., 2009. Requirements for the aquaculture of Panulirus ornatus in Australia. In 'Spiny lobster aquaculture in the Asia–Pacific region', ed. by K.C. Williams. ACIAR Proceedings No. 132, 98–109. Australian Centre for International Agricultural Research: Canberra
11. Mojjada, S.K., Joseph, I., Koya, M., Sreenath, K.R., Dash, G., Sen, S., Mahendra, Fofandi.,Anbarasu. M., Bhint, H.M., Pradeep, S., Shiju, P., Sydarao, G.. 2012. Capture based aquaculture of mud spiny lobster, Panulirus polyphagus(Herbst, 1793) in open sea floating net cages off Veraval,north-west coast of India. Indian J. Fish., 59(4) : 29-34, 2012.
12. Musbir, Sudirman, R. Bohari. 2014. Catch composition and Size distribution of the spiny lobster (Panulirus spp) related to oceanography parameters of the southern coast of South Sulawesi. Proceeding of The 3rd International Seminar of Fisheries and Marine Science, Pekanbaru-INDONESIA. No 3: 123-129.
13. Musbir, Sudirman, and R. Bohari. 2016. The Resources Of Spiny Lobster (Panulirus spp) In Southern Coastal Waters Of Bulukumba Regency. International Seminar sustainable utilization of coastal resources in tropical zone, Bengkulu, Indonesia. No. 1: 186-191.
14. Petersen E.H. and Phuong T.H. (2010).Tropical spiny lobster (Panulirus ornatus) farming in Vietnam—bioeconomics and perceived constraints to development. Aquaculture Research 41(10): e634-e642.
15. Phillips, E. S., Cobb, J. S. and George, R. W. 1980.General biology. In: Cobb, J. S. and Phillips, E. S. (Eds.), The biologyand management of lobster, Academic Press, New York, 1: 1-82.
16. Raghavan Rajeev, P. 2003. On Indian lobster capture and culture fisheries. Fish. Chimes, 22(10-11): 26-30.

17. Vijayakumaran, M., Anbarasu, M. and Kumar, T. S. 2010.Moulting and growth in communal and individual rearing of the spiny lobster, Panulirus homarus. J. Mar. Biol. Ass.India, 52 (2): 274 – 281.

*****