Brood size of seahorse, *Hippocampus kelloggi*, (Jordan and Snyder, 1909) in Cuddalore coast, Southeast coast of India

R. Balasubramanian

Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai-608 502, Tamil Nadu, India
balaram_2@rediffmail.com

Abstract

Background/Objectives: Seahorses are found worldwide in shallow coastal tropical and temperate seas. It is commercially used as medicinal purposes and they are increasing the demand 20 % per year. The low fecundity and structural patterns are leads to limited production of seahorses. The reproductive approach of seahorses, the female deposit their eggs into the male brood pouch where fertilization takes place.
Methods/Statistical Analysis: The samples after collection were preserved in 5% formalin and later dissected the brood pouches with ventral side near the base of the abdominal and middle region of tail were carefully opened and were collected the young ones.
Findings: BPSI is increased corresponding to the development of embryos and decreased after the release of the young ones. The young ones ranged from 650 to 5750 in the size range 160 -299 mm (SL). *Hippocampus kelloggi* was found to accommodate an average of 2696 young ones in its brood pouch.
Application/Improvements: In 1995, it was conservatively estimated that as many as 20 million seahorses were caught for their use in Traditional Medicine (TM) and this trade is thought to be unsustainable. Besides, anthropogenic, industrial, domestic and other disturbances to the habitat caused severe damage to seahorse population. The decline of these species is great concern in the light of global exploitation of seahorses. The brood size aspect must be showed to know the production and survival of the seahorses. This is lead to avoid over exploitation of seahorses. Hence, the present study has been carried out the brood size of seahorse *H. kelloggi*.
***Keywords*:** Seahorses, Brood pouch, Hippocampus kelloggi.

1. Introduction

Seahorses are well-known for paternal care system. The embryonic growth and development activities occur in the brood pouches of the male. Therefore, embryos having yolk sac and nutritional nourishment are independent [1]. The other aspect of brood pouch physiology and size might be influence the growth of the offspring. The female deposits their eggs into male the brood pouch during mating. After the mating, the brood pouch opening immediately will be closed and the fertilized eggs with the development process occur in an enclosed environment.

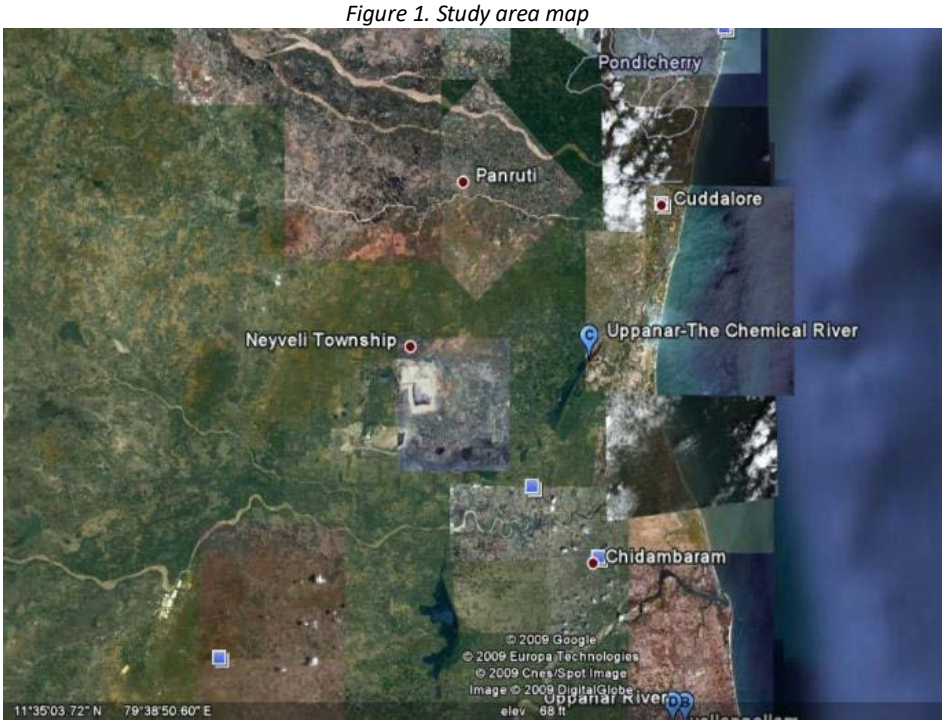
The embryos become embedded within depressions of the interior lining of the brood pouch [2]. The brood pouch is sealed during gestation. The embryos depend upon brood pouch function for gaseous exchange, removal of waste products and osmoregulation [1]. This is in addition to other sources of variation in embryonic size that can arise from differences in the size of eggs [usually positively correlated with female size and pouch size, which is related to the density of competing embryos [3].

In this present study, show particularly the effect of size and age of seahorse, *H. kelloggi* and suggest that the effect is related to aspects of embryonic development.

2. Study area

The Cuddalore coast (Lat.11* 43'N, Long. 79* 46' E) receives the rivers of Uppanar and Gadilam River. It is situated in the Bay of Bengal. This coast consider as an important fishing harbor in Tamil Nadu coast.

Figure 1. Study area map



3. Materials and Methods

The collection was made from Cuddalore coast on monthly basis over the period of one year from October 2000 to September 2001 (Figure 1). Collection were not done during April (30 days) – May (15 day) 2001 as the Tamil Nadu Government imposed the fishing holydays during this month's conserve the marine resources and many marine organisms were reported to spawn during these months. The samples after collection were preserved in 5% formalin and later dissected the brood pouches with ventral side near the base of the abdominal and up to middle region of tail were opened carefully and were collected the young ones for further analysis.

1. Brood pouch somatic index (BPSI)

The spawning season of the seahorse was delineated from the percentage occurrence of various brood sizes during different months of the year and from the monthly average BPSI. The BPSI was calculated as described [4,5] use the following formulae:

$$BPSI = \frac{\text{Brood pouch weight (g)}}{\text{Total body weight}} \times 100$$

2. Condition factor (Kn)

The condition factor (Kn) was calculated using the following formula:

$$K = \frac{W \times 10^5}{L^3}$$

Where, k = condition factor,
W = weight of the fish, and
L = length of the fish.

It is based on the ideal form of a fish where in the length–weight formula, $W = aL^b$, 'b' is equal to 3. When b 3, was seen frequently the value of k computed by this formula changes with length [6]. Relative condition factor (Kn) was computed based on the following empirical length–weight relationship that is calculated by the following formula, however, can eliminate the effect of length on k:

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$$Kn = \frac{W}{\overline{w}}$$

Where, Kn = relative condition factor;
w = observed weight; and
$\overline{w}$ = calculated weight.

The 'K' measures the deviation of an individual from the hypothetical ideal fish while the "Kn" measures the derivation of an individual from the average weight of the length.

3. Brood size

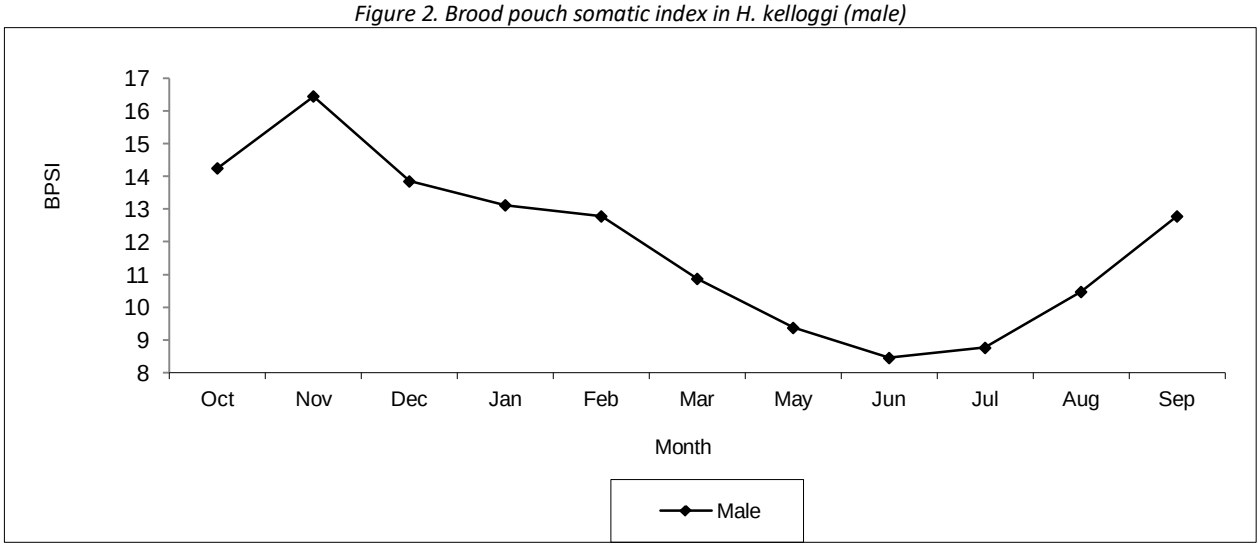
For larvae estimation only the gestation period was considered as per [5].

4. Results

1. Brood pouch somatic index (BPSI)

As the males act as the brooder, the BPSI has been calculated only in them. The monthly mean values are plotted in Figure 2. The brooder (male seahorse) carries the eggs and fertilization occurs in the brood pouch. After fertilization, at the time of larval development, the body weight of the seahorses increased. BPSI also increased corresponding to the development of embryos and decreased after the release of the young ones.

Figure 2. Brood pouch somatic index in H. kelloggi (male)



2. Relative condition factor (Kn)

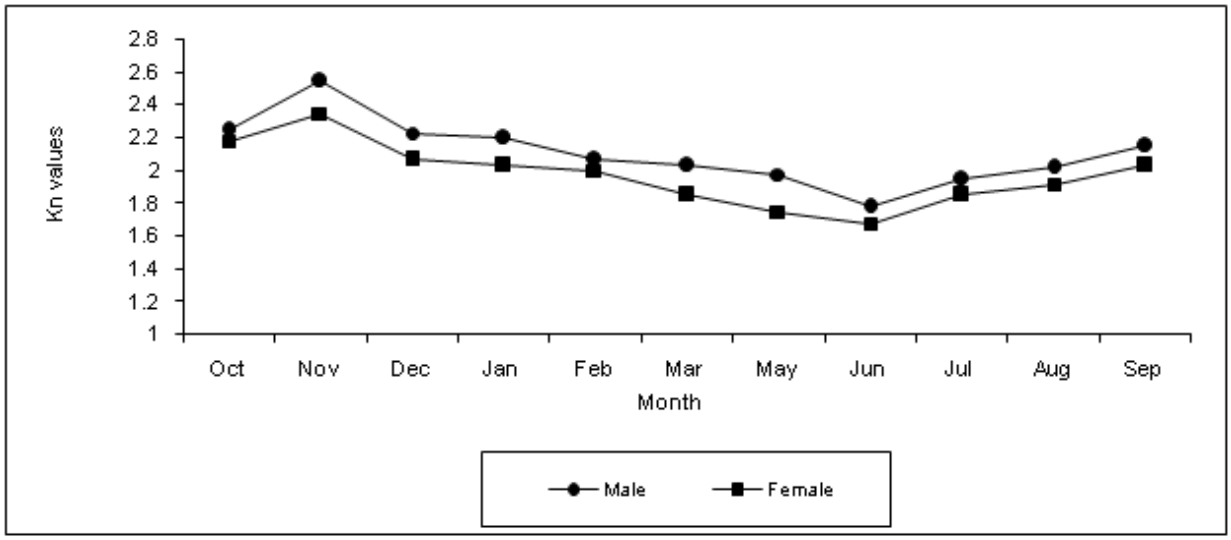
The monthly mean values of Kn obtained for males is plotted in Figure 3. The values had shown an increasing trend from July to November. This trend was similar in both males.

3. Brood size

The relationship between brood size and total length, body weight and brood pouch weight were established and are shown in Figure 4.

The number of young ones in the brood pouch was enumerated. It was ranged from 650 to 5750 with the brood pouch size rangedfrom160 -299 mm (SL). *H. Kelloggi* was found to accommodate an average of 2696 young ones in its brood pouch.

Figure 3. Relative condition factor (Kn) for H. kelloggi



1. Relationship between brood size and standard length

The brood size being related to the length of the fishes can be expressed by the following formula:

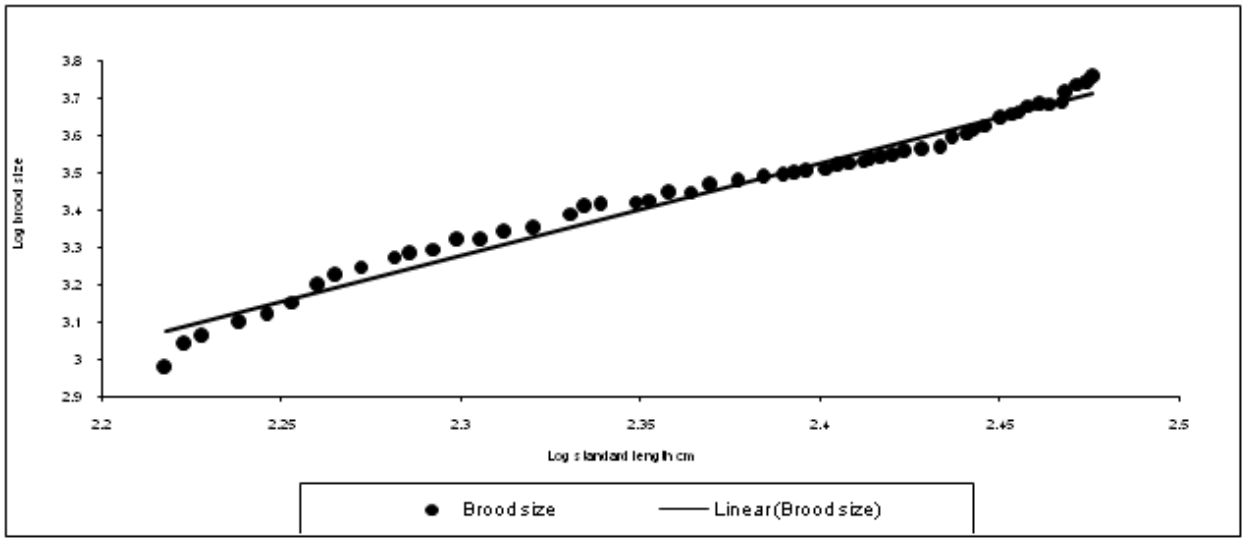
Log B = a + b Log L.

Where, B = brood size, L = total length, 'a' and 'b' = constants to be estimated by the method of least squares.

Log B = 1.1344 + 0.3573 Log L

The correlation coefficient ('r') value between brood size and standard length was found to be highly significant (r = 0.9806; P < 0.001). Thus in the present study increasing number of young ones followed increasing length of the seahorse.

Figure 4. Brood size - standard length relationship in male H. kelloggi



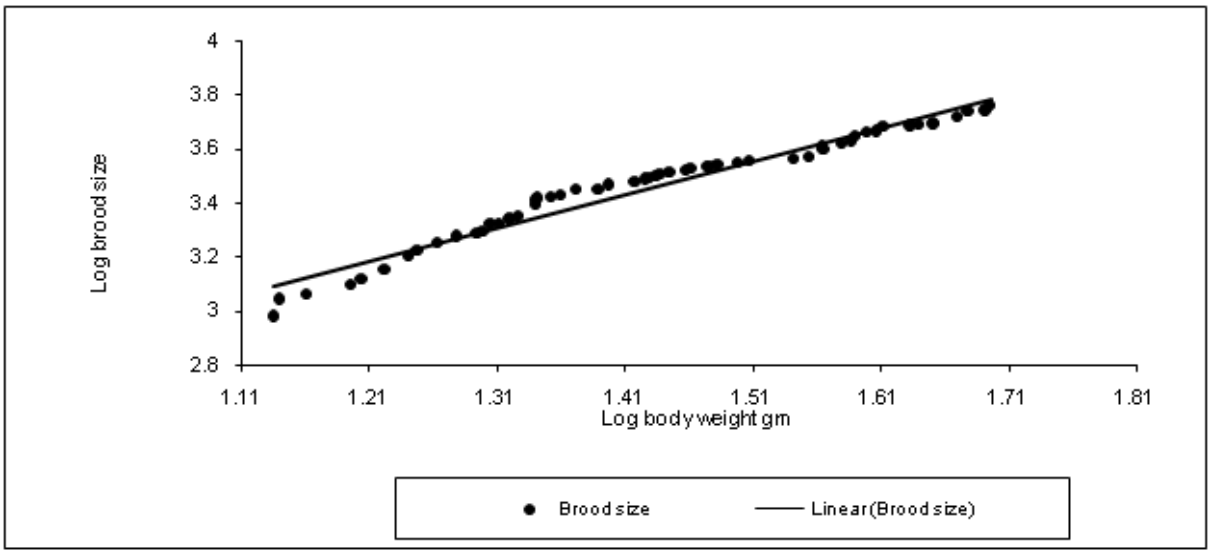
2. Relationship between brood size and body weight

The relationship between brood size and body weight of the seahorse also showed linear relationship (Figure5).The regression equation of young ones or embryo against body weight (W) can be written logarithmically as:

Log B = - 0.8954 + 0.6726 Log W

The correlation coefficient ('r') value for brood size and body weight relationship was found to be highly significant (r = 0.9441; P < 0.001), expressing high degree of correlation between the two variables.

Figure 5. Brood size - body weight relationship in male H. kelloggi



3. Relationship between brood size and brood pouch length

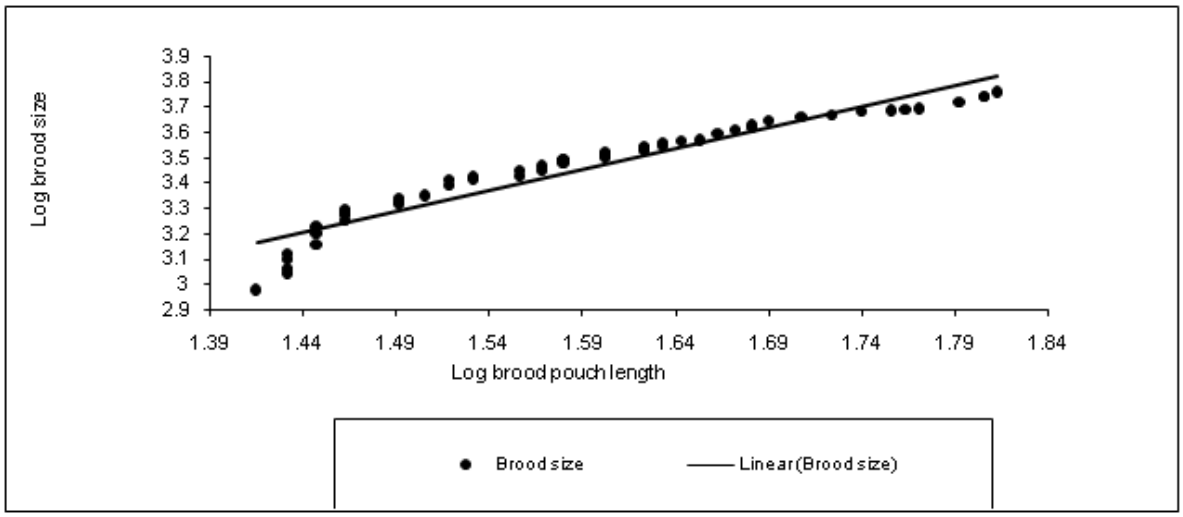
The relationship between brood size and brood pouch length (mm) of *H. kelloggi* is depicted in Figure6.

The logarithmic form of relationship between brood size and brood pouch length can be expressed as:

Log B = - 0.1240 + 0.4910 Log BPL

The correlation coefficient ('r') value for brood size and brood pouch length was significant (r = 0.6110; P < 0.001).

Figure 6. Brood size - brood pouch length relationship in male H. kelloggi



4. Relationship between brood size and brood pouch weight

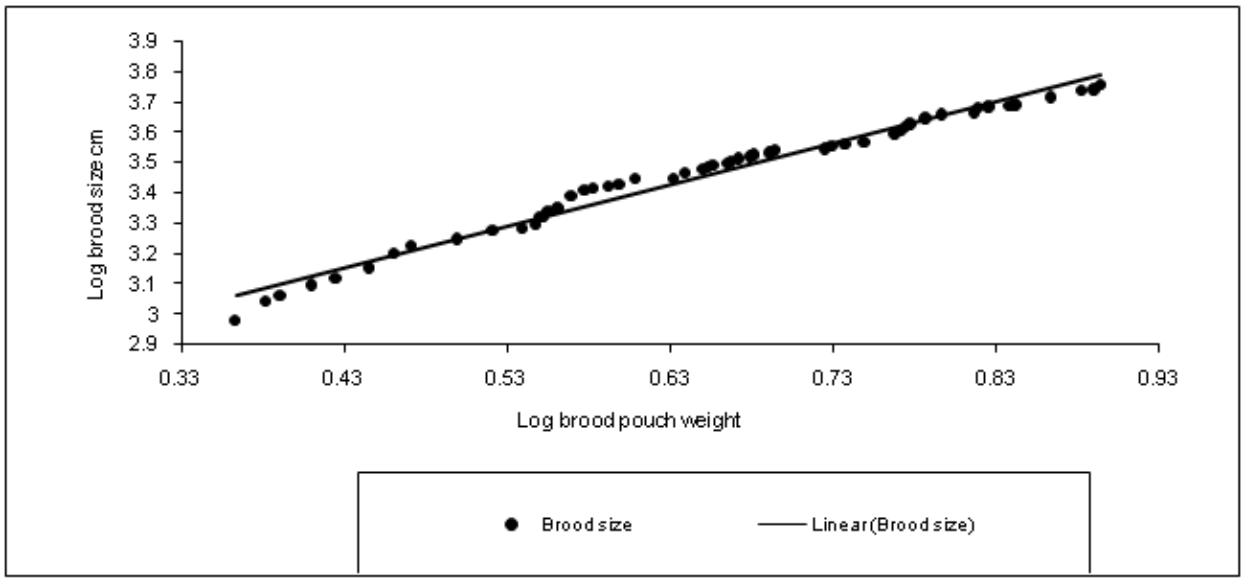
The relationship between brood size and brood pouch weight (g) of *H. kelloggi* is illustrated in Figure 7. The logarithmic form of relationship between young ones of brood size and brood pouch weight can be expressed as:

Log B = -0.9310 + 0.4551 Log BPW

The 'r' value calculated between brood size and brood pouch weight was also found to be significant (r = 0.8322; P < 0.001).

It is apparent from the present study that the brood size increased with the increasing weight of the brood pouch. It can be concluded that the increase in brood size is a fractional increase with increase in the length and weight *H. kelloggi*.

Figure 7. Brood size - brood pouch weight relationship in male H. kelloggi



5. Discussion

Present observation on the maturation and spawning of *H. Kelloggi* showed this species to be a prolonged spawner with spawning season from October to February, along the Cuddalore coast. This was also true in the observation made in *H. histrix* [7]. It was also of the similar opinion in pipe fishes and seahorses [8]. In the present study of the BPSI values of *H. Kellogg i*was higher during October - February. These indicated the occurrence of mature ovaries, testes and brood size (young ones). The sudden fall in BPSI values during June might be the completion of spawning and gestation. The minimum BPSI values was observed in July and September due to the cessation of breeding which is further indicated by the relative abundance of the fishes with immature (stage I) and mature (stage II) gonads .Fluctuations in the Kn (condition factor) values might be either related to breeding cycle [6]. The change in 'Kn' value with increasing standard length depends on the size at first maturity, which is also supported [10].

In the present study, the values of 'Kn' showed significant fluctuations in male seahorses, due to smaller sample size or different stages of maturity or spawning on the part of female or difference in weight of food content in the gut. The brood size in the present study ranged from 650 to 5750 young ones (160 to 299 mm SL). The average brood size capacity of *H. kelloggi* observed was 2692.2 young ones. Young ones ranging from 400 to 1000 in *H. trimaculatus and* 30 to 120 in *H .capensis* were recorded [11]. It has reported up to 182 per brood, whereas in Australia [2]. *H. abdominalis* produced 721 young ones [12]. In *Syngnathus fuscus*, brood size was variable, ranging from 45 to 1380 embryos as recorded [5]. It has also observed 97 to 1552 embryos [13]. Variation in fecundity between fishes of equal lengths in this species is a common phenomenon depending on the environmental factors like temperature, food and genetic differences [3]. The fecundity and larval numbers increase with an increase in body measurement as straight line relationship between fish length / weight / ovary weight and fecundity correlation coefficient values were significant between fish length / weight / ovary weight and fecundity (r = 0.9897; 0.9981 and 0.9785 respectively). Similar relationships between body measurement and fecundity in teleost fishes have also been recorded [14].

6. Conclusion

Seahorses have very low fecundity and brood size than the other fishes. This study presents descriptions of brood pouch size and its production of young ones of *Hippocampus kelloggi.* The enumeration of brood size of seahorse will be essential to provide support for conservation purpose.

7. References

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