

Captive Breeding and Hatchery Production of Mouth Brooding Jewel Cardinal Perch, *Pterapogon Kauderni*, (Koumanns, 1933) Using Brackish Water: The Role of Live Prey and Green Water Enrichment in Juvenile Production

Vishwas Rao M^{1*} and Ajith Kumar TT²

¹Research Scholar, Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai-608502, Tamil Nadu, India

²Assistant Professor and Senior Research Officer, Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai-608502, Tamil Nadu, India

Abstract

An attempt was made to study the captive breeding and larval rearing of the Cardinal fish *Pterapogon kauderni* using brackish water for the first time in India. *P. kauderni*, a mouth brooder fish was procured from the traders at the size range of 4-6 cm and acclimatized under captive conditions. Suitable water quality parameters were maintained and standardized. The fish was fed with boiled clam meat, octopus, oyster, squid and trash fish thrice a day. Spawning took place after two months of rearing, in between 10:45-13:00 hrs and hatch out occurred after the sunset. Incubation was in the male's mouth, which was extended up to 21-23 days and after hatch out, juveniles were separated from the parental tank. The tanks were maintained with optimal physico-chemical conditions as in the parent tanks. Different light intensities and diets were provided for the successful of juveniles rearing. Good survival (58%) was achieved by adopting the photoperiod 24L/0D. the results illustrated that the photoperiod and different diets given to the juveniles influences the physiological performance of the juveniles. SGR, FCR and AGR of juveniles of *P. kauderni* increased significantly with the increase of the photoperiod ($P < 0.05$). Babies looked like their parents at birth and within a week, they obtained parental coloration. Comparatively higher growth rate was observed, when they were fed with algal enriched artemia than the Poly Unsaturated Fatty Acid (PUFA). Babies reached the marketable size within 45 days. This study deliberately reveals that, breeding and rearing of the marine fish *P. kauderni* using the estuarine water and also reveals the physiological response of juveniles of *P. kauderni* to the change of photoperiod and substantiated that photoperiod and different diets influences the juvenile growth, survival and feeding.

Keywords: Mouth brooders; Captive breeding; Estuarine water; Photoperiods; Enrichment; Specific growth rate; Feed conversion ratio; Absolute growth rate; Poly unsaturated fatty acid; Docosahexaenoic acid

Introduction

Marine ornamental fish trade is a swiftly emerging sector that relies almost solely on the collection of these organisms from coral reef habitats. Despite the freshwater ornamental fishes, only a few species of marine organisms have been cultured in confinement [1]. There is an increasing demand for these fishes due to the growing human population; hence, their diversity in the reef regions is getting reduced [2]. Aquarium industry needs millions of fish every year to cater to the needs of the marine aquarists across the world. This type of fishery still, to some extent, uses highly destructive methods such as cyanide or dynamite to catch specimens [3]. Collection of these fishes from wild is done comprehensively from the all the parts of the world; continuous harvest of these fishes will not only impinge on the target species, but also will cause irreversible impact on the components of the entire reef system [4]. An important incentive for farmers to manage their water bodies for fish production is the option to generate cash income [5]. Brackish water aquaculture is one of the fast growing segments of the economy. In spite of the fact that the brackish water culture had relatively rapid growth in last decade, due to increase in production cost [6].

It has been argued that future advances in aquaculture development will come from further investment in biotechnology, including technologies ranging from protein expression and DNA vaccines to transgenic technologies. On the other hand it has also

been argued that increased production will have to come from simple farming technologies, which farmers can easily adopt, involving both production of more low priced food species and high valued species [7]. So in the present study, breeding and rearing of marine ornamental fish *P. kauderni* is achieved by using the brackish water for the first time in the country.

Among the marine ornamental fishes, cardinal fish is one of the most popular attraction of the aquarists and very important in the aquarium trade in view of its bright color, interesting display behavior and ability to live in captive conditions [8]. They are obligate paternal mouth brooders, found in the shallow waters of most temperate and tropical seas. Members of these groups are purely bred in marine water with a optimal salinity and temperature. *P. kauderni* is sex reversal;

***Corresponding author:** Vishwas Rao M, Research Scholar, Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai-608502, Tamil Nadu, India, Tel: 9175423212; E-mail: vishwasrao.au@gmail.com

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males invest more in reproduction and females actively involve in courting sex [9]. These fishes are particularly attractive in appearance and exhibit an unusual mode of reproduction in that the males incubate their female partner's eggs in their mouth [10]. They make outstanding tank companions with all fish, corals and other invertebrates. For these reasons, they have become very popular in the marine ornamental trade [11].

In the past, some studies have been made elsewhere on the captive breeding of the marine ornamental fish especially clown, damsel and cardinal fishes [12]. The bangai cardinal fish, *P. kauderni* has been also raised using sea water [10] but, presently an attempt has been made to study the captive breeding and larval rearing of *P. kauderni*, using estuarine water. From an employment generation point of view, this technology will be a good option which has a reasonably better return to the coastal community.

Materials and Methods

Species description

As *P. kauderni* is not found in Indian waters, it was procured from the licensed traders, Umino pet palace, Chennai. *P. kauderni* has short, compressed body covered with ctenoid scales characterized by two separate dorsal fins with three black bars; the mid body bar is slanting slightly backwards and extending onto the rear part of the dorsal fins and another bar which starts on the head region and extends to the eye. A large mouth and body are covered with silvery rounded spots and there is a well developed membrane between the last ventral fin and the abdomen (Figure 1A).

Behavioral observations

Estuarine water was drawn from the Vellar estuary, Tamil Nadu, India (Lat.11o 29' N; Long. 79o 45' E) with the help of 5 Hp pump during high tide and allowed to reconcile in a sump for two days. Water was then passed through sand and U.V filters and finally stocked in a storage tank installed with a canister filter, from where water was taken for hatchery operations.

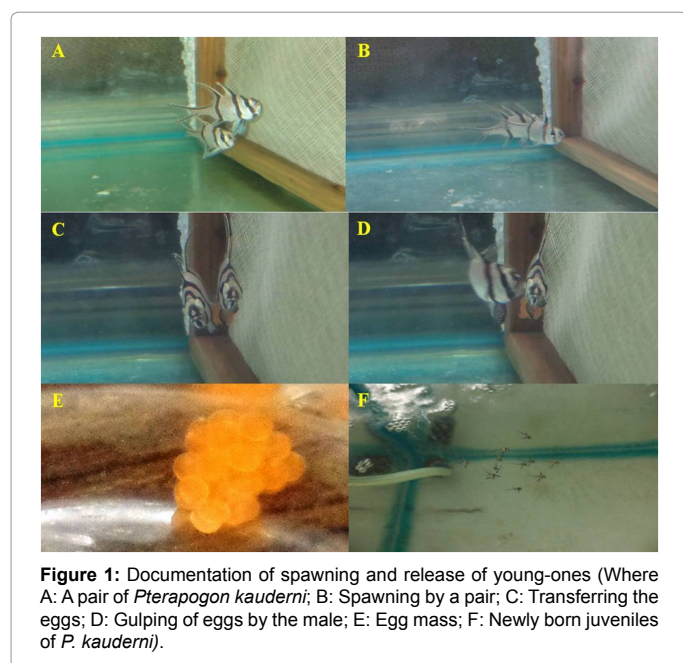


Figure 1: Documentation of spawning and release of young-ones (Where A: A pair of *Pterapogon kauderni*; B: Spawning by a pair; C: Transferring the eggs; D: Gulping of eggs by the male; E: Egg mass; F: Newly born juveniles of *P. kauderni*).

After pair formation, a couple was introduced into a 200L capacity glass tank. Courtship behavior and spawning activities were monitored daily at different intervals (06:00-09:00, 11:00-14:00, 16:00-18:00 and 22:00-23:00 hrs). Female fish released the eggs from the urogenital papillae during morning hours. Immediately after the release, male fish gulped the eggs into its mouth. Male and female fishes released the gametes almost simultaneously in a parallel position; with vents close together (Figure 1B). As soon as the egg mass was bound with the adhesive threads, the male took them into its mouth (Figure 1C). While the male repeatedly tried to settle its egg mass into the right position in its mouth, the female swam briskly around the male and pressed its lateral side (Figure 1D). Such post spawning behavior weakened as the egg mass was packed into the male's mouth. Fecundity varied from 40-55 eggs and the incubation period was 21 to 23 days.

At the initial spawning stage, male fish rejected the egg mass (Figure 1E) due to the disturbances made by the female. During this incidence, the egg mass was transferred to a beaker and egg mass was counted and individual eggs were measured with the help of an ocular micrometer.

Brood stock management

P. kauderni with the size range of 4-6 cm was selected for brood stock development. After acclimatization, they were carefully observed for any injury or sign of diseases. Making sure of this, 8 individuals were transferred to a glass tank (conditioning tank, 182×90 cm²) filled with 1000 L water, where an under water filtration system (made by using activated carbon, ceramic ring and coral sand) was provided. The fishes were fed thrice a day with different feeds such as boiled meats of clams, mussels, squids and live Acetes etc. Behavioral patterns of the fishes were carefully monitored. After 2-3 weeks, one pair measuring 5 and 7 cm grew ahead of others and the same was transferred to 500 L water holding glass tank (spawning tank 120×60 cm²). Photoperiod was maintained as 12 hr. light and 12 hr. darkness, using artificial light. Water quality parameters such as temperature, salinity and pH were measured regularly using standard methodologies. Spawning took place in the 3rd month after a brief courtship.

For the successful brood stock development, water quality parameters were maintained at different level and later, standardized. Temperature in the spawning tank was 26 ± 2°C, salinity, 22-24 ppt, dissolved oxygen, 4.5-5 mg/l and pH 7.8-8.2. Water exchange (15-30%) was given depending upon the tank's condition. After a period of two months of rearing in the above said conditions, fishes started spawning.

Preparation of algal enriched artemia diet for juveniles

Artemia cysts were allowed to hatch following standard protocols [13]. Artemia naupli were enriched for 24 hr in two 20-L acrylic cylindrical conical tanks at a maximum concentration of 30,000 artemia L⁻¹ and kept at room temperature with constant moderate aeration. Two enrichments were made viz. algal enriched and polyunsaturated fatty acid enriched (PUFA) Artemia. The alga (*Chlorella salina*) was cultivated in 70-L tanks at 24°C and at a salinity range of 22-24 ppt with organic fertilizer and Convey medium, Sigma-Aldrich® [14,15].

Larval rearing

The unique mode of reproduction was found in the coral reef teleosts and particularly in mouth brooding fishes low fecundity can be observed [16]. Females developed few large oocytes that measured between about 2.6 and 2.9 mm in diameter and held together by the chronic filaments, forming a clutch of an average number of 40-50 eggs [10]. During the study period, embryonic development was also

documented (Figure 2). Releasing of juveniles usually took place during evening hours and occasionally extended to night times (22:00 to 23:50 hrs). Juveniles were collected gently without much disturbance and transferred to the rearing tank (FRP 150 lit) (Figure 1F). They were divided into groups to study the effect of photoperiod and suitability of diets on survival and growth. Three numbers of juveniles were randomly collected on 1st, 6th, 12th and 18th days after hatching to measure the total length and mouth gap in the nearest millimeter using ocular micrometer (Erma, Tokyo) and stereo microscope.

Juveniles from the same parents were stocked in different experimental tanks with three modes of photoperiod as well as three different feeds. They were divided into 5 groups (Control-A, Tank B, Tank C, Tank D and Tank E) and stocked (10 juveniles per tank) and all the experimental tanks were carried out in 3 replicates. The feeding schedule was commenced after 10 hrs of release of juveniles in the rearing system and fed four times a day.

Tank (B) was maintained with algal enriched artemia with 16L/8D photoperiod, and tank (C), with polyunsaturated fatty acid (PUFA) enriched artemia with 16L/8D photoperiod. While, the tank (D) was maintained with algal enriched artemia with 24L/0D photoperiod and tank (E) was maintained with PUFA enriched artemia with 24L/0D photoperiod. Control tank (A) was maintained with 12L/12D photoperiod and fed with artemia, without enrichment. All the experiments were carried out in duplicate. Juveniles were fed with artemia with a concentration of 12-15 ml⁻¹ and from the 15th day onwards they were fed with fresh clam meat, squid, oyster, octopus etc.

Before feeding the juveniles, Artemia was enriched with PUFA for 5 hrs. The mixture was aerated for 10-15 minutes to ensure good integration before feeding. Prey density was approximately counted

for every 5 hr. Physical and chemical parameters excluding light were maintained as such in the parent tank. Survival (%) and growth increment (mm) of juveniles in each set-up was documented daily. Further, mortality, either due to starvation or indigestion was also recorded visually.

Calculation and data analysis

Growth performance of the fish was determined by following the standard formula given by Mohsen [17]. Daily growth rate was calculated from $GR \text{ (mm/day)} = \frac{TL_t - TL_0}{t}$, where TL_t and TL_0 are the total length at the end of the experiment and beginning of the experiment, and t is the days for the experiment. Weight gain = Final weight (g) - Initial weight (g). Specific Growth Rate (SGR) = $100 \frac{\ln W_2 - \ln W_1}{T}$ where W_1 and W_2 are the initial and final weight, respectively, and T is the number of days in the feeding period. Feed Conversion Ratio (FCR) = feed intake (g)/weight gain (g), absolute growth rate (AGR) (g/day) = Final weight - Initial weight / Days of experiment. Survival rate (SR) was calculated from $SR \text{ (%) } = \frac{NT}{(NO - NS)} \times 100$, where NT is the number of juveniles at the end of the experiment, NO is the number of metamorphic juveniles at the beginning of the experiment and NS is the number of juveniles sampled for measurement during the experiment.

Data were subjected to one-way ANOVA to test the growth performance, survival rate of Banggai cardinal fish. Data have been expressed as mean values \pm S.D. All statistical analyses were made using the statistic software SPSS version 16.0 as described by Dytham [18].

Results

Brood stock development

During feeding, it was noticed that the female gave more opportunity to the male. Among the eight fishes in the conditioning tank, one pair grew ahead of the others within two months interval. After their removal, another pair was formed within 12-15 days. The courtship began a week before spawning with the initiatives taken by both the fishes. During courtship, it was observed that, most of the time, both the fishes stayed in the tank nearer to the biofilter. It was also noticed that as soon as a female attained maturity, its pelvic region got enlarged. Behavior of the couples was observed daily at different intervals, until mating occurred, which usually occurred between 10:45 to 14:45 h.

Like, other mouth brooding apogonid fishes, *P. kauderni* reproduction was also initiated with an elaborate courtship that lasted normally several hours (6 to 8 hr). Spawning behavior comprised with several courtship displays, similar to that of other apogonids that include trembling, warping, side to side swimming, snuggling and mouth opening by the male fish [19].

Relinquish of the juveniles

Size of the ovulated oocytes ranged between 2.3-2.6 mm in diameter. An average egg mass consisted of 35 to 40 eggs that formed a round mass with 1.6 diameter. Eggs were held together by a strong filament that originated from a circular area of chorion, as described by Bernardi and Vagelli [20]. Eggs exhibited direct development and lacked the dispersive larval phase. After hatching, embryos remained in the male mouth cavity for about 10-12 days until the yolk content was utilized by the larvae and completion of developmental phase of the larvae. Immediately after the release of the juveniles from the oral cavity of the male fish, juveniles swam together and occupied the corners of the glass tank. They were transferred to the juvenile rearing

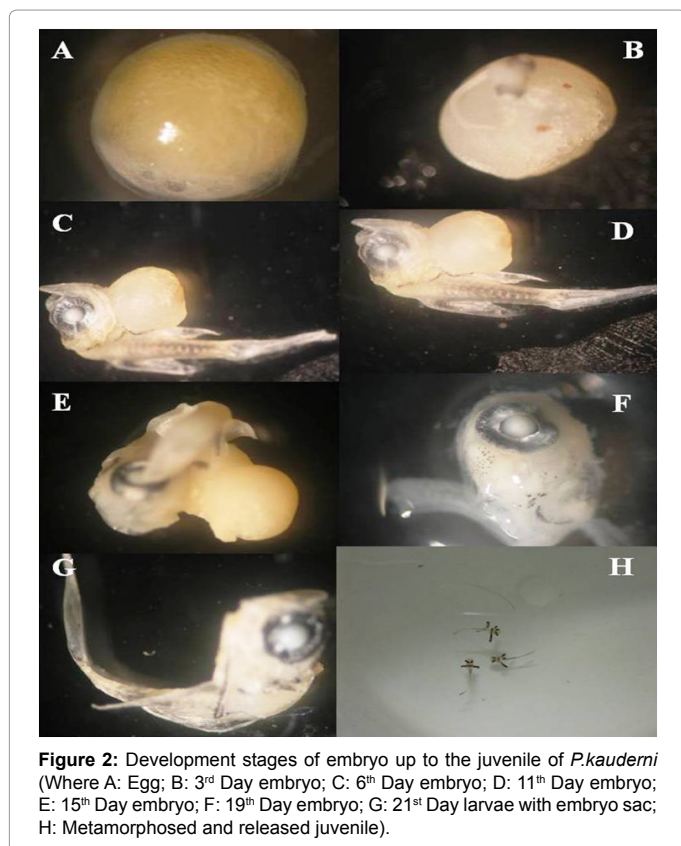


Figure 2: Development stages of embryo up to the juvenile of *P. kauderni* (Where A: Egg; B: 3rd Day embryo; C: 6th Day embryo; D: 11th Day embryo; E: 15th Day embryo; F: 19th Day embryo; G: 21st Day larvae with embryo sac; H: Metamorphosed and released juvenile).

tank and fed with the enriched rotifers. At the time of release, juveniles were 0.5 to 0.8 mm SL in size, and the yolk was almost absorbed. From the 2nd day onwards, they were fed with artemia, followed by mussel meat, clam and squid, which were squashed and given. After a week, the juveniles were introduced in to the glass tank and after two months they were shifted to a separate display tank along with the sea anemone *Heteractis magnifica* (Figure 3). As they are symbiotic to sea urchin, hence the authors also tried the juveniles to adapt with sea anemone. In context, the juveniles of Banggai cardinal can also withstand with sea anemone.

Effect of photoperiod and diet of the juveniles

In the present study, it was noticed that the enriched initial feed is essential for the survival of the juveniles. Control tank (A), 12L/12D photoperiod showed 25% juvenile survival and tank (B & C), 16L/8D photoperiod provides 47% and 45%, respectively (Figure 4).

Good survival (68% and 55%) and growth were observed in tanks D and E under 24L/0D photoperiod, respectively (Figure 5). Juveniles fed with artemia, enriched with alga under 24L/0D photoperiod (tank D) showed better survival and growth than the juveniles fed with artemia enriched with PUFA (tanks C & E) (Figures 4 and 5). Differences between various experimental groups were statistically significant ($F_{4, 145}=0.000, P<0.05$).



Figure 3: Juveniles of *Pterapogon kauderni* accompanied with the sea anemone *Heteractis magnifica*.

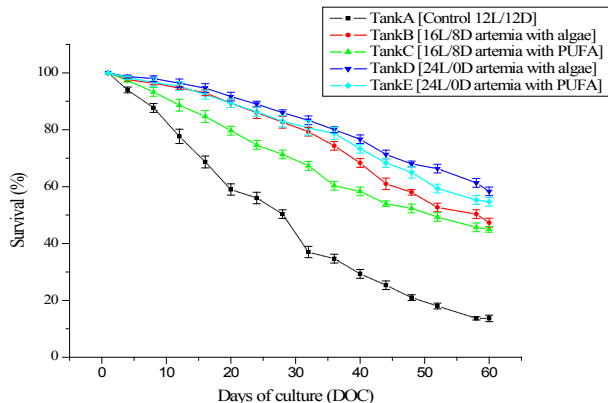


Figure 4: Survival percentage of *Pterapogon kauderni* juveniles with different photoperiods and diets.

*Each experimental group is the mean of three replicates

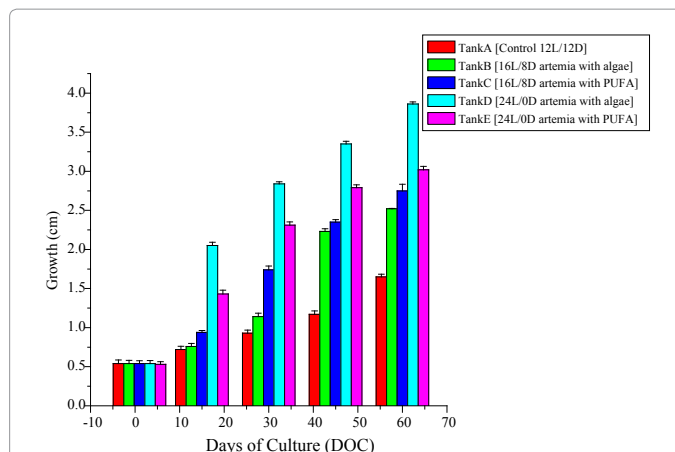


Figure 5: Growth of *Pterapogon kauderni* juveniles at different photoperiods and diets.

*Each experimental group is the mean of three replicates

One way analysis of variance was conducted to evaluate the null hypothesis that there is a significant difference in the different treatments groups in which the *P. kauderni* are reared. Level of significance with the reared juveniles of Banggai cardinal fish on different photoperiod and different diets were significantly different (Table 2).

Welch and Brown Forsythe tests of equality were also done in different experimental tanks. All the tanks were significantly different from each other (Table 3). Thus, there is a significant difference was observed in all the experimental treatment groups. And the f is asymptotically distributed. Post hoc comparisons with the use of Tukey HSD test were also revealed in different experimental groups and concluded that the group means are equally varied which are tenable. Tests revealed significant pair wise differences between each treatment groups of Banggai cardinal juveniles and that were significantly different from each other ($p<0.05$) (Tables 2 and 3).

Effect of photoperiod and different diets on SGR, FCR and AGR

The growth rate of metamorphic juveniles of *P.kauderni* during the experimental trail is shown in Figure 5. The maximum growth response in terms of specific growth rate (SGR) and final body weight was observed at experimental tanks D and E under 24L/0D photoperiod, respectively (Table 1). The final weight of the fish, weight gain and SGR is increased significantly ($P<0.05$) with the increase of the photo period and the juveniles fed with the enriched artemia with algae. SGR in all experimental groups, growth rates, SGR are significantly different ($P<0.05$) with the increase of the photoperiod which clearly states that the photoperiod and the enrichment levels play an important role.

With the increase of photoperiod and juveniles fed with different enrichments, Absolute growth rate (AGR) and feed conversion ratio (FCR) in the experimental tanks had significantly increased (Table 1). And it was observed that, the juveniles which are kept under 12L/12D and 16L/8D and fed with artemia enriched with the PUFA had low AGR (7.96 ± 0.16) and FCR (1.56 ± 0.47) (Table 1) comparing to other experimental groups.

Discussion

Increasing demand for the marine ornamental fishes and continuous collection from reef ecosystem have lead to depletion of

Parameters	Control Tank A	Tank B	Tank C	Tank D	Tank E
Initial body weight, mg/fish	18.2 ± 0.027	18.2 ± 0.031	18.2 ± 0.012	18.2 ± 0.013	18.2 ± 0.043
Initial body length (cm)	0.54 ± 0.10	0.54 ± 0.10	0.54 ± 0.10	0.54 ± 0.10	0.54 ± 0.10
Final body weight, mg/fish	385.6 ± 0.629 ^a	468.4 ± 0.227 ^b	495.8 ± 0.182 ^c	783.5 ± 0.533 ^d	588.3 ± 0.48 ^e
Final body length (cm)	1.65 ± 0.034 ^a	2.52 ± 0.005 ^b	2.75 ± 0.085 ^c	3.86 ± 0.027 ^d	3.02 ± 0.043 ^{c-d}
Weight gain (mg/fish)	367.4 ± 0.87 ^a	450.2 ± 0.371 ^b	477.6 ± 0.38 ^c	765.3 ± 0.17 ^d	570.1 ± 0.55 ^e
Absolute growth rate (mg/day)	6.12 ± 0.36 ^a	7.50 ± 0.87 ^b	7.96 ± 0.16 ^c	12.75 ± 0.45 ^d	9.50 ± 0.85 ^e
Feed intake (mg)	653.2 ± 0.49 ^a	672.9 ± 0.14 ^a	746.3 ± 0.82 ^b	968.2 ± 0.95 ^b	863.5 ± 0.79 ^c
Specific growth rate (%/day)	5.10 ± 0.45 ^a	5.41 ± 0.32 ^b	5.50 ± 0.38 ^c	6.27 ± 0.27 ^c	5.79 ± 0.21 ^c
Feed conversion ratio	1.77 ± 0.05 ^d	1.49 ± 0.23 ^c	1.56 ± 0.47 ^{b-c}	1.26 ± 0.52 ^a	1.51 ± 0.34 ^b

*Each value is means of three replicate groups

**Mean in the same row sharing the same superscript are not significantly different (P<0.05).

Table 1: Specific growth rate (SGR), absolute growth rate (AGR) and Feed conversion ratio (FCR) of *P. kauderni* (mean ± SE, n=3) which are reared at brackish water with different photoperiods and different diets. (Where Tank A=Control 12L/12D; Tank B=16L/8D artemia with algae; Tank C=16L/8D artemia with PUFA; Tank D=24L/0D artemia with algae and Tank E=24L/0D artemia with PUFA).

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Tank A	Between Groups	1.321	6	.220	943.327	.000
	Within Groups	.003	14	.000		
Tank B	Between Groups	9.359	6	1.560	3.946E3	.000
	Within Groups	.006	14	.000		
Tank C	Between Groups	8.431	6	1.405	7.976E3	.000
	Within Groups	.002	14	.000		
Tank D	Between Groups	22.321	6	3.720	3.005E4	.000
	Within Groups	.002	14	.000		
Tank E	Between Groups	14.618	6	2.436	2.326E4	.000
	Within Groups	.001	14	.000		

Table 2: One way ANOVA values revealed in between different treatment groups of *P. kauderni*. (Where Tank A=Control 12L/12D; Tank B=16L/8D artemia with algae; Tank C=16L/8D artemia with PUFA; Tank D=24L/0D artemia with algae and Tank E=24L/0D artemia with PUFA).

Robust Tests of Equality of Means					
		Statistic ^a	df1	df2	Sig.
Tank A	Welch	888.679	6	6.016	.000
	Brown-Forsythe	943.327	6	10.791	.000
Tank B	Welch	2.937E3	6	6.112	.000
	Brown-Forsythe	3.946E3	6	10.446	.000
Tank C	Welch	1.394E4	6	6.115	.000
	Brown-Forsythe	7.976E3	6	8.425	.000
Tank D	Welch	4.682E4	6	6.122	.000
	Brown-Forsythe	3.005E4	6	10.090	.000
Tank E	Welch	2.149E4	6	6.142	.000
	Brown-Forsythe	2.326E4	6	10.298	.000

a. Asymptotically F distributed.

Table 3: Equality of means that are observed in between different treatment groups of *P. kauderni* (Where Tank A=Control 12L/12D; Tank B=16L/8D artemia with algae; Tank C=16L/8D artemia with PUFA; Tank D=24L/0D artemia with algae and Tank E=24L/0D artemia with PUFA).

wild stock [21]. Further, land based culture of coral reef species could alleviate the growing market demands thereby helping to increase the wild stock and employment generation [22]. Studies on the captive breeding of clown, damsel and few cardinal fishes were made earlier using sea water [23-27] but the present study has conducted with estuarine water.

Juveniles of *P. kauderni* have been reported to take refuge in the parent's mouth [28], but it was found in the present study that the young fishes were protected by the male parent during the first few

weeks and they progressively spent more time outside the parent mouth.

Females producing larger eggs are likely to generate larger offsprings with higher chances of survival and growth rates [29]. Present study confirms this, where the egg production was found to depend on the size of the brooders.

In *P. kauderni*, the pelagic larval phase is absent and there is prolonged parental care and thus there was no release of free embryos until their settlement [28] but in the present study, during the incubation period free embryos were released. This could be due to some disturbances posed to the male by the female and environmental conditions.

Reproduction carries a cost in terms of future growth, survival and fecundity which was described by Williams [30], but in the present study, there was much difference observed from the first fecundity and the next fecundity of the brooders and there were also differences in the growth and survival of the *P. kauderni* juveniles.

Male fishes decrease their liver weight more drastically than the females at the end of the breeding season, suggesting that the energetic cost is associated with the parental care as reported by Smith and Wootton [31]. In the present study also, it was observed that the male fish, there was decrease in weight after the release of juveniles.

Fecundity rate, clutch size and spawning frequency are dependent upon several factors such as the quality of the feed, brooder condition in the confinement and environmental factors. According to Vagelli [10], size of the cardinal egg mass varied between 2.8-3.0 mm in dia, but presently it ranged between 2.3-2.8 mm and it could be due to the size of the parents, nature of feed and also several environmental parameters.

Chlorella salina is an essential food for the marine larvae [32]. Various studies [33,34] have shown PUFA's enriched diet is extremely important for optimal nervous system functioning during the early larval stages but in the present study, artemia was enriched with the micro-alga only. Present results have indicated that the general health and well being of the juveniles have been significantly improved by feeding with the enriched diet. Since the micro-alga is rich in DHA, no extra enrichment process was done, as already reported in other fishes [35].

The presence of Artemia nauplii in the enrichment medium would effect in a different way liposomes, which can exhibit an increase in size in the fish [36], the present study also evaluated that, the juveniles which

are fed with the artemia enriched with algae under the photoperiod of 24L/0D showed a maximum growth rate comparing to the other groups.

Newly hatched Amphiprion franciscana had a relatively high content of EPA (0.02 DHA:1 EPA), but a low DHA and ARA content (3.41 DHA:162.28 EPA:1 ARA), similar to reports by several other authors [37-39]. Enrichment intends to improve and balance the fatty acid profile [7], particularly increasing DHA content, to attain the optimal essential fatty acid ratio of 10 DHA:5 EPA:1 ARA, suggested by Sargent [40] and Castell. From the present results of the experiment, it clearly states that, the juveniles which are fed with the artemia enriched algae which have high growth rates (Table 1) than the other experimental groups, as the algae which have all the essential fatty acids.

The most appealing result of this work is that *P. kauderni* can indeed be successfully bred in captivity, even using low saline water, on the condition that the other physico-chemical parameters, photoperiod and feed are well optimized. Vagelli [10], studied the spawning and larval rearing of coral reef fishes using sea water with a salinity range of 33-35 ppt at a survival rate of 50 to 55 %. In the present study, the fish was bred in the estuarine water with the salinity range of 22-24 ppt and the juvenile survival rate was 68%. According to Vagelli [10], release of juveniles took place in the 10 day but in the present study it was taken in the night times after two weeks, it may be attributed to the low salinity. Live feed and proper maintenance of water quality have been found indispensable for the successful rearing of the reef fish, *P. kauderni* in captivity using estuarine water. Findings of the present study will facilitate mass scale production of *P. kauderni*, using low saline water and the technology will help for the livelihood development of the coastal community and marine biodiversity conservation.

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