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Band transformation secrets of Anemonefish *Amphiprion ocellaris*

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Present study consists the larval development of *Amphiprion ocellaris* and also documentation has done on the appearance of pigmentation and band formation, started appearing after post larval stage. Most interesting facts was recorded that on completion of 14-16th days, almost all the larvae attained full colouration of an adult fish and from day 25th onwards, all the coloured fins have got their peculiar parental traits and the total metamorphosis took place during this time. The miss band formation, band extension and band overlapping also observed in the anemone fish.

[Keywords: *Amphiprion ocellaris*, larvae, metamorphosis, pigmentation, behaviour].

Introduction

Metamorphosis is the most traumatic event in the life of an anemonefish. It is the traits transformation from simple larvae to early juvenile. Metamorphosis is a complex phenomenon, incorporating a series of abrupt changes in an individual's morphology, physiology and behaviour during the post embryonic development [1]. However, no research has been conducted so far on the detailed consistency of band formation and metamorphosis in the reef fishes. It is significant that specified in the research decision is impending and there are more than 80% of all animal species which have such complex multi-stage life cycles[1-2].

Materials and Methods

The present study is focused on conceptual and photographic documentary evidences in advances related to the behavioural traits, underlying the ecological and evolutionary progressions and pragmatic studies in the anemonefish. Hitherto, in the reef fish early life history, vital gaps remain to the understood differences in traits, adaptive implication and the reliability of traits across ontogeny. Recently, the early ontogeny of *Amphiprion nigripes* has been reported with compelling arguments for their adaptation and still there is lack of details on the band formation and its developmental stages form newly hatched larvae to juveniles[3&4]. Moreover, many findings have shown that offspring are able to alter the timing and duration of developmental periods based on ambient stimuli such as food availability, quality of foods or risk of predation. As such, there is a great potential to study the adaptive nature of behaviour between mortality menace, growth and reproductive venture.

Results and Discussion

Marine finfish require n-3 high unsaturated fatty acids (HUFA) such as EPA and DHA as essential fatty acids (EPA) for their growth[5]. But it remains unclear as to which of the n-3 HUFA, either EPA or DHA is important. DHA must be present in the diet to maximize the survival of larvae of anemone fish[6]. The developing eggs utilize DHA for energy and production of physiologically important substance like prostaglandins[7].

Fast embryonic development in tropical species, increases the degree of essentiality of amino acids, prostaglandins and other eicosanoids compared with cold and temperate species such as trout and salmonids which take a longer time to hatch[2]. The miss band formation in the anemonefish is a unique trait due to malnutrition and the band extension or overlapping may be due to natural mutation or genetic disorder (Fig. 1).

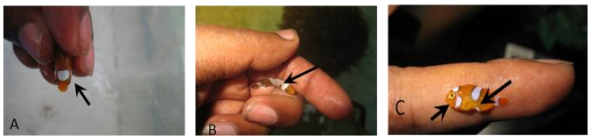

Fig.1. Miss Band formation in anemone fishes, *Amphiprion ocellaris.*
(A- Head band was missed both in post orbital zones. B - 1st and 2nd band joined and covered 50 % of the dorsal fin and C- Mid and head bands irregular)

As such, this trend highlights an important area for future studies also. Anemonefish have intricate life cycles *i.e*., they undergo abrupt ontogenetic niche shifts or metamorphosis which is mostly mistreated and it signifies an imperative research prospect. Habitually with symbiotic sea anemones, the entire course of action is allied with distinct shifts in ecological niches, thus influencing a range of important behaviours including predator avoidance, mating and dispersal[8, 9&10]. Experiences in early development might also alter the trajectories of ontogenetic development and consequently, engender humdrum prototypes of stability in behaviour irrespective of changes in morphology, physiology and ecological niche[11].

Revise of behavioural evenness across metamorphosis also poses an exclusive set of experimental challenges. Characterizing individual-level differences in traits across metamorphosis can revolutionize how we have to study the important ecological traits. Further, understanding about how and why certain characteristics are consistent across metamorphosis in spite of profound changes in hormones, morphology and environmental selection pressures represent critical gaps in our knowledge base. The use of developmental perspectives in studying animals across ontogeny is paramount if a better more holistic understanding of individual-level differences in behaviour is to be achieved. Traits have been argued to be flexible and adaptive as well as fixed and maladaptive, but a general consensus cannot be reached as behavioural properties vary by study, species and focal trait[12].

The anemonefish, mostly transparent in larval stages and the milky white band pigmentation started appearing on 9-11th days of post hatching, which is evident in the present study also. On completion of 14-16th days, almost all the larvae were attained full colouration of an adult fish and from the day 25th onwards, all the coloured fins have got their peculiar parental traits and the total metamorphosis took place during this period. Larval and adult stages of anemone fishes are appropriate to inhabit various appearances, which is possessing different developmental endeavours. Research on anemone fish metamorphosis is significant in this stare, an descriptive framework on how certain behaviours is appear maladaptive within a given life history stage by tracking behavioural changes across different stages of development (Fig. 2).

Fig. 2. Early life history stages of *Amphiprion ocellaris*

Species that undergo ontogenetic niche shifts provide with a unique type of *in-situ* experimental opportunity to study how traits differences might couple or uncouple with physiological morphological or ecological traits over development. From this revised spotlight on the developmental behaviours in the anemone fish at different life history stages and selection systems, what we infer is a unique and important loom that is worth perusing by the behavioural biologists. Despite the fact, there is no previous detail description of *A. ocellaris*. Since the larval development of *A. ocellaris* has not been documented, present study provides the baseline information on its early development, thus helpful for further research.

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References

1. Alexander D., Wilson M. and Krause J., Metamorphosis and animal traits: a neglected opportunity. *Trends Ecol. Evol.* (Cell Press), 27 (10) (2012) 529-531.
2. Werner E.E., Size, scaling, and the evolution of complex life cycles. In Size-Structured Populations. *Trends Ecol. Evol.* (Ebenman, B. and Persson, L., eds), (1988) 60-81.
3. Swagat Ghosh, Ajith Kumar, T. T. and Balasubrananian T., Embryonic development of Maldives clownfish, *Amphiprion nigripes* (Amphiprioninae). *J. Ocean Univ. China*, 11, 2, (2012) 174-180.
4. Balon E. K., Alternative ways how to become a juvenile or a definitive phenotype (and on some persisting linguistic offences). *Environ. Biol. Fishes*, 56 (1999) 17-38.
5. Ajith Kumar T. T. and Balasubramanian T., Broodstock development, spawning and larval rearing of the false clownfish, *Amphiprion ocellaris* in captivity using estuarine water. *Current Science,* 97 (10) (2009) 1483-1486.
6. Ajith Kumar T. T., Gopi M., Dhaneesh K. V., Vinoth R., Ghosh S., Balasubramanian T. and Shunmugaraj T., Hatchery production of the clownfish, *Amphiprion nigripes* at Agatti Island, Lakshadweep. *J. Environ. Biol.,* (2011) 623-628.
7. Dhaneesh K. V., Ajith Kumar T. T., Swagat Ghosh and Balasubramanian T., Breeding and mass scale rearing of Clownfish *Amphiprion percula*: Feeding and rearing in brackishwater. *Chinese J. Ocean. Limn.,* 30 (4) (2012) 528-534.
8. Ajith Kumar T. T., Prakash S. and Balasubramanian T., Establishment of Homestead hatcheries for marine ornamental fishes: An imperative need for sustainable production. In: Souvenir, Ornamentals Kerala 2012, Cochin, (2012) 25-31.
9. Ajith Kumar, T.T. and Balasubramanian T., Setting up of Backyard Hatchery for Marine Ornamental fish: An alternate livelihood, UNU - INWEH - UNESCO - International training course on coastal biodiversity in mangrove ecosystem: Course manual, In: K. Kathiresan and S. Ajmal Khan (Eds.), C.A.S. in Marine Biology, Annamalai University. (2009) 624-629.
10. Ajith Kumar, T.T. Subodh Kant Setu, Murugesan P. and Balasubramanian T., Studies on captive breeding and larval rearing of clownfish, *Amphiprion sebae* (Bleeker, 1853) using estuarine water. *Indian J. Mar. Sci*. 39. (1) (2010) 114-119.
11. Swagat Ghosh, Ajith Kumar T. T., Nanthinidevi K. and Balasubrananian T., Reef fish breeding and hatchery production using brackishwater: A sustainable technology for reef fish with special reference to Clark's clownfish, *Amphiprion clarkii* (Bennett, 1830). *Int. J. Env. Sci. Dev.,* 3(1) (2012) 56-60.
12. Olivotto, I., Cardinali M., Barbaresi L., Maradonna F. and Carnevali O., Coral reef fish breeding: the secrets of each species. *Aquaculture,* 224 (2003) 69-78.