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FEEDING, BEHAVIOUR AND GROWTH STUDIES OF FALSE PERCULA CLOWNFISH, *Amphiprion ocellaris* AND TOMATO CLOWNFISH, *Amphiprion frenatus* IN CAPTIVITY

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ABSTRACT

Feeding, behaviour and growth studies for two ornamental fish; false percula clownfish, *Amphiprion ocellaris* and tomato clownfish, *Amphiprion frenatus* were done in captivity at UMT's culture house in Terengganu. This study aims to provide more understanding on *A. ocellaris* and *A. frenatus* feeding preferences in recirculating aquaculture system (RAS), and the effects of adding Spirulina, *Arthrospira platensis* into the feed, as well as studying their feeding behaviour towards all the feed treated to them. Their spawning behaviour, growth rate, feed conversion ratio (FCR) and survival were also being observed and recorded. The feeding preferences were obtained by how much feed were consumed by clownfish pairs and their feeding activity eagerness (using MOFAI) during each feeding session. It was found that *A. ocellaris* preferred blood cockle, *Anadara granosa* the most (consumed: 153.8g, MOFAI: 727), followed by banana shrimp, *Penaeus merguiensis* (consumed: 84.7g, MOFAI: 598), mackerel, *Rastrelliger kanagurta* (consumed: 29.45g, MOFAI: 407) and commercial feed pellet (consumed: 17.95g, MOFAI: 427). All feed were significantly different from each other ($p<0.05$). Based from the pilot feed study, blood cockle feed was chosen as the feed to be treated to *A. frenatus* on three different Spirulina concentration. *A. frenatus* showed highest feed preferences towards blood cockle with 12% Spirulina feed the most (consumed: 184.9g, MOFAI: 496), followed by blood cockle with 0% Spirulina (consumed: 143.7g, MOFAI: 488) and blood cockle with 6% Spirulina (consumed: 114.8g, MOFAI: 320). There were also significant differences among all the feed ($p<0.05$). Both *A. ocellaris* and *A. frenatus* showed several spawning behaviour, especially during the three days of full moon such as; increased feed consumed, intense swimming movement at night, male swam to attract female, and male cleaned possible eggs laying spot. All clownfish gained good growth ($gday^{-1}$) rate, however the growth rate of male and female *A. ocellaris* differed according to the feed supplied to them. Male *A. ocellaris* that ate pellet ($0.031gday^{-1}$) and fish ($0.024gday^{-1}$) grew more than their female pair; while female have better growth if they were fed with blood cockle ($0.034gday^{-1}$) and shrimp ($0.033gday^{-1}$). For *A. frenatus*, all females gained more growth than their male pair (0% Spirulina: $0.128gday^{-1}$, 6% Spirulina: $0.171gday^{-1}$, 12% Spirulina: $0.443gday^{-1}$). Even though both clownfish *A. ocellaris* and *A. frenatus* consumed a lot of feed, their FCR value is high because their weight and length growth is smaller compared to the amount of feed they consumed, this is because they have already reached maturity and coral reef fish usually do not have the same proportional growth as food fish. All clownfish showed high survival rate in captivity. Hopefully the findings from this study will help fellow clownfish keepers and breeders understand the feeding behaviour and spawning behaviour of clownfish as well as improving the clownfish welfare in captivity.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Clownfish or anemonefish is one of the famous ornamental fish in aquarium trade industry around the world (FAO, 2001). Clownfish live in coral reef area associated with symbiotic sea anemones. There are 28 species of clownfish around the world (Fautin and Allen, 1992). Twenty seven species are in the genus *Amphiprion*, and only one species in the genus *Premnas*.

Global imports on marine, fresh water fish and invertebrates in 2007 have been valued at US$ 327 million. The value of the fish and invertebrates of marine origin in this trade has increased from 9 million US$ in 2003 to reach almost 29 million US$ in 2007 (Tissera, 2010). In the aquarium trade market, only 51 species of coral reef fish have been cultivated (Arvedlund *et al*., 2000) while other 1000 species are collected from the wild (Green, 2003). It was surveyed and estimated that only less than 10% of marine wildlife sold for ornamental trade purposes come from captive production (Wabnitz *et al*., 2003). In addition, it is safe to conclude that more than 90% of all marine ornamental species are acquired directly from wild resources (Tlusty, 2002; Moe, 2003).

Over the past two decades, global ornamental fish trade has increased from US$ 50–US$ 250 million. It has been estimated that 1.5–2.0 billion aquaria are being kept in households globally with more than 600,000 in the United States alone (Lewbart *et al*., 1999; Green, 2003). The false percula clownfish, *Amphiprion ocellaris* is one of the most demanded species in the trade market (FAO, 2001). The rapid expansion of the ornamental fish trade has attracted researchers and breeders to study and manage these ornamental fish populations and welfare.

Marine ornamental fish, especially reef fish are sought out and the demand for it is growing globally (Shuman *et al*., 2005; Livengood and Chapman, 2007; Moorhead and Zeng, 2010, 2011). The world's largest exporter of ornamental marine species for the private aquarium trade are tropical and subtropical countries such as Indonesia, Malaysia, Thailand, Philippines, and Australia (Olivotto *et al*., 2003). Huge majority of ornamental fish harvest from the wild to fulfil the demand for marine ornamental market