DISTRIBUTION AND LIFE HISTORY OF OMAN ANEMONEFISH, *Amphiprion omanensis*, AT THE EAST COAST OF DHOFAR, SULTANATE OF OMAN

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DEDICATION

To the spirit of my father, words are not enough to express my heartfelt feeling to him and my mother for their love, emotional support and also the most important thing is for their help during my study. My loving wife, I dedicate this thesis to you for your encouragement and support. Also to my daughters and sons who had been a great source of motivation and inspiration. I offer my warmest regards and thanks to my brothers and sisters for their continued support.

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfilment of the requirement for the degree of Doctor of Philosophy

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The present study was carried out on *Amphiprion omanensis* along the eastern coast of Dhofar region Oman between Marbat and Ras Hasik. Fish was sampled from all the

sites for a period of 16 months (January 2010 until December 2011). A SCUBA dive survey was conducted. A transect method was used for studying the distribution and relative abundance. Information regarding the environmental factors was also collected. *Amphiprion omanensis* was found with three species of host anemones, namely *Entacmaea quadricolor, Heteractis crispa* and *H. magnifica*. The fish and its host anemone showed a preference for shallow waters but no significant difference was observed. The greatest abundance was noticed between 4 and 6 m depth. The density of fish per square meter varied between the three areas; Marbat area showed a greater density of individuals per square meter than Sadah and Hasik ($p< 0.05$). *Amphiprion omanensis* social groups divided into four types of members: (i) breeding pairs, (ii) non-breeding male, (iii) single female and, (iv) juveniles (2.125 ± 0.65 SD). Parental activities were usually frequent on the day after spawning and the activities increased gradually in males until the day of hatching. These consisted of three general activities; fanning, mouthing and chasing the predators. For morphometric analysis, 25 morphological measurements were used in the discriminant function analysis, since all of the measurements were significantly correlated based on ANOVA. The canonical variant analysis resulted in two significant canonical axes with the first explaining 80.4 % of the total variability and the second with 19.6 %, respectively. For meristic characters, significant differences were found in three meristic characters namely, mean counts of anal fin rays, caudal fin rays and lateral-line scales between the groups ($p<0.05$). The reproductive activities in Dhofar region were from late September to the beginning of February. The gonadosomatic index (GSI), indicated that spawning occurred between October and January, with slight difference in the occurrence of the

peak period between the years. The fecundity in this fish varied between 872 and 2880 hydrated oocytes per batch at spawning season. Based on the findings of the present study several recommendations have been made to protect and conserve anemonefish resources in the waters of Oman.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

TABURAN DAN SEJARAH KEHIDUPAN IKAN "ANEMONE" OMAN DI PANTAI TIMUR DHOFAR, KESULTANAN OMAN

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: **Kementerian Pertanian dan Perikanan-Kesultanan Oman**

Kajian ini telah dijalankan ke atas *Amphiprion omanensis* di sepanjang kawasan pantai di timur Dhofar-Oman antara Marbat dan Ras Hasik. Ikan-ikan "anemone" ini telah ditangkap untuk tempoh 16 bulan (di antara Januari 2010 hingga Disember 2011). Penyelaman SCUBA telah dijalankan. Kaedah transek telah digunakan untuk mengkaji taburan dan kelimpahan relatif. Maklumat mengenai faktor persekitaran juga direkodkan. Spesis ikan "anemone" ini ditemui hidup bersama dengan tiga spesies perumah "anemone", iaitu *Entacmaea quadricolor, Heteractis crispa* dan *Heteractis magnifica.* Spesis ikan "anemone" dengan perumah "anemone" didapati lebih cenderung hidup di perairan cetek. Kelimpahan paling tinggi ditemui adalah di antara kedalaman 4 dan 6 m. Kepadatan ikan "anemone" dalam ukuran satu meter persegi menunjukkan perbezaan yang ketara di antara ketiga-tiga kawasan; Marbat menunjukkan kepadatan individu yang lebih besar dalam ukuran satu meter persegi daripada Sadah dan Hask ($p < 0.05$). Kumpulan-kumpulan sosial ikan "anemone" Oman ini terbahagi kepada empat kumpulan: (i) pasangan yang membiak, (ii) jantan yang tidak membiak, (iii) betina tunggal, dan (iv) kumpulan tidak matang (2.125 ± 0.65 SD). Penjagaan telur biasanya kerap dijalankan pada hari bertelur dan kadar penjagaannya meningkat secara beransur-ansur pada ikan jantan sehingga hari penetasan telur. Aktiviti penjagaan ini terdiri daripada tiga tingkah laku yang umum; menganginkan telur, "mouthing" dan mengejar pemangsa. Dalam analisis morfometrik, 25 ukuran morfologi telah dianalisis menggunakan kaedah fungsi diskriminan, memandangkan kesemua 25 ukuran tersebut mempunyai hubungan yang signifikan berdasarkan ANOVA. Analisis "canonical variant" menunjukkan dua fungsi yang signifikan, di mana fungsi pertama menerangkan 80.4 % daripada jumlah kebolehubahan dan fungsi kedua dengan 19.6 %.

Bagi ukuran meristik, perbezaan yang ketara ditunjukkan oleh tiga ukuran, iaitu bilangan sirip dubur, sirip ekor, dan garisan melintang bersisik ($p < 0.05$). Aktiviti pembiakan di Dhofar adalah dari akhir bulan September hingga awal Februari. Indeks gonadosomatik (GSI) menunjukkan pembiakan berlaku di antara Oktober dan Januari dengan sedikit perbezaan pada waktu puncak antara tahun. Kesuburan dalam ikan "anemone" ini adalah di antara 872 dan 2880 oosit terhidrat bagi setiap kumpulan pada musim bertelur. Berdasarkan hasil kajian ini, beberapa cadangan telah dibuat untuk melindungi dan memulihara sumber ikan "anemone" di perairan Oman.