

REPRODUCTIVE CHARACTERISTICS AND FACTORS AFFECTING
SPAWNING OF THE HARD CORAL (*ACROPORA* SPECIES) IN
REDANG ISLAND, MALAYSIA, SOUTH CHINA SEA

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The sexual reproduction of four *Acropora* species was studied from a population at Teluk Ketigi, Redang Island, Terengganu, Malaysia. The study was conducted from May 2005 to October 2006. Six coral colonies were selected for each *Acropora* species: three colonies for regular sampling, two for *in situ* spawning observation and one served as control. In each colony, one small branch was collected and preserved in 10% seawater buffered Formalin and decalcified with 10% Hydrochloric Acid (HCl). Remaining tissue was dissected and the diameter of 50 oocytes was recorded for each coral sample. Sampling was carried out every fortnight, and increased to every week when gonad development was observed.

No gonad development was documented in 2005. It was believed that there were two factors contributing to the absence of the gametogenesis cycle: (1) the macroalgae bloom which compromised the reproductive energy, and (2) the 2004 North-East monsoon which ended early caused a prolonged high seawater temperature between October 2004 and February 2005.

Gametogenesis started in early May 2006 and spawning took place in September 2006. The gonad was classified into four developmental stages, namely (1) no oocytes, (2) the presence of small oocytes, (3) large ovoid oocytes but no testes, and (4) the presence of large irregular oocytes with testes. Matured eggs of *A. hyacinthus* and *A. nobilis* changed color from creamy to reddish or pinkish while no change was observed in *A. millepora* and *A. cerealis*. The gametogenesis cycle is believed to be triggered by the rising seawater temperature and the growth rate of oocytes was affected by the flux of seawater temperature.

Individual *Acropora* species demonstrated varied reproductive characteristics and strategies. All the coral species studied showed hermaphroditism and broadcast spawning strategies. Among the four species, only *A. cerealis* showed synchronous spawning within species. On the other hand, asynchronous, inter-specific and intra-colony split spawning was demonstrated by the remaining three *Acropora* species.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan Ijazah Master Sains.

**SIFAT DAN FAKTOR-FAKTOR YANG MENPENGARUHI PEMBIAKAN
BATU KARANG (SPESIES *ACROPORA*) DI PULAU REDANG,
MALAYSIA, LAUT CHINA SELATAN**

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Pembiakan seksual empat spesis karang *Acropora* dikaji dari satu populasi di Teluk Ketigi, Pulau Redang, Terengganu, Malaysia dari Mei 2005 sehingga Oktober 2006. Enam koloni karang dipilih dari setiap spesis *Acropora*: tiga koloni dalam persampelan rutin, dua koloni untuk dipantau secara *in situ* dan satu koloni sebagai koloni kawalan. Satu cabang kecil dikutip dari setiap koloni dan diawetkan dalam 10% Formalin dan kemudian dikalsifikasikan dengan 10% Asid Hidroklorik (HCl). Tisu yang selebihnya dibedah dan diameter 50 oosit dari setiap sampel direkodkan. Kerja persampelan dijalankan setiap dua minggu sekali. Apabila perkembangan gonad didapati, kerja persampelan akan dilaksanakan setiap minggu sekali.

Tiada perkembangan gonad direkodkan dalam tahun 2005, dipercayai bahawa dua faktor yang menyebabkan kitar gametogenesis tidak berlaku: (1) pertambahan alga secara mendadak yang mengkompromi tenaga pembiakan karang, dan (2) musim tengkujuh Timur-Laut yang berakhir lebih awal daripada yang dijangkakan, menyebabkan suhu air laut yang tinggi dari Oktober 2004 sehingga Februari 2005.

Gametogenesis bermula dari Mei 2006 dan gamet dilepaskan pada September 2006. Gonad adalah diklasifikasikan kepada empat peringkat perkembangan, iaitu (1) tiada oosit, (2) oosit yang kecil, (3) oosit yang besar tetapi testis tidak kelihatan, dan (4) kehadiran oosit yang besar dan tidak serata. Telur *A. hyacinthus* dan *A. nobilis* yang telah matang berubah warna dari warna krim ke merah atau merah jambu, sementara perubahan warna tidak diperhatikan pada *A. millepora* dan *A. cerealis*. Kitar gametogenesis adalah dipercayai dirangsangkan oleh suhu air laut yang semakin meningkat, dan kadar pertumbuhan oosit dipengaruhi oleh perubahan suhu air laut.

Spesis individu *Acropora* menunjukkan sifat dan strategi pembiakan yang berbeza. Kesemua spesis karang menunjukkan sifat hermafroditisme dan strategi pelepasan telur secara terbuka. Dalam empat spesis karang tersebut, hanya *A. cerealis* yang menunjukkan pelepasan telur dalam masa yang sama. Sebaliknya, tiga spesis *Acropora* yang selainnya menunjukkan pelepasan telur secara berasingan, inter-spesifik dan intra-koloni.