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MATURATION PHASES OF MALE PARROTFISH (*Scarus rivulatus*, *S. qouyi* AND *S. ghobban*) IN RELATION TO REPRODUCTIVE INDEX, SEX STEROID HORMONES AND FATTY ACID PROFILE AT PULAU BIDONG, TERENGGANU

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Parrotfish play a significant role in tropical coral reef ecosystems. This study investigates maturation phases in three male parrotfish species; Surf parrotfish (*Scarus rivulatus*), Quoy's parrotfish (*S. qouyi*) and Yellowscale parrotfish (*S. ghobban*). Fish specimens were collected from Pulau Bidong, Terengganu, South China Sea. Parrotfish are hermaphroditic, with gonad development in males starting from transition phase (sex change phase) to male adult phases (initial and terminal). The stages of gonad development were differentiated through a histological examination procedure, during which the spermatogenic cells were identified and categorized. For the initial gonad development phase, there are four stages: developing, spawning, regressing, and regenerating. In contrast, the terminal phase only includes developing, spawning, and regressing stages. After the transition phase, the gonads in all parrotfish species developed according to similar microcharacteristic cycle criteria. Study found significantly high mean values of spermatozoa cells that positively correlated with reproduction index (gonadosomatic and hepatosomatic) during spawning stages of both initial and terminal phases, as well as constant higher level of 11-ketotestosterone hormone, compared to estradiol. Fatty acid analysis identified a total of 27 fatty acids (FAs), which were classified into saturated FAs, monounsaturated FAs, and polyunsaturated FAs. There were

similarities in FA profiles among parrotfish species. The mean concentration did not differ significantly across maturation phases ($p>0.05$), as the SIMPER analysis revealed that the changes in mean values between gonad phases in parrotfish showed a lower dissimilarity percentage of dissimilarity than similarities. The high average values of saturated FAs (C14:0, C16:0 and C18:0) during transition phase indicate that parrotfish require high energy reserves during the sex change phase to male individuals. There were fluctuations of polyunsaturated FAs concentration from the initial to terminal phases following the transition to male parrotfish. The mean concentration increases from the developing to the regressing stages, indicating that the polyunsaturated FAs are essential for the reproductive performance of male parrotfish.

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

FASA KEMATANGAN IKAN BAYAN JANTAN (*Scarus rivulatus, S. qouyi* DAN *S. ghobban*) DAN KAITANNYA DENGAN INDEKS PEMBIAKAN, HORMON STEROID PEMBIAKAN DAN PROFIL ASID LEMAK DI PULAU BIDONG, TERENGGANU

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Ikan Bayan memainkan peranan yang penting dalam ekosistem terumbu karang tropika. Kajian ini mengenal pasti fasa pematangan bagi tiga spesis ikan Bayan jantan; Surf parrotfish (*Scarus rivulatus*), Quoy's parrotfish (*S. qouyi*) dan Yellowscale parrotfish (*S. ghobban*) yang diperoleh dari Pulau Bidong, Terengganu, Laut China Selatan. Ikan Bayan adalah hermafrodit, yang mana perkembangan gonad jantan bermula daripada fasa peralihan (pertukaran jantina) kepada jantan (awal dan terminal). Peringkat perkembangan gonad dibezakan melalui prosedur pemeriksaan histologi di mana sel spermatogenik dikenal pasti dan dibezakan. Untuk fasa pembangunan gonad awal, mereka mempunyai empat peringkat; pengembangan, pembenihan, penerimaan dan regenerasi, manakala untuk fasa terminal hanya mengalami perkembangan, pembenihan dan regresif. Keputusan menunjukkan bahawa selepas fasa peralihan, gonad dalam semua spesis ikan Bayan mempunyai kriteria kitaran ciri mikro yang serupa. Kajian mendapati nilai purata sel spermatozoa yang ketara tinggi berkorelasi secara positif dengan indeks pembiakan (gonadosomatik dan hepatosomatik) semasa peringkat peralihan kedua-dua fasa awal

dan terminal, serta tahap hormon 11-ketotestosteron yang lebih tinggi berbanding estradiol. Analisis asid lemak mengenal pasti sejumlah 27 asid lemak (FA), yang dikelaskan kepada FA tepu, FA tak tepu tunggal dan FA poli tak tepu. Terdapat persamaan dalam profil FA di kalangan spesies ikan Bayan. Purata kepekatan adalah tidak berbeza dengan ketara mengikut fasa pematangan ($p>0.05$) kerana melalui SIMPER analisis, perubahan nilai purata antara fasa perkembangan gonad dalam ikan Bayan mempunyai nilai peratusan ketidaksamaan yang rendah berbanding persamaan. Nilai purata FA tepu yang sangat tinggi (C14:0, C16:0 dan C18:0) semasa fasa peralihan gonad menunjukkan bahawa simpanan tenaga yang tinggi diperlukan ikan Bayan semasa fasa peralihan jantina kepada individu jantan. Terdapat turun naik kepekatan FA poli tak tepu dari fasa awal kepada fasa terminal selepas peralihan kepada ikan Bayan jantan. Purata kepekatan meningkat dengan ketara daripada peringkat pengembangan kepada peringkat regresif, yang menunjukkan bahawa FA poli tak tepu adalah penting untuk prestasi pembiakan ikan Bayan jantan.