SAND TEMPERATURE PROFILE AND SEX RATIO OF GREEN TURTLE (*Chelonia mydas*) HATCHLINGS OF SARAWAK TURTLE ISLANDS, SARAWAK, MALAYSIA

By

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DEDICATION

TO MY DEAREST BROTHER,
CHAI YIT NENG

In everlasting memory and love

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of requirement for the Degree of Master of Science

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Chairperson : Mr. Liew Hock Chark

Faculty : Science and Technology

A comprehensive study on the thermal regimes of nesting beaches and hatcheries, as well as sex ratio output of green turtle hatchlings produced from *in situ* nests, hatcheries and styrofoam boxes was conducted at the Sarawak Turtle Islands comprising Pulau Talang Talang Kecil (PTTK), Pulau Talang Talang Besar (PTTB) and Pulau Satang Besar (PSB) from April 1999 to March 2000. It was found that the middle part of the nesting beaches could be divided into two thermal zones; exposed and shaded zones, with significant differences between the two zones. The average temperature differences found in the exposed zone and the shaded zone ranged from 0.5°C to 2°C, while the differences of temporal variation in sand temperature did not exceed 2.8°C. However, both ends of the beach in PTTK showed no significant differences of temporal variation in sand temperature due to the close proximity of

beach vegetation that provided more shade and protection from the sun to the area. The results also indicated that the sex ratios of hatchlings produced varied under different incubation methods. The *in situ* nests produced 61%, 60% and 51% female hatchlings in PTTK, PTTB and PSB, respectively. The sex ratio of hatchlings incubated in the hatcheries was shown to be biased toward females (87% in PTTK, 81% in PTTB and 96% in PSB). The hatchery shaded by 70% polymesh produced an average of 1:1 (female: male) sex ratios in the four nests incubated from June to December 2000. Incubation styrofoam box produced 20% and 41% female hatchlings in PTTK and PTTB, respectively.

Incubation duration was negatively correlated with incubation temperatures in PTTK ($y = -3.5192x + 162.45$, $r^2 = 0.5437$), PTTB ($y = -5.1627x + 212.95$, $r^2 = 0.7144$) and PSB ($y = -3.9757x + 176.37$, $r^2 = 0.8306$). The number of female hatchlings decreased with longer incubation periods in PTTK ($y = -1.3139x + 117.15$, $r^2 = 0.1381$) and PSB ($y = -3.7104 + 264.64$, $r^2 = 0.6657$). No evident of relationship between the incubation duration and percentage of female produced was observed in PTTB ($y = -0.6306x + 19.422$, $r^2 = 0.0236$). The pivotal temperatures for the green turtle population nesting in PTTK and PSB were calculated to be 29.60°C and 29.32°C, respectively. The study led to the conclusion that if all nests deposited in PTTK and PSB were subjected to *in situ* incubation, the overall natural sex ratio of hatchlings in PTTK was 83%: 17% (female: male), while PSB produced a more balanced sex ratio of 51%: 49% female to male hatchlings.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PROFIL SUHU PANTAI DAN NISBAH JANTINA BAGI ANAK PENYU AGAR (*Chelonia mydas*) DI KEPULAUAN PENYU SARAWAK, SARAWAK, MALAYSIA

Oleh

CHAI SAU SAN

Mac 2002

Pengerusi : **Mr. Liew Hock Chark**

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Kajian mengenai profil suhu pasir dan hatcheri, termasuk nisbah jantina anak penyu dihasilkan dengan cara pengeraman "*in situ*" , hatcheri dan kotak styrofoam telah dijalankan di Kepulauan Penyu Sarawak, iaitu Pulau Talang Kecil (PTTK), Pulau Talang Talang Talang Besar (PTTB) dan Pulau Satang Besar (PSB) dari April 1999 hingga Mac 2000. Kajian mendapati tengah pantai dapat dibahagikan kepada dua zon suhu, bahagian "terdedah" dan "teduhan" dengan perbezaan yang ketara antara kedua-dua zon. Purata perbezaan suhu di antara zon terdedah dan terdedah adalah berjulat 0.5°C hingga 2°C, dimana maksimumnya tidak melebihi 2.8°C. Manakala, pinggir pantai di Pulau Talang Talang Kecil tidak menunjukkan perbezaan suhu yang ketara kerana berdekatan dengan tumbuh-tumbuhan pantai yang memberi perlindungan cahaya daripada matahari. Keputusan kajian ini

nisbah jantina anak penyu adalah berlainan antara jenis pengeraman. Pengeraman "*in situ*" menghasilkan 61%, 60% dan 51% anak penyu betina masing-masing di PTTK, PTTB dan PSB. Nisbah anak penyu yang dihasilkan di hatcheri adalah berkecenderungan kepada betina (87% di PTTK, 81% di PTTB dan 96% di PSB). Hatcheri yang diteduh dengan 70% polimesh menghasilkan 1:1 (betina:jantan) anak penyu pada empat sarang yang dieramkan dari bulan Jun hingga Disember 2000. Pengeraman kotak styrofoam menghasilkan 20% dan 41% anak penyu betina di PTTK dan PTTB.

Suhu pengeraman mempunyai perhubungan kolerasi negatif dengan janka masa pengeraman di Pulau Talang Talang Kecil ($y = -3.5192x + 162.45$, $r^2 = 0.5437$), Pulau Talang Talang Besar ($y = -5.1627x + 212.95$, $r^2 = 0.7144$) and Pulau Satang Besar ($y = -3.9757x + 176.37$, $r^2 = 0.8306$). Di Pulau Talang Talang Kecil ($y = -1.3139x + 117.15$, $r^2 = 0.1381$) dan Pulau Satang Besar ($y = -3.7104 + 264.64$, $r^2 = 0.6657$), jumlah anak penyu jantina berkurangan dengan pemanjangan jangkamasa pengeraman. Perhubungan in adalah tidak jelas di Pulau Talang Talang Besar ($y = -0.6306x + 19.422$, $r^2 = 0.0236$). Suhu pengeraman "pivotal" untuk populasi penyu agar di Pulau Talang Talang Kecil dan Pulau Satang Besar adalah dianggar pada 29.60°C dan 29.32°C. Kajian ini juga membawa keputusan bahawa sekiranya semua sarang di PTTK dan PSB dieramkan secara "*in situ*", nisbah anak penyu secara keseluruhannua di PTTK adalah 83% : 17% (betina: jantan), manakala PSB akan menghasilkan nisbah anak penyu yang lebih seimbang iaitu 51% : 49% betina kepada jantan anak penyu.