UNIVERSITI PUTRA MALAYSIA

REPRODUCTIVE PATTERN OF DOG-FACED FRUIT BAT CYNOPTERUS BRACHYOTIS MÜLLER IN BINTULU, SARAWAK, MALAYSIA

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirement for the Degree of Master of Science

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REPRODUCTIVE PATTERN OF DOG-FACED FRUIT BAT *CYNOPTERUS BRACHYOTIS* MÜLLER IN BINTULU, SARAWAK, MALAYSIA

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Chair: Mohamed Zakaria Bin Hussin, PhD
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Reproductive period is a critical phase for most living organisms including bats. However the influence of environmental condition on the reproductive patterns of Chiroptera in Malaysia is not well studied. The development in industries, urbanisation, animal husbandry, agriculture, and the fragmentation and isolation of natural habitats are currently affect population of bats. If there is no restriction to these man-made disturbances, it will lead to the extinction of bat populations due to loss of habitat, pollution, decreasing food resources, deliberate killing, and loss of genetic diversity. Therefore, the objective is to determine the reproductive status of *C. brachyotis*, to determine the effects of environmental factors on *C. brachyotis* reproduction and to investigate the synchronisation of reproductive patterns between male and female *C. brachyotis*. A study on the reproductive patterns of dog-faced fruit bat, *C. brachyotis* was conducted at Universiti Putra Malaysia Bintulu Campus, Sarawak (UPMBC). Bats were captured in the abandoned oil palm plantation, Planted Forest which is a cultivated forest since 1990, Nirwana Natural Forest which is a secondary forest and was logged 18 years ago and Forestry Park which is also a secondary forest, using mist-nets for a period of 14 months from January 2009 to February 2010. The reproductive status was determined based on morphology of the bats. Five (I-Minor testes enlargement, no epididymal distention, II-Testes at or near maximal enlargement, no epididymal distention, III-Testes regressed, cauda epididymal distented, IV-Testes not regressed, cauda epididymal distented and V-No testiscular or epididymal enlargement) and four categories (I-Possibility pregnant, II-Lactating, III-Post-lactating and IV-Not reproductively active) of reproductive status were categorized for male and female *C. brachyotis* respectively. Bintulu climatic data were obtained from Kuching Meteorology Station, Sarawak. Assessment of fruit availability was done by casual observation. Bats reproduced at all time of the year and the peak periods were associated with the rainy seasons. The first peak of reproduction (pregnancy and lactation) occurred in January to April 2009 and second peak in June to November 2009. The highest frequency of pregnancy and lactation female coincided with the fruit abundance and the rainy season. The results indicated that *C. brachyotis* performed a non-seasonal reproductive pattern.

The knowledge on *C. brachyotis* reproductive biology can be used in the management and conservation of other threatened bat species.

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

HUBUNGAN CORAK PEMBIAKAN KELAWAR BUAH CECADU PISANG KECIL *CYNOPTERUS BRACHYOTIS* MÜLLER DI BINTULU, SARAWAK, MALAYSIA

Oleh

AZEMA BINTI IBRAHIM

November 2013

Pengerusi: Mohamed Zakaria bin Hussin, PhD
Fakulti: Perhutanan

Waktu pembiakan adalah satu fasa kritikal untuk semua organisma hidup termasuk kelawar. Walaubagaimanapun pengaruh keadaan persekitaran ke atas corak pembiakan Chiroptera di Malaysia tidak dikaji dengan sebaiknya. Pembangunan dalam industri, pembandaran, penternakan haiwan, pertanian dan pemecahan dan pemencilan habitat semulajadi pada masa sekarang mempengaruhi populasi kelawar. Jika tiada halangan kepada gangguan buatan manusia ini, ia akan menjurus kepada kepupusan populasi kelawar, berpunca daripada kehilangan habitat, pencemaran, penurunan sumber makanan, pembunuhan yang disengajakan dan juga kehilangan kepelbagaian genetik. Oleh itu, objektifnya adalah untuk menentukan status pembiakan *C. brachyotis*, untuk menentukan kesan faktor cuaca ke atas pembiakan *C. brachyotis* dan untuk menyiasat penyelarasan corak pembiakan antara *C. brachyotis* jantan dan betina. Satu kajian ke atas corak pembiakan kelawar buah cecadu pisang kecil, *C. brachyotis* telah dijalankan di Universiti Putra Malaysia Kampus Bintulu, Sarawak (UPMKB). Kelawar telah ditangkap di ladang kelapa sawit terbiar, hutan tanam semula yang mana hutan ini ditanam semenjak tahun 1990, hutan semulajadi Nirwana, yang mana ia adalah hutan sekunder dan telah dibalak 18 tahun lepas dan Taman Pertanian yang mana ia juga hutan sekunder, menggunakan jaring kabut selamat 14 bulan dari Januari 2009 hingga Februari 2010. Status pembiakan telah ditentukan berdasarkan morfologi kelawar tersebut. Lima (I-pembesaran testis minor, tiada pengembungan epididimal, II-testis pada atau hampir pembesaran maksimal, tiada pengembungan epididimal, III-testis merosot, kauda epididimal mengembung, IV- testis tidak merosot, kauda epididimal mengembung dan V-tiada testis atau pembesaran epididimal) dan empat kategori (I-kemungkinan bunting, II-menyusu, III-lepas menyusu dan IV-pembiakan tidak aktif) status pembiakan telah dikategorikan masing-masing bagi jantan dan betina. Data cuaca Bintulu telah diperolehi dari Stesen Meteorologi Kuching, Sarawak. Penilaian keterdapatan buah telah dilakukan melalui pemerhatian kasual. Kelawar membiak pada semua masa sepanjang tahun dan puncak masa telah bergabung dengan musim hujan. Puncak pembiakan pertama (bunting dan menyusu) berlaku pada Januari hingga April 2009 dan puncak kedua pada Jun

hingga November 2009. Frekuensi tertinggi betina bunting dan menyusu sama dengan kelimpahan buah dan musim hujan. Keputusan menunjukkan yang *C. brachyotis* mempunyai satu corak pembiakan yang tidak bermusim. Ilmu ke atas biologi pembiakan *C. brachyotis* boleh digunakan dalam pengurusan dan pemeliharaan spesies kelawar terancam yang lain.

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I certify that a Thesis Examination Committee has met on (21st November 2013) to conduct the final examination of Azema binti Ibrahim on her thesis entitled "Reproductive Pattern of Dog-faced fruit bat *Cynopterus brachyotis* Müller in Bintulu, Sarawak, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the degree of Master of Science.

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This thesis was submitted to the senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science.

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