UNIVERSITI PUTRA MALAYSIA

DESCRIPTIVE MORPHOLOGY, MORPHOMETRY, COMMUNITY STRUCTURE AND SPATIAL DISTRIBUTION OF HELMINTH PARASITES IN THE MALAYAN BOX TURTLE, *CUORA AMBOINENSIS* (CHELONIA: BATAGURIDAE) FROM PENINSULAR MALAYSIA

REUBEN SUNIL KUMAR SHARMA

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By

REUBEN SUNIL KUMAR SHARMA

Thesis Submitted in Fulfilment of the Requirement for the Degree of Master of Veterinary Science at the Faculty of Veterinary Medicine Universiti Putra Malaysia

May 2001

Dedicated to future chelonian parasitologists, who, unless science stagnates,
will find themselves compelled to review my opinions

"We are as dwarfs mounted on the shoulders of giants,
so we can see more and farther than they;
yet not by virtue of the keenness of our eyesight,
not through the tallness of our stature,
but because we are raised and borne aloft upon that giant mass"

~ John of Sailsbury ~

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

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Chairman: Associate Professor Dr. Rehana Abdullah Sani, DVM, Ph.D

Faculty: Veterinary Medicine

Thirty-six wild-caught *Cuora amboinensis* from Peninsular Malaysia, comprising adults and juveniles of both sexes, were examined for helminth endoparasites. A total of 11 species (5 nematodes and 6 trematodes) were recovered from various organs, namely, *Serpinema octorugatus* (small intestine), *Falcaustra duyagi* (large intestine), *Falcaustra* sp. 1 (large intestine), Oxyurid larvae sp. 1 (liver), Oxyurid larvae sp. 2 (large intestine), Atractidae sp. (large intestine), *Parorientodiscus magnus* (large intestine), Digenea sp. 1 (liver), Digenea sp. 2 (large intestine), *Polystomoides malayi* (urinary bladder), and *Polystomoides asiaticus* (oral cavity). Seven of these helminths were not previously recorded in *C. amboinensis*, while 4 species, namely *Falcaustra* sp. 1, Digenea spp. 1 and 2., and the Atractidae sp. may be new species and geographical records, and require further taxonomic workout.

The morphology and morphometry of 4 helminth species, namely, *S. octorugatus*, *F. duyagi*, *P. magnus* and *P. malayi* were studied in detail. A rigorous redescription of *S. octorugatus* was done with the aid of SEM and Pepsin-HCL

digestion. New information was obtained including the number and arrangement of the buccal ridges, the absence of the lateral papillae, the addition of a fifth post anal papillae and the complex structure of the spicule tip. This study also demonstrated the usefulness of the relative positions of the caudal papillae and derived ratios, in the characterisation of the genus *Serpinema*.

The helminth community structure of *C. amboinensis* in relation to age, gender and lifestage categories was investigated for the first time. This chelonian had a rich assemblage of helminths (observed richness = 11; expected richness, Chao2 = 9.17), with high diversity (Shannon's index = 0.78) and low evenness (0.36). This supports previous claims that *C. amboinensis* is vagile in food habits and habitat selection. Two helminths, namely *S. octorugatus* and *F. duyagi* exhibited high intensity and prevalence, and were designated as core and dominant species, while *Falcaustra* sp. 1 and Oxyurid sp. 1 were regarded as unsuccessful pioneers. The helminth community structure between the various hosts age, gender and lifestage categories were different, and may be attributed to disparate feeding habits and habitat utilisation.

Results on the spatial distribution of the helminths found in the alimentary canal of *C. amboinensis* indicate that the worms are site specific, with a relatively narrow niche width. Further, interspecific competition may not be a prominent factor in determining the habitat restriction of helminths in this turtle host. Significant and positive correlation (Spearman's rank coefficient = 0.45, $P < 0.05$) was found between the intensity and prevalence of *S. octorugatus* and the packing density of the

mucosal folds in the cranial duodenum. These helminths may actively select this niche, as the close proximity of the mucosal folds arranged in a complex labyrinth provide structural support and added traction, which function to stabilise the attachment interface. The large intestinal nematode (*F. duyagi*), on the contrary, appeared to select its habitat based on physiological rather than morphological cues. It is likely that this luminal feeder is attracted to the prolonged retention of food material in the large intestine, and the presence of particulate digesta and abundant micro-organisms.

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

DESCRIPTIVE MORPHOLOGY, MORPHOMETRY, COMMUNITY STRUCTURE, AND SPATIAL DISTRIBUTION OF HELMINTH PARASITES IN THE MALAYAN BOX TURTLE, *CUORA AMBOINENSIS* (CHELONIA: BATAGURIDAE) FROM PENINSULAR MALAYSIA

Oleh

REUBEN SUNIL KUMAR SHARMA

Mei 2001

Pengerusi: **Profesor Madya Dr. Rehana Abdullah Sani, DVM, Ph.D**

Fakulti: **Perubatan Veterinar**

Tiga puluh enam ekor *Cuora amboinensis* liar dari Semenanjung Malaysia, yang terdiri daripada dewasa dan juvana dari kedua-dua jantina, telah diperiksa untuk parasit helmin. Sejumlah 11 spesis (5 nematoda dan 6 trematoda) telah dijumpai dari pelbagai organ iaitu, *Serpinema octorugatus* (usus kecil), *Falcaustra duyagi* (usus besar), *Falcaustra* sp. 1 (usus besar), Oxyurid larvae sp. 1 (hati), Oxyurid larvae sp. 2 (usus besar), Atractidae sp. (usus besar), *Parorientodiscus magnus* (usus besar), Digenea sp. 1 (hati), Digenea sp. 2 (usus besar), *Polystomoides malayi* (pundi kencing), dan *Polystomoides asiaticus* (mulut). Peringkat juvana *P malayi* dan *P. asiaticus*, masing-masing dijumpai didalam ginjal dan paru-paru. Tujuh daripada helmin yang jumpai, pada *C. amboinensis* adalah rekod baru. Empat spesis lain, terutamanya, *Falcaustra* sp. 1, Digenea spp. 1 dan 2, serta spesis Atractidae mungkin merupakan rekod lokasi dan spesis yang baru. Walau bagaimanapun, pemeriksaan taxonomi selanjutnya diperlukan sebelum helmin ini dapat diberi gelaran spesis baru.

Ciri-ciri morfologi dan morfometri 4 spesis helmin, iaitu, *S. octorugatus*, *F. duyagi*, *P. magnus* dan *P. malayi*, telah dikaji dengan teliti. *Scanning electron microscope* telah digunakan untuk meneliti struktur permukaan, terutamanya pada kawasan kepala, ekor, dan spikul. Struktur dalaman mulut *S. octorugatus* serta morfologi *tridents*, *peribuccal shields*, *connecting cylinder* dan *basal ring* dikaji selepas tisu persekitaran telah dihadam dalam larutan pepsin-HCL. Kajian ini telah menemui beberapa ciri-ciri baru helminth ini, termasuk, susunan *buccal ridges*, ketidakhadiran papillae tepi, penambahan papillae *postanal* yang ke-lima, dan struktur komplex hujung *spicule*. Kajian ini juga mengesyorkan penggunaan posisi relatif papilla ekor sebagai suatu indikator yang baik untuk mengenalpasti genus *Serpinema*.

Struktur komuniti helmin pada *C. amboinensis* menurut umur, jantina dan peringkat hidup telah dikaji buat pertama kalinya. Spesis kura-kura ini dijangkiti dengan *richness* helmin yang agak tinggi (Index Shannon's = 0.78) dan *evenness* yang rendah (0.36). Dua spesis helmin (*S. octorugatus* dan *F. duyagi*) menunjuk intensiti dan prevalens yang tinggi, lalu dikenalpasti sebagai *core species*. Menurut *dominance ranking*, *S. octorugatus*, *F. duyagi* dan spesis Atractidae diberi designasi *dominant species*, manakala *Falcaustra* sp. 1 dan Oxyurid sp. 1 dikenalpasti sebagai *unsuccessful pioneer*. Perbezaan struktur komuniti helmin diantara jantina dan umur mungkin disebabkan oleh perbezaan makanan, keluasan kawasan merayau dan penggunaan habitat. Walau bagaimanapun, maklumat ekologi *C. amboinensis* diperlukan sebelum sebarang inferens konkrit dapat dikemukakan.

Keputusan penyebaran helmin di dalam salur pemakanan menunjukkan bahawa cacing ini menepat di kawasan-kawasan tertentu dan terhad dari segi keluasan habitat Pertandingan diantara spesis mungkin tidak mustahak dalam menentukan habitat masing-masing Intensiti dan peratus jangkitan didapati signifikan dan berkadar positif (Spearman's rank coefficient = 0 45, P < 0 05) dengan kemampatan lipatan pada lapisan mukosa Dicadangkan bahawa spesis helmin ini memilih kawasan duodenum secara aktif, kerana struktur *labyrinth* mukosa memberi sokongan untuk mencengkam Helmin usus besar (*F. duyagi*) tidak menunjukkan afiniti kepada perbezaan morfologi usus, malahan mungkin tertarik kepada makanan dan mikro-organisma yang terdapat di dalam segmen usus ini

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I certify that an Examination Committee met on 18th May 2001 to conduct the final examination of Reuben Sunil Kumar Sharma on his master of Veterinary Science thesis entitled "Descriptive Morphology, Morphometry, Community Structure, and Spatial Distribution of Helminth Parasites in *Cuora amboinensis* (Chelonia: Bataguridae) from Peninsular Malaysia" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and the Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Veterinary Science.

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

Reuben Sunil Kumar Sharma

Date: 29-5-2001

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