



USM UNIVERSITI
SAINS
MALAYSIA

UNIVERSITI SAINS MALAYSIA

DITERIMA

18 JAN 2012

Pejabat Ketua Pustakawan

Pejabat Pengurusan Dan Kreativiti Penyelidikan
Research Creativity and Management Office

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Universiti Sains Malaysia
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No. Fail : F0179
Tarikh : 14 Disember 2011

Profesor Siti Azizah Mohd Nor
Pusat Pengajian Sains Kajihiyay
Universiti Sains Malaysia

Puan,

LAPORAN AKHIR SKIM GERAN PENYELIDIKAN FUNDAMENTAL (FRGS)

Tajuk Projek : **Systematic And Phylogenetic Relationship Of The Betta Complex In
Malaysia: Implication On Conservation**

No. Akaun : 203/PBIOLOGI/671080

Dengan hormatnya perkara di atas dirujuk.

2. Terlebih dahulu saya ucapkan ribuan terima kasih di atas satu salinan laporan akhir untuk projek penyelidikan seperti tajuk di atas.

3. Adalah dimaklumkan walaupun projek ini telah selesai, kerjasama Jabatan Bendahari dipohon untuk menguruskan penutupan akaun projek pada selewat-lewatnya **31 Disember 2011**. Tempoh ini bertujuan untuk menyelesaikan semua urusan tuntutan dan bayaran yang telah dibelanjakan di dalam tempoh projek. Walau bagaimanapun, puan dinasihatkan supaya tidak mengeluarkan borang-borang pesanan baru di dalam tempoh ini.

4. Selanjutnya sila ambil perhatian terhadap perkara-perkara berikut sekiranya berkaitan:

- (i) Semua penerbitan harus merakamkan penghargaan kepada **Skim Geran Penyelidikan Fundamental (FRGS)** dan puan dipohon mengemukakan satu salinan ke Pejabat ini.
- (ii) Bahagian Penyelidikan & Inovasi boleh/akan mengagihkan semula peralatan yang telah dibeli menggunakan peruntukan geran ini seandainya terdapat penyelidik lain yang memerlukan peralatan tersebut.

5. Akhir sekali, tahniah di atas usaha dan kejayaan pihak puan dapat menyelesaikan projek ini dengan jayanya.

Sekian, terima kasih.

“BERKHIDMAT UNTUK NEGARA”
‘Memastikan Kelestarian Hari Esok’

Yang menjalankan tugas,


(AMRA OTHMAN)
Penolong Pendaftar
Unit Pengurusan Geran & Kontrak

HAN, HAR, SM

LAPORAN AKHIR SKIM GERAN PENYELIDIKAN FUNDAMENTAL (FRGS)


Tajuk Projek : Systematic And Phylogenetic Relationship Of The Betta Complex In Malaysia: Implication On Conservation

No. Akaun : 203/PBIOLOGI/671080

s.k. Dekan Penyelidikan
Pelantar Sains Fundamental
Pejabat Pelantar Penyelidikan
Universiti Sains Malaysia

Dekan
Pusat Pengajian Sains Kajihayat
Universiti Sains Malaysia

Timbalan Dekan
(Pengajian Siswazah & Penyelidikan)
Pusat Pengajian Sains Kajihayat
Universiti Sains Malaysia

 Ketua Pustakawan
Perpustakaan Hamzah Sendut
Universiti Sains Malaysia

Penolong Bendahari Kanan
Unit Kumpulan Wang Penyelidikan
Jabatan Bendahari
Universiti Sains Malaysia

Pegawai Sains
Pelantar Sains Fundamental
Pejabat Pelantar Penyelidikan
Universiti Sains Malaysia

} Disampaikan satu salinan laporan akhir projek untuk simpanan Perpustakaan

} Mohon kerjasama pihak puan untuk menguruskan penutupan akaun projek selewat-lewatnya pada **31 Disember 2011** dan mohon kemukakan satu salinan penyata kewangan terakhir ke Pejabat ini untuk tujuan rekod



FINAL REPORT FUNDAMENTAL RESEARCH GRANT SCHEME (FRGS)

*Laporan Akhir Skim Geran Penyelidikan Asas (FRGS) IPT
Pindaan 1/2009*

RESEARCH TITLE : Systematics and phylogenetic relationships of the *Betta* complex in Malaysia: implication on conservation

Tajuk Penyelidikan

PROJECT LEADER : Assoc. Prof. Dr. Siti Azizah Mohd Nor

Ketua Projek

PROJECT MEMBERS : 1. Assoc Professor Khoo Khay Huat (retired)

(including GRA)

Ahli Projek

2. Lim Teow Yeong (M. Sc- graduated 2009)

3. Noraznita Sharifuddin (M. Sc.- ongoing)

4. Gan Tze Jian (B Sc – final year project)

5. Jamsari Amirul Firdaus Jamaluddin (student assistant)

PROJECT ACHIEVEMENT (*Prestasi Projek*)

B

ACHIEVEMENT PERCENTAGE

Project progress according to milestones achieved up to this period	0 - 50%	51 - 75%	76 - 100%
Percentage			X

RESEARCH FINDINGS

Number of articles/ manuscripts/ books	Indexed Journal	<i>Non-Indexed Journal</i>
		Submitted to Genetics and Molecular Research
Paper presentations	International	<i>National</i>
	1	1
Others (Please specify)		

HUMAN CAPITAL DEVELOPMENT

Human Capital	Number		Others (Please specify):
	On-going	Graduated	
PhD Student			
Masters Student	1	1	
Undergraduate Students		1	
Temporary Research Officer			
Temporary Research Assistant		1	
Total		4	

EXPENDITURE (Perbelanjaan)

C Budget Approved (Peruntukan diluluskan) : RM 30000.00
 Amount Spent (Jumlah Perbelanjaan) : RM 30000.00
 Balance (Baki) : RM 0.00
 Percentage of Amount Spent : 100 %
 (Peratusan Belanja)

**ADDITIONAL RESEARCH ACTIVITIES THAT CONTRIBUTE TOWARDS DEVELOPING SOFT AND HARD SKILLS
 (Aktiviti Penyelidikan Sampingan yang menyumbang kepada pembangunan kemahiran insaniah)**

D

International		
Activity	Date (Month, Year)	Organizer
(e.g : Course/ Seminar/ Symposium/ Conference/ Workshop/ Site Visit)		
National		
Activity	Date (Month, Year)	Organizer
(e.g : Course/ Seminar/ Symposium/ Conference/ Workshop/ Site Visit)		

PROBLEMS / CONSTRAINTS IF ANY (Masalah/ Kekangan sekiranya ada)

E There were difficulties in getting sufficient number of samples for some of the rarer species. In addition areas (habitat) where several of these species had been previously documented have been destructed.

RECOMMENDATION (Cadangan Penambahbaikan)

F Further study should incorporate *Betta* species across the region to verify the polyphyletic status of the ambiguous species. Based on this study, and inclusion of regional *Betta* sequences obtained from the GenBank, the taxonomic status of several presumed species needs to be reviewed. Thus, the inclusion of additional regional data could clarify any taxonomic ambiguity particularly for the Malaysian Bettas.

RESEARCH ABSTRACT – Not More Than 200 Words(Abstrak Penyelidikan – Tidak Melebihi 200 patah perkataan)

G

A total of 59 individuals from 18 presumed species (one unknown species included) of Malaysian *Betta* within 7 complex groups were analysed. With the addition of 22 additional GenBank sequences from the same complex, the 16S rRNA NJ tree revealed that the five *Betta* groups; *bellica*, *splendens*, *coccina*, *akarensis* and *waseri* formed monophyletic groups while the *picta* and *pugnax* groups were paraphyletic. The phylogenetic tree showed five major clades; (1) *waseri*, *akarensis*, *pugnax* and *picta* groups, (2) *B. prima* and *B. edithae* (*picta* group), (3) *coccina* group (4) *splendens* group (5) *bellica* group. The *bellica* group was found to be the sister-group of the remaining *Betta* species. The boundaries of 11 *Betta* species (*B. waseri*, *B. tomi*, *B. pi*, *B. pugnax*, *B. pulchra*, *B. miniopinna*, *B. persephone*, *B. brownorum*, *B. rutilans*, *B. simorum*, *B. bellica*) were ambiguous. An unidentified taxon (referred to as *B. cf pugnax*) could likely represent a new species. It was morphologically similar to the *B. pugnax* complex (with having unique combination of several morphological characters and reproductive behavior) but not completely resembling any *Betta* previously documented. These morphological differences paralleled the present genetic data which differentiated this unknown species in the 16S rRNA gene tree. Further investigation with addition of regional data is highly recommended.

Date :
Tarikh

Project Leader's Signature:
Tandatangan Ketua Projek

COMMENTS, IF ANY/ ENDORSEMENT BY RESEARCH MANAGEMENT CENTER (RMC)
(Komen, sekiranya ada/ Pengesahan oleh Pusat Pengurusan Penyelidikan)

H

Name:
Nama:

Signature:
Tandatangan:

Date:
Tarikh: