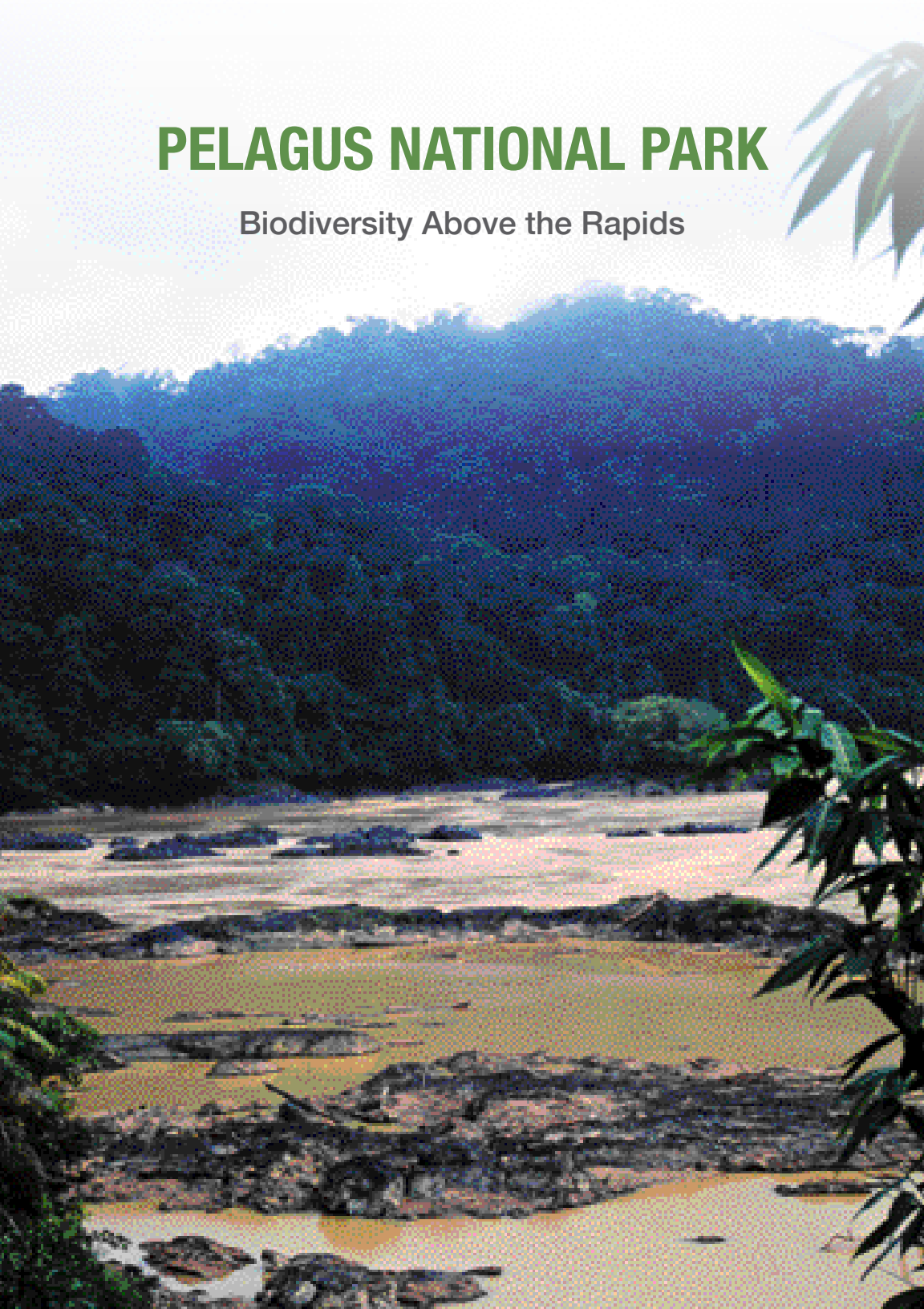
PELAGUS NATIONAL PARK

Biodiversity Above the Rapids



Life from Headwaters to the Coast

PELAGUS NATIONAL PARK

Biodiversity Above the Rapids

Edited by

Andrew Alek Tuen, Indraneil Das
Karen Lee Suan Ping and Jayasilan Mohd-Azlan

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Andrew Alek Tuen, Indraneil Das, Karen Lee Suan Ping and Jayasilan Mohd-Azlan

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Half-title page: The Rapids of Pelagus, as seen in August 2003. Photo: I. Das
Frontispiece: *Megophrys nasuta*, the Bornean Horned Frog. Photo: Pui Yong Min
Foreword page and across: Aerial view of Pelagus Kaki Wong. Photo: Tonny Ganyai.

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FOREWORD

Prof. Datuk Dr. Mohamad Kadim Suaidi
Vice Chancellor, Universiti Malaysia Sarawak

Since its humble beginnings in 1992, Sarawak's first public university, Universiti Malaysia Sarawak (UNIMAS), has put natural resource management and biodiversity conservation at the forefront of its research agenda. This includes the setting up of the Faculty of Resource Science and Technology and the Institute of Biodiversity and Environmental Conservation. The location of UNIMAS on the island of Borneo has given us a unique opportunity to study its biodiversity, one of the most diverse in the world. Over the years, university researchers have discovered new species and uncovered new facets of the biology of numerous threatened species and landscapes, contributing to the conservation of species and habitats in Sarawak and beyond.

To be globally relevant and forward looking, UNIMAS has established linkages and collaborated with like-minded individuals and institutions within Malaysia and overseas. On 24 September 2013, we formalised a research collaboration with Sarawak Energy, to embark on the first in-depth study of the 2,041-hectare Pelagus National Park. As a result of this collaboration, significant new findings have come to light and have been featured in this book.

I would like to congratulate the authors, editors and publishers for their hard work and perseverance, to help unravel the wonders of biodiversity of Pelagus, and make this place of magic and mystery accessible to the world.

MESSAGE

Datu Haji Sharbini Suhaili
Group Chief Executive Officer, Sarawak Energy Berhad

Congratulations to all those who are part of this important publication. Your contribution will enhance knowledge and understanding of Sarawak's biodiversity areas in general and the Pelagus National Park in particular.

In mid-2020, it was announced by the Sarawak government that Sarawak will become a high-income economy by 2030 through the two core principles of a digital economy and environmental sustainability, and Sarawak Energy is fully aligned to this vision.

We are developing our energy resources sustainably to deliver greater access to affordable, reliable and sustainable energy for Sarawak and its people, in alignment with Goal #7 of the United Nations Sustainable Development Goals (SDG) 2030.

Just over a decade ago, Sarawak made a strategic decision to reduce our dependence on thermal resources of coal, gas and diesel through the Sarawak Corridor of Renewable Energy.

As a result, Sarawak Energy is now the largest renewable energy developer and provider in Malaysia through our investments in large renewable hydropower as well as solar and micro-hydro for remote areas.

As a member of the International Hydropower Association, we are a strong advocate of sustainable hydropower and are working to integrate a robust sustainability agenda into our business. It is estimated that less than 2% of our land area will be affected when we fully harness our hydropower potential to ensure a sustainable energy future for our state and beyond.

To conserve biodiversity in line with SDG #15, we are working with various state agencies, higher learning institutions, local communities and stakeholder groups on efforts to mitigate any negative impact and maximise the positive impact of our projects and operations.

Initiatives include the implementation of sustainable management of forest types which are important water catchments. We also contribute to

the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services. Our partnerships so far have yielded encouraging successes.

1. The Batang Ai National Park and catchment area, located within the area of the 35-year-old Batang Ai Hydroelectric Plant (HEP), serve as a buffer zone that supports the regeneration of the surrounding environment. The area is now home to a sustainable population of the Bornean orangutan in Sarawak and forms part of the transboundary conservation area with Indonesia's Betung Kerihun National Park.
2. For the Murum HEP project, the Wildlife Monitoring and Rescue (WiMoR) operation with the Sarawak Forestry Corporation rescued and relocated wildlife in significant numbers to safer areas before impoundment.

To ensure we understand the effectiveness of our efforts, research and development is an important part of our business. This creates greater understanding of the impact of our projects by enhancing the body of knowledge and enables us to make informed decisions in environmental management and conservation.

In 2013, we partnered with Universiti Malaysia Sarawak (UNIMAS) and rolled out the Hydropower Environmental Sustainability Programme with a focus on three objectives:

i. To identify critical local environmental issues that warrant closer attention;
ii. Collect necessary data in forming baseline knowledge particularly in the areas of aquatic and terrestrial ecology and biodiversity; and
iii. Support the development of local research capability and capacity within Sarawak on related environmental topics.

The 2,041-hectare Pelagus National Park was identified as one of the study locations under this programme given its importance as a protected area. Significant findings have been established and are featured in this book.

We are pleased to support this book publication together with Universiti Malaysia Sarawak (UNIMAS) in line with SDG #17 which calls for multi-stakeholder partnerships that mobilise shared knowledge, expertise, technology and financial resources.

On behalf of Sarawak Energy, I would like to thank UNIMAS for this research collaboration and for sharing your expertise and resources.

We are also fortunate to have collaborated with and gauged the support from like-minded organisations such as our higher learning institutions, Forest Department Sarawak and Sarawak Forestry Corporation in enabling Sarawak Energy to play a greater role in local environmental conservation efforts.

I would also like to congratulate Sarawak Energy's Research and Development team. I am confident that you have gained valuable experience and further exposure through this research as part of Sarawak Energy's hydropower development journey.

PREFACE

Andrew Alek Tuen, Indraneil Das,
Karen Lee Suan Ping* and *Jayasilan Mohd-Azlan

Sarawak's vast protected areas network, including its National Parks, are home to many of the State's natural wonders- floral, faunal, geological and at the level of landscapes. Central Sarawak, in particular, is an important area for biodiversity conservation, being home to uncountable Bornean endemics.

Its thriving National Parks vindicate the commitment of the State Government as a responsible caretaker of Sarawak's biodiversity. Halting biodiversity loss is one of the top State agendas, whereby Sarawak is determined to conserve and protect its wildlife and natural ecosystem. This project sits in line with the University's niche area of biodiversity and environmental conservation. This book, based on extensive field research by the staff of our two organisations, brings together new information on species, their habitats and other aspects of natural history.

Little has been written about Pelagus National Park. Scientific understanding of biodiversity intended for conservation is crucial for our advancement to preserve the State's natural heritage. Identifying the distribution, richness and habitat use of animals in tropical rainforest are essential for understanding their ecology, and in facilitating management of such biodiversity-rich areas. This book attempts to enumerate selected zoological groups, many of which had hitherto remained undetected in these dense tropical rainforests. The faunal studies reported here include inventories of mammals, birds, reptiles, amphibians, fishes and macroinvertebrates, a critical first step towards understanding the biodiversity of Pelagus National Park.

The work targets local stakeholders, management authorities, naturalists, researchers and the general public. Most enthusiasts continue to see protected areas as a parade of natural wonders, to be appreciated and protected for future generations. An understanding of our biodiversity may thus support complex needs of conservation. It is hoped that nature enthusiasts and those who are interested in tropical biodiversity will find this book beneficial. Acknowledgement is here made to the authors who have gathered these data, substantially increasing our knowledge and awareness of an important part of our national heritage.

Foremost, we thank Sarawak Energy Hydropower Environmental Sustainability Program for a research grant to conduct the activities mentioned in this work. We are grateful to the Resident of Kapit Division for welcoming us to the area under his jurisdiction, and to the longhouse folks from Rumah John at Nanga Benin (John anak Asun and family), Rumah Bujah at Nanga Pelagus (Bujah anak Ijau and family) and Rumah Laja at Nanga Peraran (Laja anak Sandak and family), for assisting with the research.

Prof. Dr. Wan Hashim bin Wan Ibrahim, the Deputy Vice Chancellor for Research and Innovation, Prof. Dr. Lo May Chiun and her staff at the Research Innovation and Enterprise Centre facilitated the research on the UNIMAS side. We also thank the staff of the Institute of Biodiversity and Environmental Conservation, and the Faculty of Resource Science and Technology, UNIMAS, for logistic and field assistance: Isa Sait, Rahah Mohd. Yakup, Mohd. Hasri Al-Hafiz Haba, Ketty Daun, Pasey Lisus, Mohsin bin Zainalabidin, Siti Maimunah binti Ibrahim and Felicia Reyap, besides our many research assistants and graduate research students.

The Sarawak Forest Department provided research permits for the individual projects reported here. Entry to Pelagus Resort area was provided by Pelita Holdings Sdn. Bhd, and we thank its manager, Netty Haji Narawi. We thank Mohd. Tajuddin Abdullah, Qammil Muzzammil Abdullah, Amirruddin Ahmed, Faisal Ali Anwar Ali, Aaron M. Bauer, Henry Bernard, Chan Kin Onn, Stuart James Davies, Ulmar Grafe, Suhaila binti Abdul Hamid, Kelvin Lim, Lo May Chiun, Suhaili Mokhtar, Mustafa Abdul Rahman, Abdullah Samat and Tan Heok Hui for reviews of the chapters, and Genevieve V. A. Gee for copy editing. We are thankful to Chien C. Lee for images of birds, Faisal Ali Anwar Ali for the images of bats and to the family of the late Brian Houldershaw for the images of the Rapids from the 1960s, made possible through the kindness of Albert Field.

We dedicate this book to the kind-hearted folks of the Rajang Basin, who offered us their homes and carried the burden and joy of discovery.

FISHES

Tonny Ganyai, Hafida Bolhen, Jongkar Grinang, Karen Lee Suan Ping, Toloy Keripin Munsang **and** *Lee Nyanti*

The Pelagus area is located in the middle stretches of Batang Rajang, in the central part of Sarawak, under the administrative division of Kapit. The area is well-known for its long and dangerous rapids that extend for a distance of 12.8 km. Over the years, these "rapids of death" have capsized many boats along its treacherous and unpredictable waterways.

To determine the fish composition in the Pelagus area, three study sectors were sampled, namely, Nanga Benin, representing the downstream area; Nanga Peraran, the midstream area; and Punan Bah, which represents the upstream areas. At each sector, sampling stations were established along the Batang Rajang and its tributaries (Fig. 1; Table 1). Field sampling was conducted in April and August of 2014, as well as January and July of 2015. Fishing methods applied include gill nets of various mesh sizes (2.5 cm, 3.81 cm, 5.08 cm, 7.62 cm and 10.16 cm), 3-layered nets, cast nets (Fig. 2–3) and electro-shocking. Similar fishing efforts were employed at the different stations (Fig. 4) and at other study sectors.

Fishes caught were mostly identified in the field (Fig. 5), but others were brought to the laboratory for further study. Representative samples were photographed and preserved in 10% formalin and later transferred into 70% ethanol for long-term preservation.

A total of 3,456 individuals, belonging to 21 families and 86 species were caught from the study area (Table 2). Some of the commonly caught species from Pelagus area are shown in Fig. 6. Members of the Cyprinidae represent 69% of the total individuals caught, with *Nemacheilus kapuasensis* and *Rasbora hosii* being the two most dominant species. Downstream of the Pelagus area, a total of 1,334 fishes, representing 17 families and 61 species were recorded (Table 2). Cyprinidae comprise 56% of the individuals, the dominant species being *Nemacheilus kapuasensis*. The midstream area recorded a total of 1,209 individuals, belonging to 14 families and 62 species (Table 2) and was dominated by the Cyprinidae, comprising 76% of the total individuals. *Rasbora dusonensis* was the dominant species at this area. The upstream area recorded a total of 913 individuals, belonging to 12 families and 46 species (Table 2). Cyprinidae was the dominant family, representing 80% of the total number of individuals, the dominant species being *Rasbora hosii.*

Table 1: Coordinates of sampling stations at Batang Rajang and its tributaries at the three sectors in the Pelagus area.

Sector	Station	Name of River	Coordinates
Nanga Benin (downstream)	DS1	Sg. Kapit Ulu	2.1382°N, 113.0710°E
	DS2	Sg. Mella	2.1326°N, 113.0825°E
	DS3	Sg. Beluli	2.1487°N, 113.0784°E
	DS4	Sg. Raya	2.1526°N, 113.0845°E
	DS5	Sg. Senyamok	2.1636°N, 113.0689°E
	DS6	Sg. Benin	2.1655° N, 113.0687°E
	DS7	Sg. Sap	2.1649°N, 113.0535°E
	DS8	Sg. Amang	2.1753°N, 113.061°E
	DS9	Sg. Mejau	2.1765°N, 113.0419°E
	DS10	Sg. Ngua	2.1794°N, 113.0462°E
	DS11	Btg. Rajang	2.1388°N, 113.0759°E
Nanga Peraran (midstream)	MS1	Sg. Ensawie	2.2530°N, 113.0951°E
	MS2	Sg. Buya	2.2499°N, 113.1265°E
	MS3	Sg. Sama	2.2663°N, 13.1578°E
	MS4	Sg. Rarai	2.2207°N, 113.1456°E
	MS5	Sg. Serian	2.1927°N, 113.1472°E
	MS6	Sg. Peraran Kecil	2.1908°N, 113.1199°E
	MS7	Sg. Pelaran Besar	2.1906°N, 113.1220°E
	MS8	Sg. Lebau	2.2057°N, 113.1079°E
	MS9	Sg. Serau	2.1926°N, 113.0985°E
	MS10	Sg. Sebingol	2.1992°N, 113.0912°E
	MS11	Btg. Rajang	2.2084°N, 113.154°E
Punan Bah (upstream)	US1	Sg. Pangau Kecil	2.4688°N, 113.5064°E
	US2	Sg. Pangau	2.4718°N, 113.4843°E
	US3	Sg. Bon	2.4450°N, 113.4663°E
	US4	Sg. Lanan	2.4283°N, 113.4497°E
	US5	Sg. Benatu	2.3991°N, 113.3740°E
	US6	Sg. Mia	2.3830°N, 113.3803°E
	US7	Sg. Senganya	2.3797°N, 113.3385°E
	US8	Sg. Mikai	2.3474°N, 113.3108°E
	US9	Btg. Rajang	2.4320°N, 113.4364°E

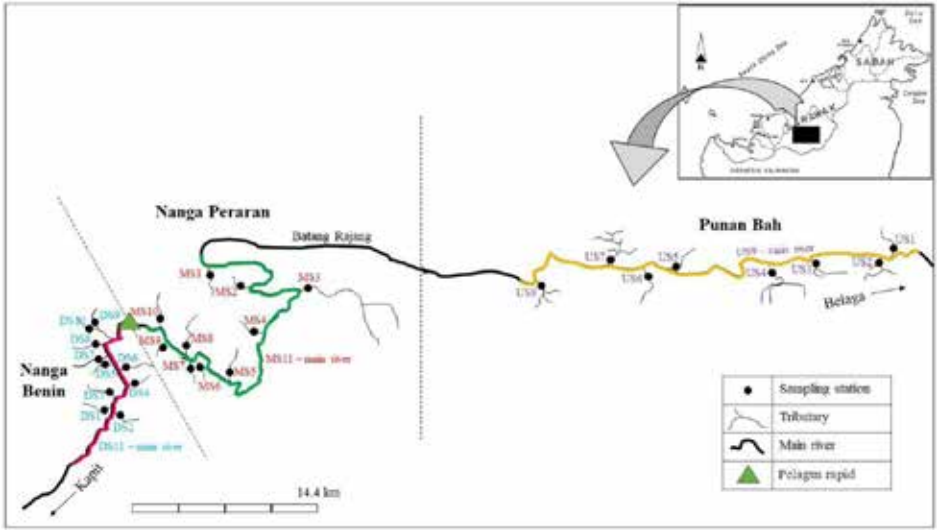

Fig. 1. Sampling stations along Batang Rajang (DS11, MS11 and US9) and its tributaries at three sectors in the Pelagus area: Nanga Benin (downstream area), Nanga Peraran (midstream area) and Punan Bah (upstream area).

Fig. 2. Cast-netting in the rapids to catch *Pangasius macronema*, which is locally known as "Buris".

Fig. 3. 'Buris' is generally targeted by local fishermen for personal consumption, while the larger fishes are sent to the market at Kapit.

Fig. 4. A representative habitat at the tributary of Batang Rajang.

Fig. 5. Fish identification and morphometric measurements at Rumah John, Nanga Benin.

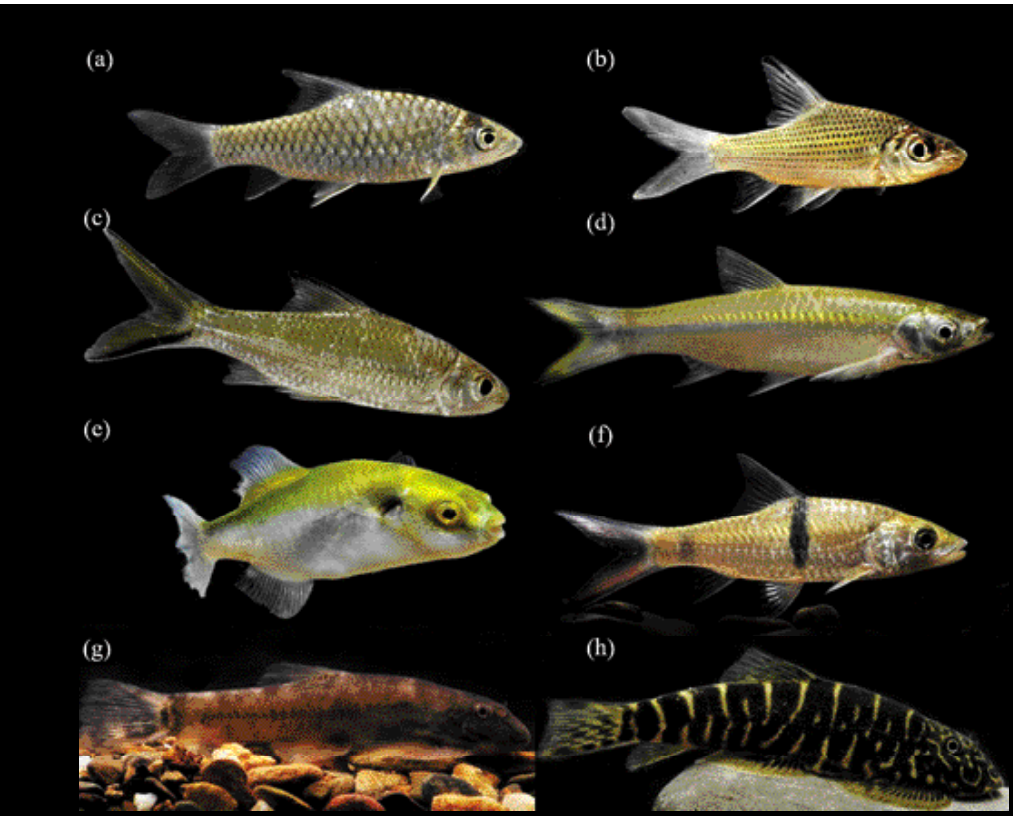

Fig. 6. Representative fish species sampled in Pelagus, Batang Rajang, Sarawak: (a) *Tor tambra;* (b) *Cyclocheilichthys repasson;* (c) *Barbonymus collingwoodii;* (d) *Rasbora dusonensis;* (e) *Auriglobus modestus;* (f) *Hampala macrolepidota;* (g) *Neogastromyzon chini;* (h) *Gastromyzon fasciatus.* Photos: Pui Yong Min.

Table 2: A checklist of fishes of the Pelagus region. Updated 14 May 2020.

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Ambassidae	*Parambassis wolffii* (Bleeker, 1850)	Duskyfin Glassy Perchlet	●				●
Bagridae	*Bagrichthys macracanthus* (Bleeker, 1854)	Black Lancer Catfish		●	●	●	●
	Bagrichthys micranodus Roberts, 1989	Bagrid Catfish		●			●
	Bagroides melapterus Bleeker, 1851	Bagrid Catfish		●			●
	Hemibagrus fortis (Popta, 1904)	Yellow Catfish	●	●	●	●	●
	Hemibagrus capitulum (Popta, 1904)	Bagrid Catfish	●	●	●	●	●
	Hemibagrus wyckii (Bleeker, 1858)	Bagrid Catfish	●		●	●	●
	Mystus nigriceps (Valenciennes, 1840)	Twospot Catfish	●	●	●	●	●
Balitoridae	*Homaloptera orthogoniata* Vaillant, 2002	River Loach		●		●	
	Homalopteroides nebulosus (Alfred, 1969)	River Loach	●	●	●	●	
	Homalopteroides tweediei (Herre, 1940)	River Loach		●		●	
Channidae	*Channa lucius* (Cuvier, 1831)	Snakehead	●	●	●	●	●
	Channa striata (Bloch, 1793)	Striped Snakehead	●	●	●	●	

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Clariidae	*Clarias leiacanthus* Bleeker, 1851	Forest Walking Catfish	●				●
Cobitidae	*Pangio anguillaris* (Vaillant, 1902)	Eel-loach	●		●	●	
	Pangio semicincta (Fraser-Brunner, 1940)	Eel-loach	●	●		●	
	Syncrossus hymenophysa (Bleeker, 1852)	Tiger Botia	●		●	●	●
Cyprinidae	*Barbodes sealei* (Herre, 1933)	Minnow		●		●	
	Barbodes banksi (Herre, 1940)	Spotted Barb	●	●	●	●	
	Barbodes kuchingensis (Herre, 1940)	Barb	●	●		●	
	Barbonymus balleroides (Valenciennes, 1842)	Barb	●	●		●	●
	Barbonymus collingwoodii (Günther, 1868)	Barb	●	●	●	●	●
	Barbonymus gonionotus (Bleeker, 1849)	Silver Barb	●				●
	Barbonymus schwanefeldii (Bleeker, 1854)	Tinfoil Barb	●	●	●	●	●
	Crossocheilus cobitis (Bleeker, 1854)	Minnow		●		●	
	Crossocheilus oblongus (Kuhl & Van Hasselt, 1823)	Siamese Flying Fox		●		●	
	Cyclocheilichthys apogon (Valenciennes, 1842)	Beardless Barb	●	●	●	●	●

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Cyprinidae	*Cyclocheilichthys armatus* (Valenciennes, 1842)	Barb	●	●	●	●	●
	Cyclocheilichthys repasson (Bleeker, 1853)	Barb		●		●	
	Hampala bimaculata (Popta, 1905)	Barb	●	●	●	●	●
	Hampala macrolepidota Kuhl & Van Hasselt, 1823	Hampala Barb	●	●	●	●	●
	Labiobarbus fasciatus (Bleeker, 1853)	Barb	●	●	●	●	
	Labiobarbus festivus (Heckel, 1843)	Signal Barb	●	●	●	●	●
	Labiobarbus leptocheilus (Valenciennes, 1842)	Barb		●		●	
	Labiobarbus ocellatus (Heckel, 1843)	Barb		●		●	
	Lobocheilos ovalis Kottelat & Tan, 2008	Minnow	●	●		●	●
	Lobocheilos cf. *falcifer* (Valenciennes, 1842)	Minnow	●	●	●	●	●
	Luciosoma setigerum (Valenciennes, 1842)	Apollo Shark-minnow	●	●		●	●
	Luciosoma spilopleura Bleeker, 1855	Apollo Shark-minnow	●	●	●	●	●
	Luciosoma trinema (Bleeker, 1852)	Apollo Shark-minnow	●	●		●	

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Cyprinidae	*Osteochilus melanopleurus* (Bleeker, 1852)	Minnow	●		●	●	●
	Osteochilus microcephalus (Valenciennes, 1842)	Minnow	●	●		●	
	Osteochilus schlegelii (Bleeker, 1851)	Giant Shark-minnow	●	●	●	●	●
	Osteochilus vittatus (Valenciennes, 1842)	Bonylip Barb	●	●	●	●	●
	Osteochilus waandersii (Bleeker, 1853)	Minnow	●	●	●	●	●
	Osteochilus sp.	Minnow	●			●	●
	Oxygaster anomalura van Hasselt, 1823	Minnow		●	●	●	●
	Parachela hypophthalmus (Bleeker, 1860)	Minnow	●			●	
	Parachela oxygastroides (Bleeker, 1852)	Glass Fish		●	●	●	●
	Puntioplites waandersi (Bleeker, 1859)	Minnow	●	●	●	●	●
	Rasbora argyrotaenia (Bleeker, 1849)	Silver Rasbora	●			●	●
	Rasbora borneensis (Bleeker, 1860)	Rasbora	●	●	●	●	
	Rasbora dusonensis (Bleeker, 1850)	Rosefin Rasbora	●	●	●	●	
	Rasbora volzii Popta, 1905	Rasbora	●	●	●	●	●

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Cyprinidae	*Rasbora hosii* Boulenger, 1895	Rasbora	●		●	●	
	Rasbora sp.	Rasbora	●			●	
	Tor tambra (Valenciennes, 1842)	Semah Mahseer	●	●		●	
Eleotridae	*Oxyeleotris urophthalmoides* (Bleeker, 1853)	Sleeper	●			●	
Gastromyzontidae	*Gastomyzon punctulatus* Inger & Chin, 1961	Hillstream Loach	●			●	
	Gastromyzon fasciatus Inger & Chin, 1961	Hillstream / oach	●	●		●	
	Neogastromyzon chini Tan, 2006	River Loach	●			●	
	Parhomaloptera microstoma (Boulenger, 1899)	River Loach			●	●	
Gobiidae	*Glossogobius aureus* Akihito & Meguro, 1975	Golden Tank Goby	●			●	
Helostomatidae	*Helostoma temminckii* Cuvier, 1829	Kissing Gourami	●				●
Mastacembelidae	*Macrognathus maculatus* (Cuvier, 1832)	Frecklefin Eel	●	●			●
Nemacheilidae	*Nemacheilus kapuasensis* Kottelat, 1984	Sand-loach	●	●	●	●	
Notopteridae	*Chitala borneensis* (Bleeker, 1851)	Knifefish			●	●	●

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Osphronemidae	*Osphronemus goramy* Lacépède, 1801	Giant Gourami			●	●	●
	Osphronemus septemfasciatus Roberts, 1992	Gourami		●		●	●
Pangasiidae	*Pangasius macronema* Bleeker, 1850	Shark Catfish	●	●	●		●
	Pseudolais micronemus (Bleeker, 1846)	Shortbarbel Pangasius	●	●	●	●	●
	Pangasius nasutus (Bleeker, 1863)	Shark Catfish	●			●	●
	Pangasius nieuwenhuisii (Popta, 1904)	Shark Catfish	●			●	●
Pristolepididae	*Pristolepis grootii* (Bleeker, 1852)	Indonesian Leaffish		●	●	●	●
Siluridae	*Kryptopterus bicirrhis* (Valenciennes, 1840)	Glass Catfish	●	●		●	●
	Kryptopterus cryptopterus (Bleeker, 1851)	Sheatfish		●	●	●	●
	Kryptopterus lais (Bleeker, 1851)	Sheatfish	●		●	●	●
	Kryptopterus limpok (Bleeker, 1852)	Long-barbel Sheatfish	●	●	●		●
	Kryptopterus macrocephalus (Bleeker, 1858)	Striped Glass Catfish		●	●	●	●
	Kryptopterus minor Roberts, 1989	Ghost Catfish		●	●		●

Family	Scientific Name	Common Name	River Reach			Habitat	
			Downstream	Middle Stream	Upper Stream	Tributary	Main River
Siluridae	*Kryptopterus schilbeides* (Bleeker, 1858)	Sheatfish		●	●	●	
	Phalacronotus apogon (Bleeker, 1851)	Sheatfish		●	●	●	●
	Wallago leerii Bleeker, 1851	Striped Wallago Catfish		●		●	●
Sisoridae	*Glyptothorax platypogon* (Valenciennes, 1840)	Sisorid Catfish	●	●		●	
Tetraodontidae	*Auriglobus modestus* (Bleeker, 1850)	Pufferfish	●			●	●
Zenarchopteridae	*Hemirhamphodon kuekenthali* Steindachner, 1901	Halfbeak		●		●	

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