Fish Passage Challenge in Indonesia

Dr. Arif Wibowo
Research Center for Conservation of Marine and Inland Water Resources
National Research and Innovation Agency of Indonesia

- **Lack of Understanding and Awareness.**

The lack of knowledge about the importance of fishways.

The focus on dam construction and water infrastructure tends to ignore the needs of fish migration and biodiversity.

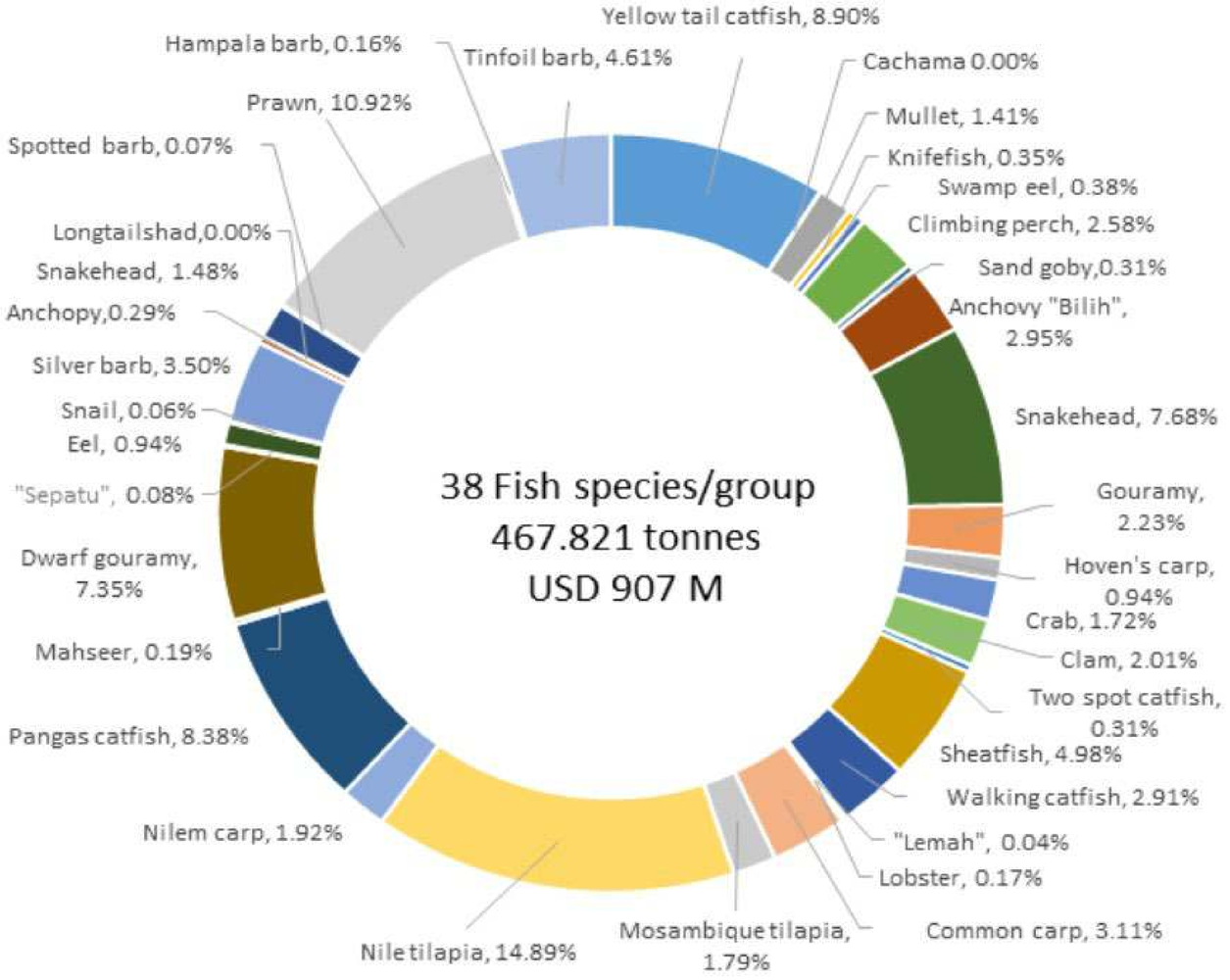
Protein sources from Inland Fisheries

Ikan Sidat, Primadona Ekspor dan Upaya Perlindungannya

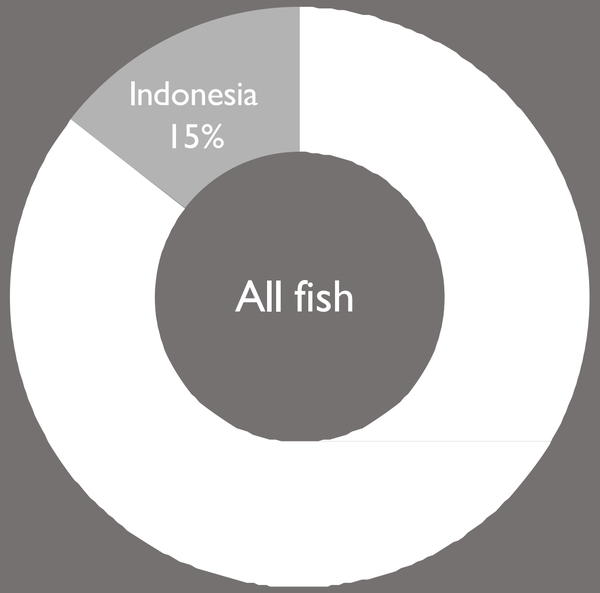
Senin 28 Nov 2022 22:10 WIB

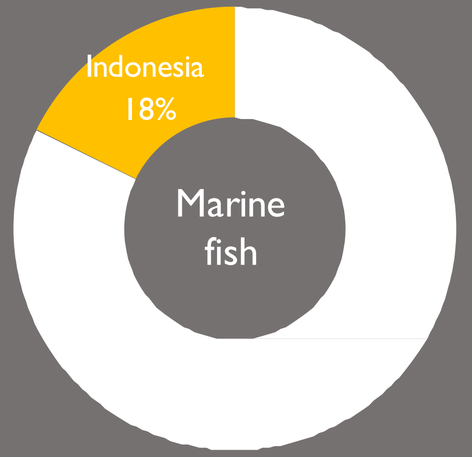
Tahun 2020 nilai ekspor sidat Indonesia mencapai USD 16 juta atau 0.25 T (BPS)

Fish are important – nutrition



Fish Biodiversity





References
Kottelat 1993, Reid et.al, 2013, Reis et.al, 2016

Social Survey

sharing fishways with the Ministry Public Work and Housing (PUPR)

Sharing fishways with Ministry of Planning and Development (BAPPENAS)

sharing fishways with the environmental impact assessment section, Ministry of Environment and Forestry

Sharing fishways with the School of environment, University Indonesia

- Coordination with Directorate of General Electricity, Ministry of Energy and Mineral Resources drafting Indonesia National Standard (SNI) to include fishway in the regulation
- Meeting with Local University, Gadjah Mada University, (Fisheries Department, Yogyakarta to identify collaboration opportunities in research
- Meeting with Department of River Engineering (Research Institute of River Engineering) Ministry of Public Works and Public Housing, Sukoharjo, Solo, Central Java to collaborate in technical model of fishway

10th World Water Forum, Bali, Indonesia (May, 2024)

Discussion with Ministry of Energy and Mineral Resources drafting SNI (Indonesia National Standard)

Meeting with Head of Department Fisheries, Gadjah Mada University, Yogyakarta

Meeting and Discussion with Department of River Engineering, PUPR, -Solo, Central Java

djpt_kkp · Ikuti

djpt_kkp Haaa ikan punya jalan? yang bener aja..
Bener dong! Sini fishermin spill tentang fishway atau jalan ikan.

Inovasi berupa fishway menjadi salah satu cara yang ditawarkan untuk memastikan pembangunan bendungan sungai tetap bisa dibangun, tetapi tidak mengganggu siklus hidup ikan.

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BRIN Kembangkan Jalur Ikan Bermigrasi, Begini Sistemnya

Nikita Rosa - detikEdu

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Membuat "Jalan Khusus" bagi Ikan

Pembangunan bendungan memiliki banyak manfaat. Namun, adanya bendungan pada sungai bisa menghalangi migrasi ikan sehingga siklus hidup ikan terancam. Karena itu, peneliti di Badan Riset dan Inovasi Nasional mengembangkan inovasi mengenai pembuatan jalan khusus bagi spesies tersebut.

Deonisia Arlinta

Indonesia memiliki biodiversitas ikan air tawar yang tinggi. Setidaknya ada 1.300 spesies ikan air tawar di Indonesia. Keanekaragaman itu terbesar kedua di dunia setelah Brasil. Kekayaan biodiversitas itu patut untuk dijaga sebagai sumber ketersediaan pangan sekaligus benteng pertahanan terhadap perubahan iklim.

Akan tetapi, pembangunan yang semakin gencar saat ini membuat keanekaragaman ikan air tawar tersebut semakin terancam. Hal itu terutama terkait pembangunan bendungan maupun bendung di sejumlah wilayah.

Bendungan memiliki banyak manfaat bagi kehidupan masyarakat, mulai dari irigasi pertanian, penyediaan air minum, pembangkit listrik, hingga rekreasi. Akan tetapi, di balik berbagai manfaat tersebut, pembangunan bendungan bisa berdampak pada kehidupan populasi ikan di sungai.

Namun, keberadaan bendungan dapat menghambat kegiatan migrasi ikan. Berbagai jenis ikan tidak mampu melewati pembatas bendungan sehingga siklus hidupnya pun terganggu. Padahal, dari sekitar 1.300 spesies ikan di Indonesia, hampir 80 persen bermigrasi untuk pemijahan, mencari makan, ataupun mencari daerah yang sesuai untuk berkembang biak.

Kepala Pusat Riset Konservasi Sumber Daya Laut dan Perairan Darat Badan Riset dan Inovasi Nasional (BRIN) Arif Wibowo, di Jakarta, Sabtu (19/8/2023), menuturkan, isu konektivitas menjadi persoalan yang dihadapi pada perkembangan ikan air tawar di Indonesia. Sungai yang dimodifikasi dengan pembangunan bendungan membuat migrasi ikan terganggu. Hal ini mengakibatkan sumber daya ikan di sungai tersebut menjadi berkurang.

"Kalau sungai tidak dibangun bendungan, 30 tahun ke depan biomassa ikan bisa sampai 100 persen. Namun, kalau dibangun bendungan, hanya tersisa 20 persen. Selain itu, 100 persen ikan yang hidup bermigrasi akan hilang," tuturnya.

Salah satu jenis ikan air tawar yang hidup bermigrasi ialah ikan sidat. Ikan tersebut melakukan pemijahan di laut, kemudian berkembang dan hidup di sungai. Jika jalur migrasi dari ikan sidat terhalang oleh bendung, dikhawatirkan jenis ikan tersebut menjadi sulit ditemukan di Indonesia.

Peneliti di Badan Riset dan Inovasi Nasional (BRIN) Dwi Atminarso dalam keterangan pers yang terbit pada 17 Maret 2023 menuturkan, hasil penelitian yang dilakukannya tentang Bendungan Perjaya di Sungai Komering, Sumatera Selatan, menunjukkan adanya dampak pembangunan bendungan terhadap penurunan populasi spesies ikan.

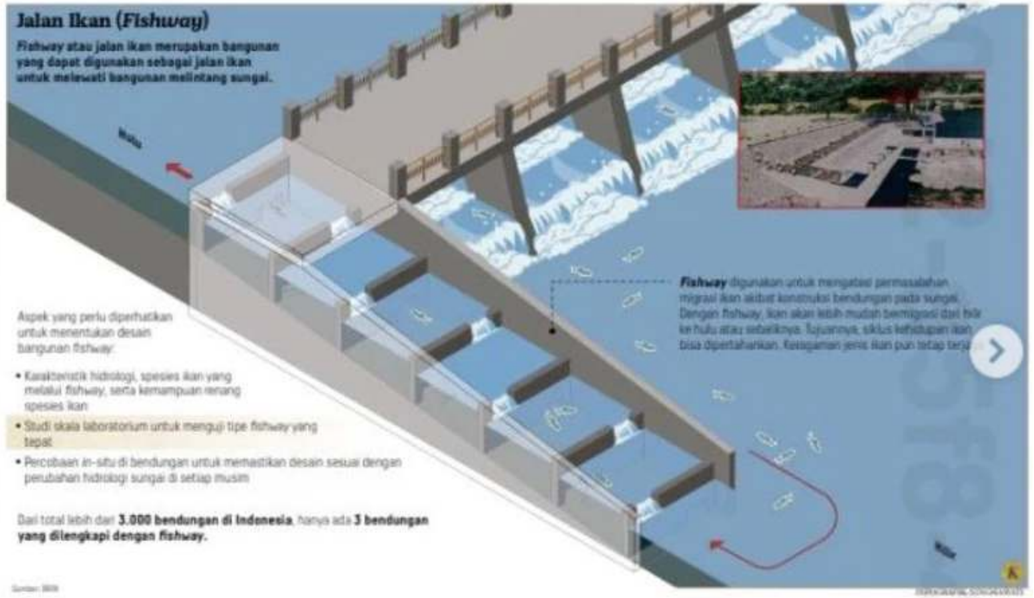
Pembangunan bendungan di Sungai Komering telah berdampak terhadap penurunan spesies ikan dari sebelumnya sekitar 50 spesies menjadi 38 spesies. "Bendungan di Sungai Komering menghalangi jalur migrasi ikan. Ada kebutuhan untuk memastikan bahwa pengembangan sungai tidak berdampak pada perikanan," katanya.

"Fishway"

Arif menyampaikan, pembangunan bendung ataupun bendungan tidak mungkin dihentikan karena kebutuhan masyarakat semakin tinggi. Untuk itu, solusi berupa inovasi diperlukan demi memastikan bendungan tetap bisa dibangun, tetapi tidak mengganggu siklus hidup ikan.

Inovasi berupa *fishway* atau jalan ikan menjadi salah satu cara yang ditawarkan. *Fishway* atau jalan ikan ini merupakan bangunan yang dapat digunakan sebagai jalan ikan untuk melewati bangunan melintang sungai, seperti bendung atau bendungan. Selain *fishway*, ada pula *fishtruck* dan *fishladder* atau tangga ikan yang berfungsi sebagai tangga bagi ikan untuk berenang dari hilir ke hulu atau sebaliknya.

Menurut Arif, adanya bangunan jalan khusus ikan di bendungan bisa menjadi solusi yang baik terhadap aktivitas perikanan serta pembangunan sistem irigasi dan pembangkit listrik di sungai. Pembangunan jalan khusus ikan ini diharapkan lebih masif di Indonesia.



Saat ini, jumlah bendungan yang dilengkapi dengan *fishway* di Indonesia masih sangat minim. Dari sekitar 1.300 bendungan, hanya terdapat tiga bendungan dengan *fishway*, yakni bendungan di Sungai Musi (Sumatera Selatan), Sungai Batanghari (Sumatera), dan Sungai Poso (Sulawesi Tengah).

Pembangunan jalan khusus ikan yang belum masif di Indonesia disebabkan oleh berbagai tantangan. Kurangnya kesadaran mengenai pentingnya menjaga biodiversitas ikan air tawar menjadi salah satu tantangannya. Hal itu menyebabkan pembangunan jalan khusus ikan tidak masuk dalam rencana pembangunan bendungan atau bendung.

Selain itu, regulasi yang mengatur kewajiban adanya *fishway* pada pembangunan bendungan belum tersedia. Aturan turunan untuk kewajiban pembangunan jalan khusus ikan diharapkan segera terealisasi dengan adanya Instruksi Presiden Nomor 1 Tahun 2023 tentang Pengarusutamaan Pelestarian Keanekaragaman Hayati dalam Pembangunan Berkelanjutan.

Arif menambahkan, tantangan lainnya ialah adanya pertimbangan anggaran dalam pembangunan. Untuk membangun jalur khusus ikan, setidaknya dibutuhkan tambahan dana sekitar 10 persen dari total anggaran pembangunan bendungan.

Namun, anggaran tersebut seharusnya tidak menjadi persoalan lantaran manfaat yang didapatkan dengan adanya jalan khusus ikan jauh lebih besar. "Setidaknya 10 persen dari biaya bendungan yang dipakai untuk pembangunan *fishway* itu *benefit cost*-nya bisa kembali setelah delapan tahun. Hal itu akan berkelanjutan karena jumlah ikan terjaga dan tak ada ikan yang hilang," tuturnya.

Spesifik

Arif menyampaikan, inovasi *fishway* bukan hal yang pertama di dunia. Beberapa negara sudah menerapkan jalan ikan dalam pembangunan bendung ataupun bendungan. Namun, penelitian tetap dibutuhkan untuk setiap pembangunan *fishway* di suatu wilayah sebab pembangunan jalan khusus ikan yang spesifik bergantung pada lokasi pembangunan.

Sebelum membangun *fishway*, perlu diperhatikan antara lain keanekaragaman jenis ikan yang tinggal di sungai tersebut, termasuk pada ukuran, biomassa, serta pola hidup ikan ketika migrasi. Selain itu, pembangunan *fishway* di suatu wilayah perlu memperhatikan hidrodinamika air, kecepatan aliran air, ketinggian air, serta pola air di setiap musim.

Kombinasi antara data ikan dan data air diperlukan untuk membangun jalan khusus ikan. Oleh karena itu, sistem *fishway* di satu wilayah tidak dapat langsung ditiru di wilayah lain. Bentuk serta komponen dari bangunan *fishway* harus bisa mengakomodasi kondisi di wilayah tersebut.

Deputi Bidang Kebijakan Pembangunan BRIN Mego Pinandito menuturkan, riset dan inovasi mengenai *fishway* akan terus dikembangkan. Riset tersebut diperlukan untuk membantu menjaga keseimbangan sistem irigasi dan ekosistem ikan perairan darah, terutama untuk membantu migrasi ikan dalam mempertahankan siklus hidupnya.

"Ikan menjadi sumber pangan penting bagi masyarakat sehingga perlu dilestarikan. Ikan, khususnya ikan air tawar, memiliki *life cycle* migrasi dari hulu ke hilir. Jadi, sebaiknya perencanaan sistem irigasi memperhatikan keberlangsungan hidup ikan," ungkapnya.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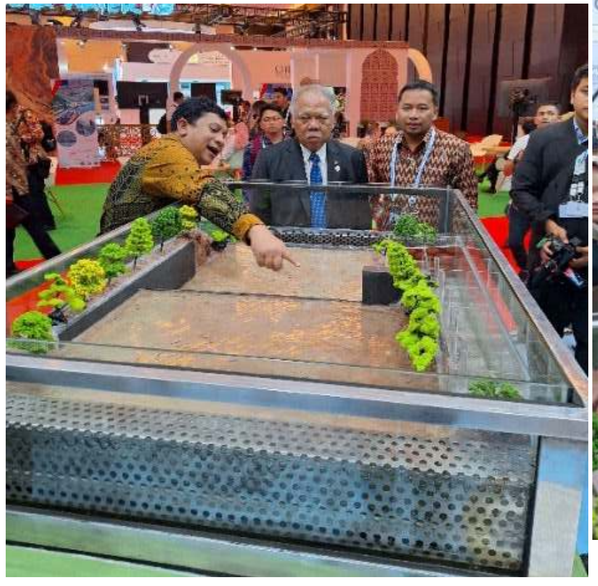


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2ND ANNOUNCEMENT

ACIAR-supported scholars graduate new fisheries course

The six ACIAR-funded scholars shortly after graduating. From left to right: Rezki Antoni Suharmi (Indonesia), Moh. Faozan Tsani (Indonesia), Aye Myint Swe (Myanmar), Nyi Nyi Tun (Myanmar), Somphou Phasulath (Lao PDR), Vaviyo Simonkhoun (Lao PDR). Image: CSU

John Dillon program (Kurniawan)

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DEGREE BY RESEARCH

BRIN

- **Limited Data and Research**

Data related to fish migration, local species, and their ecological behaviour in Indonesian waters is still limited

Lack of research on fishway designs that are suitable for endemic fish species in Indonesia.

Species migration characteristic

1. Diadromous/migrate between freshwater and sea (Catadromous and Anadromous). Example : Eels (Anguilla sp), Giant freshwater prawn (Macrobrachium sp), salmon, Pangasius krempfi,
2. Potamodromous/complete life cyle wholly within freshwater. Example: Mahseer, *Hemibagrus nemurus, Barbonymus gonionotus, Hampala macrolepidota.*
3. Amphidromous/migrate between freshwater and sea but not for reproductive purpose. Example: Gobidae

DNA Barcodes 2015; 3: 144–169 DE GRUYTER OPEN

Review Open Access

Nicolas Hubert*, Kadarusman, Arif Wibowo, Frédéric Busson, Domenico Caruso, Sri Sulandari, Nuna Nafiqoh, Laurent Pouyaud, Lukas Rüber, Jean-Christophe Avarre, Fabian Herder, Robert Hanner, Philippe Keith, Renny K. Hadiaty

DNA Barcoding Indonesian freshwater fishes: challenges and prospects

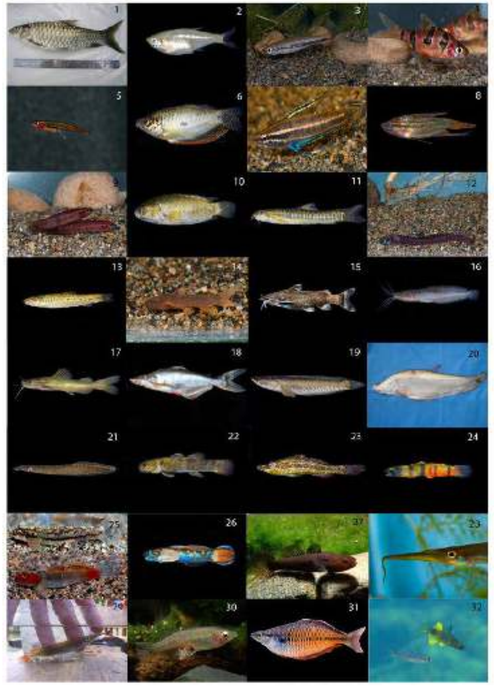


Figure 1. Map of Indonesia including the 23 islands considered in the present review (Appendix) with biogeographic provinces and their boundaries. 1, Bali; 2, Bangka; 3, Batam and Bintan; 4, Belitong; 5, Buru; 6, Java; 7, Kalimantan; 8, Madura; 9 Natuna and Riau; 10, Sumatera; 11, Bacan; 12, Celebes; 13, Ceram; 14, Flores; 15, Halmahera; 16, Indonesian Timor; 17, Lombok; 18, Sumba; 19, Sumbawa; 20, Ternate; 21, Talaud; 22, Aru; 23, Indonesia New Guinea.

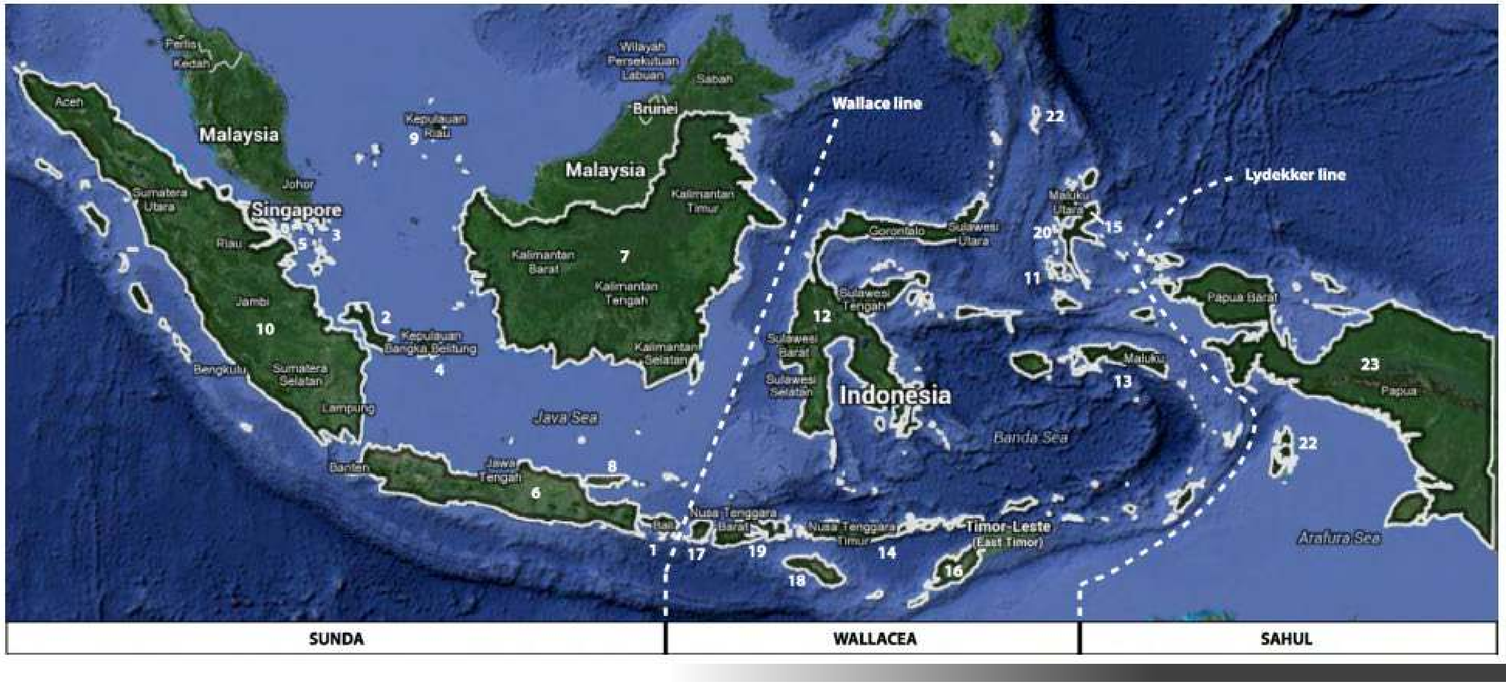
1) **1172 native species (79 families group)**, among the world's most speciose.
2) Among which **630 species are endemic and 28 are exotic species** of the country. The family Cyprinidae is the most speciose family with 241 species.
3) Indonesia hosts **the world's highest density** of fish species

Local Species

MAJOR FISH SP IN SUNDA LAND

MAJOR FISH SP IN WALLACE ZONE

MAJOR FISH SP IN SAHUL LAND



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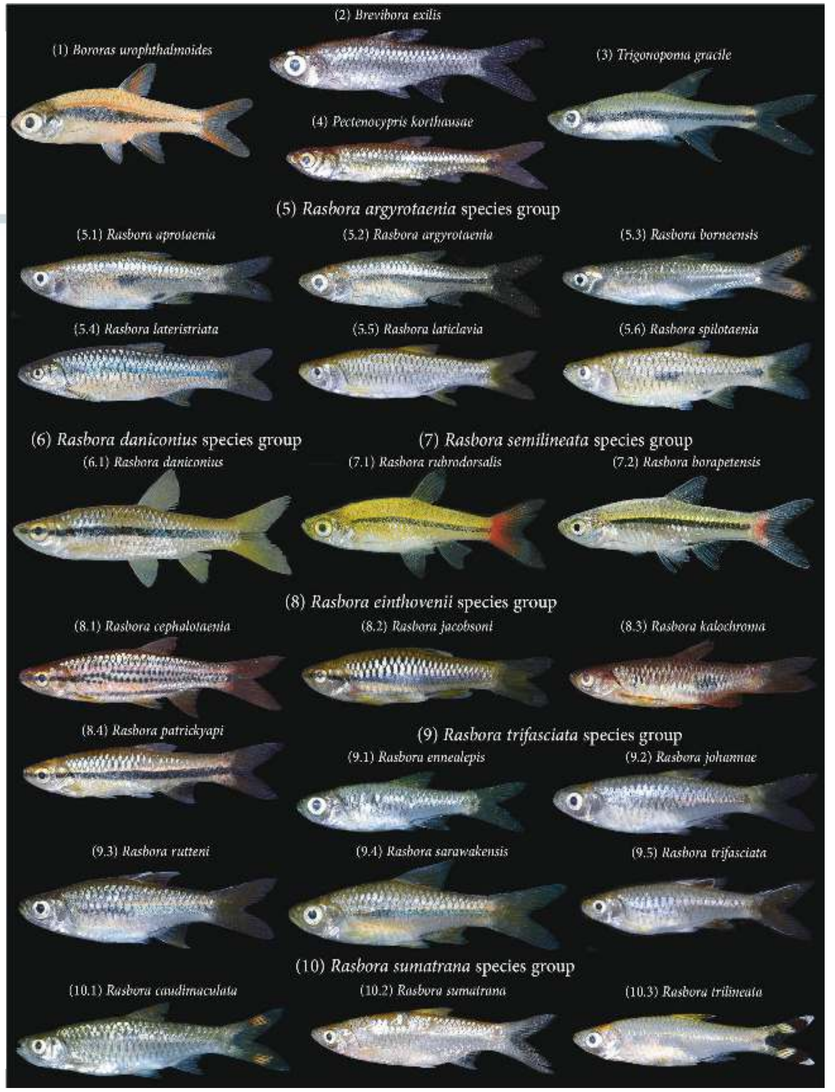
Article | Open access | Published: 18 February 2020

Disentangling the taxonomy of the subfamily Rasborinae (Cypriniformes, Danionidae) in Sundaland using DNA barcodes

Arni Sholihah, Erwan Delrieu-Trottin, Tedjo Sukmono, Hadi Dahruddin, Renny Risdawati, Roza Elvyra, Arif Wibowo, Kustiati Kustiati, Frédéric Busson, Sopian Sauri, Ujang Nurhaman, Edmond Dounias, Muhamad Syamsul Arifin Zein, Yuli Fitriana, Ilham Vemendra Utama, Zainal Abidin Muchlisin, Jean-François Agnèse, Robert Hanner, Daisy Wowor, Dirk Steinke, Philippe Keith, Lukas Rüber & Nicolas Hubert ✉

Scientific Reports **10**, Article number: 2818 (2020) | Cite this article

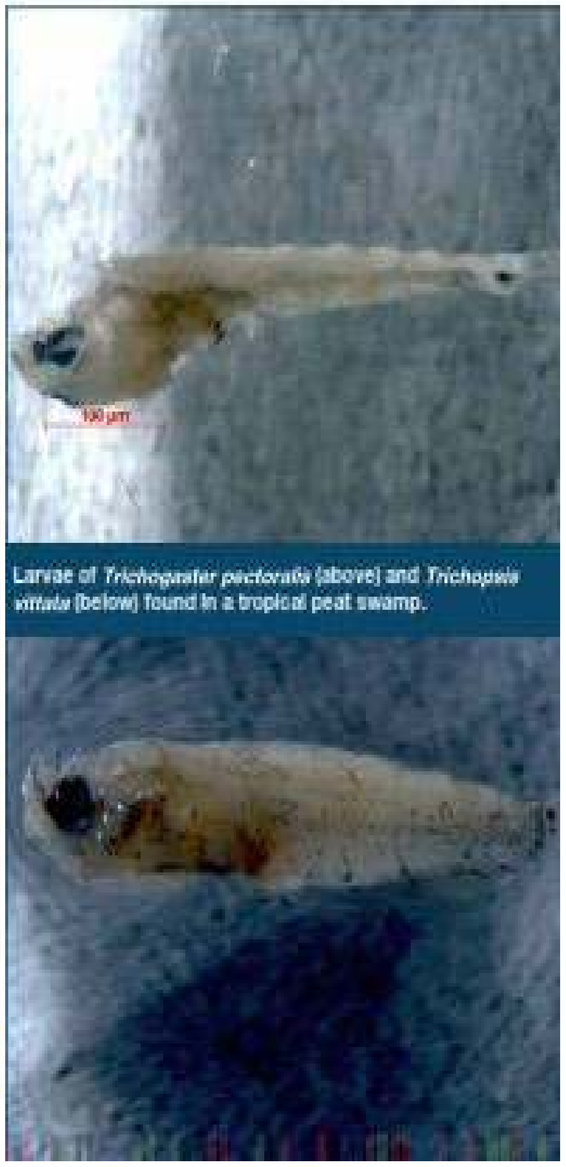


international BARCODE OF LIFE
Barcode BULLETIN
Oct 2015
Vol.6, Issue 3

ACIAR BRIN Charles Sturt University

Identifying Fish Larvae in a Tropical Peat Swamp System

Written by and images by: Arif Wibowo (Research Institute for Inland Fisheries, Indonesia)

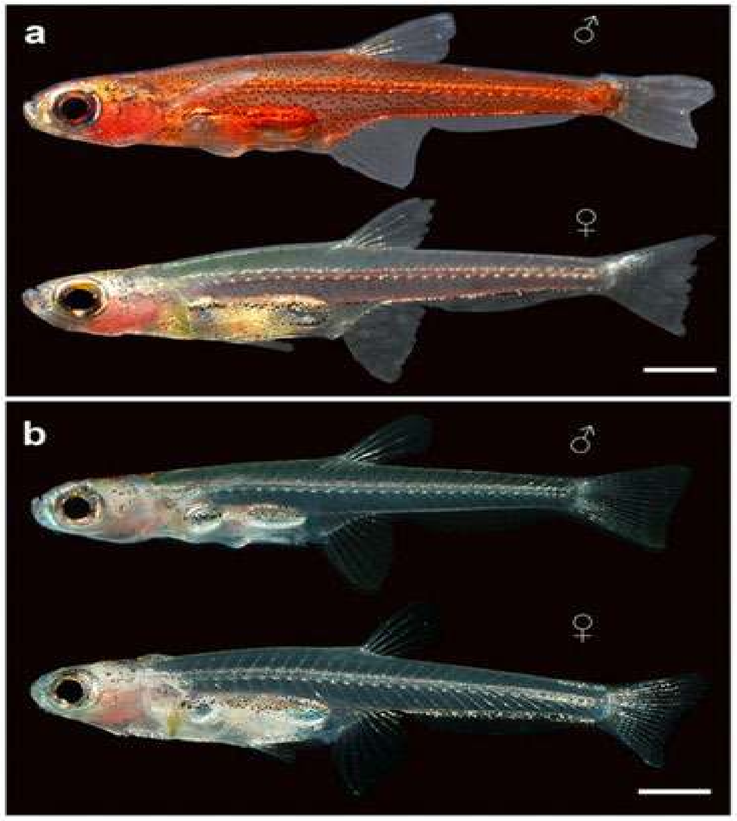


Larvae of *Trichopsetter pectoralis* (above) and *Trichopsis vittata* (below) found in a tropical peat swamp.

Canal blockage in Peatland

Fishes from Peatland

Paedocypris



Paedocypris progenetica has been claimed to be the one of smallest known species of fish in the world. The smallest mature female measured 7.9 mm (0.31 in) and the largest known individual was 10.3 mm (0.41 in).[1]

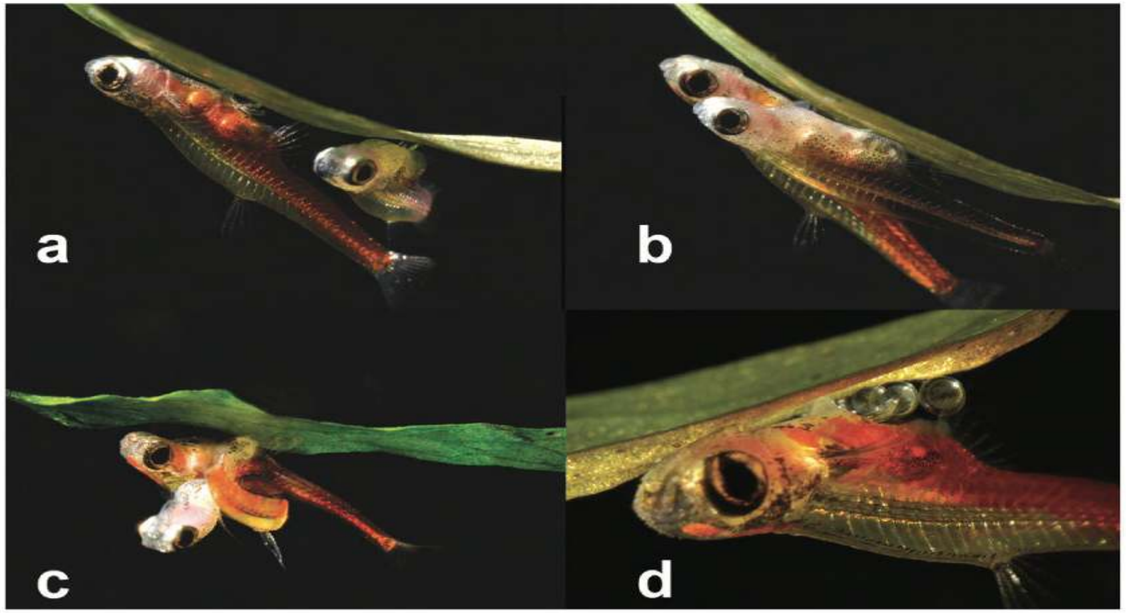


Fig. 7. *Paedocypris carbunculus*, spawning behaviour: a, male has attracted a female; b, male and female in parallel posture during egg deposition; c, both in spawning embrace; d, male in contact with eggs via pelvic fins and keratinized pad (Photos: Oliver Perrin).

Proceedings of the Royal Society B: Biological Sciences. **273** (1589): 895–899. doi:10.1098/rspb.2005.3419.

Pectenocypris

7 languages

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From Wikipedia, the free encyclopedia

Pectenocypris is a genus of small fish in the family Cyprinidae endemic to freshwater habitats in Borneo and Sumatra in Indonesia.[1]

Species [edit]

There are currently 4 recognized species in this genus:[1]

- *Pectenocypris balaena* T. R. Roberts, 1989
- *Pectenocypris korthausae* Kottelat, 1982
- *Pectenocypris micromysticetus* H. H. Tan & Kottelat, 2009
- *Pectenocypris nigra* Wibowo, Ahnelt & Kertamihardja, 2016[2]
- *Pectenocypris rubra* Ahnelt, Wibowo & Prianto, 2020[3]

References [edit]

1. ^ a b Froese, Rainer; Pauly, Daniel (eds.). "Species in genus *Pectenocypris*". *FishBase*. May 2017 version.
2. ^ Wibowo, A., Ahnelt, H. & Kertamihardja, E.S. (2016): *Pectenocypris nigra*, a new danionine species (Teleostei: Cyprinidae: Danioninae) from Sumatra (Indonesia). *Acta Biologica Turcica, 29 (4): 137-142.*
3. ^ Ahnelt, H.; Wibowo, A.; Prianto, E. (2020). "A new species of *Pectenocypris* (Teleostei: Cyprinidae) from peat swamps in Sumatra"

Pectenocypris

Pectenocypris korthausae

Scientific classification

Domain:	Eukaryota
Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes
Family:	Cyprinidae
Subfamily:	Danioninae
Genus:	***Pectenocypris*** Kottelat, 1982

Acta Biologica Turcica 29 (4) 137-142, 2016 Received 22 July 2016; Accepted 22 Sept. 2016

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E-ISSN: 2458-7893, http://www.actabiologicaturcica.info

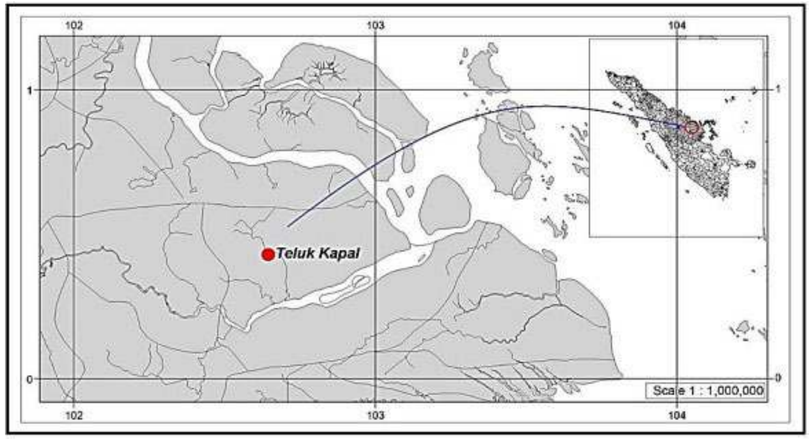
Pectenocypris nigra, a new danionine species (Teleostei: Cyprinidae: Danioninae) from Sumatra (Indonesia)

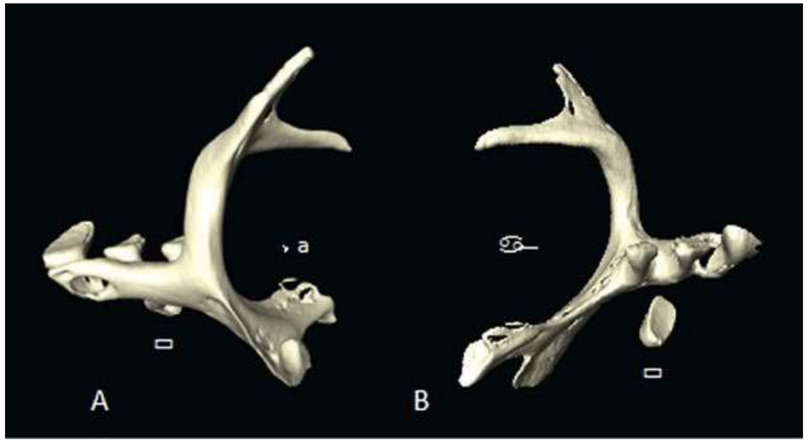
Arif WIBOWO[1], Harald AHNELT[*2], Endi S. KERTAMIHARDJA[3]

1. Three species of Pectenocypris, endemic to Indonesia, are known: Pectenocypris balaena from western Borneo, P. korthausae Kottelat from southern Borneoand Sumatra and P. micromysticetus Tan & Kottelat from Sumatra
2. The new species differ from their congeners in the combination of following characters: coloration, number of scales in lateral midline and number of gill rakers.

New species

(*Pectenocypris nigra*)





VERTEBRATE ZOOLOGY
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70 (1): 1–8
2020
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A new species of *Pectenocypris* (Teleostei: Cyprinidae) from peat swamps in Sumatra

HARALD AHNELT[1,2,*], ARIF WIBOWO[3,4], EKO PRIANTO[5]

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Accepted September 27, 2019.
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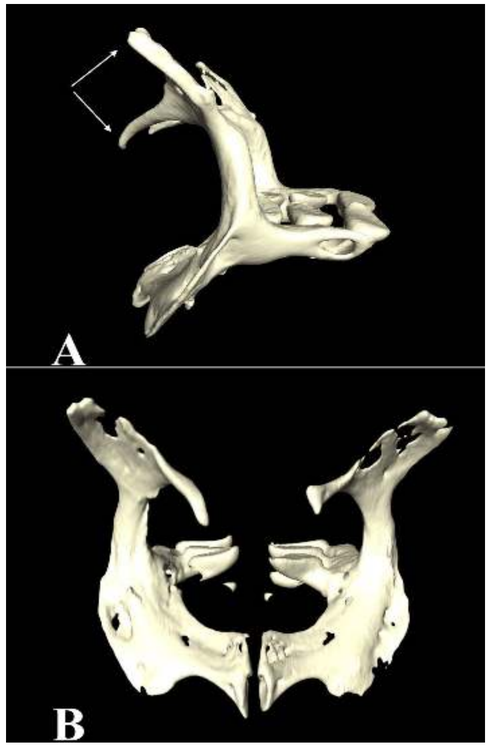
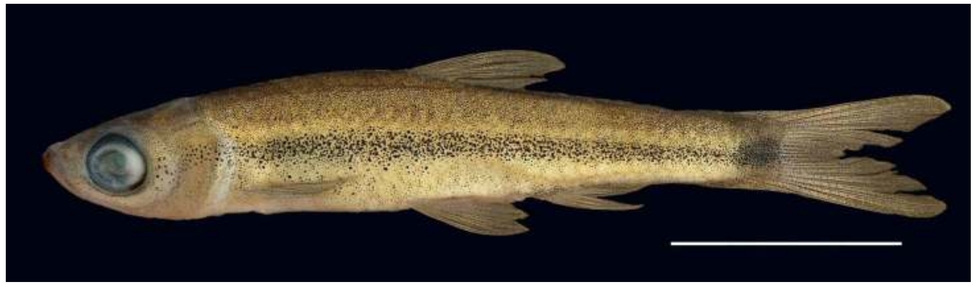
Published in print Q1/2020.

Editor in charge: Uwe Fritz





Pectenocypris rubra differs from the other fourspecies of this genus in the following combination of characters: an oval black spot at the base of the caudal fin, scales in lateral midline 33, 7-8 pored lateral line scales, 202 gill-rakers on first gill arch, small dark grey symphysal knob on lower jaw, and a long and narrow caudal peduncle

MITOCHONDRIAL DNA PART B: RESOURCES, 2018
VOL. 3, NO. 1, 122–124
https://doi.org/10.1080/23802359.2018.1424585

Taylor & Francis
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MITOGENOME ANNOUNCEMENT

OPEN ACCESS Check for updates

The complete mitochondrial DNA sequence of *Pectenocypris* sp. (Actinopterygii: Cyprinidae) from Serkap River, Sumatra, Indonesia

Dwi Atminarso[a,b], Arif Wibowo[a,b], Wahyu Endra Kusuma[c], Eko Prianto[d], Harald Ahnelt[e], Anti Vasemägi[f,g] and Yoshinori Kumazawa[h]

Figure 1. A maximum likelihood tree illustrating the phylogenetic position of *Pectenocypris* sp. among other rasborine cyprinids. The maximum likelihood analysis was conducted using concatenated amino acid sequences of 13 mitochondrial protein genes (3,813 sites) and Garli v2.0 (Zwickl 2017) under the mtREV + IG substitution model. Numbers at each node are bootstrap probabilities by 500 replications shown only when they are 50% or larger. INSD accession numbers of mitogenomic sequences for each taxon are shown along with the taxon name.

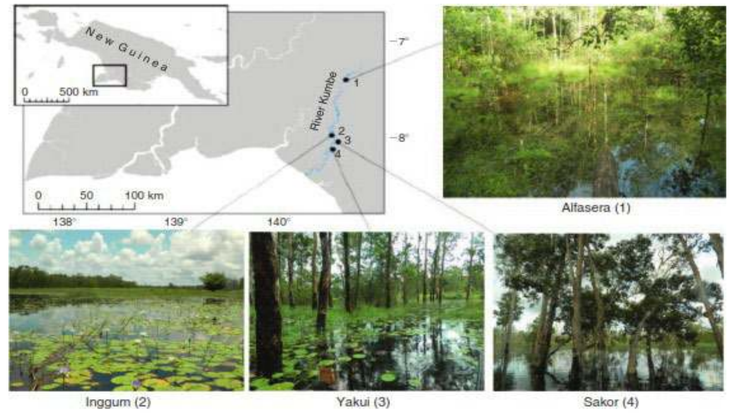
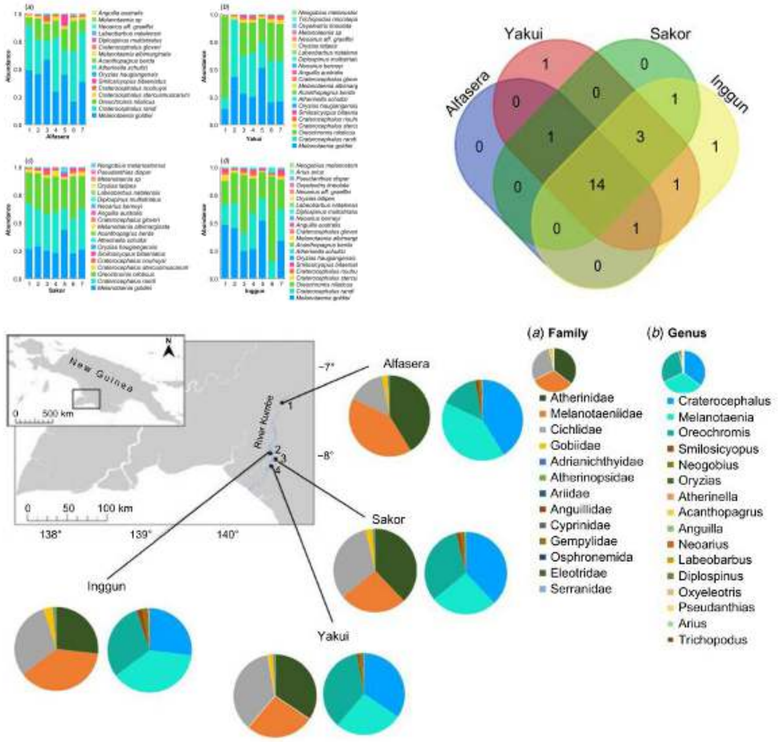


Fig. 1. Sampling locations (1–4) in the River Kumbe, Indonesia. 1, Alfasera; 2, Inggum; 3, Yakui; 4, Sakor.

In contrast with many earlier DNA barcoding studies in fish, we were not able to determine the species identity for a large proportion of sequenced larvae (68%)



CSIRO PUBLISHING

RESEARCH PAPER
https://doi.org/10.1071/PC21078

PACIFIC CONSERVATION BIOLOGY

Assessing freshwater fish biodiversity of Kumbe River, Papua (Indonesia) through environmental DNA metabarcoding

Arif Wibowo[A,*], Kurniawan Kurniawan[A], Dwi Atminarso[A,B], Tri Heru Prihadi[C], Lee J. Baumgartner[B], Meaghan L. Rourke[B,D], Satoshi Nagai[E], Nicolas Hubert[F] and Anti Vasemagi[G,H]

For full list of author affiliations and declarations see end of paper

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Email: wibowo@daad-alumni.de

Handling Editor:
Alan Lymbery

ABSTRACT

Context. The ability to accurately assess biodiversity is a critical first step towards effective conservation and management. However, assessment of biodiversity using conventional monitoring programs is often constrained by high cost and a lack of taxonomic expertise. Environmental DNA (eDNA) metabarcoding may be a useful tool to efficiently catalogue biodiversity in areas that cannot be easily assessed using other methods. **Aims.** Here, we evaluated the potential of eDNA metabarcoding for assessing fish biodiversity and distribution in the Kumbe River, Papua Province, Indonesia. **Methods.** We selected four sampling locations and collected seven eDNA samples from each location. We used eDNA metabarcoding of the Cytochrome-*b* gene to characterise the fish community. **Key results.** A total of 23 species were detected, three of which comprised 92% of sequence reads detected: *Melanotaenia goldiei* (32%), *Craterocephalus randi* (31%), and the invasive tilapia *Oreochromis niloticus* (29%). Only five species

- **Social and Cultural Conditions**

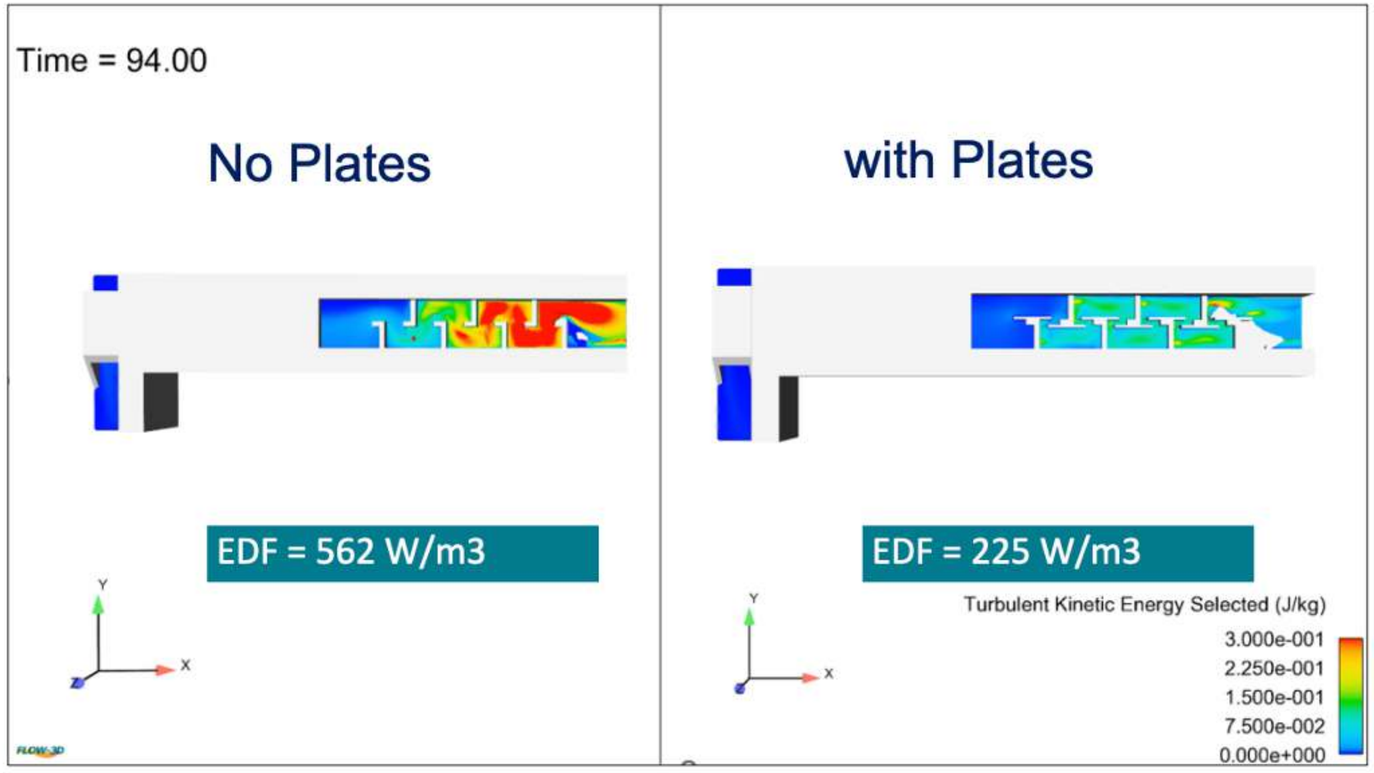
local communities are less supportive of fishway projects due to interest with their economic activities

Other conflic of interest

- **Suboptimal Fishway Design**

Many fishways fail to function because their designs do not match the specific needs of local fish (for example, size, current speed, or ability to fight currents).

Fishways built in Indonesia tend to adopt designs from other countries without local adaptation.



By adding plates to the slots can reduce turbulence in fishway pools

Batanghari River (West Sumatra)

- The Japanese government provided a loan for the construction of the Batanghari weir in 2006.
- The Batanghari River is 1700 km long and is the longest river in Sumatra. It is the habitat of 120 species of fish.
- There has been no observation of the fish ladder's effectiveness in facilitating fish migration at Batanghari weir.

The Ministry of Public Work and Housing (PUPR) owns the property

North Sumatra

Sei Ular Weir located in Desa Pulau Tagor, Kecamatan Serba Jadi, Serdang Bedagai Regency.

Perjaya Weir

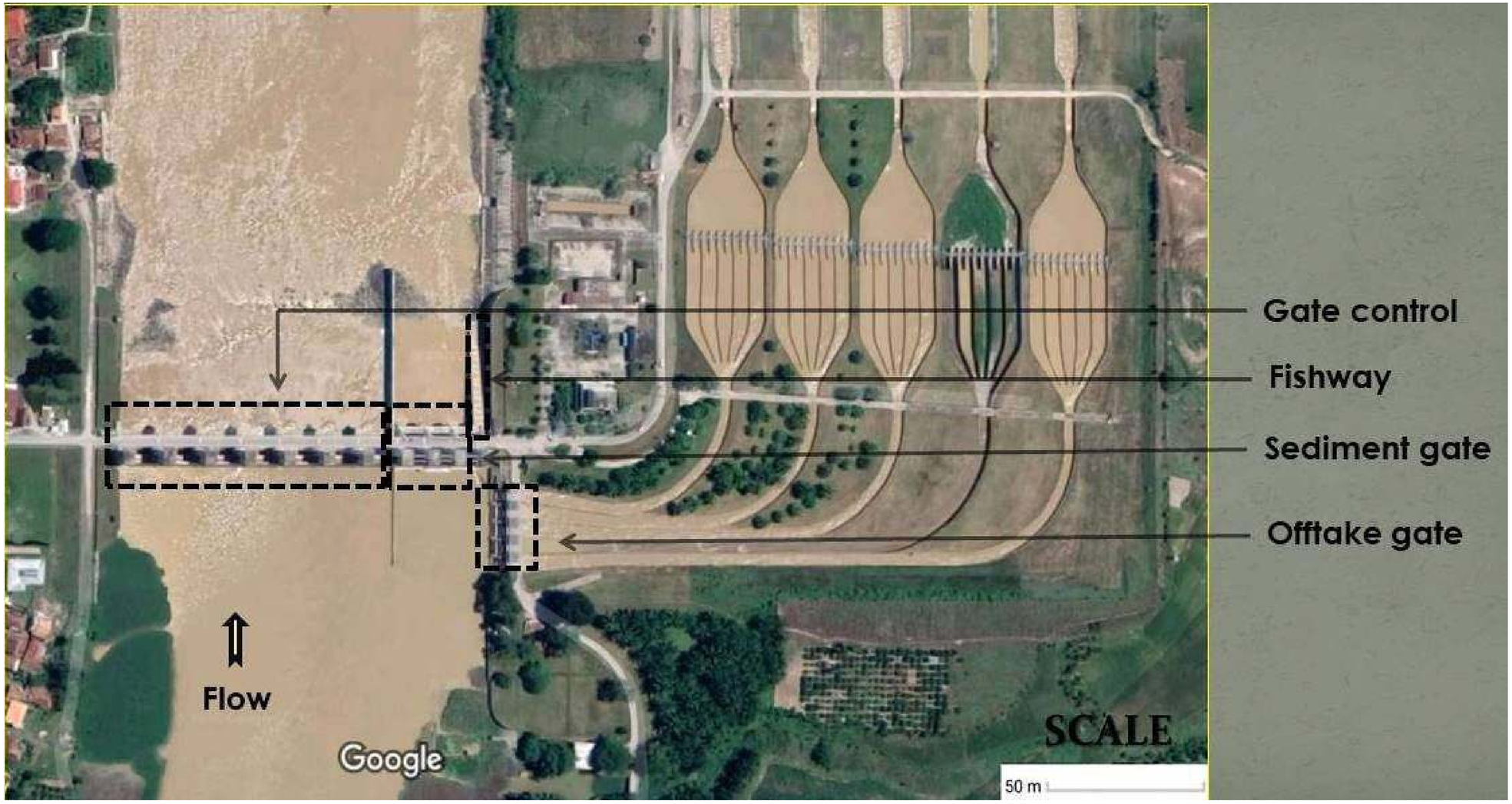
South Sumatra

The Ministry of Public Work and Housing (PUPR) owns the property.

145 km and one of 9 Musi river's tributaries

Built in 1991 by Japan constructor and based on Japan's Ayu fish

Diagram of the irrigation offtake in the Perjaya weir



SPECIAL ISSUE

CSIRO PUBLISHING

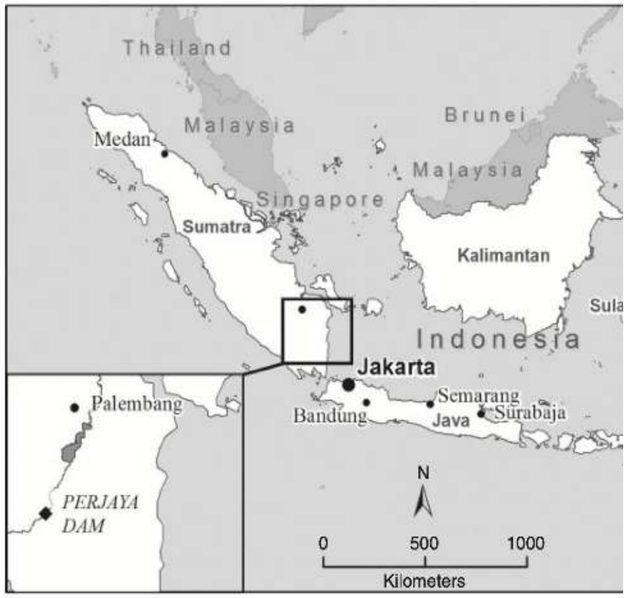
Marine and Freshwater Research, 2018, **69**, 1805–1813
https://doi.org/10.1071/MF18088

Perspective

Addressing fish-passage issues at hydropower and irrigation infrastructure projects in Indonesia

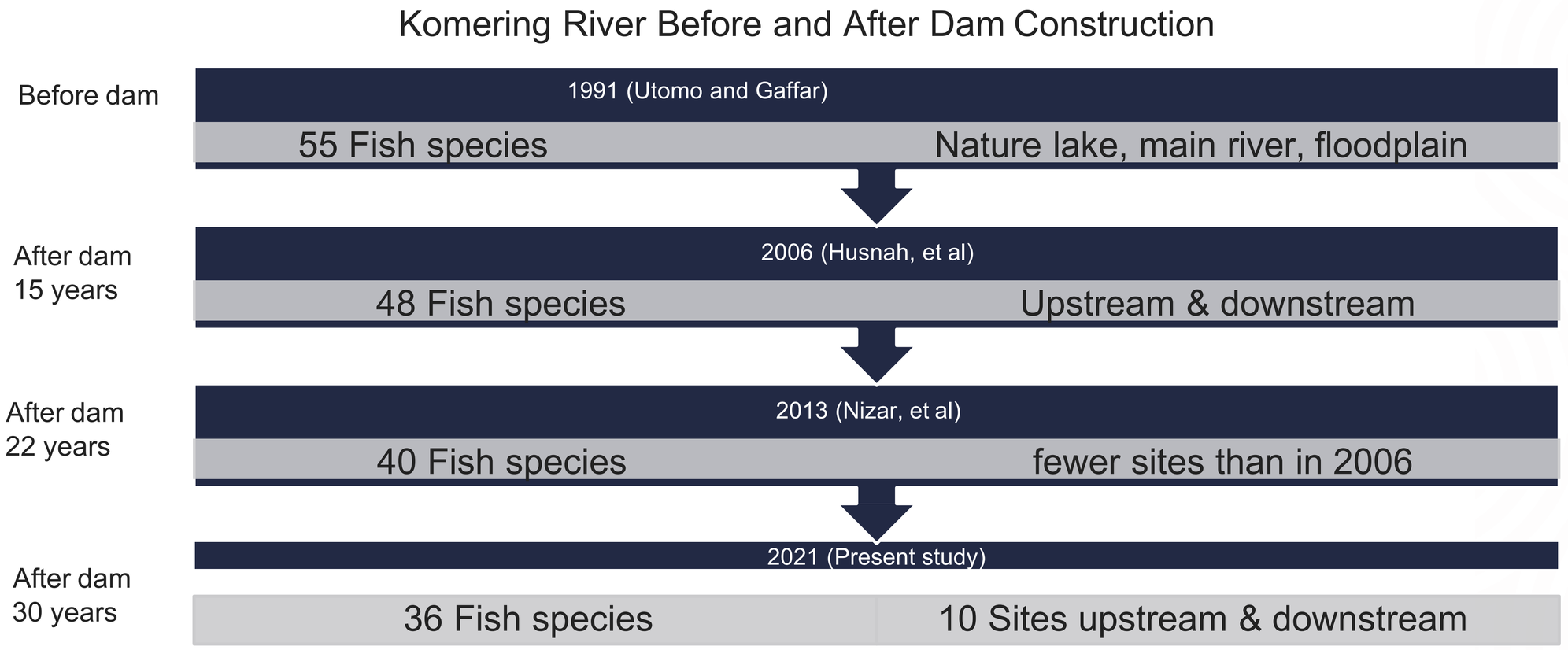
Lee J. Baumgartner[A,D] *and Arif Wibowo*[B,C]

[A]Institute of Land, Water and Society, Charles Sturt University, PO Box 789, Albury, NSW 2640, Australia.
[B]Research Institute for Inland Fisheries and Fisheries Extension, Ministry of Marine Affairs and Fisheries, Jalan Gub H Bastari number 8, 8 Ulu, Seberang Ulu I, Kota Palembang, Sumatera Selatan 30111, Indonesia.
[C]Southeast Asia Fisheries Development Centre, Inland Fisheries Resources Development and Management Department, Palembang 30252, Indonesia.
[D]Corresponding author. Email: lbaumgartner@csu.edu.au



Design flaws in the existing facilities, 1). The entrance is located a significant distance downstream from the weir face and would be difficult for fish to locate, 2). The internal baffle design was based on those for salmonids and no current information is available on fish swimming abilities in the Komering River, 3). The fishway exit is directly adjacent to a large, unscreened, irrigation diversion

Fish Community Changes



Iconic and highly economic

Fisherman's catch target

The main culinary ingredient, ornamental fish

Fully protected

- PP No. 7 th 1999, KemenKP No. 1 th 2021
- *Chitala lopis*, *Chitala hypselonotus*, *Chitala borneensis*, dan *Notopterus notopterus*
- IUCN 2020: *Chitala lopis* jawa extinct

Differences in Taxonomic Claims

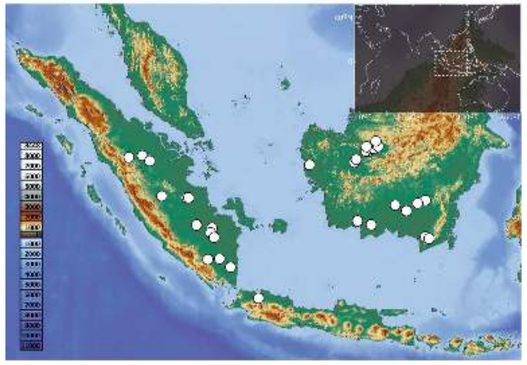
Robert (1989) A single species, Chitala lopis, refers to the opposite phase of the life cycle. Kottelat & Widanarni, (2005) three species identified, although their classification is still uncertain..

Vol. 52: 285–301, 2023
https://doi.org/10.3354/esr01281
ENDANGERED SPECIES RESEARCH
Endang Species Res
Published November 30

OPEN ACCESS CC BY

Rediscovery of the giant featherback *Chitala lopis* (Notopteridae) in its type locality resolves decades of taxonomic confusion

Arif Wibowo[1,*], Haryono Haryono[2], Kurniawan Kurniawan[1], Vitas Atmadi Prakoso[1,3,12], Hadi Dahruddin[2], Indah Lestari Surbani[4], Yohanes Yudha P. Jaya[5], Sudarsono Sudarsono[5], Fathur Rochman[1], Boby Muslimin[1], Tedjo Sukmono[6], Meaghan L. Rourke[3,7], Harald Ahnelt[8,9], Simon Funge-Smith[10], Nicolas Hubert[11]



Global Ecology and Conservation 49 (2024) e02786

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: www.elsevier.com/locate/gecco

Genetic and morphological evidence of a single species of bronze featherback (*Notopterus notopterus*) in Sundaland

Arif Wibowo [a], Haryono Haryono [b], Kurniawan Kurniawan [a], Vitas Atmadi Prakoso [a,e,k,*], Hadi Dahruddin [b], Indah Lestari Surbani [c], Boby Muslimin [a], Yohanes Yudha P. Jaya [d], Sudarsono Sudarsono [d], Ivor G. Stuart [e], Harald Ahnelt [f,g], Simon Funge-Smith [h], Anti Vasemägi [i], Nicolas Hubert [j]

[a] *Research Center for Conservation of Marine and Inland Water Resources, National Research and Innovation Agency, Cibinong Science Center, Jl. Raya Jakarta – Bogor Km 46, Cibinong, West Java 16915, Indonesia*
[b] *Research Center for Biosystematics and Evolution, National Research and Innovation Agency, Cibinong Science Center, Jl. Raya Jakarta – Bogor Km 46, Cibinong, West Java 16915, Indonesia*
[c] *Yayasan Selaras Hijau Indonesia, Jl. Bumi Perkemahan RT 05 RW 03 Desa Tangkit, Kecamatan Sungai Gelam, Muaro Jambi, Jambi 36363, Indonesia*
[d] *Food and Agriculture Organization (FAO) Representation in Indonesia, Menara Thamrin Bld. 7th floor, Jalan M.H. Thamrin Kav. 3, Jakarta 10250, Indonesia*
[e] *Gulbali Institute for Agriculture, Water and Environment, Charles Sturt University, PO Box 789, Albury, New South Wales 2640, Australia*
[f] *Department of Evolutionary Biology, University of Vienna, Djerassiplatz 1, 1030 Vienna, Austria*

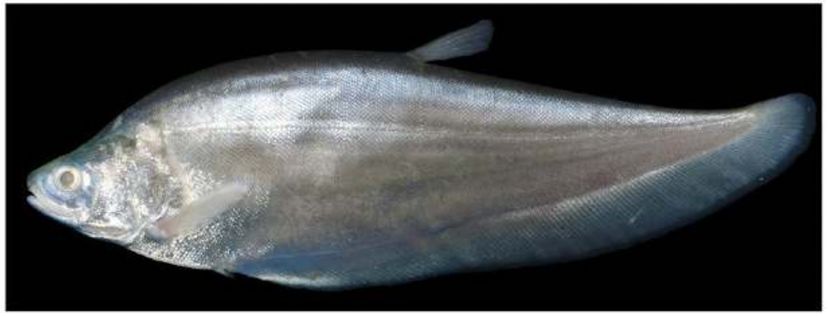
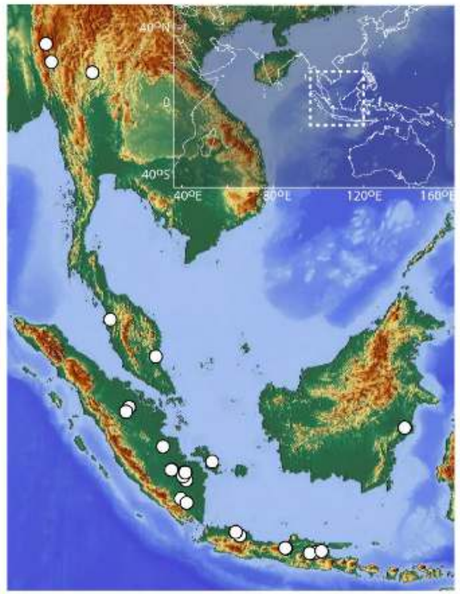


Fig. 1. Photograph of a specimen of *Notopterus notopterus* collected in Sumatra (BIF3689, SL=238 mm).



Infografik Video Asia Tenggara Kolom Good Network

LINGKUNGAN

Sering Jadi Bahan Pempek, Ikan Putak Kini Masuk Hewan yang Dilindungi

8. *Notopterus notopterus* (belida jawa);

KEPUTUSAN MENTERI KELAUTAN DAN PERIKANAN REPUBLIK INDONESIA
NOMOR 1 TAHUN 2021
TENTANG
JENIS IKAN YANG DILINDUNGI

Uncertain in Taxonomic Claims

The putak fish, assumed to be belida jawa, belongs to the belida fish category. Our research findings indicate that putak fish are a distinct species within the belida group. Therefore, we advocate removing them from the list of protected fish species.

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A journal dedicated to conservation and wildlife management in the Pacific region.

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RESEARCH ARTICLE

Previous

Evidence of fish community fragmentation in a tropical river upstream and downstream of a dam, despite the presence of a fishway

Dwi Atminarso [A B C *], Lee J. Baumgartner [A], Robyn J. Watts [A C], Meaghan L. Rourke [A D], Jennifer Bond [A C] and Arif Wibowo [B]

+ Author Affiliations

* Correspondence to: dwiatminarso@gmail.com

Performance of a pool and weir fishway for a non-salmonid tropical fish community in the Komering River, Indonesia

A total of 38 species were caught in the fishway and 27 species (71%) successfully ascended the fishway.

Eleven species were collected exclusively in the bottom, eight species were caught exclusively in the top and 20 species were caught from both top and bottom.

Fish In Irrigation inlet

NO	Local Name	Species	Family	Number of individuals					
				0 Km	5 Km	10 Km	20 Km	40 Km	TOTAL
1	Baru	*Puntius brevis*	Cyprinidae	50	10	82	9		**151**
2	Lampam	*Barbodes schwanefeldi*	Cyprinidae	2	1	2	1		**6**
3	Seluang	*Rasbora argyrotaenia*	Cyprinidae	10		201	281	2	**494**
4	Sebarau	*Hampala macrolepidota*	Cyprinidae	1					**1**
5	Tawes	*Barbodes gonionotus*	Cyprinidae			1			**1**
6	Sumatera Tiger barb	*Barbus tetrazona*	Cyprinidae				1	21	**22**
7	Kapor	*Pristolepis fasciata*	Pristolepididae	1					**1**
8	Buntal	*Tetraodon cutcutia*	Tetraodontidae				2		**2**
9	Beringit	*Mystus singaringan*	Bagridae		1				**1**
10	Kepras	*Cyclocheilichthys Apogon*	Cyprinidae			1			**1**
11	Sepat siam	*Trichogaster pectoralis*	Osphronemidae			15	2		**17**
12	Tempalo	*Trichopsis vittata*	Osphronemidae				1	2	**3**
13	Betok	*Anabas testudineus*	Anabantidae			1			**1**
14	Sapu sapu	*Pterygoplichthys disjunctivus*	Loricariidae				12	2	**14**
15	Nila	*Tilapia niloticus*	Cichlidae	1				1	**2**
16	Cere	*Gambusia affinis*	Poecillidae					1	**1**
17	Udang capit	*Macrobrachium sp*	Palaemonidae				9	13	**22**
18	Udang beras	*Macrobrachium sp*	Palaemonidae				73	415	**488**

Pterygoplichthys disjunctivus

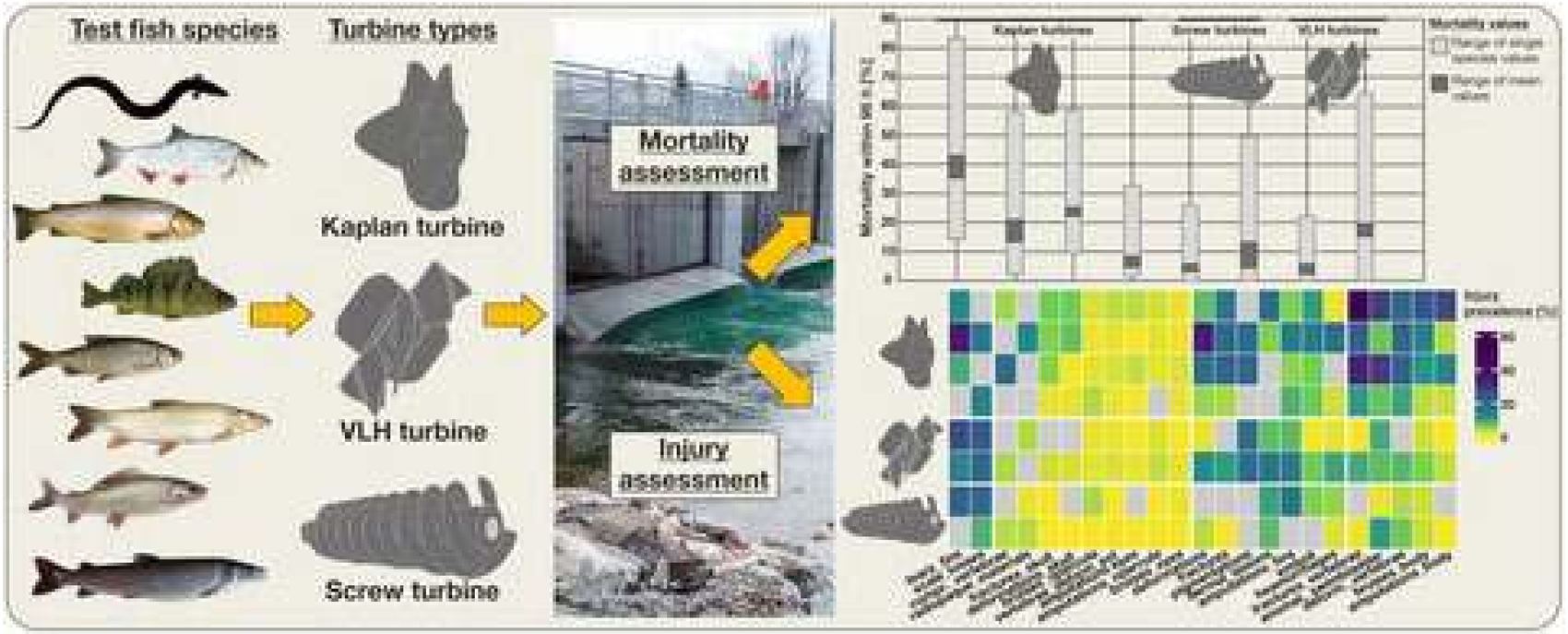
Barbus tetrazona

Rasbora argyrotaenia

Gambusia affinis

course title

Hydropower & fish



Source: Mueller et al. (2022)

Hydropower dams

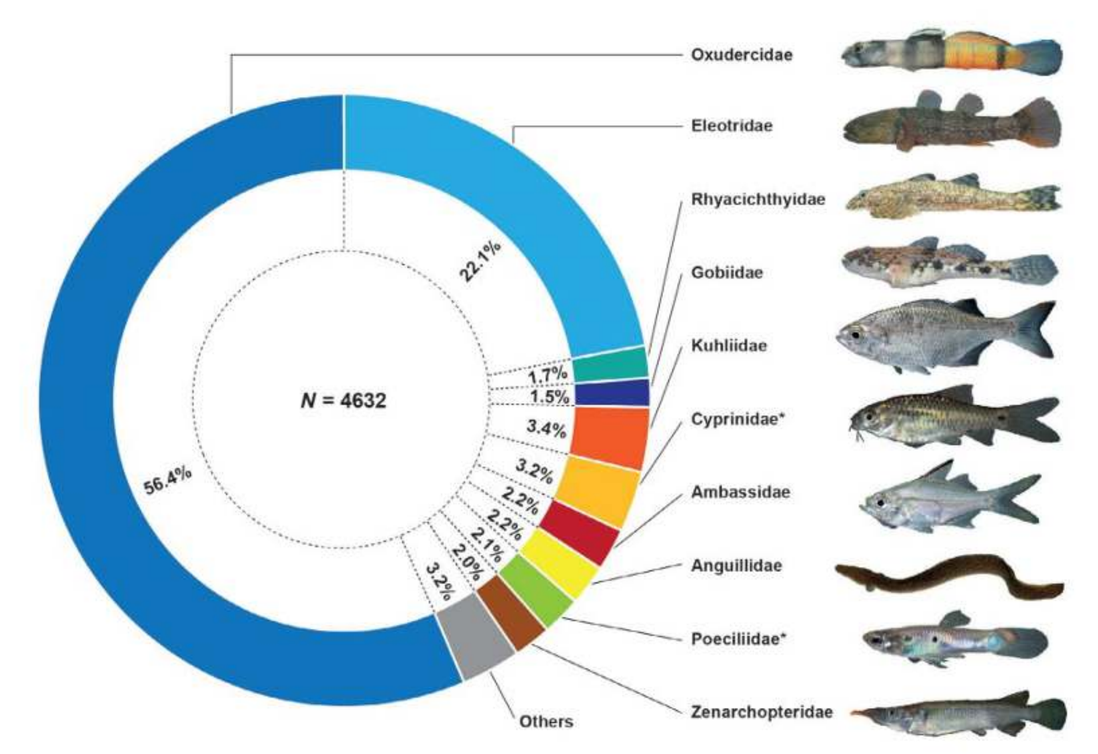
- Provide water and electricity but harm fish migration and reproduction (Krauss et al., 2010; Wang et al., 2023).
- Turbines can injure and kill fish, causing declines in populations (Klopries & Schüttrumpf, 2020).

Impact of hydropower on eels

Image Sources: europe.wetlands.org (2020)

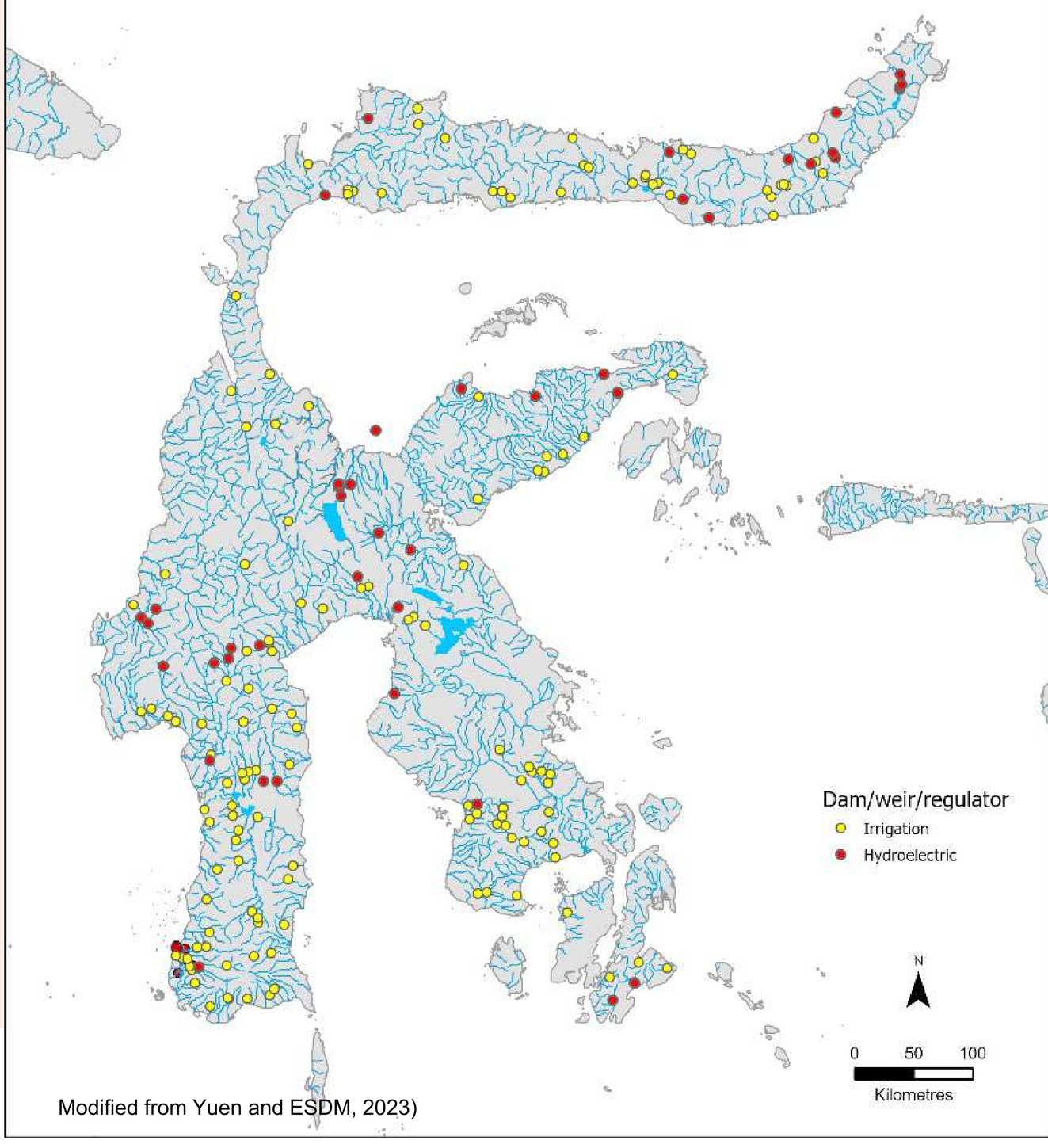
Image Sources: European Eel Foundation (2021)

Fish Biodiversity and Hydropower and irrigation dams/weir in Sulawesi



33 rivers, 58 species, 24 family

Damanik etal., 2024

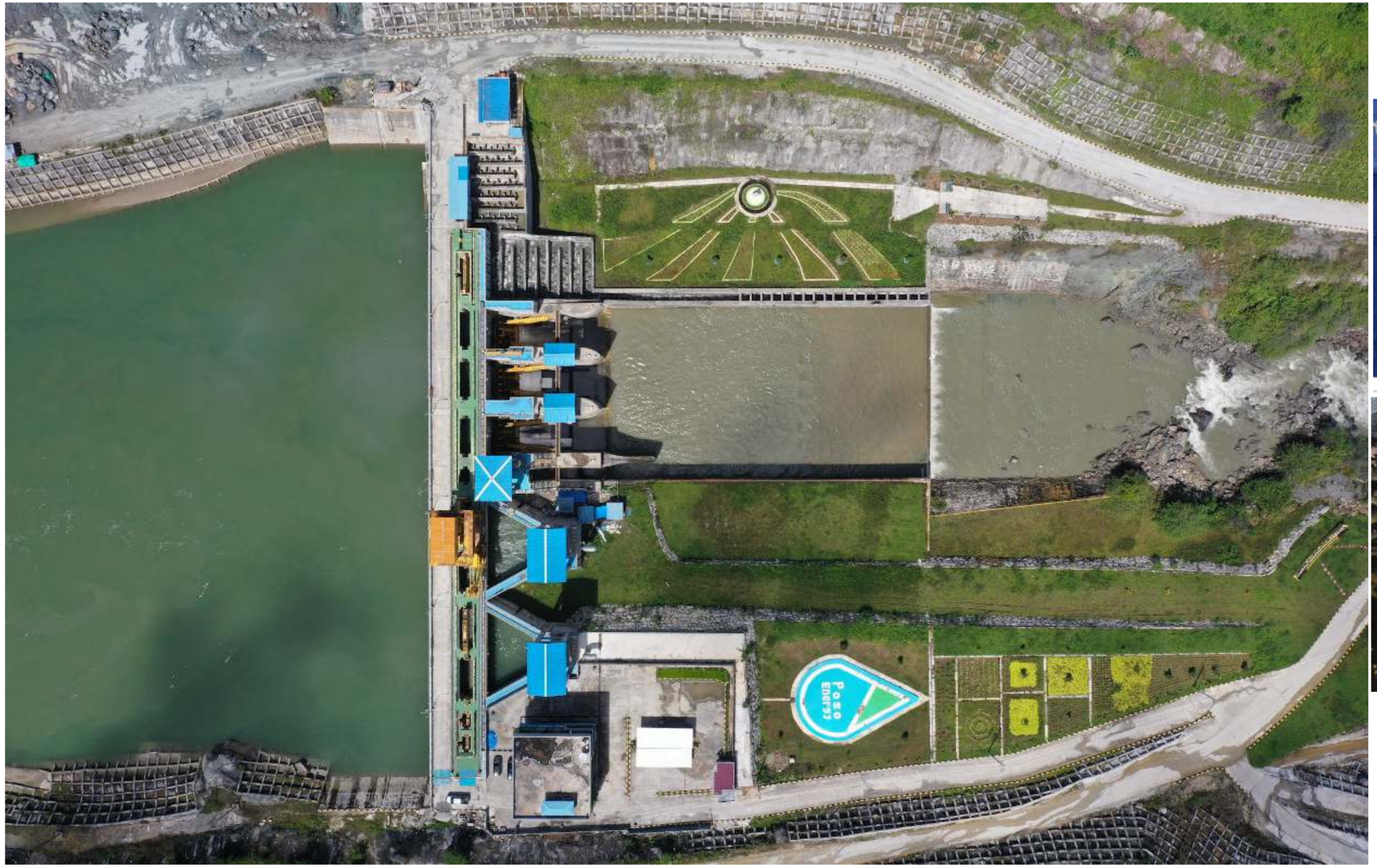


Modified from Yuen and ESDM, 2023)

Charles Sturt University

Poso 1

Central Sulawesi
Poso Energy (Private company) owns the property.



Poso 2

Planned Poso Dam 3

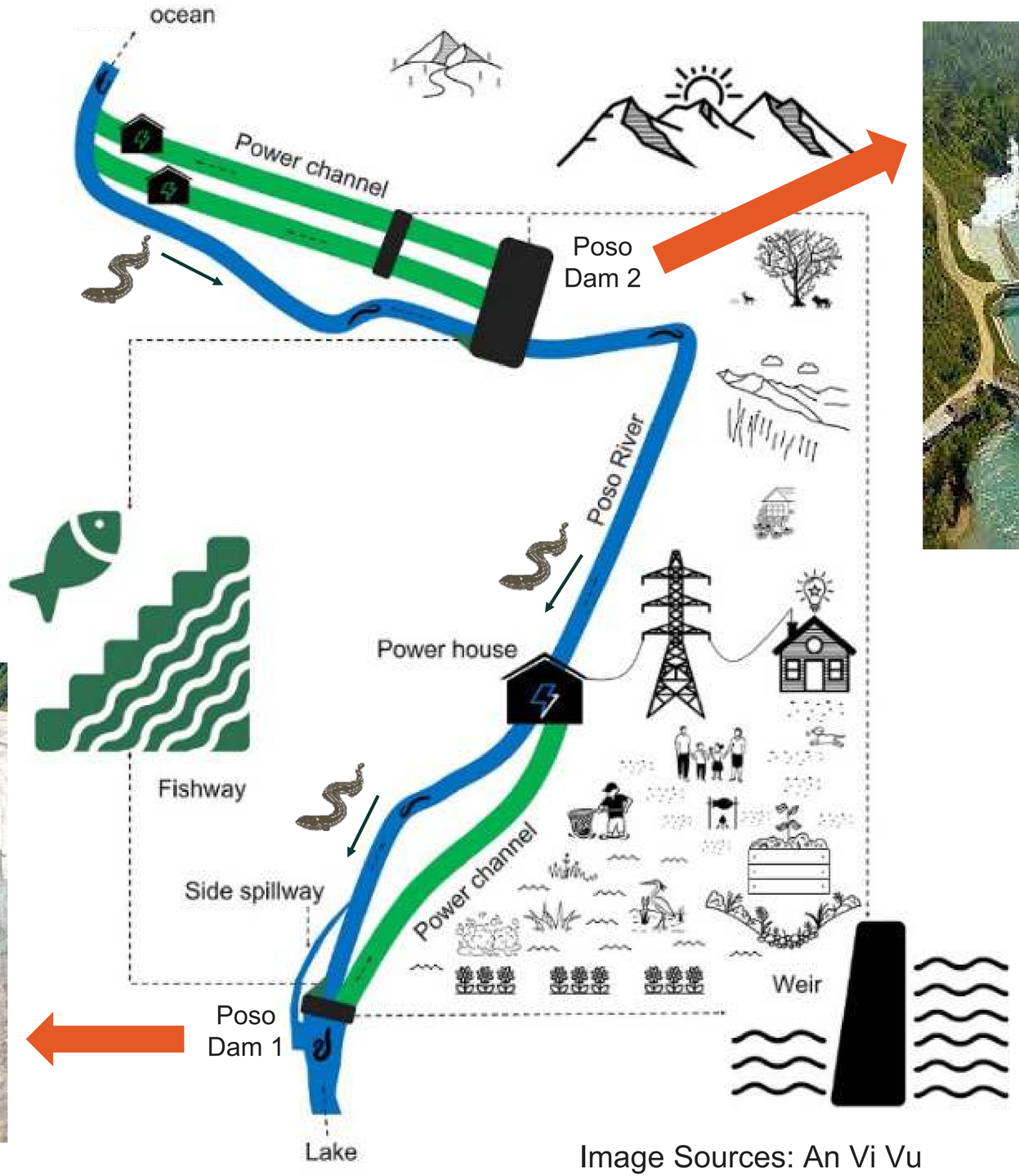
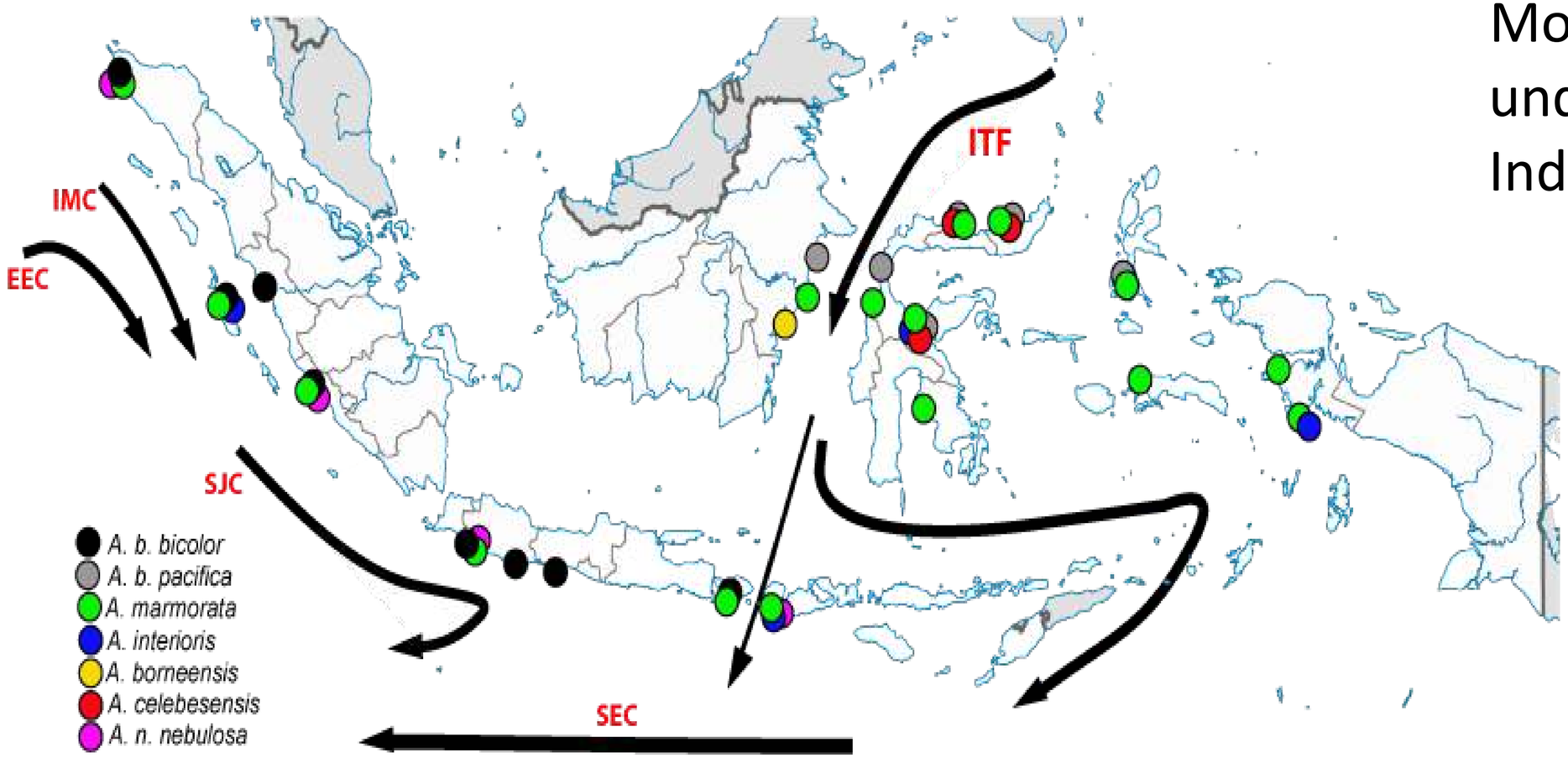


Image Sources: An Vi Vu

Eels's Biodiversity



Fahmi, 2015

More understanding on Indonesian eels

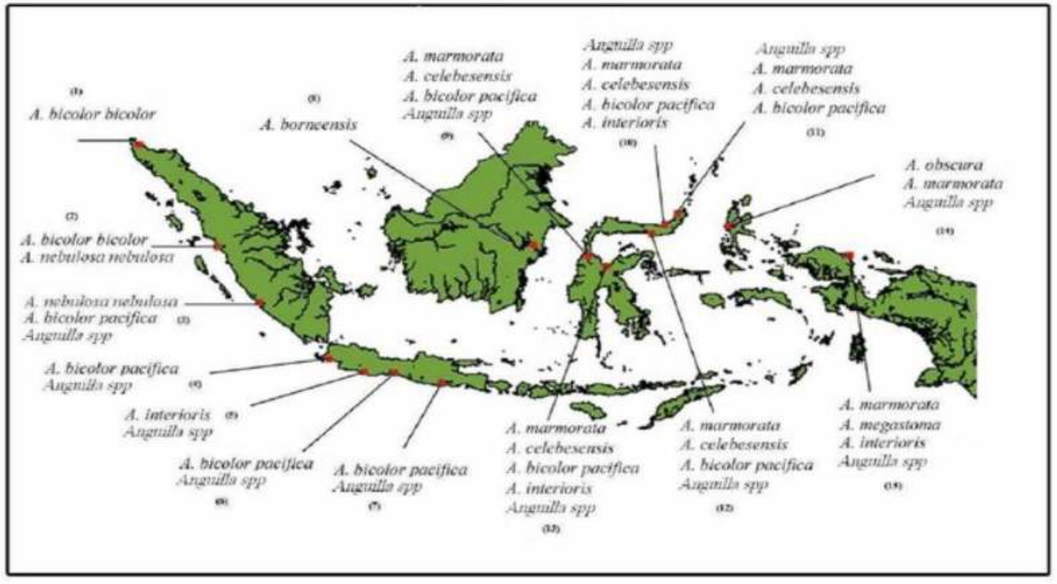
diversity

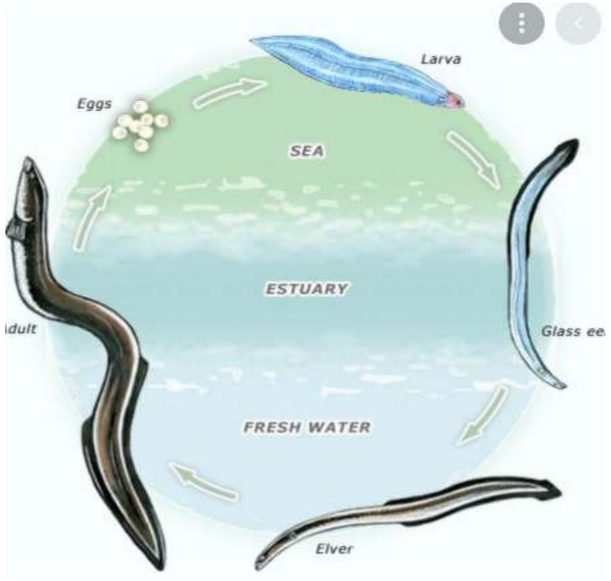
MDPI

Article

Assessing Temporal Patterns and Species Composition of Glass Eel (*Anguilla* spp.) Cohorts in Sumatra and Java Using DNA Barcodes

Arif Wibowo [1,2], Nicolas Hubert [3,*], Hadi Dahruddin [4], Dirk Steinke [5], Rezki Antoni Suhaimi [1,2], Samuel [1,2], Dwi Atminarso [1,2,6], Dian Pamularsih Anggraeni [1,2], Ike Trismawanti [1,2], Lee J. Baumgartner [6] and Nathan Ning [6]





3500 ton glass eel dengan estimasi USD 195 mil ~ 2.9 Tril (2012) (Brasor and Tsubuku 2012)

Poso production, 10 ton glass eels ~ 2.6 mil and 42 ton elver/yellow ~ 12.6 mil (2017)

Global Ecology and Conservation 26 (2021) e01493

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: http://www.elsevier.com/locate/gecco

Original Research Article

Genetic diversity, population structure and demographic history of the tropical eel *Anguilla bicolor pacifica* in Southeast Asia using mitochondrial DNA control region sequences

Melfa Marini [a, b, *], Ivane R. Pedrosa-Gerasmio [c], Mudjekeewis D. Santos [d], Takuro Shibuno [a], Ayu Daryani [a], Maria Rowena R. Romana-Eguia [e], Arif Wibowo [a, b]

[a] *Inland Fishery Resources Development and Management Department, Southeast Asian Fisheries Development Center, Jl. Gubernur H.A Bastari No 08, Jakabaring Palembang, 30252, Indonesia*
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[c] *Department of Marine Sciences, College of Science and Mathematics, Mindanao State University – Iligan Institute of Technology, Iligan City, Philippines*
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[e] *Aquaculture Department, Southeast Asian Fisheries Development Center, Binangonan Freshwater Station, Binangonan, 1940, Rizal, Philippines*

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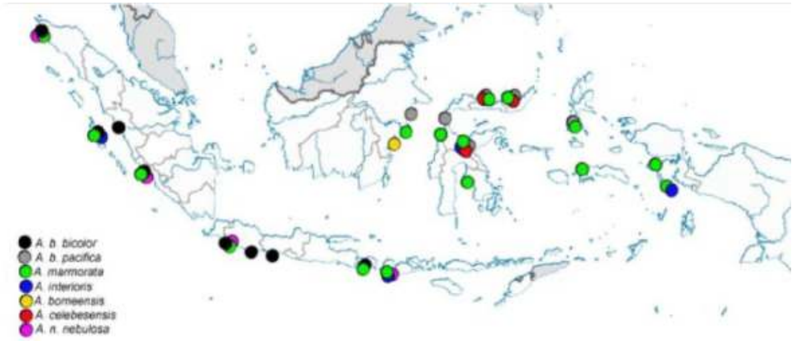
Keywords:

ABSTRACT

The tropical catadromous eel, *Anguilla bicolor pacifica*, an important fishery resource in Southeast Asia, is under threat due to overexploitation (especially of its glass eel phase) and the limited information on their current genetic status which is necessary for resource management. Mitochondrial DNA (mtDNA) control region sequences, a useful marker for population genetic studies in many aquatic organisms, were used to investigate the genetic diversity, population structure and demographic history of *A. bicolor pacifica* in the region



C. Anguilla celebensis

Anguilla celebensis memiliki bentuk tubuh bulat memanjang, mirip dengan belut. Sirip dada relatif kecil dan terletak tepat di belakang kepala yang mirip daun telinga, sehingga dinamakan "belut bertelinga". Letak perutnya jauh dari kepala dan mulut terminal. Sirip punggung menyatu dengan sirip ekor dan sirip dubur. Seperti spesies sidat lainnya, spesies ini memiliki sisik yang halus di permukaan tubuhnya. Pada tubuhnya terdapat 100 - 108 ruas tulang belakang/vertebrae. Memiliki panjang total (total length/TL) mencapai maksimum 150 cm.

Anguilla celebensis

Aquatic Sciences (2025) 87:2
https://doi.org/10.1007/s00027-024-01128-0

Aquatic Sciences

RESEARCH ARTICLE

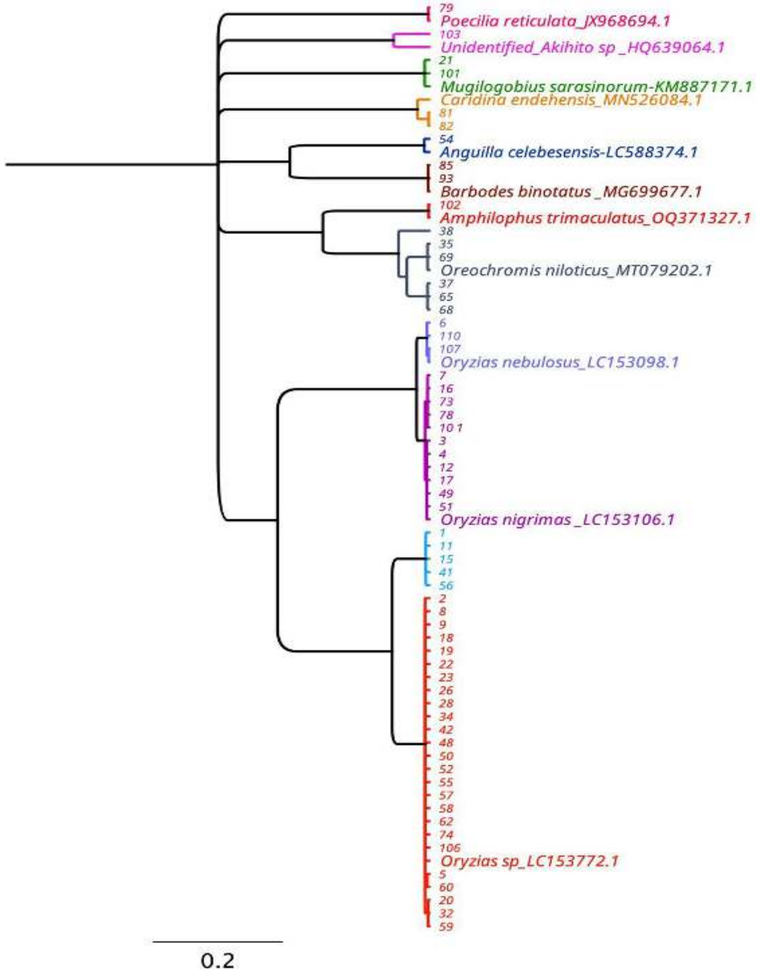
Characterizing spatial patterns among freshwater fishes and shrimps of the Poso River (Sulawesi, Indonesia) using DNA barcoding

Arif Wibowo[1] · Kurniawan Kurniawan[1,3,4] · Vitas Atmadi Prakoso[1,3,4] · Rendy Ginanjar[1,3,4] · Fathur Rochman[1] · Mochammad Zamroni[1] · Dwi Atminarso[1] · Bayu Kreshna Adhitya Sumarto[1] · Andi Chadijah[1] · Deni Irawan[1] · Tri Deniansen[1] · Irma Suriani[2] · Agus Noor Syamsi[2] · Andi Achmadi[2] · Indah Lestari Surbani[5] · Sabda Alam Akbar[5] · Nicolas Hubert[6] · Wayne Robinson[3] · Ivor G. Stuart[3] · Lee J. Baumgartner[3]

Received: 29 May 2024 / Accepted: 28 September 2024

Abstract

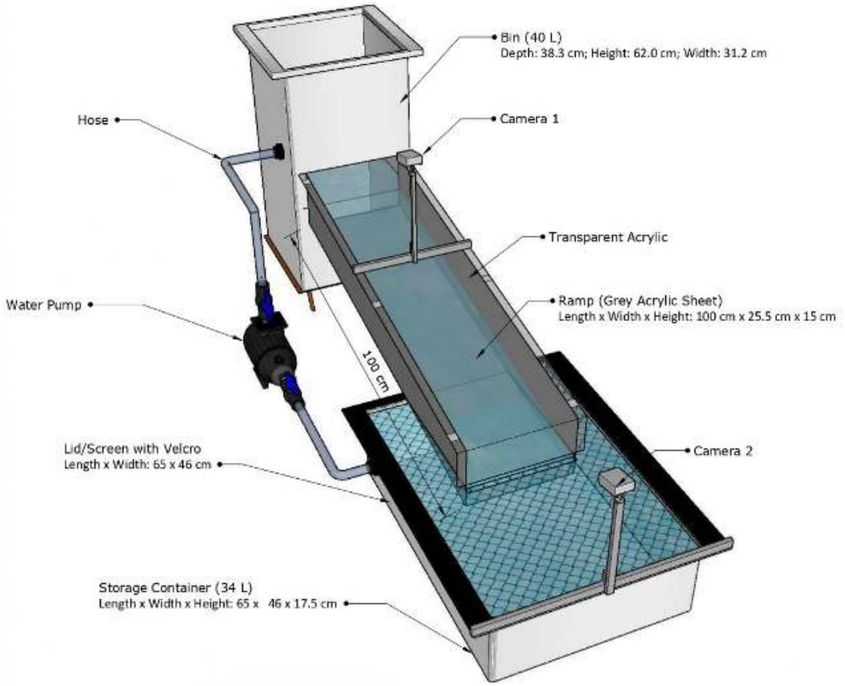
Fish biodiversity assessments are vital for understanding threats and aquatic ecosystem health. In the Poso River, Central Sulawesi, changes in biodiversity are influenced by habitat alteration, non-native species, and overfishing. This study evaluates fish and crustacean biodiversity in the Poso River system to address these challenges for improving fisheries management, conservation, and fish passage integration into hydropower development. The present biodiversity study utilized a comprehensive methodology that encompassed both traditional taxonomic approaches and DNA barcoding, specifically targeting the mitochondrial cytochrome *c* oxidase subunit-1 (*COI*) gene for accurate species identification and spatial boundary validation. The survey was conducted in the upstream, hydropower area and downstream areas of the river. We found 27 species of fish in the Poso River, including both native (e.g., *Anguilla celebesensis*, *Oryzias nebulosus*, *Rhyacichthys aspro*) and non-native species (e.g., *Melanochromis auratus*, *Amphilophus trimaculatus*, *Oreochromis niloticus*). Two International Union for Con-



Fishway Effectivity Assessment

PLTA Poso 1 (Trap)		PLTA Poso 1 (Env. Flow)		PLTA Poso 2 (Trap)		PLTA Poso 2 (Env. Flow)	
Fish	n	Fish	n	Fish	n	Fish	n
Trap 1 (up-Down)		Oreochromis niloticus	56	Trap 1 (Outlet Up-Down)	Fish	Tilapia niloticus	38
Rhyacichthys aspro	4	Cichlasoma trimaculatum	20	Tilapia niloticus	7	Cichlasoma trimaculatum	5
Tilapia niloticus	3	Adrianichthys sp 5	19	Barbodes binotatus	1	Rhyacichthys aspro	5
Adrianichthys sp5	2	Melanochromis auratus	12	Adrianichthys sp5	1	Osteochilus vittatus	3
Osteochilus vittatus	2	Awous sp	4			Awous sp	2
Barbodes binotatus	2	Gambusia affinis	4			Melanochromis auratus	1
		Mugilogobius sarasinorum	3	Trap 2 (Outlet Down_up)		Schismatogobius sp	1
		Osteochillus vittatus	3	Sicyopterus sp	3		
Trap 2 (Outlet Down_up)		Adrianichthys sp 4	2	Anguila marmorata	12		
Rhyacichthys aspro	4	Barbodes binotatus	2	Macrobrachium sp	1		
Barbodes binotatus	13	Anguilla marmorata	1	Trap 3 (Inlet Down_up)	1		
Osteochilus vittatus 2				Anguilla sp	2		
Trap 3 (Inlet Down_up)				Rhyacichthys aspro	1		
Barbodes binotatus	1						

Fish passed fishway: 1-2 fish per 24 hours and effectivity for multispesies 50% (7/14)

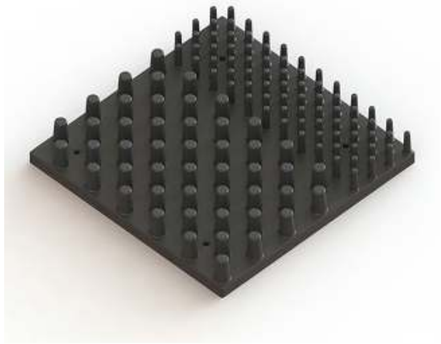


Assessment on juvenile eels' physiological and climbing performance

Flume experiment: Indonesia
Species: Indonesian anguillid eels (elvers)

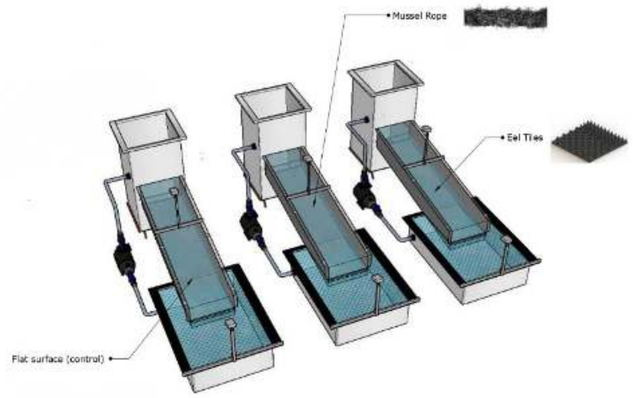
Explanatory variables:
Substrate type (eel tiles; ropes; no substrate)
Flow rate (0.1 m/s and 1.0 m/s)

n=20 each trial; 4 replicates



Eel tiles

Rope



Methodology

Test the optimum climbing substrate (from the flume experiment) in the field

Field experiment: Poso Dam (side spillway Poso Dam 1)

Species: juvenile anguillid eels (elvers) in Poso River (*A. marmorata*, *A. bicolor pacifica*, *A. celebesensis*)

Explanatory variables:
Substrate type (substrate, no substrate)
Time (night/day)

n=30 each trial; 5 replicates

Assessment on morphological, biochemical, population and community of juvenile eels migrating upstream

Location: Poso River, Indonesia

Explanatory variables:

(a) Longitudinal sites (estuary to dam);

(b) Seasons (dry and wet)

Trapping (based on most effective trap from RQ1)

- 7 nights

Population dynamics	Morphological	Biochemical
Age (otoliths)	**Morphometric measurements**	**Osmoregulation:** Osmolality
Sex ratios (M:F)	**Swim bladder development**	**Hormones:** whole body cortisol
Age at sex determination	**Eye development**	**Energetics:** glucose, creatinine
	Fin development	**Blood chemistry:** Na, Cl, K, Mg, P, cholesterol, triglycerides, albumin, AST, ALT, and ALP

Water physico-chemistry

Water velocity, depth, pH, water temperature, dissolved oxygen, salinity, turbidity and alkalinity

Image source: Vu & Baumgartner (2021)

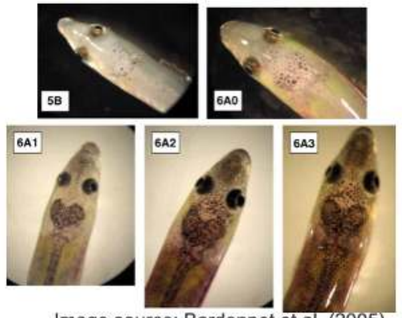
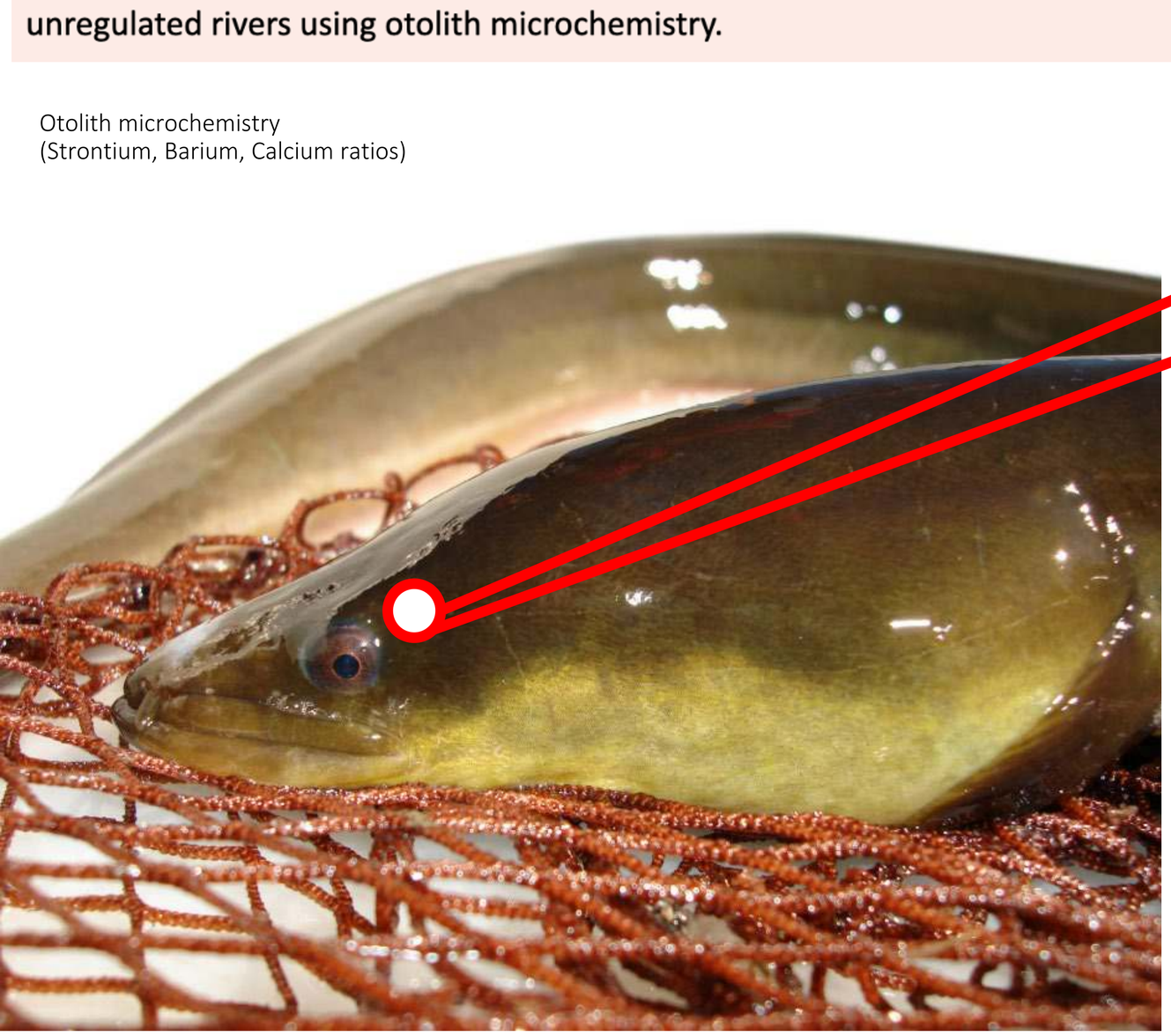
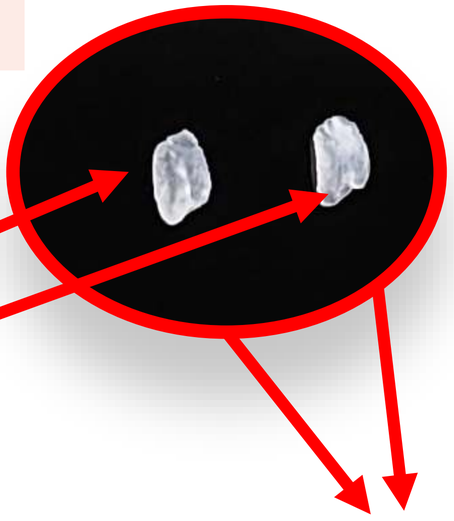


Image source: Bardonnet et al. (2005)

Objective 1: Determine riverine-estuarine migration patterns of Anguillid eels in regulated and unregulated rivers using otolith microchemistry.

Otolith microchemistry
(Strontium, Barium, Calcium ratios)





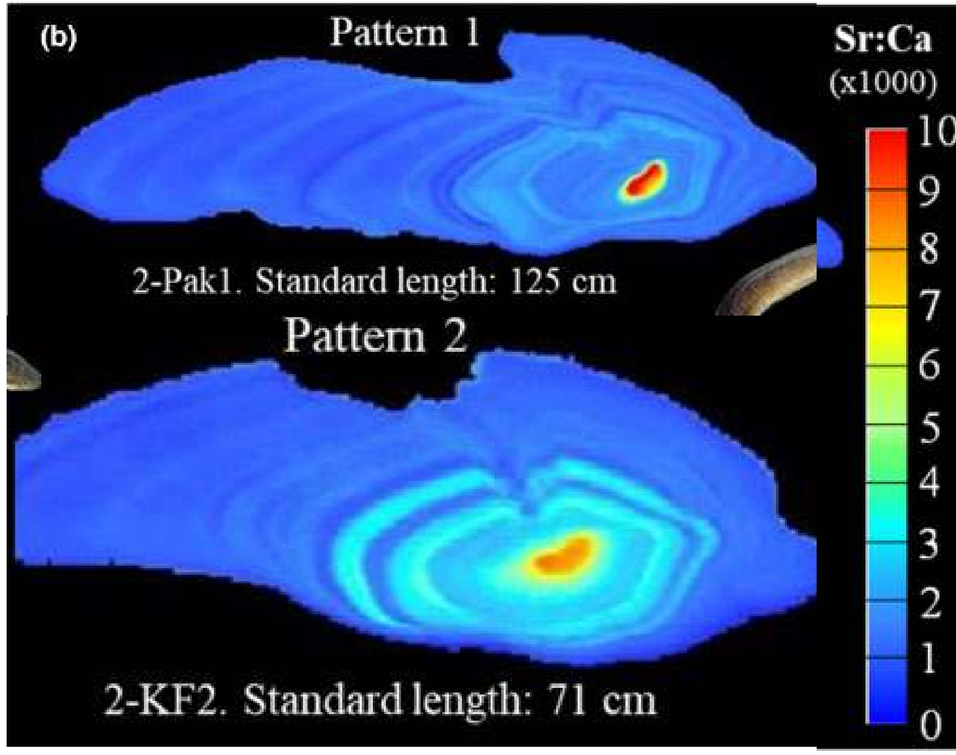


FIGURE 4 Variations of Sr:Ca ratios from core to edge of otoliths of *Anguilla marmorata*. (a) Dashed horizontal lines are environmental thresholds: freshwater residence if $y < 3.25$; brackish water residence if $3.25 \leq y < 10.17$; and marine water residence if $y > 10.17$. Black lines indicate Sr:Ca ratios that are chemically different between two adjacent zones (identified by regime shift analysis). (b) Two-dimensional Sr:Ca ratio maps. See Appendix S3 for individual plots of Sr:Ca ratios and Ba:Ca ratios. Specimen codes and total length are indicated

Do glass eels migrating in regulated and unregulated rivers of the Tomini Bay area exhibit sibling relationships?

Objective: Assess glass eel recruitment and kinship reconstruction in Poso and surrounding rivers

Method

Glass eel Collection

Locations

Tomini bay estuary :

Poso River, Bongka River, Palu River, Tinombo river

Field trip:

Dry Season, September-November 2024/2025

Wet season, May-July 2025/2026

Fishing method

Fyke net

- Number of fyke net : 4 units,
- five days including two days before new moon, at the new moon and 2 days after new moon.
- Time: 3-6am

Charles Sturt University

BRIN BADAN RISET DAN INOVASI NASIONAL

ACIAR

West Java

The Water Resource Management Office of West Java Province (PSDA) owns the property

CIBARENO RIVER WEIR INDONESIA

FISH PASSAGE STRUCTURE DESIGN

CO-ORDINATES : 6°52'41" S 106°25'11" E ELEV ~294m

Charles Sturt University

CSU Engineering Consulting

CERTIFIED

BY.....

NOT FOR CONSTRUCTION

BRIN

ACIAR

Charles Sturt University Gulbali Institute

FISH PASSAGE STRUCTURE
CIBARENO, INDONESIA

DESIGN DRAWINGS

TITLE SHEET

501 of S18

KD18062 - 364

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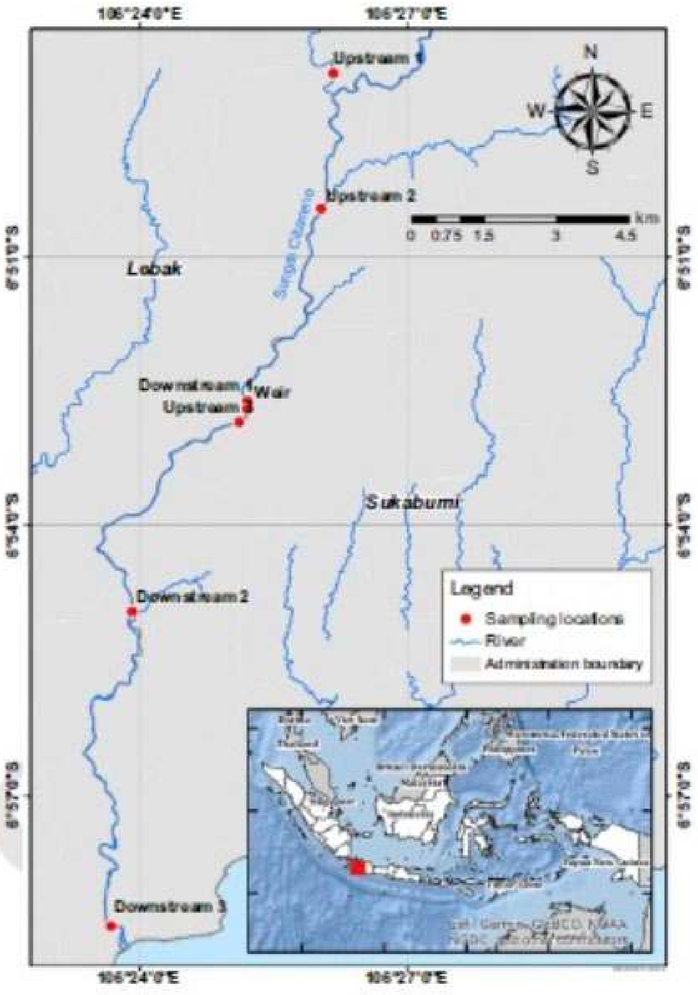

Aquatic Conservation: Marine and Freshwater Ecosystems

WILEY

ARTICLE OPEN ACCESS

Integrating Direct Experimental Fishing and Environmental DNA Metabarcoding to Assess Fish Biodiversity in the Cibareno River, Indonesia, to Support Fishway Design

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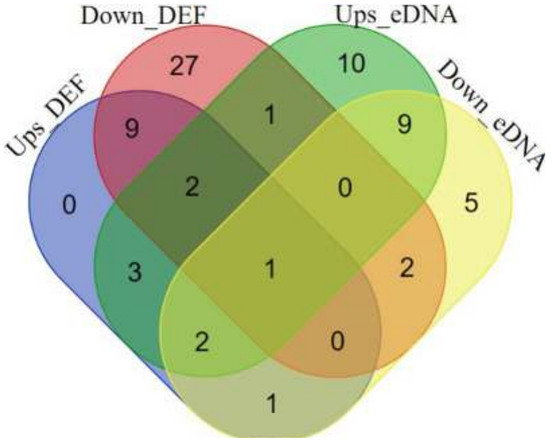

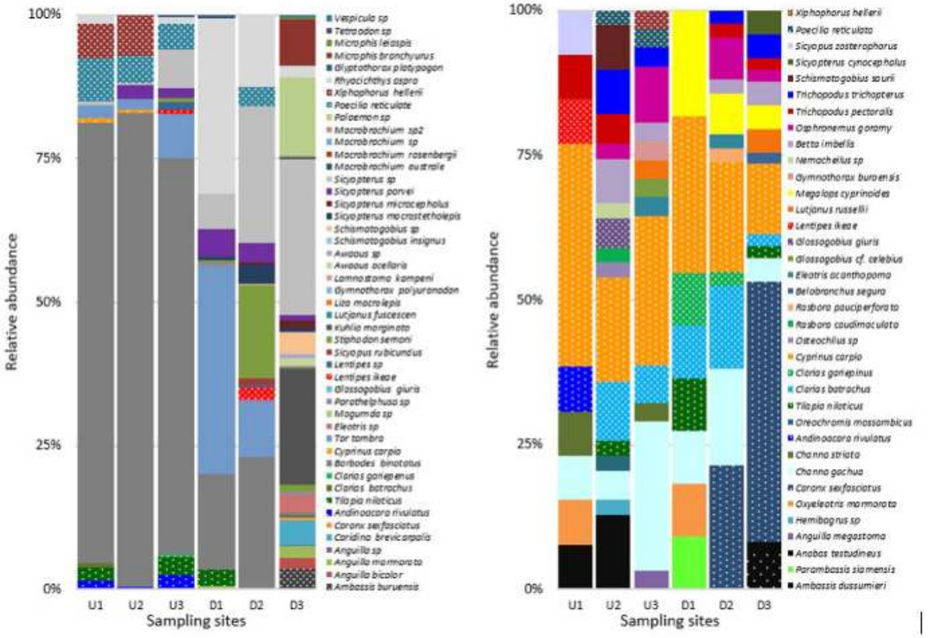

MARINE & FRESHWATER RESEARCH

RESEARCH PAPER
https://doi.org/10.1071/MF24236

MARINE & FRESHWATER RESEARCH

DNA barcoding reveals larval fish diversity and distribution along the Cibareno River (West Java, Indonesia)

Arif Wibowo[A], Andi Chadijah[A], Kurniawan Kurniawan[A,B,C], Vitas Atmadi Prakoso[A,B,C,*], Dwi Atminarso[A,B,C], Deni Irawan[A], Fathur Rochman[A], Septiana Sri Astuti[A], Indah Lestari Surbani[D], Tri Deniansen[A], Imron Rosadi[E], Yohanes Yudha P. Jaya[E], Sudarsono Sudarsono[E], Lee J. Baumgartner[B], Nicolas Hubert[F] and Ivor G. Stuart[B]

For full list of author affiliations and declarations see end of paper

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Email: vprakoso@csu.edu.au

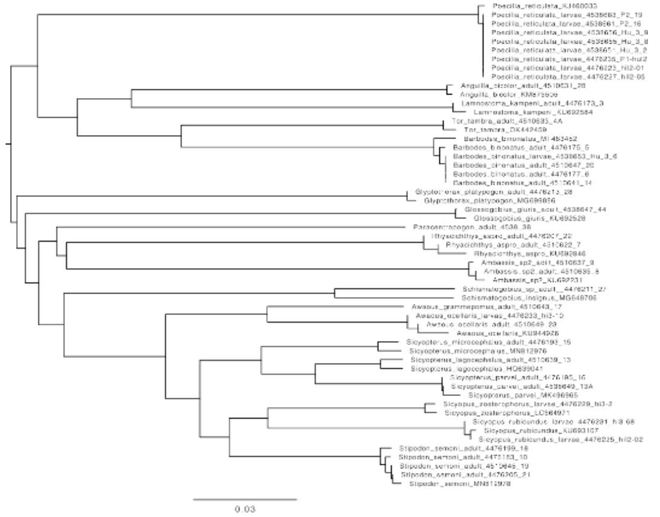
Handling Editor:
Peter Unmack

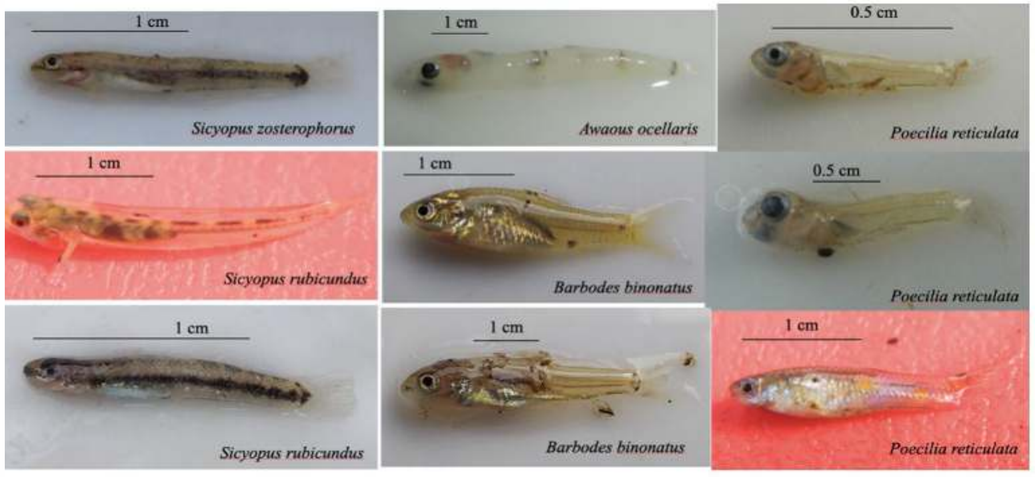
ABSTRACT

Context. There is a global problem with ongoing riverine infrastructure projects where, despite knowledge of potential environmental impacts, there is rapid development, often without appropriate environmental safeguards. This results in fragmentation of riverine fish communities, especially diadromous species. Understanding freshwater fish larval ecology is critical to provide insight into the likely impacts of these projects. **Aims.** To assess fish larval biodiversity on the basis of DNA barcoding, abundance and its distribution pattern in the Cibareno River. **Methods.** Fish larvae were collected at six locations in the Cibareno River. The larvae were identified by DNA barcoding. **Key results.** A notable disparity was seen in the distribution of larval abundance in different locations. The non-native species, *Poecilia reticulata*, was the most abundant larval species, with an intraspecific diversity of 0.003 (99.7% similarity). The upstream area exhibited a lower level of larval species diversity than did the downstream area. **Conclusions.** Genetic identification can reliably identify fish larvae and determine their spatial riverside distribution in the Cibareno River. The conservation of connectivity maintains fish community integrity and diversity between upstream and downstream locations in the weir building plan. **Implications.** This discovery emphasises the relevance of larval identification in fish biodiversity assessment and sustainable fisheries resource monitoring.

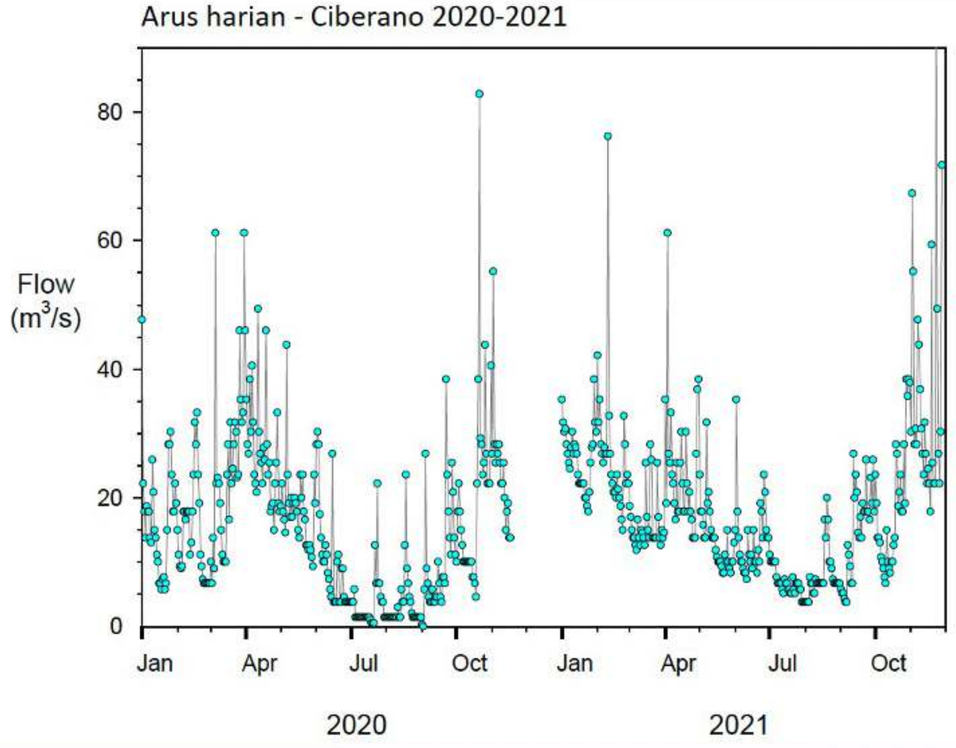
Keywords: aquatic ecology, biodiversity, conservation, DNA barcoding, early life stages, ichthyoplankton, larval fish, species composition.

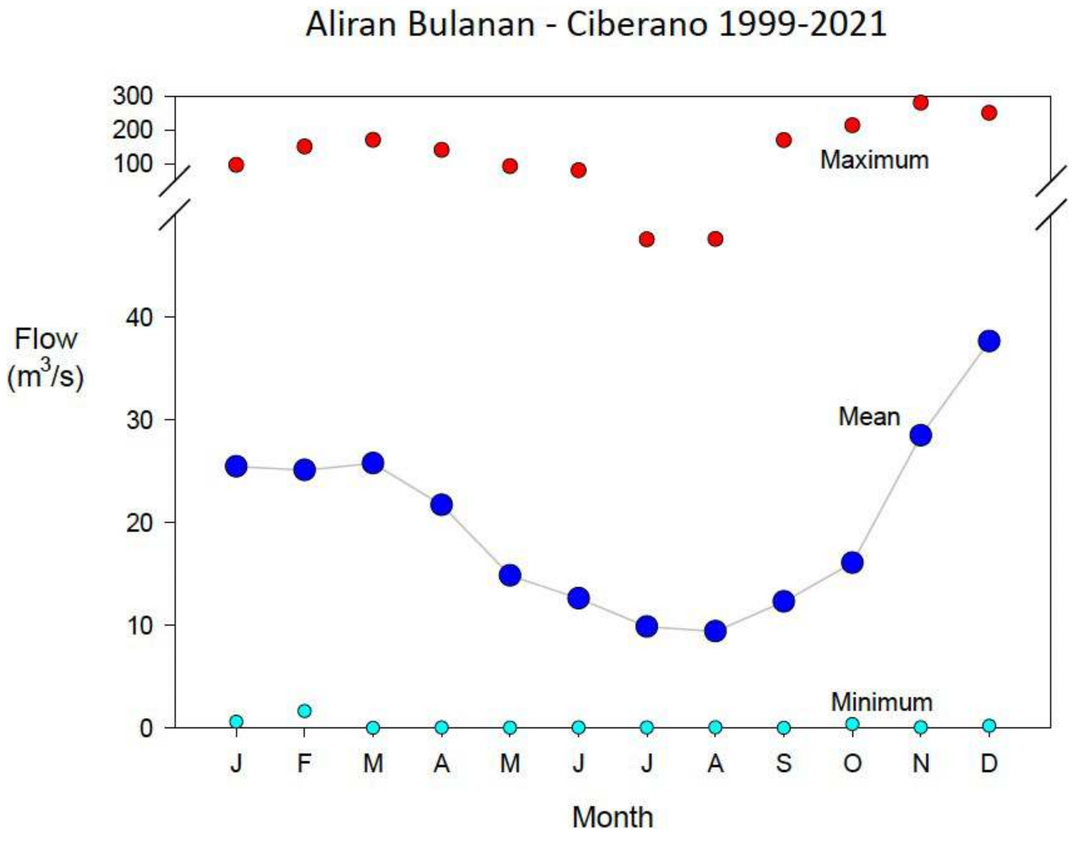
Introduction



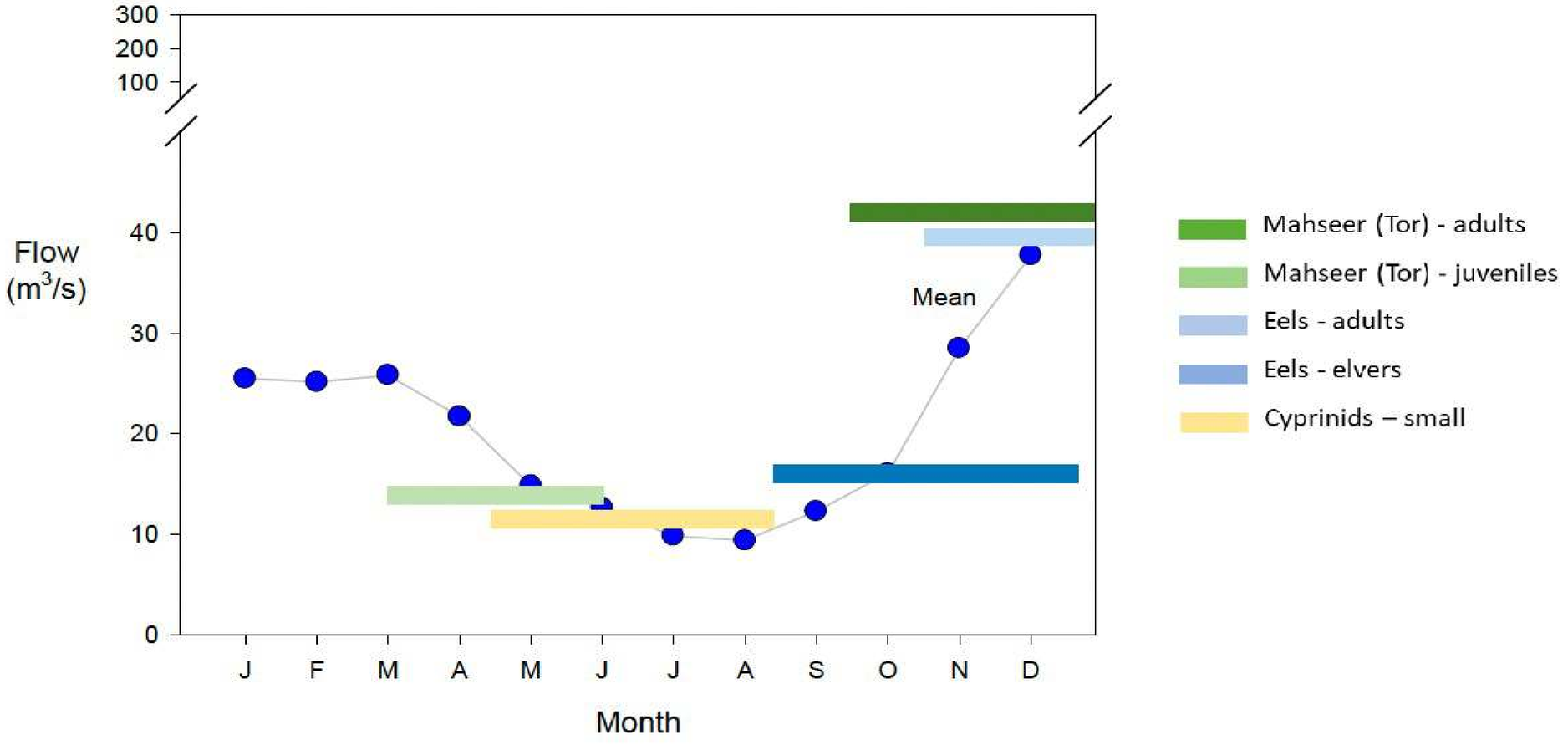


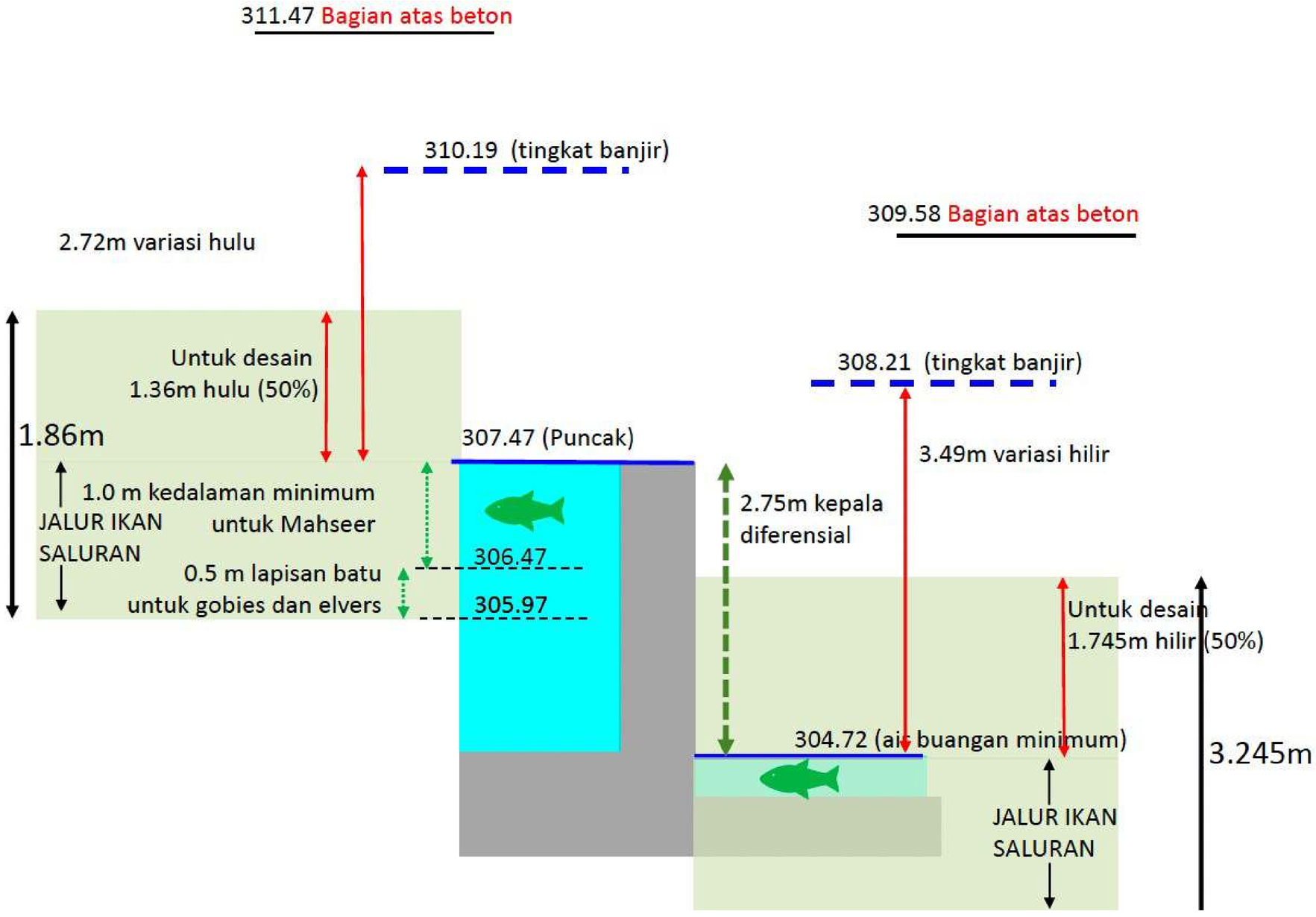
Studi Kasus - Caringin Bendung

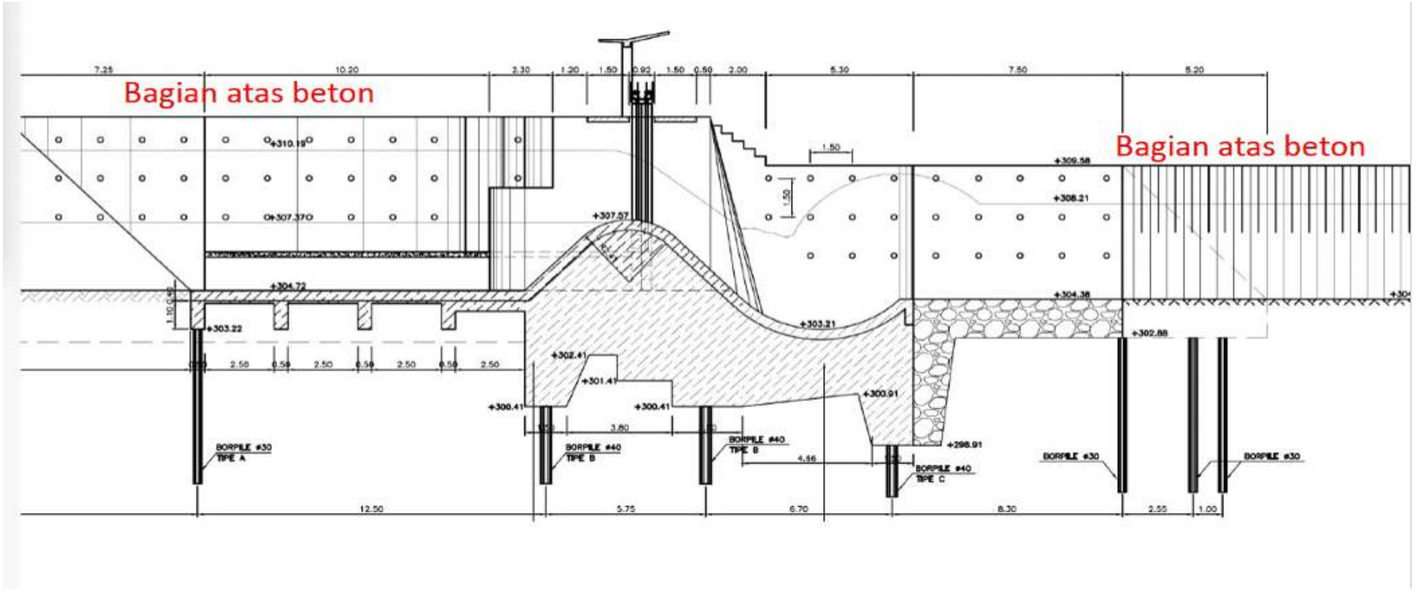


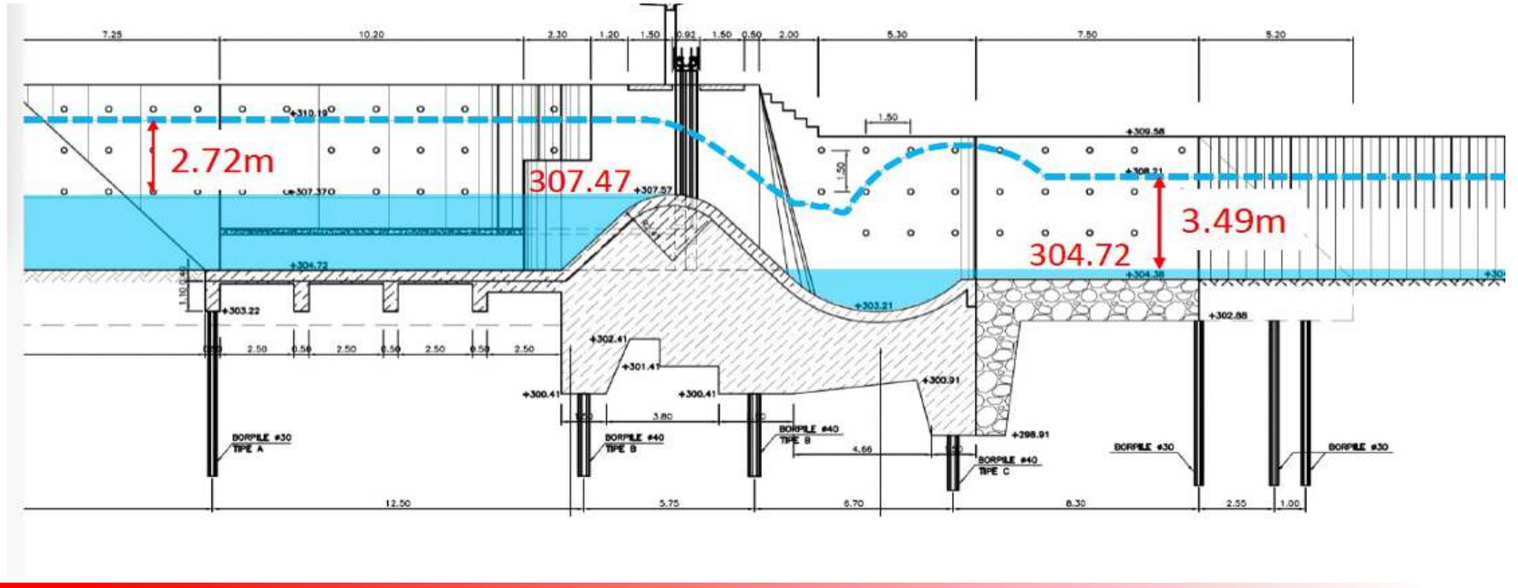


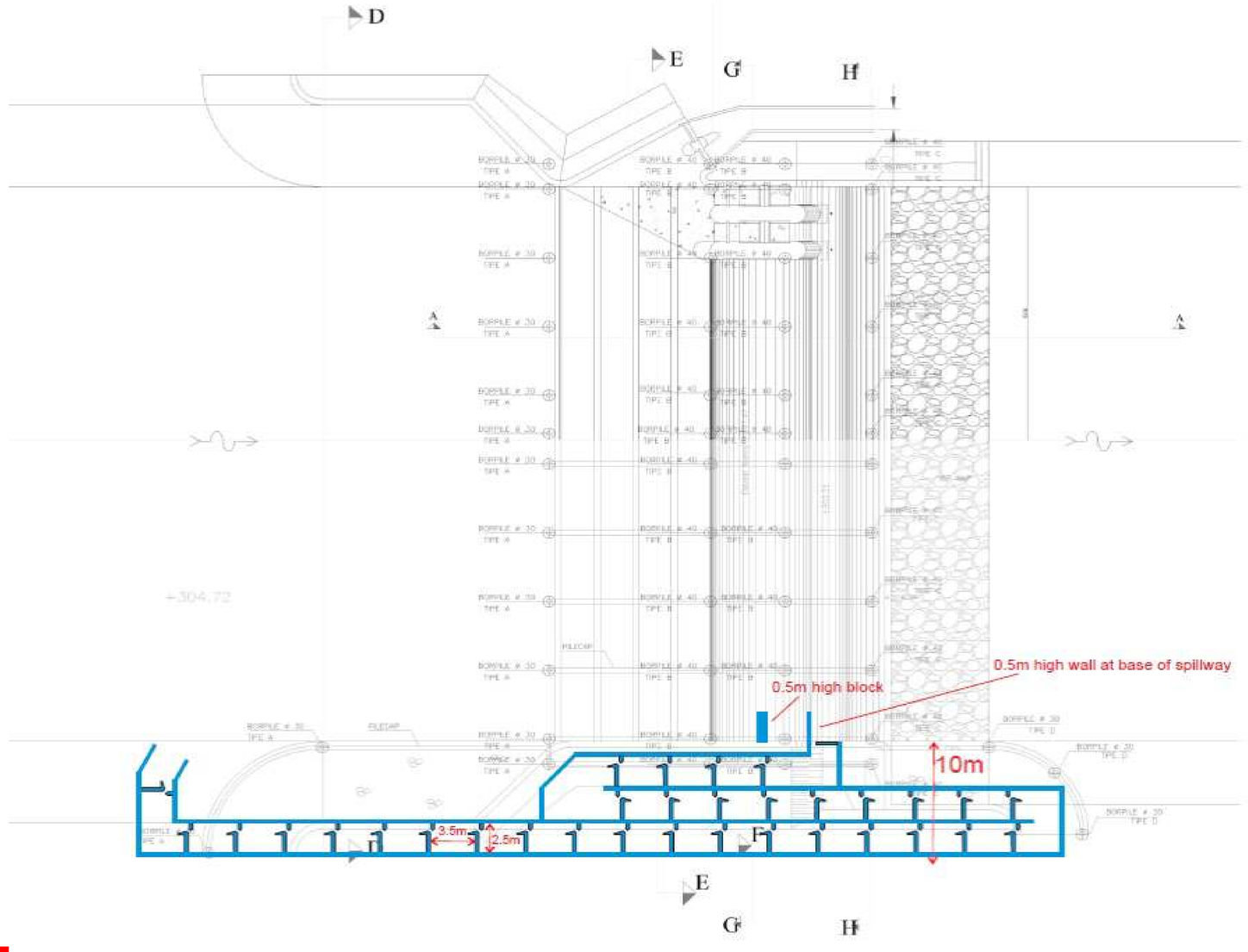
Ciberano Sungai – migrasi ikan




311.47 Bagian atas beton
310.19 (tingkat banjir)
2.72m variasi hulu
Untuk desain
1.36m hulu (50%)
1.86m
1.0 m kedalaman minimum
untuk Mahseer
JALUR IKAN
SALURAN
0.5 m lapisan batu
untuk gobies dan elvers
307.47 (Puncak)
306.47
305.97
309.58 Bagian atas beton
308.21 (tingkat banjir)
3.49m variasi hilir
2.75m kepala
diferensial
Untuk desain
1.745m hilir (50%)
304.72 (air buangan minimum)
JALUR IKAN
SALURAN
3.245m


Bagian atas beton
Bagian atas beton

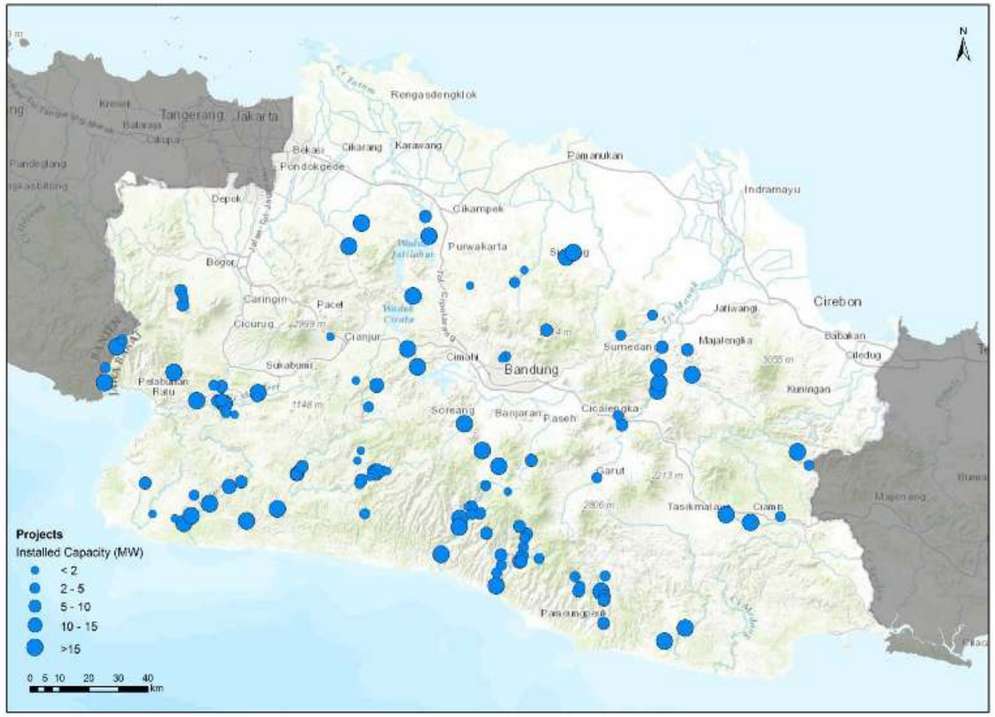

2.72m
307.47
3.49m
304.72

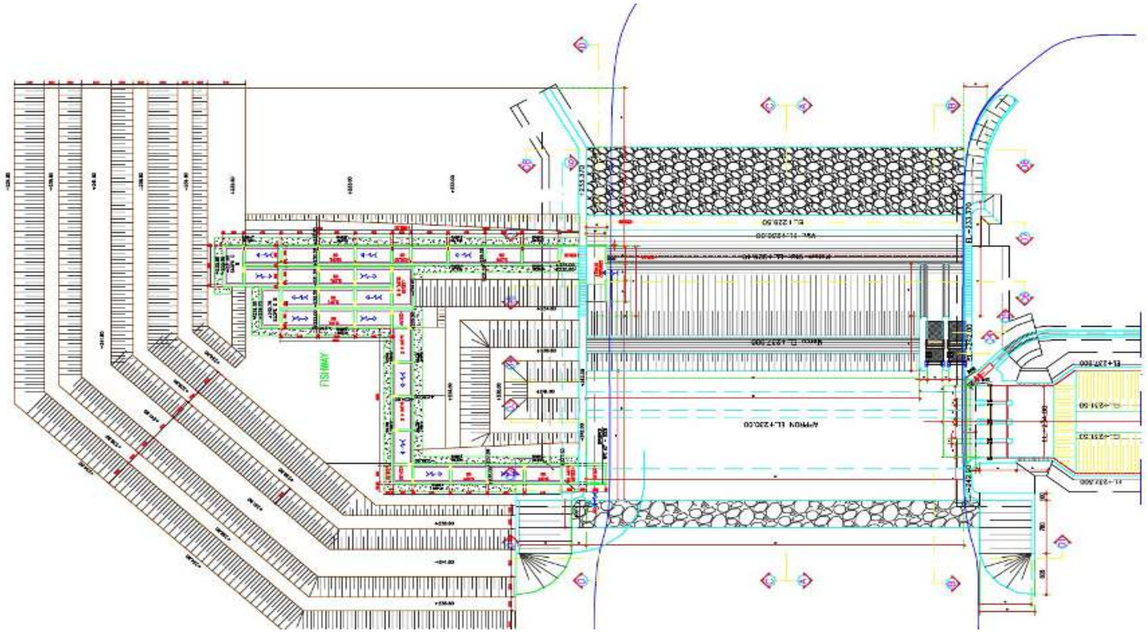

D
E
G
H
A
A
0.5m high block
0.5m high wall at base of spillway
10m
3.5m
2.5m
F
E
G
H

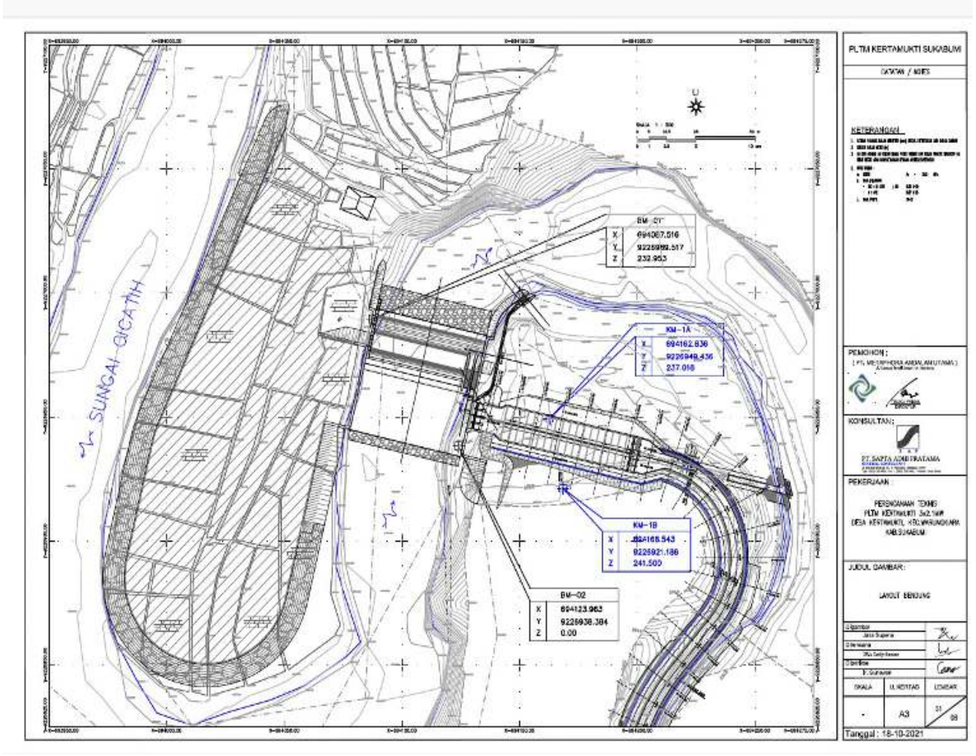
Kertamukti Weir

West Java

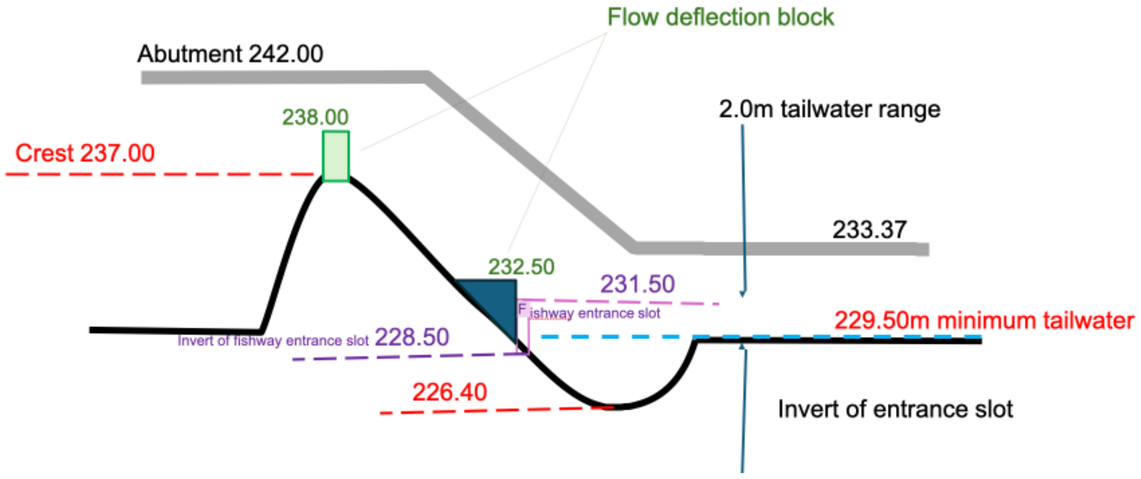
Methapora Andalan Utama (Private company) owns the property.

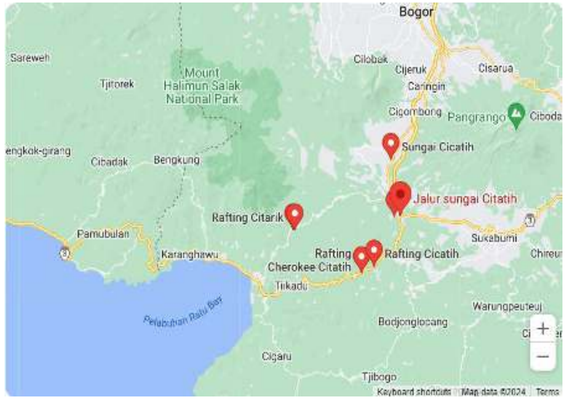






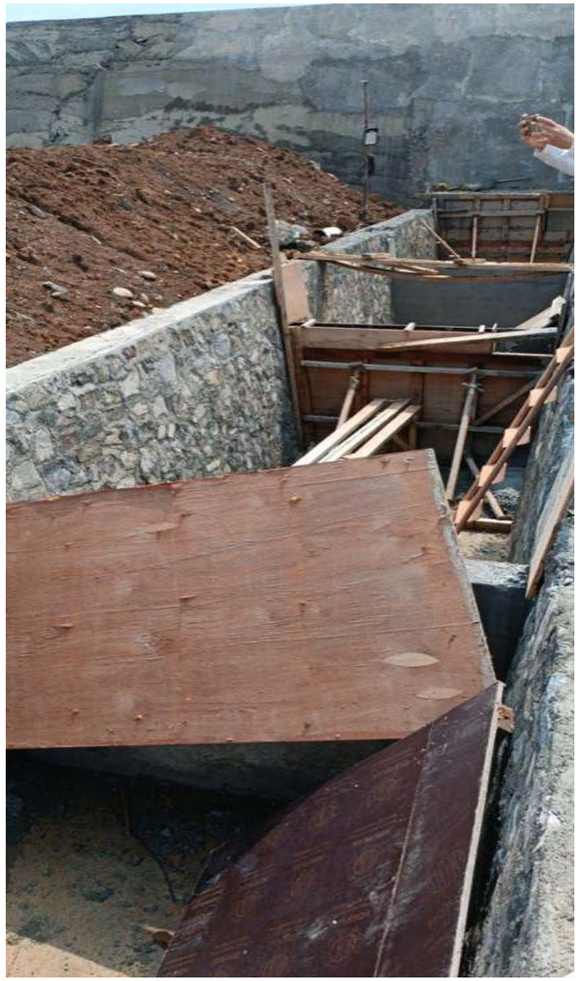
Research activities in Kertamukti Weir, Sukabumi, West Java, Indonesia





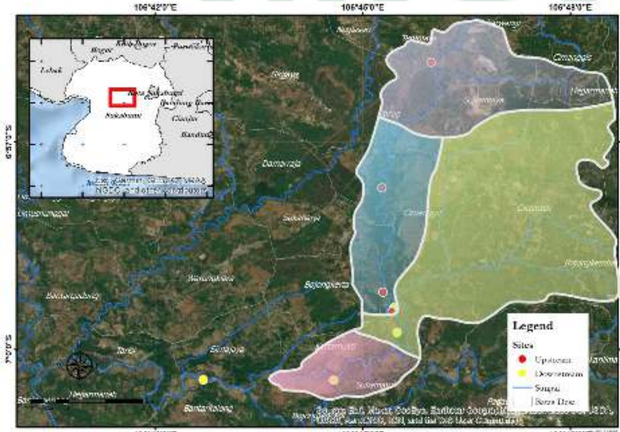
Area of Citatih River, Sukabumi West Java

November 2024



CHAPTER 3: IMPACTS OF FISH COMMUNITY TO KERTAMUKTI HYDROPOWER

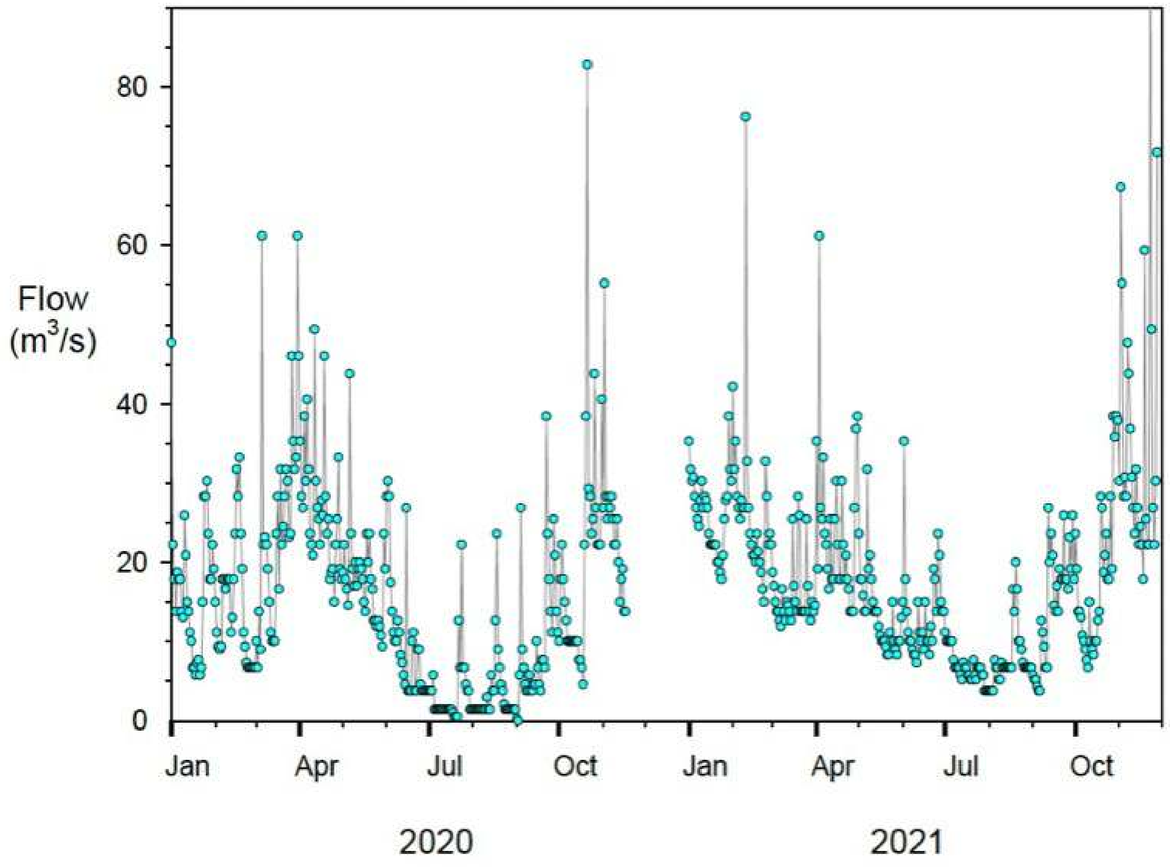
- **Work and time plan:**
  - Surveys: 1 Oct/Nov 24 (DWI), 2 - Mar/Apr (25), 3 - Jul/Aug (25), 4 - Nov (25) and 5 Feb/Mar (26).
  - Completed section in proposal - Dec 2024.
  - Candidate of PhD presentation and acceptance of proposal – Jan 2025.
  - ETHICS Preparation with CSU before survey 2 Mar/Apr 25.
  - Indonesia permissions (Research permit from BRIN, Local government (Sukabumi Regency, Kertamukti district), hydropower company etc) before survey 2 Mar/Apr 25.
  - Obtain all equipment/research sampling team etc. before survey 2 Mar/Apr 25.
  - Field sampling Survey 2 - Mar/Apr (25), Survey 3 - Jul/Aug (25), 4 - Nov (25) and 5 Feb/Mar (26).
  - Methodology and implementation:
    - Physical section – review data before survey **2** and survey **2-5** and assessment/write up by Aug 26.
    - Biological section – review data before survey **2** and survey **2-5** and assessment/write up by Aug 26.
    - Integration – start after survey 3 and complete after survey **5**, write up by Aug 26.
  - Write paper for submission Aug 26.



• Topographic, Hydrological Challenges and Climate Change

Indonesia has a varied topography, with many steep and fast-flowing rivers. This makes it difficult to build effective fishways.

Climate change causes uncertainty in water flow patterns, which can affect the effectiveness of fishways.



In the dry season the dam will dry up and only water will be available in the stilling pool area.

During the rainy season, all the water will overflow into the dam body and the peak occurs during flooding.

- **Habitat Destruction, Ecosystem Fragmentation and Cost and Funding**

Dams, canals, and other infrastructure often cut off fish migration routes.

Fishways require significant costs for planning, construction, and maintenance. In many cases, infrastructure project developers prioritise cost efficiency, so fishways are not a priority.

EXISTING WATER INFRASTRUCTURES

231 RESERVOIRS

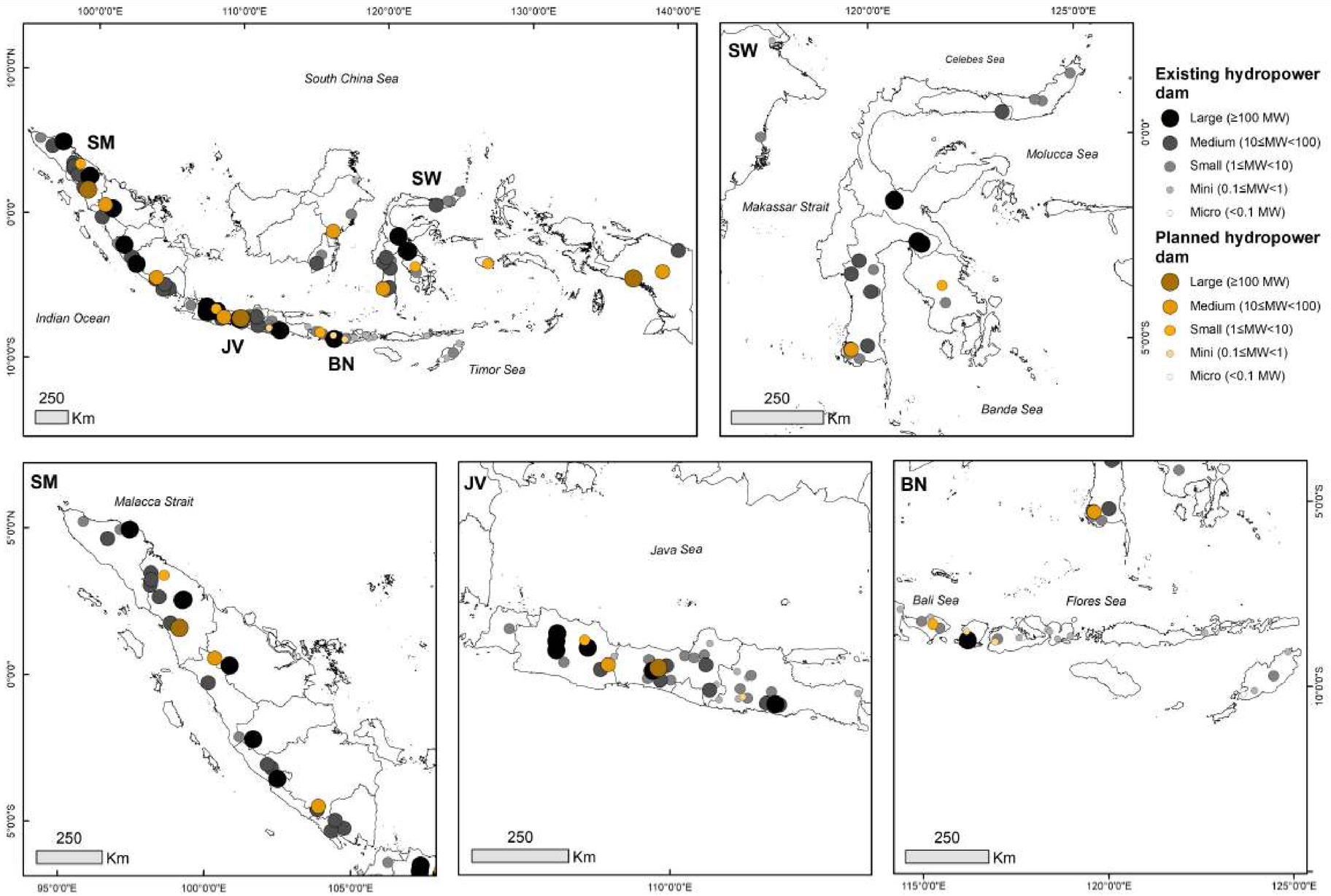
3299 WEIRS

TOTAL 3530

Proposed dams 2019-2024 = 65 New Large Dams

Massive Dam Construction in Indonesia for Hydroelectric Power and Irrigation

Hydropower development in Indonesia



Currently 99 hydropower dams in existence or under construction

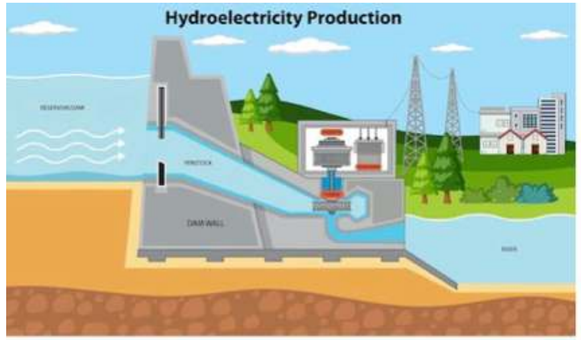
18 hydropower dams planned

Source: Yuen et al. (2023)

- **Limitations of Regulation, Law Enforcement and Lack of Multi-Stakeholder Collaboration**

There are no specific regulations that require the construction of fishways in every dam or hydroelectric power plant (PLTA) project. Weak law enforcement related to the protection of aquatic habitats.

There is no synergy between the government, academics, NGOs, and local communities in planning and implementing fishways.



SALINAN

PRESIDEN
REPUBLIK INDONESIA

INSTRUKSI PRESIDEN REPUBLIK INDONESIA

NOMOR 1 TAHUN 2023

TENTANG

PENGARUSUTAMAAN PELESTARIAN KEANEKARAGAMAN HAYATI

DALAM PEMBANGUNAN BERKELANJUTAN

PRESIDEN REPUBLIK INDONESIA,

The Government of Indonesia is committed to expediting the attainment of the national Sustainable Development Goals (SDGs) target

The concept of Environmental Protection and Management (PPLH), as defined in Law No. 32 of 2009, encompasses a comprehensive and systematic approach aimed at preserving environmental functions

The Government Law of the Republic of Indonesia Number 46 of 2016, which pertains to the procedural guidelines for conducting strategic environmental

Government Regulation No. 121 of 2015, which pertains to the utilisation of water resources in alignment with the Sustainable Development Goals (SDGs)

Presidential Regulation of the Republic of Indonesia Number 111 of 2022, which pertains to the execution of efforts aimed at attaining the Sustainable Development Goals.

The issuance of Minister of Public Works Regulation Number 9 of 2021, which provides recommendations for the implementation of sustainable construction,

Ministerial Regulation No. 19 of 2015 from the Ministry of Energy and Mineral Resources (ESDM).

President Joko Widodo officially endorsed Presidential Decree No. 1 of 2023 on January 16, 2023, which pertains to the integration of biodiversity into sustainable development practises.

Presidential Decree No. 1 of 2023

SALINAN

PRESIDEN
REPUBLIK INDONESIA

INSTRUKSI PRESIDEN REPUBLIK INDONESIA

NOMOR 1 TAHUN 2023

TENTANG

PENGARUSUTAMAAN PELESTARIAN KEANEKARAGAMAN HAYATI

DALAM PEMBANGUNAN BERKELANJUTAN

PRESIDEN REPUBLIK INDONESIA,

Dalam rangka pengarusutamaan pelestarian keanekaragaman hayati untuk tercapainya keseimbangan dan keterpaduan dalam pembangunan berkelanjutan diperlukan koordinasi dan integrasi antar kementerian/lembaga dan pemerintah daerah, dengan ini menginstruksikan:

MAINSTREAMING DIVERSITY CONSERVATION BIODIVERSITY FOR SUSTAINABLE DEVELOPMENT

7. Menteri Pekerjaan Umum dan Perumahan Rakyat:
   a. menyusun kebijakan teknis dan rencana terpadu pembangunan infrastruktur dengan mempertimbangkan unsur penyebaran keanekaragaman hayati antara lain kawasan konservasi, kawasan ekosistem esensial, habitat, dan daerah penyebaran flora dan fauna, serta daerah yang secara ekologis penting dan bernilai tinggi;
   b. mendukung keberlanjutan habitat satwa liar dan/atau kawasan yang mempunyai nilai keanekaragaman hayati tinggi dalam pembangunan infrastruktur; dan
   c. menerapkan prinsip pembangunan hijau atau *green infrastructure* antara lain jalan layang, koridor penyeberangan atau lintas satwa, pembangunan batas atau pagar alami dalam pembangunan infrastruktur pada wilayah yang melintasi habitat satwa liar dan/atau kawasan yang mempunyai nilai keanekaragaman hayati tinggi, serta menerapkan prinsip konstruksi berkelanjutan.

“support sustainability of wildlife habitat and/or an area with high biodiversity value in infrastructure development”

“implement green infrastructure such as flyovers, wildlife corridors, and natural barriers in infrastructure development for the area that is crossing the wildlife habitat and/or has high biodiversity value, and also commit to implementing sustainable infrastructure principles ”

SALINAN

PRESIDEN
REPUBLIK INDONESIA

PERATURAN PEMERINTAH REPUBLIK INDONESIA
NOMOR 38 TAHUN 2011
TENTANG
SUNGAI

DENGAN RAHMAT TUHAN YANG MAHA ESA

PRESIDEN REPUBLIK INDONESIA,

Pasal 25

(1) Perlindungan aliran pemeliharaan sungai sebagaimana dimaksud dalam Pasal 20 ayat (3) huruf a ditujukan untuk menjaga ekosistem sungai.

(2) Menjaga ekosistem sungai sebagaimana dimaksud pada ayat (1) dilakukan mulai dari hulu sampai muara sungai.

(3) Perlindungan aliran pemeliharaan sungai dilakukan dengan mengendalikan ketersediaan debit andalan 95% (sembilan puluh lima persen).

(4) Dalam hal debit andalan 95% (sembilan puluh lima persen) tidak tercapai, pengelola sumber daya air harus mengendalikan pemakaian air di hulu.

Article 25, point 1, and 2 of the **Indonesian Government Regulation on Rivers** mandate **the preservation of river flow for the protection of river ecosystems from upstream to downstream**.

MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT
REPUBLIK INDONESIA

PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT
REPUBLIK INDONESIA
NOMOR 9 TAHUN 2021
TENTANG
PEDOMAN PENYELENGGARAAN KONSTRUKSI BERKELANJUTAN

DENGAN RAHMAT TUHAN YANG MAHA ESA

MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT
REPUBLIK INDONESIA,

Regulation of Ministry Public Works and Housing, Indonesia Number 9 year 2021 regarding Guideline to Implement Sustainable Construction

1.5.6 Bangunan Pelengkap

Bangunan-bangunan atau perlengkapan yang akan ditambahkan ke bangunan utama diperlukan keperluan :

(1) Pengukuran debit dan muka air di sungai maupun di saluran.

(2) Rumah untuk operasi pintu.

(3) Peralatan komunikasi, tempat teduh serta perumahan untuk tenaga operasional, gudang dan ruang kerja untuk kegiatan operasional dan pemeliharaan.

(4) Jembatan di atas bendung, agar seluruh bagian bangunan utama mudah di jangkau, atau agar bagian-bagian itu terbuka untuk umum.

(5) Instalasi tenaga air mikro atau mini, tergantung pada hasil evaluasi ekonomi serta kemungkinan hidrolik. Instalasi ini bisa dibangun di dalam bangunan bendung atau di ujung kantong lumpur atau di awal saluran.

(6) Bangunan tangga ikan (*fish ladder*) diperlukan pada lokasi yang senyatanya perlu dijaga keseimbangan lingkungannya sehingga kehidupan biota tidak terganggu. Pada lokasi diluar pertimbangan tersebut tidak diperlukan tangga ikan.

Locations that need to maintain environmental balance to prevent biodiversity disturbance require fish ladder infrastructure. In locations outside of these considerations, fish ladders are not required.

National Standardization Agency of Indonesia

BADAN STANDARDISASI NASIONAL

SNI

Standar Nasional Indonesia

SNI 8397:2017

Guide to a feasibility study for the construction of a Micro Hydro Power Plant (PLTMH).

Panduan studi kelayakan pembangunan Pembangkit Listrik Tenaga Mikro Hidro (PLTMH)

SNI 8397:2017 - Tangga Ikan (Fish Ladder)

Standar ini memberikan panduan teknis mengenai perancangan, pembangunan, dan pemeliharaan tangga ikan di perairan yang terhalang oleh infrastruktur manusia, seperti bendungan atau pengaturan aliran air. Tangga ikan ini dirancang untuk memungkinkan ikan bermigrasi ke hulu atau hilir tanpa terhalang oleh struktur buatan.

Ruang Lingkup SNI 8397:2017

1. **Desain Tangga Ikan:**
   - **Tipe dan Model:** Standar ini menguraikan berbagai tipe tangga ikan yang sesuai dengan jenis ikan dan kondisi aliran air, termasuk tangga jenis bertangga, berundak, atau berbentuk celah (notch).
   - **Dimensi:** Menentukan dimensi tangga ikan yang optimal untuk spesies ikan yang berbeda, termasuk kedalaman air, ketinggian setiap langkah, dan kecepatan aliran air di dalam tangga.

SNI 8397:2017

This standard provides technical guidance regarding the design, construction, and maintenance of fish ladders in waters obstructed by human infrastructure, such as dams or water flow regulation. These fish ladders are designed to allow fish to migrate upstream or downstream without being obstructed by artificial structures.

Ministry of Environment and Forestry

Kajian Lingkungan Hidup (Environmental Assessment)

Berdasarkan ketentuan UU No. 32/2009 dan UU CK/2011, **Kajian Lingkungan Hidup** (*Environmental Assessment*) untuk Perencanaan dan Pelaksanaan **Pembangunan** di Indonesia antara lain mencakup:

1. **Kajian Lingkungan Hidup Strategis** (KLHS) → Perencanaan Kebijakan, Rencana dan Program (Landscape)
2. **Amdal, UKL-UPL dan SPPL** yang terintegrasi antara lain dengan kajian-kajian terkait pencemaran lingkungan dan pengelolaan LB3 → Perencanaan Usaha dan/atau Kegiatan (Tapak)
3. **Audit Lingkungan Hidup** yang terintegrasi dengan Analisis Risiko Lingkungan Hidup (ARLH) → Pelaksanaan Usaha dan/ atau Kegiatan (Tapak)

According to the provisions of Law No. 32/2009 and UU CK/2011, the Environmental Assessment for Development Planning and Implementation in Indonesia encompasses various aspects:

1. Strategic environmental studies
2. AMDAL, UKL-UPL dan SPPL (environment impact Assessment)
3. Environmental audit

Sumber:
https://m.medcom.id/foto/ekonomi/5b2XeL2K-melihat-aktivitas-gajah-di-terowongan-tol-pekanbaru-dumai

https://foto.bisnis.com/view/20191217/1182270/terowongan-gajah-tol-pekanbaru-dumai

Tol Sumatrai dilengkapi dengan enam terowongan untuk perlintasan gajah di dalamnya yang terletak di Seksi 2 (Sungai Tekuana) dan Seksi 4 (dekat Suaka Margasatwa Balai Raja).

Six tunnels for elephant crossings on the Sumatrai Toll Road are located in Section 2 (Tekuana River) and Section 4 (near Balai Raja Wildlife Reserve)

Business plan for hydroelectric power plant activities. Additionally, the intake form should incorporate a *fishway*. The construction of a *fishway* will facilitate the movement of fish.

2.3 Garis Besar Komponen Rencana Usaha dan/atau Kegiatan

Rencana usaha dan/atau kegiatan PLTA Sion yang akan dilaksanakan terdiri dari 4 (empat) tahap yaitu Tahap Pra Konstruksi, Tahap Konstruksi, Tahap Operasional dan Tahap Pasca Operasional. Kegiatan-kegiatan pada tahapan tersebut adalah sebagai berikut :

detail. Bendung *Intake* hendaknya juga dilengkapi dengan *fishway*. *Fishway* adalah struktur yang akan dibangun untuk memungkinkan terjadinya pergerakan ikan. Bentuk *fishway* dan

Akibat Bendung PLTMH Tanpa Fishway, Habitat Ikan Endemik sepanjang 1,5 KM Sungai Batang Pelangai Gadang Terancam Punah

Satriawan
Senin, 9 Januari 2023, 19:56 WITA

Bendung PLTMH PT Dempo Sumber Energi

Padang – Ikan Mingkih (Cestraeus plicatilis C.V.), ikan endemik sungai Batang Pelangai Gadang di Kecamatan Ranah Pesisir, Kabupaten Pesisir Selatan, Provinsi Sumatera Barat terancam punah. Pasalnya, jalur migrasi atau ruaya ikan yang hidup di hulu sungai dan bertelur di muara sungai itu, terhalang atau terputus oleh bendung Pembangkit Listrik Tenaga Mikro Hydro (PLTMH) yang dibangun PT Dempo Sumber Energi (PT DSE). Bendung yang dibangun memutus aliran air sungai tersebut tidak dilengkapi dengan tangga atau jalur khusus untuk turun naik ikan bermigrasi (fishway).

Hal ini diungkapkan oleh Anggota DPRD Kabupaten Pesisir Selatan dari Fraksi Partai Amanat Nasional, Novermal, S.H., M.H. melalui keterangan tertulisnya, Senin pagi, 9 Januar 2022. “Dinas Perkimtan dan LH Kabupaten Pesisir Selatan, Dinas LH Provinsi Sumbar, dan Kementerian LHK harus segera mengevaluasi dokumen lingkungan PLTMH PT DSE di sungai Batang Pelangai Gadang,” ujar Novermal. “Karena, bendung yang mereka bangun tidak dilengkapi dengan fishway,” tegasnya.

Number of infrastructures built and/or rehabilitated for fish migration routes (*fishways*) by PUPR and KKP

		2.1.9. Luas kawasan pesisir dan pulau-pulau kecil yang direhabilitasi	Hektare	KKP, Pemda
		2.1.10. Luas jalur migrasi biota perairan yang dibangun atau direhabilitasi	Hektare	KKP*, Swasta, Kemenhub
		2.1.11. Jumlah jalur migrasi biota perairan yang direhabilitasi	Jalur	KKP*, Swasta, Kemenhub
		2.1.12. Jumlah infrastruktur yang dibangun[/direhabilitasi] untuk jalur migrasi ikan (*fishway*)	Jumlah infrastruktur	PUPR, KKP
		2.1.13. Jumlah lokasi pemulihan ruang laut dari aktivitas perikanan	Lokasi	KKP
	2.2. Peningkatan efektivitas pemulihan ekosistem darat, kawasan pesisir dan laut	2.2.1. Proporsi keberhasilan pemulihan ekosistem darat dan perairan darat	Lokasi	KLHK, BRGM, PUPR
		2.2.2. Proporsi keberhasilan pemulihan ekosistem darat dan perairan darat	Lokasi	KLHK, KKP, BRGM

KEMENTERIAN PERENCANAAN PEMBANGUNAN NASIONAL/
BADAN PERENCANAAN PEMBANGUNAN NASIONAL
REPUBLIK INDONESIA

JALAN TAMAN SUROPATI NOMOR 2 JAKARTA 10310
TELEPON (021) 31936207, 3905650; FAKSIMILE (021) 3145374
www.bappenas.go.id

Nomor : B-01622/Dt.3.5/PR.01.02/01/2024 Jakarta, 29 Januari 2024
Sifat : Biasa
Lampiran : 1 (satu) berkas
Hal : Undangan Rapat Koordinasi Rancangan RPJMN 2025-2029
Bidang Pengelolaan Keanekaragaman Hayati

Nomenklatur	Indikator	Baseline	Target 202
Rehabilitasi ekosistem lamun yang rusak (kumulatif) - KLHK	Luas kawasan lamun yang direhabilitasi (hektar) (kumulatif) - KLHK		
Rehabilitasi ekosistem lamun yang rusak (kumulatif) -KKP *) Usulan proyek dari Dit KP	Luas kawasan lamun yang direhabilitasi (hektar) (kumulatif) - KKP	0	10
Rehabilitasi kawasan pesisir dan pulau-pulau kecil	Luas kawasan pesisir dan pulau-pulau kecil yang direhabilitasi (hektar)		
~~Rehabilitasi jalur migrasi biota laut yang dilindungi~~	~~Jumlah jalur migrasi biota laut yang dilindungi yang direhabilitasi~~		
Pengembangan infrastruktur jalur migrasi ikan (*fishway*)	Jumlah infrastruktur yang dibangun/direhabilitasi untuk jalur migrasi ikan (fishway)	4	

Inclusive fishway in greater collaboration and **RPJMN means medium-term development (5 years),** created by Bappenas as the basis for Indonesia's development planning for the next 5 years.

Development of fish migration route infrastructure (fishway) - ***Nomenclature***

Number of infrastructure built/ rehabilitated for fish migration routes (fishways) - ***indicator***

Sukabumi Regency

BUPATI SUKABUMI
PROVINSI JAWA BARAT
PERATURAN DAERAH KABUPATEN SUKABUMI
NOMOR 1 TAHUN 2023

TENTANG

PENGELOLAAN PERIKANAN

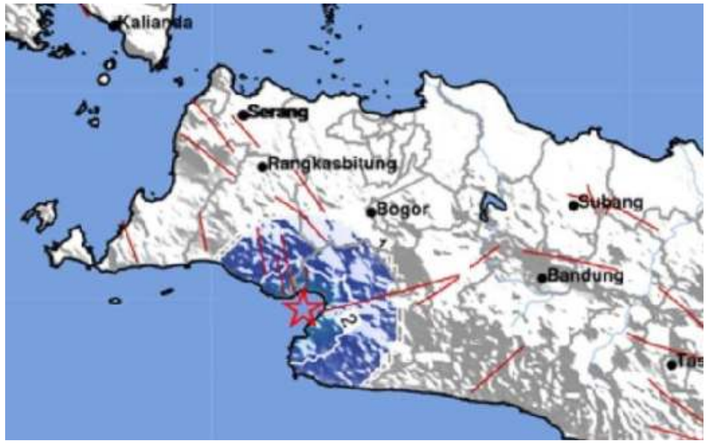
DENGAN RAHMAT TUHAN YANG MAHA ESA.

BAB IX
PELESTARIAN SUMBERDAYA IKAN

Bagian Kesatu
Pelestarian Jenis Ikan
Pasal 32

(1) Dalam rangka Pelestarian jenis ikan Pemerintah Daerah melakukan :
a. pembangunan jalur laluan ikan (*fishway/fish ladder*) pada setiap bendung dan bendungan yang dibangun disepanjang jalur migrasi/ruaya ikan;
b. pelestarian induk dan benih ikan; dan
c. domestikasi dan pelepasliaran benih ikan di alam;

The Sukabumi District Government has issued the Sukabumi District Regional Regulation on Fisheries Management, article 32 point 1 of which states that the **Regional Government must build fishways at each dam/dam along fish migration corridors to preserved fish species.**



Location of Sukabumi, West Java

No.	River name	Site/barrier name	Responsible agency/owner	Contact name	Contact email	Nearest city	Longitude	Latitude	st
Sumatra Island									
1	Komering River	Perjaya weir	BBWS VIII SUmatra/ central Government (PUPR)	Moh. Faozan Tsani	faozan975@gmail.com	Palembang	4.3049° S	104.3967°	
2	Batanghari River	Dharmasraya weir	BWS Padang/ central Government (PUPR)	-	-	Bandung	1.1121	101.6158	
Sulawesi Island									
3	Poso river	Side Spillway Poso 1	PT Poso / Private	Irma Suriani	irma@posoenergy.com	Palu	-1,669211	120,652053	
4	Poso river	Poso 1 DAM	PT Poso / Private	Irma Suriani	irma@posoenergy.com	Palu	-1,669211	120,652053	
5	Poso river	Poso 2 Weir	PT Poso / Private	Irma Suriani	irma@posoenergy.com	Palu	-1,648364	120,658037	
Java Island									
6	Ciwulan river	Cikalong weir	BBWS Citanduy/ central Government (PUPR)	Pak Hendra/ Pak Def	bbws.citanduy@yahoo.com	Bandung	7° 39' 0	108° 33' 0	
7	Citanduy river	Manganti Weir	BBWS Citanduy/ central Government (PUPR)	Pak Hendra/ Pak Def	bbws.citanduy@yahoo.com	Ciamis	-7,448332	108,717712	
8	Citanduy river	Pataruman Weir	BBWS Citanduy/ central Government (PUPR)	Pak Hendra/ Pak Def	bbws.citanduy@yahoo.com	Banjar	-7,365756	108,560919	
9	Cijolang river	Bantarheulang Weir	BBWS Citanduy/ central Government (PUPR)	Pak Hendra/ Pak Def	bbws.citanduy@yahoo.com	Ciamis	-7,288801	108,556212	
10	Cijolang river	Matenggeng DAM	BBWS Citanduy/ central Government (PUPR)	Pak Hendra/ Pak Def	bbws.citanduy@yahoo.com	Cilacap	-7,264621	108,570781	
11	Cicatih river	Kertamukti Weir	PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-6,990678	106,756844	
12	Cimandiri	In order to comply with the Sukabumi district regulation, it is necessary for these companies to incorporate fishways into their hydropower dams. The requirement for fishways will be further elucidated through focus group discussions, which will determine if an extension permit or a new permit is required.	PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi			
13	Cibojong		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,041239	106,783281	
14	Cikaso		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,23206	106,817075	
15	Cikaso		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,237006	106,810369	
16	Cibareno		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-6,895833	106,402222	
17	Cihanyawar		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,141217	107,184708	
18	Citajur		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,171366	107,171205	
19	Citajur		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,152278	107,126803	In
20	Cibuni		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,201344	107,247075	th
21	Cibuni		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,201333	107,263583	
22	Cibuni		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,202444	107,229764	
23	Cisadea		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,328594	107,194447	
24	Cibalapulang		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,200425	106,992858	
25	Cipaku		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,203372	107,427003	
26	Cicatih		PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-7,007668	106,721575	
27	Cicatih	Cicatih weir	PSDA Province/ Local Goverment (west Java Province)	Pak Diky/Andria Hendraningrat	uptdcisareno@gmail.com	Sukabumi	-6,952781	106,756497	

THANK YOU


ACIAR


BRIN
BADAN RISET
DAN INOVASI NASIONAL


Charles Sturt
University