Freshwater fishes (Osteichthyes, Actinopterygii) in the Riam Kanan River and Reservoir, South Kalimantan, Indonesia

by Rizmi Yunita

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ANNOTATED LIST OF SPECIES

Freshwater fishes (Osteichthyes, Actinopterygii) in the Riam Kanan River and Reservoir, South Kalimantan, Indonesia

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Abstract. In this study, we conducted an analysis of the freshwater fish population in the Riam Kanan Reservoir, a stagnant freshwater body with a diverse array of freshwater fish species with significant importance for fisheries. Our research revealed that the fish species sampled in the Riam Kanan Reservoir totaled 7,577, encompassing 15 families and 30 distinct species. Overall, our findings underscore the richness and diversity of freshwater fish in the Riam Kanan Reservoir, with the Cyprinidae family being the most dominant. The novelty of our research lies in its contribution to information regarding sources of animal protein and its contribution to ensuring food security. Furthermore, our research emphasizes the adoption of environmentally friendly fishing methods in the Riam Kanan Reservoir, promoting sustainability and ecological preservation.

Key words. Diversity, diversity, monitoring, inventory, reservoir, tropical fish

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INTRODUCTION

Riam Kanan Reservoir provides habitat for freshwater fishes and serves as a fish farm in South Kalimantan, Indonesia. The reservoir was constructed in 1973 to dam the Riam Kanan River in Aranio Village, Banjar Regency, South Kalimantan, Indonesia. Reservoirs are created to fulfill various human needs, functioning as agricultural irrigation resources, flood control mechanisms, hydroelectric power plants, sources of raw water for transportation, sites for water tourism, and domestic and industrial purposes. Additionally, they serve as a resource for fishing and aquaculture (Adjie and Utomo 2011; Li et al. 2013; Rawali et al. 2021; Siswanto and Ramadhani 2021). Freshwater fisheries play a significant role in providing animal food resources, economic value, and social benefits to the community (Sentosa and Satria 2015; Siswanto and Ramadhani 2021). Freshwater fish from the Riam Kanan Reservoir constitute a healthy source of animal protein for the surrounding population, contributing to local and national food security. Continuous monitoring of the presence of freshwater fish is necessary to observe the species inhabiting these waters, and to prevent any decrease in fish populations, both in numbers and types (Adjie and Utomo 2011; Mote 2017; Ohee 2018; Taradhipa et al. 2018). We aim to ensure that freshwater fish food resources remain abundant throughout the year, meeting the needs of society without experiencing declines or extinctions.

The Riam Kanan Reservoir is approximately 50 years old and has entered the recovery and stabilization stage (Chairuddin and Yunita 2003), advancing with distinctive characteristics. Nutrient levels have increased alongside primary production, leading to balanced biota dynamics as the quantity of decomposed nutrient material by bacteria stabilizes. Ecological conditions are now considered stable, resembling those of a natural lake. The reservoir's waters have achieved relative stability in trophic status, evident through the presence of producer communities such as plankton and aquatic plants, consumer communities including zoobenthos and fish, and water quality conditions that support aquatic life (Kumawat et al. 2019). Trophic status in the water ranges from oligotrophic to eutrophic conditions (Brahmana and Achmad 2012). The abundance of nutrients in the Riam Kanan Reservoir sustains a diverse aquatic biota, including various fish species. Research on freshwater fish in the Riam Kanan Reservoir has been extensive, shedding light on the growth and development of both endemic and introduced fish species that have adapted to the varying water quality conditions within the ecosystem (Adjie and Utomo 2011; Chown 2012; Lenny 2017; Nur et al. 2021). This research underscores the reservoir's role as a habitat for a wide range of ecologically and economically valuable fish species. Understanding the presence of these fish in the Riam Kanan Reservoir offers crucial insights into the current and future state of freshwater fisheries. This information is invaluable

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for the conservation of fish diversity and the sustainable management of fisheries resources (Hockings et al. 2019; Langhans et al. 2019; Li et al. 2020).

The Riam Kanan Reservoir offers numerous benefits to freshwater fisheries. However, the survival of fish in freshwater habitats faces various threats and challenges, including climate change, pollution, habitat degradation, and human activities such as the improper disposal of waste into the waters. Additionally, excessive fishing efforts can negatively impact fish populations within the reservoir (Moreno-Mateos et al. 2012; Brahmana and Achmad 2012; Raharja et al. 2018; Haris and Yusanti 2019; Santoso et al. 2020; Riepe et al. 2021; Santoso et al. 2021). Research in the fisheries sector primarily involves fish farming activities, specifically the use of 'Keramba Jaring Apung (KJA)' or floating net cages. These activities have shown consistent growth year after year (Fahmi et al. 2009; Haris and Yusanti 2019; Nur et al. 2020). The fish species commonly cultivated in KJA include *Cyprinus carpio* (Linnaeus, 1758), *Oreochromis niloticus* (Linnaeus, 1758), and the catfish *Pangasius hypophthalmus* (Sauvage, 1878). KJA activities significantly contribute to the stable income of local residents (Nur et al. 2020). Although KJA activities hold great promise economically and provide local communities with a reliable source of income, it is important to note that ecologically, these activities can impact the presence of permanent or endemic fish species, as KJA often involves cultured or introduced fish within the Riam Kanan Reservoir (Umar and Sulaiman 2013). The objective of freshwater fisheries research in the Riam Kanan Reservoir is to investigate the existence of fish species still thriving in this habitat, including precise information on the presence of freshwater fish that have the potential to serve as a protein-rich food resource in the reservoir. Fish specimen inventory research in this area has been relatively limited, resulting in minimal data on the number and types of fish inhabiting the Riam Kanan waters. Therefore, the findings of this research can significantly contribute to our understanding of the fish species inhabiting Riam Kanan, which, in turn, can inform the development of freshwater fish farming, fisheries management, ecosystem conservation, and policies related to fisheries resources within the Riam Kanan Reservoir.

STUDY AREA

Fish distribution and abundance constitute primary data, while secondary data collected from various sources (Nur et al. 2020, 2021) is used to comprehend the presence of fish in the waters of Riam Kanan. Fish sampling in the Riam Kanan waters was divided into 10 sampling zones, including Aranio villages (DA), Mandikapau Timur villages (DMT), Batu Hitam villages/Batu Hitam River (SBT), Madang-Sirang (MS), Bukit Batas (BB), Liang Tauman (LT), Padang Hawui (PH), Karangan Haur (KH), Kalaan (KI), and Bunglai (BI) (Figure 1). The main river leading to the Riam Kanan Reservoir was included in the data collection area. Fish samples were conducted throughout the year due to the year-round tropical climate. The Riam Kanan Reservoir is situated within the Barito River basin, specifically along the Riam Kanan River in the Aranio District, located 25 km east of Martapura, the capital of Banjar Regency, and approximately 60 km east of Banjarmasin, the capital of South Kalimantan Province. The Riam Kanan Reservoir is a component of the Nature Reserve, Protected Forest, and Nature Tourism areas, with legal recognition from the local government through Regulation Number 4 of 2021 concerning the Banjar Regency Regional Spatial Plan for 2021-2041. The Aranio Riam Kanan sub-district covers a surface area of 92 km^2, with a projected area spanning 1043 km^2 characterized as a low topographic area. The maximum water level is 62 m above sea level, while the minimum water level is 52 m above sea level, and the reservoir has a capacity of 1,200 million m^3. Geographically, the catchment area of the Riam Kanan sub-watershed encompasses 39,872 ha, comprising 9,200 Ha of forests, 10,591 ha of water area, 487 Ha of scrub forest, 1,473 ha of reforestation, and 11,712 ha of reeds. The reservoir serves multiple purposes, including hydroelectric power generation, fishing, fish farming, and water transportation.

The Riam Kanan Reservoir area is inhabited by several villages and settlements, with the river playing a vital role in daily activities. Generally, the activities of the Riam Kanan community revolve around the use of water, either as fish farmers utilizing cages or floating nets, or as fishermen searching for fish in Riam Kanan. Fishermen and fish farmers typically employ "kelotok" boats or motorboats powered by engines, while some use non-motorized boats referred to as "jukung". The Madang-Sirang (MS) area is an open expanse of water with the potential to serve as both a spawning area and a feeding ground for fish. It is characterized by the presence of large rivers and an abundance of aquatic plants, including algae such as *Hydrilla verticillata* (L.f.) Royle, *Myriophyllum brasiliense* Cambess, water hyacinth, water lettuce, *Salvinia*, water morning glory, coontail, and water fern. Padang Hawui (PH) is an enclosed area also with spawning and feeding potential, predominantly influenced by smaller rivers. PH features numerous aquatic plants, including *Hydrilla verticillata* (L.f.) Royle, *Myriophyllum brasiliense* Cambess, water hyacinth, and various other aquatic flora. During the dry season, some parts of the waters recede into dry land, while other areas still have a gentle flow of water. These dry land sections often serve as grazing areas for local cattle raising. Detailed information regarding fish collection sites can be found in Table 1 and Figure 2.

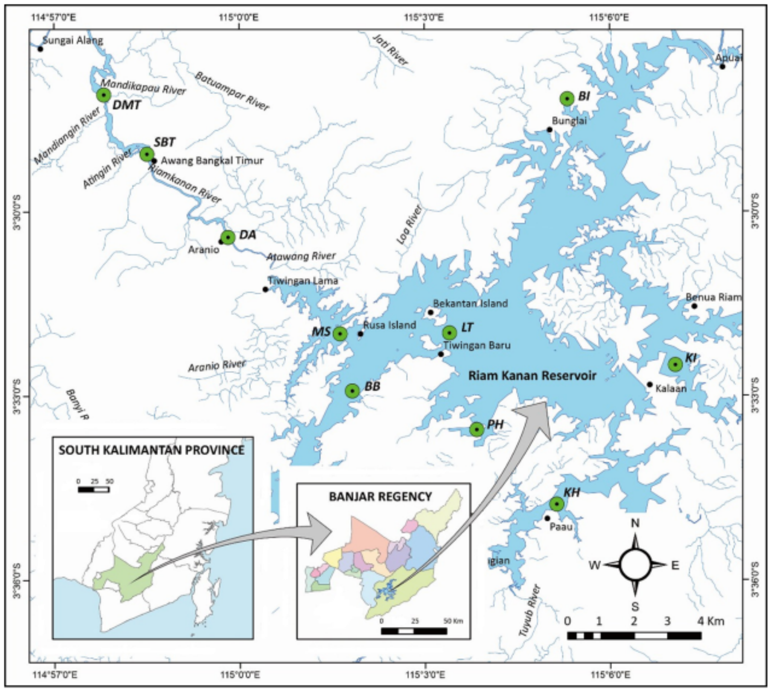

Figure 1. Map of the Riam Kanan Reservoir, showing the study area, location of the collection sites.

Table 1. Geographic and ecological information about the fish collection sites Riam Kanan Reservoir

Site	Stream	Latitude	Longitude	Riparian vegetation	Main impacts
A	Bukit Batas	03°32′25.08″S	115°02′34.44″E	Marginal vegetation, shrubs and grasses	Pasture and residential areas
B	Bukit Batas	03°32′13.56″S	115°03′12.60″E	Marginal vegetation, Shrubs and grasses	Pasture and residential areas
C	Bukit Batas	03°32′09.96″S	115°03′13.86″E	Marginal vegetation, Shrubs and grasses	Pasture and residential areas
D	Liang Tauman	03°31′58.08″S	115°01′39.36″E	Marginal vegetation, higher concentration of grass-es, and scattered trees	Pasture
E	Bukit Batas	03°31′32.88″S	115°01′21.00″E	Marginal vegetation, shrubs and grasses	Pasture and residential areas
F	Pelabuhan Waduk Riam Kanan	03°31′14.52″S	115°01′21.00″E	Marginal veg., Shrubs and grasses	Pasture and residential areas
G	Sungai Awang Bangkal	03°31′14.52″S	115°00′36.00″E	Marginal veg., Higher concentration of grasses, and scattered trees	Pasture
H	Bendungan Karang Intan-Sungai	03°27′12.96″S	115°57′37.8″E	Marginal veg., Higher concentration of grasses, and scattered trees	Pasture

METHODS

Fish sampling. Fish collection samples were obtained in 2020 between 08:00 and 17:00. Professional fishermen assisted in the fish sampling process. Various fishing methods were used, including gill nets with mesh sizes of 2.5 × 2.5 cm, 3 × 3 cm, 7 × 7 cm, and lengths of 75 × 1.3 m and 50x1 m, cast nets locally referred to as 'lunta' with mesh size of 0.6 × 0.6 cm, pole and line fishing gear of various sizes, and loop nets. All collected specimens were taxonomically classified following the references of Weber and de Beaufort (1913, 1916, 1922), Inger and Chin (1962), Kottelat et al. (1993), and Murdy et al. (1994) and scientific names were cross-referenced and verified through Fishbase (http://www.fishbase.org). Morphometric and meristic records were recorded, including differences in coloration, body spots, maximum size, and other characteristics of the catch. Unidentified fish specimens were preserved in 10% formaldehyde and subsequently transported to the laboratory for identification, where they were stored in glass jars. All fish specimens were sourced either from nearby fish markets/harbors or were directly caught by fishermen. We searched for genetic sequence data of the freshwater fish species from Riam Kanan at GenBank, National Center for Biotechnology Information (NCBI) on the website https://www.ncbi.nlm.nih.gov/.

Figure 2. Photograph of Riam Kanan Reservoir sampling sites. Letters correspond to sites as listed in Table 1.

RESULTS

The total number of fish specimens collected in Riam Kanan Reservoir was 7,577, comprising 15 families and 30 species. This collection included both endemic Kalimantan fish species and several families of introduced fish (Table 2). The dominant fish families in Riam Kanan Reservoir were Cyprinidae, Bagridae, and Eleotridae, accounting for 57.52%, 8.88%, and 7.41% of the fish biodiversity, respectively (Table 2; Figs. 3–5).

Table 2. Inventory of fish species in the Riam Kanan Reservoir. Abbreviations: DA = Desa Aranio, STB = Sungai Tambang Batu, DMT = Desa Mandakapau Timur, BB = Bukit Batas, LT = Liang Tauman, KH = Karangan Haur, BI = Bunglai, KI Kalaan, PH = Padang Hawui, MS = Madang Sirang. Introduced species are indicated with an asterisk (*).

Family, species	**Distribution**									
	DA	**STB**	**DMT**	**BB**	**LT**	**KH**	**BI**	**KI**	**PH**	**MS**
Anabantidae										
Anabas testudineus (Bloch, 1792)*		+							+	
Aplocheilidae										
Aplocheilus panchax (Hamilton, 1822)*	+	+	+							
Bagridae										
Mystus nemurus (Cuvier & Valenciennes, 1840)		+	+	+	+	+	+	+	+	
Mystus nigriceps (Cuvier & Valenciennes, 1840)	+	+	+	+	+	+	+	+	+	+
Belonidae										
Strongylura strongylura (van Hasselt, 1823)	+	+								
Belontiidae										
Betta anabatoides (Bleeker, 1851)			+							
Trichogaster trichopterus (Pallas, 1770)	+	+	+						+	+
Cichlidae										
Oreochromis niloticus (Linnaeus, 1758)*										+
Channidae										
Channa striata (Bloch, 1793)*		+		+	+	+	+	+	+	
Channa micropeltes (Cuvier, 1831)		+		+	+	+	+	+	+	+
Cyprinidae										
Barbodes schwanenfeldii (Bleeker, 1854)	+	+	+	+	+	+	+	+		
Hampala macrolepidota (van Hasselt, 1823)	+	+	+	+	+	+	+	+	+	+
Mystacoleucus marginatus (Valenciennes, 1842)	+	+	+	+	+	+	+	+	+	+
Osteochilus waandersii (Bleeker, 1852)			+							
Osteochilus hasseltii (Valenciennes, 1842)*	+	+	+	+	+	+	+	+	+	+
Cyclocheilichthys apogon (Valenciennes, 1842)				+				+	+	+
Osteochilus repang (Popta, 1902)				+	+	+	+	+	+	+
Rasbora argyrotaenia (Bleeker, 1849)									+	+

Family, species	Distribution									
	DA	**STB**	**DMT**	**BB**	**LT**	**KH**	**BI**	**KI**	**PH**	**MS**
Rasbora caudimaculata (Volz, 1903)	+	+	+						+	
Oxygaster anomalura (van Hasselt, 1823)	+	+	+	+				+	+	
Puntius anchisporus (Vaillant, 1902)	+	+	+							
Puntioplites bulu (Bleeker, 1851)		+	+							
Eleotridae										
Oxyeleotris marmorata (Bleeker, 1852)	+	+	+	+	+	+	+	+	+	+
Mastacembelidae										
Mastacembelus erythrotaenia (Bleeker, 1850)		+	+	+	+	+		+		+
Macrognathus aculeatus (Bloch, 1786)									+	+
Notopteridae										
Chitala lopis (Bleeker, 1851)	+	+	+	+	+	+	+	+		+
Osphronemidae										
Osphronemus goramy (Lacépède, 1801)*	+	+	+	+	+	+	+	+	+	+
Pristolepididae										
Pristolepis grootii (Bleeker, 1852)	+	+	+							
Siluridae										
Belodontichthys dinema (Bleeker, 1851)									+	
Tetraodontidae										
Tetraodon kretamensis (Inger, 1953)	+	+	+						+	+

Family Cyprinidae

Hampala macrolepidota **(Kuhl & van Hasselt, 1823)**

Figure 3A

Hampala macrolepidota—Weber and de Beaufort 1916: 144.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Riam Kanan Harbour; 03°31′14.52″S, 115°00′36.00″E; 54 m alt.; 15.VI.2020; gill nets; KM213080.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Body scaly, ctenoid type. Linea lateralis above the pectoral fins to the base of the tail, number 22–27. No snout. Mouth extensible, position terminal. No teeth. Dorsal fin with hard, weak fingers. Pelvic fin in front of anal fin. Pelvic fins behind pectoral fins and abdominal in position. Anal, pelvic and central part of the caudal fin red. Caudal fin forked. Dorsal and ventral body silvery, with black vertical stripes between pelvic and dorsal fins. Adult fish have a black spot between the dorsal and pelvic fins, but this is faint in adults. The colour pattern of juveniles and adults may vary by river.

Mystacoleucus marginatus **(Valenciennes, 1824)**

Figure 3B

Mystacoleucus marginatus—Weber and de Beaufort 1916: 108.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Riam Kanan Harbour; 03°31′14.52″S, 115°00′36″E; 54 m alt.; 15.VI.2020; gill nets; MZ605469.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body, ctenoid type. No linea lateralis. No snout. Mouth extensible, terminal mouth position, no teeth. Dorsal fin, single, has hardened and weak fingers. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins, abdominal position. Forked caudal fin with yellow colour and black tip. The dorsal, anal, pelvic, and pectoral fins are yellow-black in colour. Dorsal colour green-black, abdomen white-yellow.

Barbodes schwanenfeldii **(Bleeker, 1854)**

Figure 3C

Puntius schwanefeld—Weber and de Beaufort 1916: 178.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Riam Kanan Harbour; 03°31′14.52″S, 115°00′36.00″E; 54 m alt.; 15.VI.2020; gill nets; MK978150.1

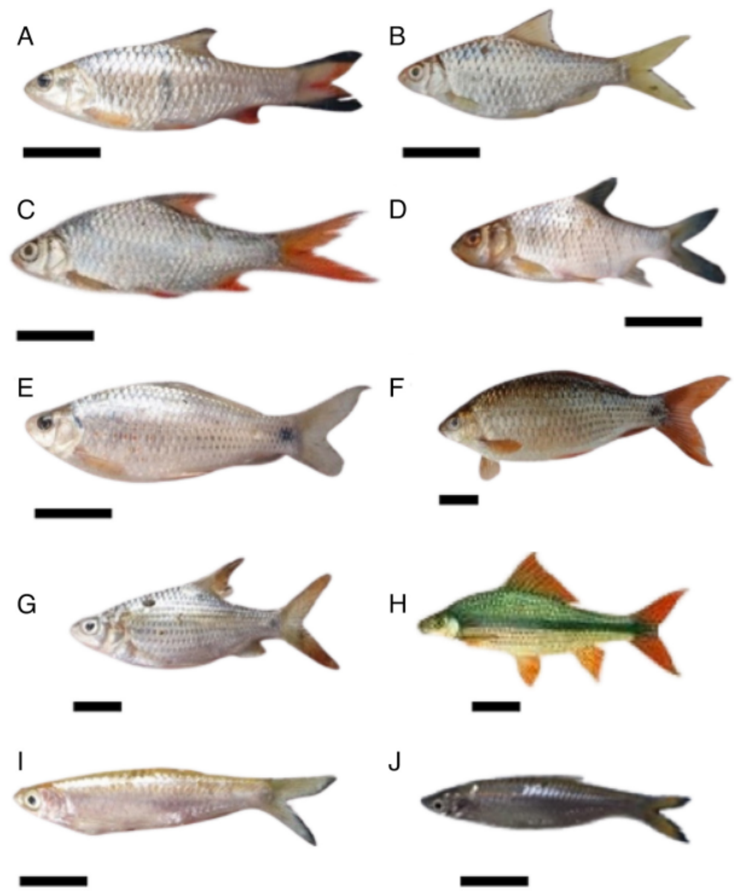

Figure 3. Fish species in the Riam Kanan Reservoir, with local name in parentheses. **A.** *Hampala macrolepidota* (Adungan), SL 230 mm. **B.** *Mystacoleucus marginatus* (Baradis), SL 90 mm. **C.** *Barbodes schwanenfeldii* (Abang-abang), SL 83 mm. **D.** *Puntioplites bulu* (Sanggang), SL 102 mm. **E.** *Osteochilus hasseltii* (Puyau) SL 85 mm. **F.** *Osteochilus repang* (Puyau baan) SL 190 mm. **G.** *Cyclocheilichthys apogon* (Puyau sangin), SL 85 mm. **H.** *Osteochilus waandersii* (Mangkih) SL 135 mm. **I.** *Rasbora caudimaculata* (Saluang batang), SL 110 mm. **J.** *Rasbora argyrotaenia* (Saluang), SL 30 mm. (local name), scale bars = 1 cm.

Identification. Hard bone skeleton. Head symmetrical. Body compressed, scaly, of ctenoid type. Linea lateralis above pectoral to caudal fin. Mouth extensible, position terminal. No teeth. Dorsal fin only one, hardened with weak fingers. Pelvic fin in front of anal fin. Pelvic fins behind pectoral fins, abdominal in position. Dorsal, anal, pelvic, and pectoral fins silvery white. Caudal fin forked. Dorsal body silvery white; slightly darker, silvery green.

Puntioplites bulu **(Bleeker, 1851)**
Figure 3D

Puntius bulu—Weber and de Beaufort 1916: 199.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Karang Intan River; 03°27′12.96″S, 114°57′37.80″E; 54 m alt.; 15.VI.2020; gill nets; MK621899.1

Identification. Hard bone skeleton. Head symmetrical. Body compressed, scaly. Linea lateralis above pectoral to caudal fins. Mouth extensible, terminal mouth position; no snout. No teeth. Dorsal fin with hardened, weak fingers. Only one dorsal fin. Pelvic fin in front of anal fin. Pelvic fins behind pectoral fins, abdominal in position. Caudal fin forked. Dorsal, caudal, anal, pelvic, and pectoral fins silvery yellow; fin tips black. Dorsal body silvery yellow; ventral body yellow.

Osteochilus hasseltii **(Valenciennes, 1842)**
Figure 3E

Osteochilus hasselti—Weber and de Beaufort 1916: 135.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Bukit Batas Banjar;

03°32′25.08″S, 115°02′34.44″E; 54 m alt.; 15.VI.2020; gill nets; OR674043.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body, ctenoid type. No linea lateralis. No snout. Mouth extensible, terminal mouth position. Smooth lips. No teeth. Dorsal fin has hardened and weak fingers. Only one dorsal fin. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins in abdominal position. Caudal fin forked, yellow with orange tip. Dorsal fin greyish-yellow, anal and pelvic fins yellow with orange tips. Pectoral fins yellow with a greyish-black stripe. Body colour dark yellow, back, silvery yellow with shiny scales all over the body.

Osteochilus repang **(Popta, 1902)**
Figure 3F

Osteochilus repang—Weber and de Beaufort 1916: 131.

Material examined. INDONESIA • **South Kalimantan Province** Banjar Regency Bukit Batas Banjar; 3°32′25.08″S 115°2′34.44″E; 54 m alt.; 15.VI.2020; gill nets; No voucher

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body, ctenoid type. No linea lateralis. No snout. Mouth extensible, terminal mouth position. Smooth lips. No teeth. Dorsal fin has hardened and weak fingers. Only one dorsal fin. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins in abdominal position. The caudal fin is forked, yellow in colour with an orange tip. The dorsal fin is greyish-yellow, while the anal and pelvic fins are yellow with orange tips. The pectoral fins are yellow with a greyish-black stripe. Body colour, dark yellow back, silvery yellow with shiny scales all over the body.

Cyclocheilichthys apogon **(Valenciennes, 1842)**
Figure 3G

Cyclocheilichthys apogon—Weber and de Beaufort 1916: 156.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Bukit Batas Banjar; 03°32′25.08″S, 115°02′34.44″E; 54 m alt.; 15.VI.2020; gill nets; MH688250.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body. No linea lateralis. No snout. Mouth extensible, terminal mouth position. Lips smooth. No teeth. Dorsal fin fingers hardened and weak. Only one dorsal fin. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins, in abdominal position. Caudal fin forked. Dorsal and caudal fins blackish-grey; anal, pelvic and pectoral fins greyish-yellow. Body colour green, shiny scales throughout the body.

Osteochilus waandersii **(Bleeker, 1852)**
Figure 3H

Puntius waandersi—Weber and de Beaufort 1916: 200.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Karang Intan River; 03°27′12.96″S, 114°57′37.80″E; 30 m alt.; 15.VI.2020; gill nets; MH688273.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body. No linea lateralis. Mouth extensible, terminal mouth position. Dorsal fin has hardened and weak fingers. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins in abdominal position. Caudal fin forked, yellow in colour with orange tip, with a black groove in the middle. Dorsal fin blackish-grey; anal, pelvic and pectoral fins red/orange to greyish-yellow. Body colour, dorsal silvery yellowish grey, body with a black stripe 3 mm wide up to the tail, fainter up to the operculum, abdomen milky white toyellow and entirely silvery.

Rasbora caudimaculata **(Volz, 1903)**
Figure 3I

Rasbora trilineata—Weber and de Beaufort 1916: 67.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Karang Intan River; 03°27′12.96″S, 114°57′37.8″E; 30 m alt.; 15.VI.2020; cast net; NC_063872.1

Identification. Symmetrical head. Body shape compressed and elongated. Body scaly, cycloid type. Linea lateralis located above the pectoral fins. The left and right sides of the linea lateralis have black lines. Mouth small, can be elongated. Inferior mouth position, lower jaw longer than upper jaw. No teeth. The dorsal fin has weak fingers only. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins in abdominal position. Caudal fin forked, blackish yellow in colour with black marks on the upper and lower sides. Body silvery yellow, with a clear black line from the operculum to the caudal fin. Anal and pectoral dorsal fins silvery yellow, pelvic fins silvery white.

Rasbora argyrotaenia **(Bleeker, 1849)**
Figure 3J

Rasbora argyrotaenia—Weber and de Beaufort 1916: 61.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Liang Tauman; 03°31′58.08″S, 115°01′39.36″E; 54 m alt.; 15.VI.2020; cast net; OP209774.1

Identification. Symmetrical head. Body shape compressed and elongated. Body scaly. Left and right sides of the linea lateralis with black lines. Mouth is small and can be extended. Inferior mouth position, no teeth. Dorsal fin has weak fingers only. Pelvic fins in front of the anal fin but behind the pectoral fins in abdominal position. Tail fin forked, blackish yellow in colour. Body colour silvery yellow, black stripe on head from operculum to caudal fin. Anal and pectoral dorsal fins clear yellow, pelvic fins silvery white.

Oxygaster anomalura **(van Hasselt, 1823)**
Figure 4A

Chela oxygaster—Weber and de Beaufort 1916: 52, Howes 1979: 187.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Awang Bangkal River; 03°31′32.88″S, 115°01′21″E; 30 m alt.; 15.VI.2020; cast net; LC492333.1

Identification. Hard bone skeleton. Symmetrical head. Body shape compressed and elongated. Body scaly, cycloid type. Linea lateralis above pectoral fins to pelvic fins. Mouth can be elongated. Inferior mouth position. No teeth. No snout. Lips smooth. Dorsal fin has hardened and weak fingers. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins in abdominal position. Caudal fin forked. Dorsal, caudal, anal, pelvic, and pectoral fins translucent white in colour. Body colour yellow, back silvery white abdomen, black stripe in middle of body until the caudal fin.

Puntius anchisporus **(Vaillant, 1902)**
Figure 4B

Puntius anchisporus—Weber and de Beaufort 1916: 190.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Riam Kanan Harbour; 03°31′14.52″S, 115°00′36.00″E; 54 m alt.; 15.VI.2020; scoop net; MW591158.1

Identification. Symmetrical head. Compressed body shape. Body scaly, cycloid type. Linea lateralis interrupted at number 10–11. No snout. Mouth extensible, terminal position. Lips smooth. Dorsal fin has hardened and weak fingers. Pelvic fin in front of anal fin. Pelvic fins behind the pectoral fins in abdominal position. Caudal fin forked. Dorsal, caudal, anal, pelvic, and pectoral fins translucent white in colour. Body colour, yellow back, silvery white abdomen, there is a black stripe in the centre of the body with a total of 4 stripes.

Family Bagridae

Mystus nemurus **(Cuvier and Valenciennes, 1840)**
Figure 4C

Macrones nemurus—Weber and de Beaufort 1913: 341.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Bukit Batas; 03°32′25.08″S, 115°02′34.44″E; 54 m alt.; 15.VI.2020; gill nets; ON868711.1

Identification. Hard bony skeleton. Head symmetrical, rough. Body shape depressed and elongated. Body without scales. Linea lateralis above pectoral fins. Pair of rattles on upper and lower jaws, long and short, nasal rattle short to eyes, maxillary rattle long to anal fin. Mouth cannot be extended, subterminal position. Teeth present, canine type, sharp, pointed and numerous. Rough lips. Dorsal fin has hardened and weak fingers. Adipose fin as long as anal fin. Pelvic and pectoral fins in abdominal position. One pectoral fin radius becomes a stinger and secretes poison so that the stinger functions as a means of self-defence.

Mystus nigriceps **(Cuvier and Valenciennes, 1840)**
Figure 4D

Macrones nigriceps—Weber and de Beaufort 1913: 337.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Karang Intan River; 03°31′14.52″S, 115°00′36.00″E; 30 m alt.; 15.VI.2020; gill nets; KU692656.1

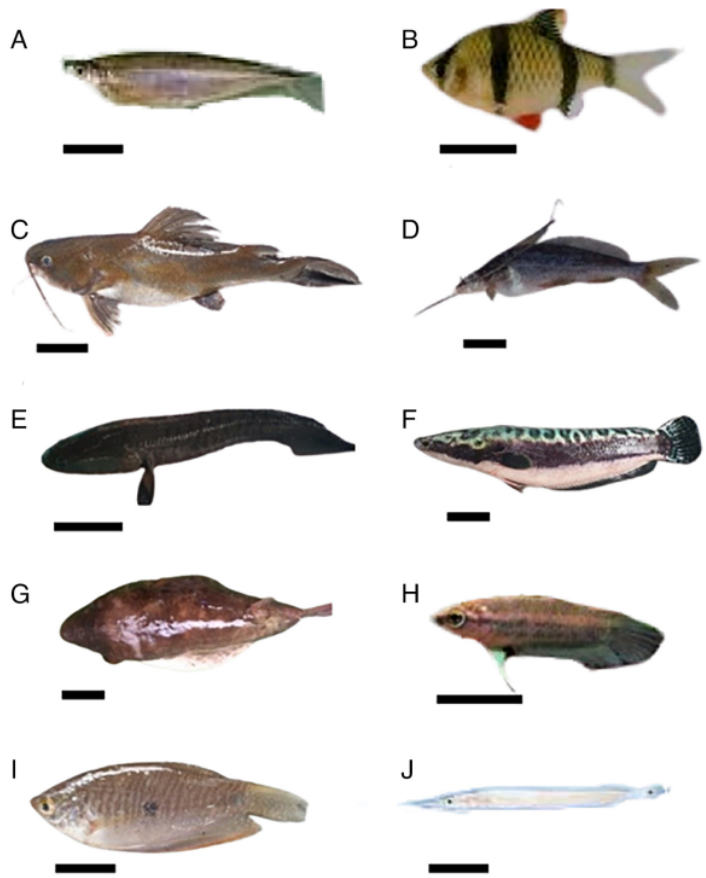

Figure 4. Species of fish caught in the Riam Kanan Reservoir. **A.** *Oxygaster anomalura* (Saluang langkai), SL 95 mm. **B.** *Puntius anchisporus* (Dara manginang), SL 22 mm. **C.** *Mystus nemurus* (Baung), SL 243 mm. **D.** *Mystus nigriceps* (Senggiringan), SL 116 mm. **E.** *Channa striata* (Haruan), SL 77 mm. **F.** *Channa micropeltes* (Toman), SL 161 mm. **G.** *Tetraodon kretamensis* (Buntal), SL 105 mm. **H.** *Betta anabatoides* (Kelatau), SL 22 mm. **I.** *Trichogaster trichopterus* (Sapat), SL 49 mm. **J.** *Strongylura strongylura* (Julung-julung), SL 133 mm. (local name), scale bars = 1 cm.

Identification. Hard bony skeleton. Head symmetrical, rough. Body shape depressed and elongated. Body without scales. Linea lateralis above pectoral fins. Two pairs of rattles on the upper jaw and two pairs on the lower jaw. Dorsal rattle short to eyes, maxillary rattle long to anal fin. Mouth cannot be extended, terminal position. Teeth on upper and lower jaws. Canine tooth type, sharp, pointed and numerous. Rough lips. Dorsal fin has hardened and weak fingers. Caudal fin forked. Adipose fin of *Mystus nigriceps* is longer than that of *Mystus nemurus*. Pelvic fins abdominal relative to the pectoral fins. One radius of the pectoral fin turns into a venom-secreting stinger as a means of self-defence.

Family Channidae

***Channa striata* (Bloch, 1793)**
Figure 4E

Ophiocephalus striatus—Weber and de Beaufort 1922: 317.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Bukit Batas; 03°32′13.56″S, 115°03′12.6″E; 54 m alt.; 15.VI.2020; pole line; OQ852694.1

Identification. Hard bone skeleton. Symmetrical head. Body shape is depressed and elongated. Scaly body. No snout. Mouth wide and not extendable. Superior mouth position. Teeth on upper and lower jaws. Canine type teeth, sharp and numerous. Tongue present, lips rough. Beginning of dorsal fin above the pectoral fin. Dorsal and anal fins long, weakly fingered, extend up to the caudal fin. Position of pelvic fins close to pectoral fins, thoracic. Caudal fin homocercal. Dorsal, caudal, anal, pelvic, and pectoral fins blackish-grey. Body colour dorsal blackish-grey and ventral milky white.

Channa micropeltes **(Cuvier, 1831)**
Figure 4F

Ophiocephalus micropeltes—Weber and de Beaufort 1922: 328.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Bukit Batas; 03°32′25.08″S, 115°02′34.44″E; 54 m alt.; 15.VI.2020; pole line; MW020447.1

Identification. Hard bone skeleton. Symmetrical head. Body depressed and elongated. Scaly body. No snout. Mouth wide, not extendable, terminal mouth position. Canine type teeth on upper and lower jaws. Only one dorsal fin, beginning of dorsal fin above pectoral fin. Dorsal fin extending to caudal fin. Position of pelvic fins with respect to the pectoral fins is thoracic. Dorsal, caudal, anal, pelvic, and pectoral fins blackish-grey. Body colour, blackish-grey dorsal, pelvic part with orange stripe. Colour starts from the mouth to the caudal fin, above and below which there is an interrupted black line with irregular spots. Orange stripe and black spots on body of adult fish disappear with age.

Family Tetraodontidae

Tetraodon kretamensis **(Inger, 1953)**
Figure 4G

Tetraodon kretamensis—Inger and Chin 1962: 192.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Karang Intan River; 03°27′12.96″S, 114°57′37.80″E; 30 m alt.; 15.VI.2020; gill nets; OQ857168.1

Identification. Hard bone skeleton. Symmetrical head. Body globiform, not scaly. No linea lateralis, no scute. Mouth not extendable, terminal position. Incisor type teeth on upper and lower jaws. Tube nostrils. Dorsal fin behind pectoral fin. Caudal fin homocercal. Dorsal, caudal, anal, and pectoral fins blackish-green in colour. Back and abdomen yellowish-white.

Family Belontiidae

Betta anabatoides **(Bleeker, 1851)**
Figure 4H

Betta anabatoides—Weber and de Beaufort 1922: 357.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Awang Bangkal River; 03°31′32.88″S, 115°01′21″E; 30 m alt.; 15.VI.2020; scoop net; GQ912000.1

Identification. Symmetrical head. Body shape compressed, scaly, ctenoid type. No scute, no linea lateralis. No teeth. Mouth extensible, terminal position. Only one dorsal fin. Labyrinth on gills. Dorsal fin shorter than anal fin. Position of pelvic fins relative to pectoral fins thoracic. Tapered caudal fin. Dorsal, caudal, anal, pelvic, and pectoral fins blackish-grey. Body colour of back and abdomen blackish-grey. There are three horizontal black lines on the body, and the body is transparent.

Trichogaster trichopterus **(Pallas, 1770)**
Figure 4I

Trichopodus trichopterus—Weber and de Beaufort 1922: 366.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Awang Bangkal River; 03°31′32.88″S, 115°01′21″E; 30 m alt.; 15.VI.2020; scoop net; JN896639.1

Identification. Symmetrical head. Compressed body shape. Body scaly, with long scute on pelvic fins that functions as a sense organ. Mouth can be elongated, terminal position, no teeth. Dorsal fin shorter than anal fin. Pelvic fins abdominal in relation to the pectoral fins. Caudal fin lunate, with black spots at tip. Dorsal, caudal, anal, pelvic, and pectoral fins grey, with yellow or orange tips. Body colour dorsal grey-black.

Family Belonidae

Strongylura strongylura **(van Hasselt, 1823)**
Figure 4J

Tylosurus strongylurus—Weber and de Beaufort 1922: 121.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Awang Bangkal River; 03°31′32.88″S, 115°01′21″E; 30 m alt.; 15.VI.2020; scoop net; ON166056.1

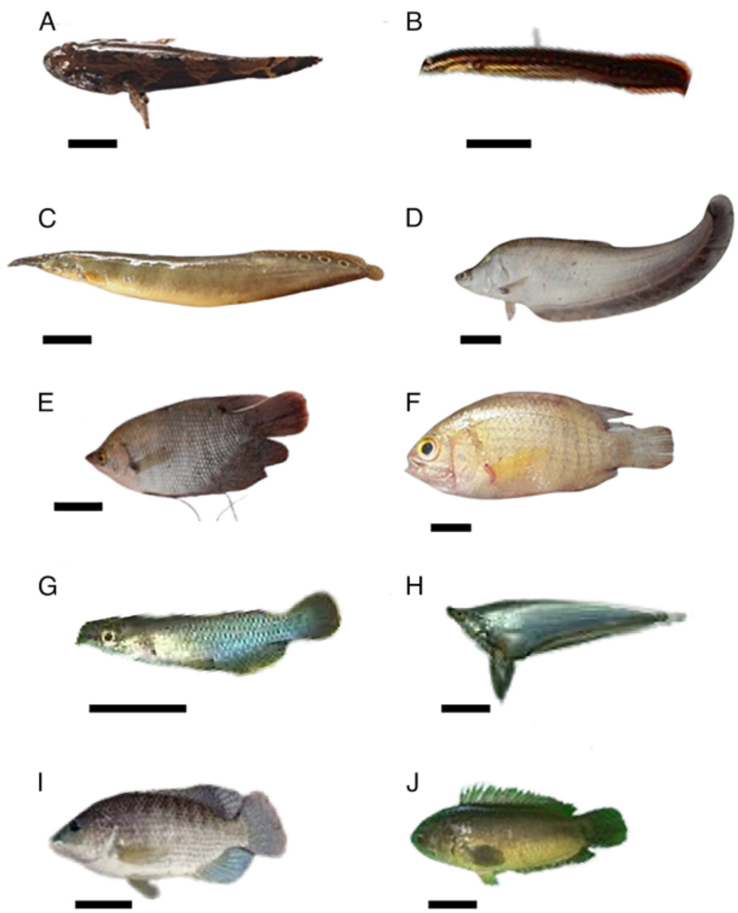

Figure 5. Species of fish caught in the Riam Kanan Reservoir. **A.** *Oxyeleotris marmorata* (Bakut), SL 202 mm. **B.** *Mastacembelus erythrotaenia* (Tilan), SL 301 mm. **C.** *Macrognathus aculeatus* (Sili-sili), SL 220 mm. **D.** *Chitala lopis* (Pipih), SL 175 mm. **E.** *Osphronemus goramy* (Kalui), SL 91 mm. **F.** *Pristolepis grootii* (Patung), SL 75 mm. **G.** *Aplocheilus panchax* (Timah-timah), SL 30 mm. **H.** *Belodontichthys dinema* (Lais), SL 152 mm. **I.** *Oreochromis niloticus* (Nila), SL 144 mm. **J.** *Anabas testudineus* (Papuyu), SL 104 mm. (local name), scale bars = 1 cm.

Identification. Symmetrical head. Body elongated. Scaly body, no linea lateralis. Mouth not extendable, terminal position. Upper and lower jaws equally long. Dorsal fin has hardened and weak fingers. Pelvic fin in front of anal fin. Pelvic fins abdominal in relation to pectoral fins. Caudal fin homocercal. Dorsal, anal, pelvic, and pectoral fins blackish-grey, with a yellow stripe up to the caudal fin. Abdomen is milky white.

Family Eleotridae

***Oxyeleotris marmorata* (Bleeker, 1852)**
Figure 5A

Oxyeleotris marmorata—Inger and Chin 1953: 175.

Material examined. INDONESIA – SOUTH KALIMANTAN PROVINCE • Banjar Regency Liang Tauman; 03°31′58.08″S, 115°01′39.36″E; 54 m alt.; 15.VI.2020; gill nets; MK628379.1

Identification. Hard bone skeleton. Symmetrical head. Body shape depressed. Scaly body, ctenoid type, no linea lateralis. Mouth not extendable, inferior position. Teeth present on upper and lower jaws, canine type. Two dorsal fins each having weaker fingers. Position of pelvic fins towards the pectoral fins is parallel, thoracic. Caudal fin homocercal. Dorsal, anal, pelvic, and pectoral fins blackish-orange grey, with a yellow stripe up to the caudal fin.

Family Mastacembelidae

Mastacembelus erythrotaenia **(Bleeker, 1850)**
Figure 5B

Mastacembelus erythrotaenia—de Beaufort and Briggs 1962: 432.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Bukit Batas; 03°32′13.56″S, 115°03′12.6″E; 54 m alt.; 15.VI.2020; pole line; MT508538.1

Identification. Symmetrical head. Body shape anguilliform and elongated. Body scaly, no linea lateralis. Mouth not extendable, superior position. Upper jaw is longer than lower. Teeth on upper and lower jaws, canine type, many in number. Dorsal, caudal, and anal fins fused, each having hard and weak fingers, no pelvic fins. Dorsal, anal, and pectoral fins blackish-orange grey, with a yellow stripe up to the caudal fin.

Macrognathus aculeatus **(Bloch, 1786)**
Figure 5C

Macrognathus aculeatus—de Beaufort and Briggs 1962: 425; Roberts 1980: 387, 1989: 180.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Liang Tauman; 03°31′58.08″S, 115°01′39.36″E; 54 m alt.; 15.VI.2020; pole line; OP947651.1

Identification. Symmetrical head. Body shape anguilliform and elongated. Body scaly, no linea lateralis. Mouth not extendable, superior position. Upper jaw longer than lower, teeth present, nose present. Dorsal, caudal, and anal fins each having hard and weak fingers. Dorsal, anal, and pectoral fins blackish-orange grey, with a yellow stripe up to the caudal fin, and no pelvic fins. Anal fin with a yellowish-black circle. Caudal fin homocercal.

Family Notopteridae

Chitala lopis **(Bleeker, 1851)**
Figure 5D

Notopterus chitala—Weber and de Beaufort 1913: 10; Roberts 1992a: 370.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Bukit Batas; 03°32′25.08″S, 115°02′34.44″E; 54 m alt.; 15.VI.2020; gill nets; OP953294.1

Identification. Hard bone skeleton. Symmetrical head. Body shape compressed and elongated. Body scaly, ctenoid type. Linea lateralis below dorsal fin parallel to body shape, from above operculum to caudal fin. Mouth cannot be extended, terminal position. Upper and lower jaws of equal length, teeth present, canine type. Dorsal fin has hardened and weak fingers. Pelvic fins united with anal and caudal fins. Dorsal, anal, pelvic, and pectoral fins silvery grey, abdomen is silvery white.

Family Osphronemidae

Osphronemus goramy **(Lecepede, 1801)**
Figure 5E

Osphronemus goramy—Weber and de Beaufort 1922: 344, Roberts 1992b: 352.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Liang Tauman; 03°31′58.08″S, 115°01′39.36″E; 54 m alt.; 15.VI.2020; gill nets; MK049481.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body, no linea lateralis. No snout. Mouth cannot be extended, terminal position. Teeth on upper and lower jaws, canine type. Dorsal fin has hardened and weak fingers. Pelvic fins long with a snout serving as a sensory organ. Pelvic fins abdominal to pectoral fins. Caudal fin homocercal. Dorsal, anal, pelvic, and pectoral fins blackish-orange grey, abdomen white.

Family Pristolepididae

Pristolepis grootii **(Bleeker, 1852)**
Figure 5F

Pristolepis grootii—Weber and de Beaufort 1936: 480.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Awang Bangkal River;

03°31′32.88″S, 115°01′21″E; 30 m alt.; 15.VI.2020; gill nets; KR131615.1

Identification. Hard bone skeleton. Symmetrical head. Compressed body shape. Scaly body. Mouth not extendable, terminal position. Dorsal fin has hard and weak fingers. Pelvic fin in front of anal fin. Pelvic fins and pectoral fins both abdominal. Caudal fin homocercal. Dorsal, anal, pelvic, and pectoral fins greyish green in colour.

Family Aplocheilidae

Aplocheilus panchax **(Hamilton, 1822)**
Figure 5G

Aplocheilus panchax—Weber and de Beaufort 1922: 374.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Awang Bangkal River; 03°31′32.88″S, 115°01′21.00″E; 30 m alt.; 15.VI.2020; scoop net; OQ860132.1

Identification. Symmetrical head, silvery head markings, tin heads. Body shape depressed. Body scaly, no linea lateralis. Mouth not extendable, terminal position. No teeth. Dorsal fin with weak fingers only. Pelvic fin in front of anal fin. Pelvic and pectoral fins both abdominal. Caudal fin homocercal. Dorsal, anal, pelvic, and pectoral fins blackish-grey, abdomen silvery white.

Family Siluridae

Belodontichthys dinema **(Bleeker, 1851)**
Figure 5H

Belodontichthys dinema—Weber and de Beaufort 1913: 204, Roberts 1989: 144.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Liang Tauman; 03°31′58.08″S, 115°01′39.36″E; 54 m alt.; 15.VI.2020; cast net; MH757447.1

Identification. Hard bone skeleton. Symmetrical head. Compressed and elongated body shape, no linea lateralis. Mouth not extendable, inferior position, teeth present, canine type on upper and lower jaws. Dorsal fin has hardened and weak fingers. Pelvic fins in front of anal fin. Pelvic fins abdominal with respect to pectoral fins. Caudal fin forked. Dorsal, anal, pelvic, and pectoral fins silvery yellow-grey, abdomen is silvery white.

Family Cichlidae

Oreochromis niloticus **(Linnaeus, 1758)**
Figure 5I

Oreochromis niloticus—Trewavas 1983: 140.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Riam Kanan Harbour; 03°31′14.52″S, 115°00′36.00″E; 54 m alt.; 15.VI.2020; gill nets; OR742021.1

Identification. Symmetrical head. Body shape compressed, scaly, ctenoid type. No scute. Mouth can be extended, terminal position. Linea lateralis interrupted at top and bottom, upper from the gill lid to the dorsal fin with weak fingers, lower linea lateralis starts from the dorsal fin with weak fingers tobase of caudal fin. Teeth present, incisor type. Pelvic fins parallel to pectoral fins in abdominal position. Dorsal, caudal, anal, pelvic, and pectoral fins blackish-grey. Caudal fin homocercal. Typical body colour on dorsal and ventral parts blackish-grey.

Family Anabantidae

Anabas testudineus **(Bloch, 1792)**
Figure 5J

Anabas testudineus—Weber and de Beaufort 1922: 334.

Material examined. INDONESIA – South Kalimantan Province • Banjar Regency Karang Intan River; 03°27′12.96″S, 114°57′37.80″E; 30 m alt.; 15.VI.2020; pole line; OP491866.1

Identification. Symmetrical head. Body shape compressed, scaly, cycloid type. No scute. Mouth can be extended, terminal position. Linea latelaris located above the pectoral fins to the middle of the base of the tail, 22–27 pieces. Teeth present, villiform type. Dorsal fin has 16–20 sharp hard fingers, 7–10 weak fingers.

Pelvic fins parallel to pectoral fins in abdominal position. Dorsal, caudal, anal, pelvic and pectoral fins blackish-green in colour. Caudal fin homocercal. Typical body colour on dorsal and ventral parts blackish-green. Gills equipped with additional respiratory device, the labyrinth.

DISCUSSION

The Riam Kanan Reservoir area encompasses a diverse range of habitats. Surrounding the reservoir, there are deep waters with depths of 10–30 m, as well as river waters with depths of 0–5 m. The reservoir is characterized by slow currents and a tranquil surface. Temperature stratification makes the upper water layer typically warm, while the lower layer is cold, or conversely, the upper layer may be cold while the lower layer is warm. These habitat variations result in distinct adaptations among aquatic inhabitants. For instance, fish residing in the river exhibit unique morphologies and behaviors, such as a slender body shape to navigate strong currents and for agile movement (Gordon 2019; Radinger et al. 2019; Sun et al. 2019). In contrast, fish inhabiting the deeper reservoir waters tend to exhibit larger, more robust body morphologies, often emphasizing weight gain over length gain.

Environmental factors governing the Riam Kanan Reservoir's waters are influenced by water quality, physical parameters, chemical parameters, habitat structure, and nutrient availability—all of which impact the distribution and abundance of fish in the reservoir (Chairuddin and Yunita 2003; Radinger et al. 2019; Raharja et al. 2019). Our research has led to the collection of 7,570 fish specimens, representing 15 families and 30 species. These findings underscore the Riam Kanan Reservoir's potential as a habitat for a diverse range of freshwater fish species. Notably, our research reveals a rich diversity of freshwater fish in the Riam Kanan Reservoir, with the especially within the Cyprinidae family, which represented at 57.52% of the fish species diversity.

This collection includes both endemic and introduced fish species within the Riam Kanan Reservoir (Table 2; Figures 3–5). The collected fishes encompass economically valuable species for consumption, such as those from the families Anabantidae, Bagridae, Belontiidae, Cichlidae, Channidae, Cyprinidae, Eleotridae, Mastacembelidae, Notopteridae, Osphronemidae, Pristolepididae, and Siluridae. Additionally, we noted the presence of fishes suitable for the ornamental fish market, including species from the families Aplocheilidae, Belonidae, Belontiidae, and Cyprinidae, specifically *Puntius anchisporous* (Vaillant, 1902). *Puntius anchisporus* (Vaillant, 1902) is not found in the GenBank NCBI. Its characteristic features include having a red color at the tips of the dorsal and pelvic fins, with four vertical black lines on the body. *Puntius anchisporus* (Vaillant, 1902) is a homotypic synonym of *Puntigrus anchisporus* (Vaillant, 1902) and shares similarities with *Puntigrus tetrazona* (Bleeker, 1855) with NCBI Taxonomy ID 1606681 found in Sumatra. *Puntius anchisporus* (Vaillant, 1902) and *Puntigrus tetrazona* (Bleeker, 1855) likely share similarities in their color patterns and the black lines they possess. *Puntigrus tetrazona* (Bleeker, 1855) is *Puntius tetrazona* (Bleeker, 1855) and *Puntius anchisporus* (Vaillant, 1902) and *Puntius tetrazona* (Bleeker, 1855) are different species (Kottelat et al. 1993; Weber & Beaufort, 1916).

A non-economic fish from the Tetraodontidae family, *Tetraodon kretamensis* (Inger, 1953), synonym *Dichotomyctere kretamensis* (Inger, 1953), is also not found in GenBank CNBI. *Tetraodon kretamensis* (Inger, 1953) has many black spots on its dorsal area and is dark blackish in color. *Tetraodon nigroviridis* (Marion de Procé, 1822) synonym *Tetraodon fluviatilis* (Hamilton, 1822) has many black spots on its dorsal area and is of a darker yellowish-green colour, making these black spots very distinctive. *Tetraodon kretamensis* (Inger, 1953) shares similarities with *Tetraodon nigroviridis* (Marion de Procé, 1822), synonym *Tetraodon fluviatilis* (Hamilton, 1822), synonym *Chelonodon fluviatilis* (Hamilton, 1822) as both have a body colour pattern dominated by black spots on the dorsal area. *Tetraodon kretamensis* (Inger, 1953), *Tetraodon nigroviridis* (Marion de Procé, 1822) and *Tetraodon fluviatilis* (Hamilton, 1822) are different species (Kottelat et al. 1993). Tetraodontidae, commonly known as Puffers, are generally not consumed due to the toxins they contain, specifically tetrodotoxins found in their skin and liver. Puffers play an essential ecological role as predators that help maintain balance in aquatic ecosystems by consuming small fish. Japanese chefs often have the expertise to process and cook puffer fish (fugu); however, the people of Riam Kanan and South Kalimantan have not utilized puffer fish for consumption. The presence of puffer fish in the Riam Kanan Reservoir presents an opportunity to develop processed food commodities or export fish products. This inventory of both economic and non-economic fish species underscores the potential for further development and the benefits it can offer both now and in the future.

The family Cyprinidae exhibited the highest species richness in the Riam Kanan Reservoir, accounting for 57.52% of the total fish species (Figures 6, 7). Cyprinidae is found in various regions of Indonesia, including the Riam Kanan Reservoir and is notably diverse and dominant in tropical freshwater ecosystems. The introduced Cyprinidae species, *Osteochilus hasseltii* (Valenciennes, 1842) has successfully established itself within the freshwater environment of Riam Kanan. It is consistently present throughout the year, and is considered native in this ecosystem. Other Cyprinidae collected included *Barbodes schwanenfeldii* (Bleeker, 1854) [homotypic synonym *Puntius schwanefeldi* (Bleeker, 1854)], *Barbonymus schwanefeldii* (Bleeker, 1854), *Barbodes schwanenfeldii* (Bleeker, 1854), *Puntius schwanenfeldii* (Bleeker, 1854), *Barbus schwanenfeldii*

(Bleeker, 1853) [heterotypic synonym *Puntius schwanenfeldii* (Bleeker, 1854) with the common name(s) goldfoil barb], *Mystacoleucus marginatus* (Valenciennes, 1842) [basionym: *Barbus marginatus* (Valenciennes, 1842) homotypic synonym: *Systomus marginatus* (Valenciennes, 1842) with NCBI Taxonomy ID: 193150], *Puntioplites bulu* (Bleeker, 1851) [NCBI Taxonomy ID 227279, synonym *Puntius bulu* (Bleeker, 1863)], *Osteochilus waandersii* (Günther, 1868) [synonym *Puntius waandersi* (Bleeker, 1863)], *Rasbora caudimaculata* (Volz, 1903) [synonym *Rasbora trilineata* (Steind, 1870)], and *Oxygaster anomalura* (van Hasselt, 1823) [synonym *Chela oxygaster* (Valenciennes, 1844)]. *Osteichilus repang* (Popta, 1902) is not found in GenBank, along with its synonym. *Osteichilus repang* (Popta, 1902) is represented by a single specimen found in the Bo River in 1902, which is a tributary of the Mahakam River, and also found in the Riam Kanan Reservoir. In the Bagridae family, *Mystus nemurus* synonym *Hemibagrus nemurus* (Valenciennes, 1840) [basionym *Bagrus nemurus* (Valenciennes, 1840)] [homotypic synonym *Mystus nemurus* (Cuvier & Valenciennes, 1840); GenBank common name: Asian redtail catfish, NCBI BLAST name: bony fishes (Schoch et al. 2020)]

A research study conducted in 1998 on fish diversity and distribution in the Riam Kanan River section collected between 4,854 to 5,313 fish specimens, representing 12 to 14 families and 23 to 25 fish species, with the Cyprinidae family dominating (Yunita 1989). In contrast, our 2020 research yielded a collection of 7,570 fish specimens, encompassing 15 families and 30 species. This substantial increase in the number of fish specimens provides insights into both similarities and differences in terms of species and families over a roughly 20-year period from 1998 to 2020. Accurate identification skills are essential for this task, as the differences among specimens can be minuscule, including distinctions in eye color, slight variations in body shape, and the presence or absence of specific markings, particularly within Cyprinidae. This family overwhelmingly dominates in terms of both the number of fish and the diversity of species within the study area, and in other freshwater ecosystems of the tropics and subtropics (Kottelat et al. 1993). Species of this family are adapted to various water flow conditions, ranging from calm to fast-flowing waters, thanks to their streamlined body shapes that enable agile and swift movements.

Other abundant and species-rich families found in Riam Kanan Reservoir, representing less than 10% of the total diversity include the Bagridae 8.88%, Eleotridae 7.41%, Aplocheilidae 5.57%, Belontiidae 4.90%, Channidae 4.07%, Notopteridae 3.39%, Anabantidae 2.95%, and Osphronemidae 1.81% (Figures 6, 7).

Our study of freshwater fish inventory yields valuable information regarding fish species suitable for aquaculture and breeding programs, such as flounder (*Belida* spp.) or the featherback *Chitala lopis* (Bleeker, 1851). Featherback, in particular, experience high demand, resulting in the continuous capture of individuals ranging from small to large sizes. This is because featherback meat serves as a primary ingredient in snack production. Featherback fish are relatively rare in local markets or supermarkets. Although efforts have been initiated to provide featherback fingerlings, further research is required for the commercialization of this species. Another noteworthy fish species is the betutu or bakut fish, *Oxyeleotris marmorata* (Bleeker, 1852), which is caught, collected, and exported while still in a fresh state. The larger the fish, the higher its value in the live and fresh market. The local community around the Riam Kanan Reservoir has already explored export opportunities for this species.

Freshwater fish serve as a vital source of protein for the community (Trizzino et al. 2015; Sun et al. 2019). In the midst of the global COVID-19 pandemic, the consumption of freshwater fish as a protein source became even more crucial. Fish food aids in strengthening the body's immunity against viral attacks, thus enhancing overall community and individual resilience (Yunita 1989). Government and international programs are actively working towards enhancing food security through the development of sustainable freshwater fish farming, with a particular focus on developing countries.

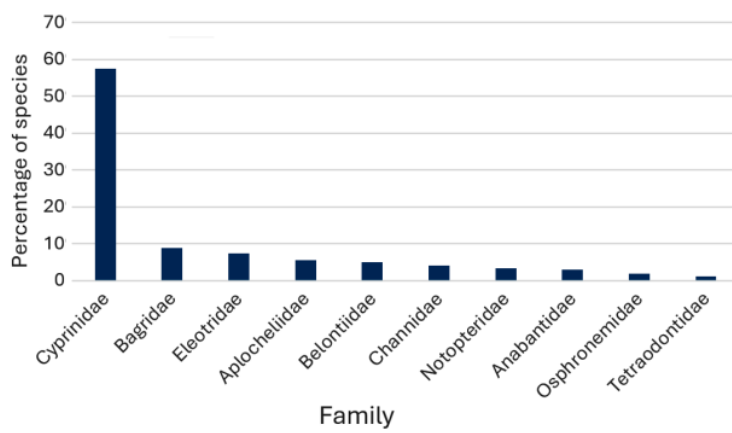

Figure 6. Percentage of species by family in Riam Kanan Reservoir, Indonesia.

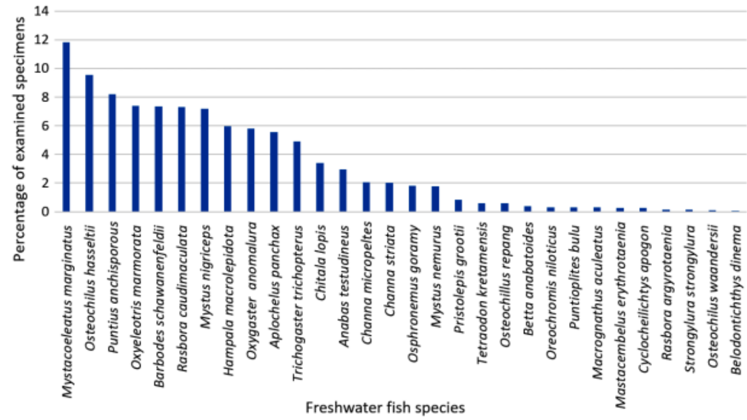

Figure 7. Percentage of examined fish specimens by species in Riam Kanan Reservoir, Indonesia.

Methodological and technological limitations present formidable obstacles and challenges in the field of freshwater fish research. Our fish survey methods are intentionally straightforward, utilizing nets designed to selectively capture larger fish while allowing smaller ones to escape. This approach not only sustains fish populations but also supports their continued growth and development within the Riam Kanan Reservoir. The implementation of size-specific netting has a profound impact on promoting sustainable fishing practices and environmentally friendly methods in freshwater fishing within the Riam Kanan ecosystem. The implications of our research underscore the significance of freshwater fish inventory data in shaping the Riam Kanan Reservoir's ecosystem and highlights the importance of further research aimed at determining the profitability and sustainability of freshwater fish populations, particularly those that may be at risk or endangered.

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ADDITIONAL INFORMATION

Conflict of interest
The author declares that no competing interests exist.

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Data availability
All data that support the findings of this study are available in the main text.

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