Species richness of riparian vegetation after three decades of Kenyir dam establishment

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ABSTRACT

This data article is on riparian vegetation species richness in four different streams located in the Sultan Mahmud Hydroelectric dam, also known as Kenyir dam and commonly referred to as Tasik Kenyir, Terengganu. The dataset consists of three reservoir-island streams and the other is a small stream located on the mainland. A total of 41 families and 90 species of riparian plants were reported for the first time after 34 years of the establishment of the Sultan Mahmud Hydroelectric dam. Trees contributing 60% of the species recorded in this study and the others were non-tree species, including climbers, ferns, epiphyte, herbs, shrub, strangling trees and palms. Among the recorded riparian plant species, two are introduced which are Clidemia hirta and Mimosa pigra. The highest diversity of riparian plant found in the stream of Sungai Kiang, followed by Sungai Ikan and Sungai Saok with 46, 29 and 17 species respectively for the reservoir-island streams. The mainland stream, Sungai Siput recorded 37 species. These riparian plants provide important ecosystem services, among others soil stabilization, habitat and food for aquatic fauna and water filtration. In terms of plant utilization potential and values, 47 species are identified having medicinal value, 10 species with ornamental value and another 36 species are timber trees. Our study demonstrates that the riparian plants are closely linked to stream size with variability associated with types of stream systems. The data

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collected also demonstrates that the riparian plant community is at the seral stages of riparian forest. This is indicated by the increase in plant species richness as the vegetation gradually changes from riparian towards mature forest composition. To secure ecological functions of Tasik Kenyir riparian plant assemblages, particularly in stabilizing the lake’s margin and riverbank, it is recommended that monitoring and legal protection may need to be imposed by local authority.

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### Value of the Data
- This data include several types of plant species presence in three reservoir-island streams and a small stream on the mainland that flow into Tasik Kenyir, Terengganu.
- The data are the first record of riparian vegetation along streams that were previously severely degraded by the construction of the Sultan Mahmud Hydroelectric dam. This data may be used to underpin for management and conservation of riparian ecosystem in the tropics.
- The information related to the potential utilization of the plants (e.g., in medicinal, ornamental and timber) and the type of plant found in the study areas were also given.
- Trees are more common among the riparian plant contributing 60% of the species recorded in this study and the other non-tree species consists of climbers, ferns, epiphyte, herbs, shrub, strangling trees and palms.
- The checklist will allow researchers to collaborate, extend their checklist and broaden their statistical analyses especially on spatial scale (comparing disturbed-undisturbed habitats) and beta-diversity (interhabitat similarity).

### 1. Data

This data article presents survey results of the riparian vegetation diversity and their presence in three small reservoir-island streams and a small stream on the mainland that flow into the Sultan Mahmud Hydroelectric dam, Terengganu (Table 1). From these, additional information such as, ecosystem services (e.g., timber, ornamental and medicinal plants) (Tables 1 and 2), introduced
List of riparian plant species in four different streams at Kenyir hydroelectric dam. Non-trees species include climbers, ferns, epiphyte herbs, shrub, strangling tree and palm.

| Family          | Species                   | Common name         | Types   | Location | Use [1] |
|-----------------|---------------------------|---------------------|---------|----------|---------|
|                 |                           |                     | SI      | SK       | SSK     | SSP     | M [2]   | O       | T |
| Achariaceae     | Hydnocarpus castanea      | Alai batu           | Tree    | 1        | 0       | 0       | 0       | /       | / |
| Adiantaceae     | Adiantum latifolium       |                     | Fern    | 1        | 0       | 0       | 0       | /       | / |
| Anacardiaceae   | Pentaspadon velutinus     | Pelong beledu       | Tree    | 0        | 1       | 1       | 1       | /       | / |
|                 | Campnoserpa squamatum     | Terentang           | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Anisophyllaeace | Anisophylla disticha      | Raja berangkat      | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Annonaceae      | Cananga odorata           | Kenanga hutan       | Tree    | 1        | 0       | 0       | 0       | /       | / |
|                 | Desmos dasymaschatus      | Kenerak             | Tree    | 1        | 0       | 0       | 0       | /       | / |
|                 | Fissistigma latifolium    | Akar pisang bukit   | Climber | 0        | 0       | 0       | 1       | /       | / |
|                 | Xylopia magna             | Jangkang bukit      | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Apocynaceae     | Alstonia angustifolia     | Pulai               | Tree    | 1        | 1       | 0       | 0       | /       | / |
| Araceae         | Alocasia macrorrhizos     | Keladi seberang     | Herb    | 0        | 1       | 0       | 0       | /       | / |
| Areaceae        | Arenga obtusifolia        | Langkap             | Palm    | 1        | 1       | 1       | 1       | /       | / |
|                 | Korthalsia laciniosa      | Rotan               | Palm    | 1        | 0       | 0       | 0       | /       | / |
|                 | Livistona speciosa        | Serdang             | Palm    | 0        | 0       | 0       | 1       | /       | / |
|                 | Pinanga malaiana          | Pinang              | Palm    | 0        | 1       | 0       | 0       | /       | / |
| Asteraceae      | Wedelia triflora          | Bunga butang        | Herb    | 1        | 0       | 0       | 1       | /       | / |
|                 | Mikania cordata           | Selaput tunggul     | Climber | 0        | 0       | 0       | 1       | /       | / |
|                 | Mikania micrantha         | Selaput tunggul     | Climber | 0        | 1       | 0       | 0       | /       | / |
| Calophyllaceae  | Calophyllum ferrugineum   | Bintangor           | Tree    | 0        | 0       | 0       | 1       | /       | / |
|                 | Mesua lepidota            | Penaga              | Tree    | 1        | 0       | 0       | 0       | /       | / |
| Cecropiaceae    | Poikilospermum suaveolens | Akar setawan        | Epiphyte| 0        | 0       | 1       | 1       | /       | / |
| Celastraceae    | Salacia maingayi          | Hempedal ayam       | Climber | 0        | 0       | 1       | 0       | /       | / |
| Chrysobalanaceae| Parinari oblongifolia     | Membatu             | Tree    | 0        | 0       | 0       | 1       | /       | / |
| Clusiaceae      | Garcinia atroviridis      | Asam gelugor        | Tree    | 0        | 0       | 0       | 1       | /       | / |
| Costaceae       | Costus speciosus          | Setawar hutan       | Herb    | 1        | 0       | 0       | 1       | /       | / |
| Cyperaceae      | Scleria ciliaris           | Rumput rusiga       | Herb    | 0        | 1       | 0       | 1       | /       | / |
|                 | Cyperus digitatus          | Rumput rusiga       | Herb    | 0        | 1       | 0       | 0       | /       | / |
| Dilleniacae     | Dillenia indica           | Simpoh epal gajah   | Tree    | 0        | 1       | 0       | 0       | /       | / |
|                 | Dillenia reticulata       | Simpoh gajah        | Tree    | 0        | 1       | 0       | 0       | /       | / |
|                 | Dillenia grandifolia      | Simpoh daun besar   | Tree    | 0        | 1       | 0       | 0       | /       | / |
|                 | Dillenia pulchella        | Simpoh paya         | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Dipterocarpaceae| Shorea leprosula          | Meranti tembaga     | Tree    | 0        | 0       | 1       | 1       | /       | / |
| Dipterocarpaceae| Shorea ovalis             | Meranti kepong      | Tree    | 0        | 0       | 0       | 1       | /       | / |
|                 | Dipterocarpus cornutus     | Keraing gombang     | Tree    | 0        | 1       | 0       | 0       | /       | / |
|                 | Dipterocarpus costulatus   | Keraing kipas       | Tree    | 0        | 0       | 1       | 0       | /       | / |
| Euphorbiaceae   | Sapum discolor            | Ludai               | Tree    | 1        | 0       | 1       | 1       | /       | / |
|                 | Macaranga gigantea        | Mahang telinga gajah| Tree    | 0        | 1       | 0       | 1       | /       | / |
|                 | Macaranga triloba         | Mahang              | Tree    | 1        | 0       | 0       | 1       | /       | / |
|                 | Macaranga hypoleuca       | Mahang putih        | Tree    | 0        | 1       | 0       | 1       | /       | / |
|                 | Mallotus macrostachyus     | Balik angin         | Tree    | 0        | 1       | 0       | 1       | /       | / |
|                 | Bridelia glauca           | Kenidai             | Tree    | 0        | 1       | 0       | 0       | /       | / |
|                 | Agrostistachys gaudichaudi| Julong-julong       | Tree    | 0        | 0       | 0       | 1       | /       | / |
|                 | Elaterispermum tapos       | Perah               | Tree    | 0        | 1       | 0       | 0       | /       | / |
|                 | Streblus elongtus         | Tempinis            | Tree    | 0        | 0       | 1       | 0       | /       | / |
| Fagaceae        | Lithocarpus lucida        | Mempening giring    | Tree    | 0        | 0       | 0       | 1       | /       | / |
|                 | Lithocarpus wallichianus   | Mempening           | Tree    | 0        | 0       | 1       | 0       | /       | / |
| Gleicheniaceae  | Dicranopteris linearis    | Paku resam          | Fern    | 0        | 1       | 0       | 0       | /       | / |
| Hypericaceae    | Cratoxylum formosum       | Mempat              | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Ixonanthaceae   | Ixonanthus reticulata     | Tenggek burung      | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Lectythidaceae  | Barringtonia macrocarpa   | Putat               | Tree    | 0        | 1       | 0       | 0       | /       | / |
| Leeeaceae       | Leea indica               | Mali-mali           | Shrub   | 1        | 0       | 0       | 0       | /       | / |
| Leguminosae     | Intisia palembanica       | Merbau              | Tree    | 1        | 1       | 1       | 1       | /       | / |
|                 | Bauhinia bidentata        | Tapak kuda          | Climber | 1        | 1       | 1       | 0       | /       | / |
|                 | Mimosa pigra              | Semalu besar        | Shrub   | 0        | 1       | 0       | 1       | /       | / |
|                 | Parkia speciosa           | Petai               | Tree    | 0        | 1       | 0       | 1       | /       | / |
|                 | Cynometra malaccensis      | Kekatong            | Tree    | 1        | 0       | 0       | 0       | /       | / |

(continued on next page)
Invasive alien species and the types of plants (e.g., tree, herbs, shrubs, climbers) (Tables 1 and 3) were given which might be useful for forest regeneration comparison, model for natural succession of riparian ecosystem, natural flooding and river banks’ control, pathway for invasive species, conservation.

### Table 1 (continued)

| Family             | Species                  | Common name       | Types    | Location | Use [1] | SI | SK | SSK | SSP | M [2] | O | T |
|--------------------|--------------------------|-------------------|----------|----------|---------|----|----|-----|-----|------|---|---|
| Lytheraceae        | Lagerstroemia speciosa   | Bungor tree       | Tree     | 1 1 0 1  | /       |    |    |     |     |      |   |   |
| Malvaceae          | Commersonia bartramia    | Angkut-angkut tree| Tree     | 0 0 0 1  | /       |    |    |     |     |      |   |   |
| Melastomataceae    | Clidemia hirta           | Senduduk putih    | Shrub    | 1 1 1 1  | /       |    |    |     |     |      |   |   |
| Melastomataceae    | Melastoma sanguineum     | Senduduk bulam    | Shrub    | 0 1 0 0  | /       |    |    |     |     |      |   |   |
| Moraceae           | Artocarpus elasticus     | Terap nasi tree   | Tree     | 0 1 1 1  | /       |    |    |     |     |      |   |   |
| Myristaceae        | Horsfieldia irya         | Piangu tree       | Tree     | 0 1 0 0  | /       |    |    |     |     |      |   |   |
| Myrtaceae          | Syzygium foxworthianum   | Jambu air hutan   | Tree     | 1 1 0 0  | /       |    |    |     |     |      |   |   |
| Ophioglossaceae    | Helminthostachys zeliana | Tunjuk langit fern| Fern     | 1 0 0 0  | /       |    |    |     |     |      |   |   |
| Phyllantaceae      | Breynia coronea          | Chuma padang shrub| Shrub    | 1 0 0 1  | /       |    |    |     |     |      |   |   |
| Phyllanthus pectinatus |  | Asam Melaka tree    | Tree     | 0 0 0 1  | /       |    |    |     |     |      |   |   |
| Rubiaceae          | Canthium horridum        | Melor hutan shrub | Tree     | 1 1 0 1  | /       |    |    |     |     |      |   |   |
| Rubiaceae          | Uncaria acida            | Kait-kait climber | Tree     | 0 1 0 0  | /       |    |    |     |     |      |   |   |
| Sapindaceae        | Pometia pinnata          | Kasai tree        | Tree     | 1 0 1 0  | /       |    |    |     |     |      |   |   |
| Schizaceae         | Lygodium flexuosum       | Paku pakis climber| Tree     | 1 0 1 1  | /       |    |    |     |     |      |   |   |
| Ulmaceae           | Trema tomentosa          | Mengkirai tree    | Tree     | 0 1 0 0  | /       |    |    |     |     |      |   |   |
| Woodsiaceae        | Diplazium esculentum     | Paku makan herb   | Tree     | 1 0 0 0  | /       |    |    |     |     |      |   |   |
| Zingiberaceae      | Etlingera metirocheilos  | Tepus tanah herb  | Tree     | 0 1 0 1  | /       |    |    |     |     |      |   |   |

Note: The sites for field visits are abbreviated as SI = Sungai Ikan; SK = Sungai Kiang; SSK = Sungai Saok and SSP = Sungai Siput. Value of the plant was based on Burkil [1] and Kamarudin & Latiff [2]. The abbreviated referrer as M = medicinal; O = ornamental and T = timber.

### Table 2
Classification of the riparian plants based on their potential use.

|                | Medicinal | Ornamental | Timber |
|----------------|-----------|------------|--------|
| Sungai Siput   | 21        | 3          | 15     |
| Sungai Kiang   | 23        | 2          | 17     |
| Sungai Saok    | 9         | 4          | 10     |
| Sungai Ikan    | 18        | 5          | 9      |

### Table 3
The classification of riparian plant in four different rivers.

|                | Tree | Palm | Herb | Climbers | Shrub | Others |
|----------------|------|------|------|----------|-------|--------|
| Sungai Siput   | 22   | 2    | 4    | 4        | 5     | 0      |
| Sungai Kiang   | 28   | 2    | 4    | 5        | 6     | 1      |
| Sungai Saok    | 9    | 1    | 0    | 3        | 1     | 3      |
| Sungai Ikan    | 15   | 2    | 3    | 3        | 4     | 2      |
as well as their geographical tolerance and adaptations. Incidence-based species richness information is translated into inter-habitat similarity data to compare their relative similarity in species presence (Fig. 1). The presence of more common species between a pair of sites resulted in higher site similarity which signifies physical and biological affinity between locations (i.e., streams). The data are also interpreted using common similarity index (Jaccard's) to derive the inter-streams similarity values (Table 4) which are useful for spatial and beta-diversity assessments within the similar geographical ranges.

2. Experimental design, materials, and methods

Site visits were made to record all riparian plants found along a 100 m distance x 5 m width on both banks from three reservoir-island streams and one stream on the mainland within the Sultan Mahmud Hydroelectric dam. The survey belts were set up about 50–100 m from the lake margin of highest high water level of the reservoir. The areas covered were Sungai Ikan, Sungai Kiang, Sungai Saok and Sungai Siput. Plant collection and observation were carried out by researchers to cover as much area as

![Dendrogram](image)

**Fig. 1.** Dendrogram generated from Ward’s method comparing the riparian plant community of three reservoir-island streams and small mainland stream (Sungai Siput) in Kenyir hydroelectric dam, Terengganu.

| Stream   | Jaccard similarity value | Number of shared species |
|----------|--------------------------|--------------------------|
| Sungai Siput | 0.24                   | 11                       |
| Sungai Kiang | 0.15                   | 9                        |
| Sungai Saok | 0.11                   | 7                        |
| Sungai Ikan | 0.14                   | 6                        |

**Table 4**

Jaccard similarity value and number of shared species.
possible during the visit. Plants that were found within the belt distance were identified in situ. Plant cuttings for identification especially the infertile plant were made. Plant identification was also carried out in the laboratory based on herbarium specimens. All plants were identified to family, generic and species level based on the relevant identification book [3,4]. The data were briefly analyzed to obtain a similarity index between a paired streams based on the Jaccard index using Paleontological Statistics Software Package (PAST) v.3. Cluster analysis was done on similar data set using the same software to graphically illustrate the inter-habitat relationship based on the presence of riparian vegetation at those locations.

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Transparency document

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