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# SOCIO-ECONOMIC AND LIVELIHOOD ASSESSMENT OF INLAND FISHERMEN IN MUDA RIVER BASIN

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### *Abstract*

The Muda River is a shared watercourse between Kedah and Penang state. The inland fishery sector of Malaysia is an important socio-economic sector as it provides a vital source of protein, employment and livelihood for fishers who solely depend on it. However, anthropogenic and environmental issues such as water pollution, eutrophication, depletion of water level, erosion, sedimentation, and overfishing have further compounded the fish environment in Muda river basin. This study was conducted to evaluate the socio-economic and livelihood status of the inland fishermen around Muda river basin. A total of 46 fishermen respondents were selected randomly from the list of fishermen with the Department of Fisheries. The sample survey was carried out in November 2018 and data were analysed using Statistical Package for Social Sciences (SPSS). The data interpretations showed that majority of the fishermen community are literate and the highest level of education in the fishermen community is Form 6 or Diploma. The findings show that primary occupation of the respondents was fishing and some of them are doing odd jobs and working in farmland to create a secondary source of income source. Lack of proper knowledge, research, data, training and much of governmental support was the major constraints of inland fisheries in the study area. It is recommended that the government should closely monitor fisheries in the area in order to prevent overfishing, work with NGOs and at the same time look into the welfare and livelihood of the fishermen.

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**Keywords:** Fish diversity, socio-economic, Muda river, Kedah, Penang, livelihood.



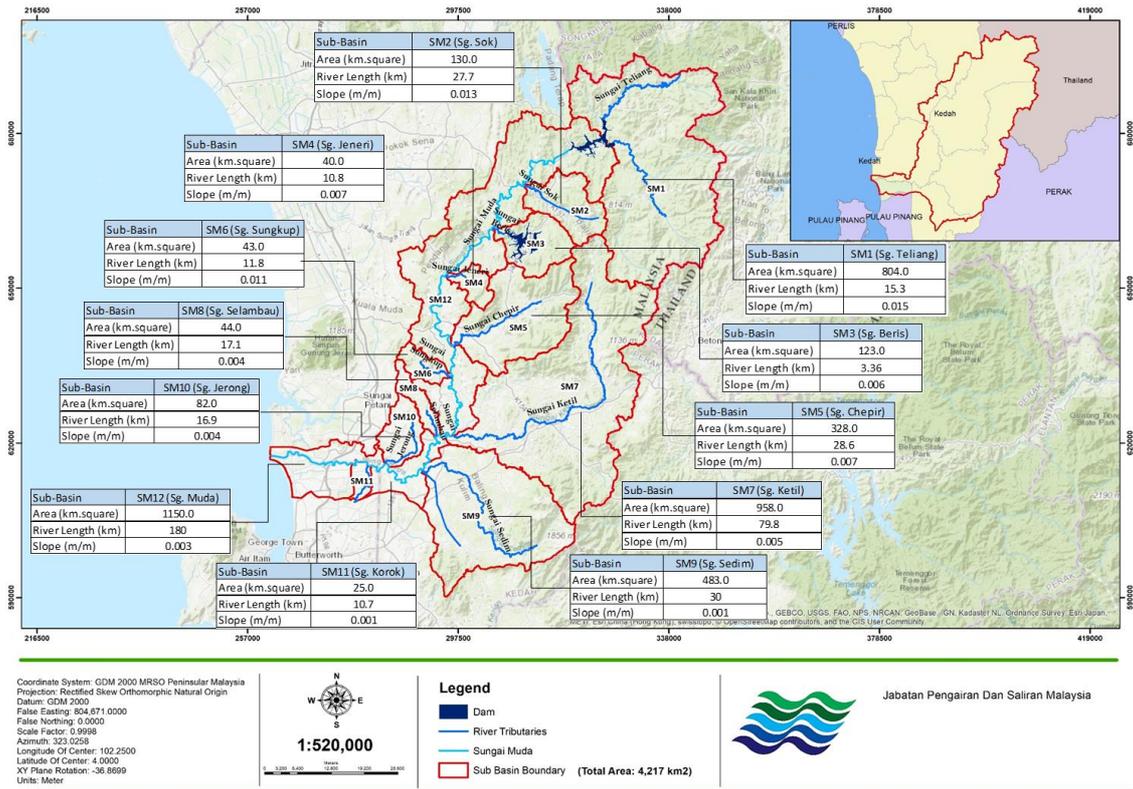
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## 1. Introduction

The fishery sector contributes significantly to the national economy in Malaysia (Safa, 2004) and plays a significant role in the rural population. There are several definitions of the inland fisheries. The European Inland Fisheries Advisory Commission (EIFAC) of the FAO has described inland fisheries term as fish species that spend all or part of their life cycle in freshwater (Cowx, 2015). According to the Fisheries Act 1985, inland fisheries are defined as fisheries in riverine waters. Fisheries Research Institute (2018) defined inland fisheries as the extraction of fish from lakes, rivers, minefields, streams, canals, reservoirs, dam and other freshwater bodies. In 2017, the value added by the fisheries sector in Malaysia was estimated at RM2.4 million (US\$0.57 million at 1 US\$ = RM4.19), which represents about 26.7% from the agri-food industry (Department of Fisheries, 2017). In 2017, inland fisheries sector in Malaysia stood at 5,177.19 tonnes or RM 93,312,623 (US\$ 22,274,036.95 at 1 US\$ = RM4.19) to the Gross Domestic Product (GDP) (Daud & Safiei, 2018). Inland fisheries sector in Kedah amounted to 892.12 tonnes of RM7,634,130 (US\$ 1,822,292.51 at 1 US\$ = RM4.19) (ibid).

### 1.1. Location and geography of the Muda River Basin

The catchment of the Muda river basin in the northwest of Peninsular Malaysia covers about 4210 km<sup>2</sup> and is the largest river system in the northern region (Figure 01). The Muda river basin covers six districts (Baling, Padang Terap Kuala Muda, Baling, Sik and Kulim) and 28 *mukims* (parishes) and has the length of 180 km (Julien et al., 2006; Ghani et al., 2010). The Muda river rises from the northern mountainous area of Kedah and then flows 30 km river downstream to form an inter-state boundary between Kedah and Penang and is considered a vital water catchment as well as natural resource area providing timber, fisheries, forest products and natural heritage conservation (Chuah et al., 2011; Sah et al., 2012). The network of Muda river basin is formed from Ketil River, Tembus River, Chepir River, Teliang River, Endin River, Sedim River, Sik River, Baho River, Sungai Legong River, Sungai Telui River, Sungai Beris River dan Jenin River (Daud & Safiei, 2018). Ketil River (868 km), Sedim River (626 km), and Chepir River (335 km) are the three main tributaries of Muda River system. Muda Dam, Pedu Dam, Ahning Dam, and Beris Dam are four major dams within Muda River Basin (Lee, 2009; Ghani, 2010; Sim et al., 2018). Muda River is one of the most important water resources for agriculture and water supply for Kedah and Penang (Lee et al., 2013).



**Figure 01.** Muda River Basin (Department of Irrigation and Drainage, 2019)

Department of Fisheries in Kedah reported that there are 172 villagers involved in inland fisheries all year round that cover the district of: Kuala Muda – Yan (60 persons), Sik (50 persons), Kulim (30 persons) and Baling (32 persons).

## 2. Problem Statement

Muda river basin experienced changes in its fish environment due to interlinked anthropogenic and environmental issues. The anthropogenic issue includes water pollution (illegal waste dumping site), eutrophication, depletion of water level, erosion (from sand mining and logging activities), sedimentation, and overfishing. Reduction fish stocks and flooding are the main environmental trends at Muda river basin. These problems interconnect and impact onto the livelihood of the fishermen who live along the Muda river basin. According to Omar et al. (2003), and Ghani et al. (2010), the unsustainable management of Muda river basin is threatening the fish population in Muda river basin that is critical for the survival of the fishermen in Muda river basin.

## 3. Research Questions

The main research questions addressed by this study are:

- What are the types fishing economic sources of inland fisheries in the Muda River Basin?
- What is the strength, weakness, opportunity and threat of inland fisheries industry in Muda river basin?

- What are the livelihood strategies to employed to increase the potential of inland fisheries?
- How do inland fisheries become an alternative source of income to rural communities?

#### 4. Purpose of the Study

The purpose of this research is to improve the livelihood of the fishers in Muda river basin. The research objectives of this research study are:

- identify the economic sources of inland fisheries in the Muda River Basin
- determine the strength, weakness, opportunity and threat of inland fisheries industry in Muda river basin
- determine the economic potential of inland fisheries resources that can be further developed to improve the livelihood of fishermen in the rural area
- investigate the role of inland fisheries as an alternative source of income for the rural population

#### 5. Research Methods

##### 5.1. Data collection

The sample survey was carried out from November 2018 till March 2019. The sample survey (questionnaires and interview) aimed to obtain socio-economic information on household income and livelihood, fishing operations, and other activities related to inland fisheries. For the sample survey, 46 fishermen of the total of 172 inland fishermen in Muda river basin were randomly selected, and by the suggestions of the Department of Fisheries and by village leaders.

##### 5.2. Data Analysis

Data were coded and analysed using SPSS and Excel. The survey teams collaborate with the Department of Fisheries of Kedah and District Fisheries Office (PPD) of Kuala Muda, Sik, Kulim and Baling who arrange the interview schedule with the inland fishermen.

##### 5.3. Profile of respondents

Inland fishermen in Muda river basin is divided into two categories (Table 01):

- Category A: full-time fishermen, subsidy recipient and non-subsidy recipient
- Category B: Part-time or seasonal basis

**Table 01.** The profile of inland fishermen and potential area of inland fishing in Muda river basin.

Location	Category A Full time		Category B Part-time
	Subsidy recipient	Non-subsidy recipient	Non-subsidy receipt
Kampung Titi Merdeka, Kuala Muda	13	1	N.A
Empangan Sg Muda, Gubir, Sik	12	2	N.A

Kg Ujung Panjang, Kulim	9	2	1
Kg Kuala Lesung, Kuala Ketil, Baling	4	1	1
Total	38	6	2

Source: FRI 2018

Most of the respondents (58.7%) were aged between 41-60 years, while a small number (19.6%) were aged between 61-80 years. Most of the respondents (23.9%) had between 11 to 20 years of experience, 26.1 % had between 21 to 30 years of experience, 23.9 % had between 31 to 40 years of experience, 17.4% had between one to nine years of experience. Only a small percentage (8.7%) had more than 40 years of experience.

The inland fishermen in Muda river basin comprised of inland fishermen from Kampung Titi Merdeka (Kuala Muda district), Muda dam, Gubir (Sik district), Kampung Ujung Padang, Sidam Kanan (Kulim district) dan Kampung Kuala Lesung, Kuala Ketil (Baling district). The location of the study area is further divided into 3 groups such as:

- Upstream: Kampung Kuala Lesung (Baling district)
- Mid-stream of Muda river basin: Muda dam, Gubir (Sik district) dan Kampung Ujung Padang (Kulim district)
- Downstream of Muda river basin: Kampung Titi Merdeka (Kuala Muda district)

Overall, however, the majority (more than 70 %) of the interviewed fishermen say they were not satisfied with the subsidy provided by the authorities as it was not adequate. Nevertheless, the fishermen were grateful to the authorities for the subsidies but suggested that the authorities should help them better in aquaculture of fisheries in the Muda lake, provide technical training for them and provide/rent boats and other fishing equipment to them.

#### **5.4. Educational Level of Inland Fishermen**

The majority (91.3%) of the inland fishermen surveyed received formal education whereas, about 8.7% of the respondents did not receive any formal schooling. This shows that that literacy rates among the fishermen population in Muda river basin is high (91.3%) and the highest-level education in the communities is Form 6 or Diploma.

## **6. Findings**

### **6.1. Household expenditure of fishermen in Muda river basin**

The total household expenditure of fishermen at Muda river basin was RM895.32 per month, which included food, rental, vehicle instalments, school expenses, utilities, cigarettes and other expenses. Based on the analysis, food component was the highest expenditure at RM516.51, followed by others (RM516.25), rental makes up of RM266.67, school expenditure for their children was accounted at RM243.11, vehicle instalment (RM165.00), cigarettes (RM101 .60) and utilities (RM99.51) as shown in Table 02.

**Table 02.** Average households' expenditures of fishermen in Muda river basin

Location	Kg Titi Merdeka (Kuala Muda)	Muda dam (Sik)	Kg Ujung Padang (Kulim)	Kg Kuala Lesung (Baling)	Average (RM/month)
Food	576.92	461.43	454.55	650.00	516.51
Rental	-	200	300	-	266.67
Vehicle instalment	180	150	-	-	165
School fees and expenses	278.33	27.43	190.44	256.00	243.11
Utilities (water, electricity, phone bill)	119.36	83.75	108	75	99.51
Cigarettes	104.72	120	80.50	93.33	101.60
Other expenses	716.67	225	450	630	516.25
Average expenses	983.46	810.36	846.33	985.83	895.32

Source: FRI 2018

Fisherman's income is calculated according to the cash or revenue distribution system. Head of Household Income (KIR) income is calculated and categorised according to the government-defined poverty level, as shown in Table 03. For this study, the Poverty Line (PLI) 2014 was used as the basis for analysing land fisherman poverty level (if applicable).

**Table 03.** Poverty Line (PLI) based on the calculation of income in 2014 (Unit: RM/month)

States	City		Rural	
	Poor	Hard-core poor	Poor	Hard-core poor
Peninsular	940.00	580.00	870.00	580.00
Sabah and Labuan	1,180.00	760.00	1,160.00	690.00
Sarawak	1,040.00	700.00	910.00	610.00

Source: FRI 2018

According to Mustapa et al. (2018), poverty in Malaysia is based on the PLI, poverty line income (Malaysian absolute poverty line), which is a quantitative money metric measure. In Peninsular Malaysia, PLI for the poor in the rural area is RM870, whereas PLI for hard-core poor is RM 580 (Table 03). When the households in a city area with a gross monthly income at RM940 and RM580 in Peninsular Malaysia are poor and hard-core poor, respectively. It is therefore concluded that all the fishermen in the survey obtained income below the national average, and most of them close to or below the poverty line. So, if the objective of the authorities is to alleviate poverty and bring fishermen out of poverty, they should do much more to help the fishermen of the Muda river basin.

## 6.2. Lists of species caught in Muda river basin

Based on the interviews with the respondents, the Muda river basin system demonstrates a high level of overall biodiversity 18 types of species representing nine families are found in the catch (Table 04). The

nine families are Cyprinidae, Palaemonidae, Bagridae, Butidae, Osphronemidae, Cichlidae, Pangasiidae, Pristolepididae, Notopteridae. From the catch composition; it shows that Tilapia make up of 28.3% of the catch, Lampan Sungai only accounted for 21.7%, Udang galah and baung sungai (15.2% respectively). Patin contributes only 6.5 % of the catch whereas Lampan Jawa representing 4.3% of the catch. Ketutu and Lampan only represent about 2.2 % catch respectively. These findings are more or less similar to the findings of Lee et al. (2013).

**Table 04.** List of species caught in Muda river basin

Species	Local name	Scientific name
1	Lampan Sungai	<i>Puntius schwanefeldii</i>
2	Lampan Jawa	<i>Arbonymus gonionotus</i> ( <i>Barbonymus gonionotus</i> )
3	Lampan ekor merah	<i>Barbonymus schwanefeldii</i>
4	Udang galah	<i>Macrobrachium rosenbergii</i>
5	Baung sungai	<i>Mystus nigriceps</i>
6	Baung jelung	<i>Mystus spp.</i>
7	Baung lawi	<i>Mystus spp</i>
8	Ketutu	<i>Oxyeleotris marmorata</i>
9	Sepat	<i>Trichogaster spp</i>
10	Pucuk pisang	<i>Labiobarbus fasciatus</i>
11	Temperas	<i>Cyclohelichthys apogon</i>
12	Tilapia	<i>Tilapia sp</i>
13	Sebarau	<i>Hampala macrolepidota</i>
14	Terbol	<i>Osteochilus hasseltii</i>
15	Patin	<i>Pangasianodon hypophthalmus</i>
16	Patong	<i>Pristolepis Fasciatus</i>
17	Selat	<i>Notopterus notopterus</i>
18	Kalui	<i>Osphronemus goramy</i>

Source: Department of Fisheries Kedah 2018 and Fisheries Research Institute 2018

The data gathered from catch data showed that *ikan Baung sungai, Lampam Jawa, Lampam sungai* dan *Pucuk pisang* are the species of fish that are regularly caught by the fishermen in Muda river basin. The high species diversity and evenness are mostly found in the mid-stream of Muda river basin which covers the area from Muda dam, Gubir, Sik, Kg Ujung Panjang and Kulim). Most fisherman in Muda river basin does not depend solely on fishing for their livelihood.

### 6.3. Discussion and Analysis

The results of this study identified that inland fisheries in the Muda River Basin are a valuable economic resource of the rural people living in and around the Muda Lake region. Results show that a substantial percentage of the population is involved with fishing in the lake and the rivers in the study area. Most of the fishermen, however, have other sources of income as the income from fishing is not enough to sustain their families. In order for them to survive on just fishing, their livelihood must be improved with outside help, preferably from the government or the private sector or NGOs.

Based on the in-depth qualitative interviews with the fishermen, it was found that the main strength of fisheries in the Muda lake and river area was the large water bodies that are teeming with fishes, the high biodiversity of many species of fishes, the good weather and hydrology of the area, and the accessibility of the fishing grounds to the fishermen's villages. The weaknesses, however, include the use destructive fishing gears such as small-meshed nets, electric shocks and poisoning at the headwater of the Muda river basin such as at Ulu Muda dam, Gubir, Sik and Kampung Ujung Padang. River pollution at Kampung Kuala Lesung, Baling and illegal dumpsite of a 1.4-hectare plot of land in Kampung Kemumbong, Sidam Kiri, near Sungai Petani also contributed to the cause of the decline of the fish stocks in Muda river basin. Another factor contributing to habitat destruction of the fishes is from the extensive pollution from palm oil plantation at Padang Serai. The Program Sukarelawan Perikanan (SUPER) is a co-management program between the fishing communities and the Department of Fisheries to prevent the illegal fishing methods that contribute to the degradation of fish ecosystems in Muda river basin.

In order to improve the livelihood of the fishermen, Mukim Sidam Kanan Inland Fishermen Association recognise that needs to have aquaculture sectors as an entry point of improving the livelihood of fishermen communities in Sidam Kanan. Aquaculture provides job opportunities to the fishermen communities in the rural area ranging from supplying to processing and marketing the fish products. Mukim Sidam Kanan Inland Fishermen Association pays particular attention to address the marketing opportunities for the fishes caught from Muda river basin. Most inland fishers not able to sell their products easily due to poor mechanisms of processing, packaging, marketing and lack of storage equipment. With proper marketing of the inland fisheries products, fishermen can sell their products to consumers in good condition and at the same time, it will reduce the wastage, damage and loss of the seafood products.

But the little is known about the poverty level of the fisherman who is dependent on this river for their livelihood, especially when there is no fish in the river. There has been no work done in the study area on the livelihood of the fisherman.

## **7. Conclusion**

Inland fisheries in Malaysia are often not a national priority as they are undervalued or overlooked. There are few studies and publications on the socio-economic aspects of inland fisheries in the Muda river basin. Lack of reliable and research data prevents the effective implementation of fisheries management and control of Muda river basin. More research is needed to obtain primary data to develop appropriate management measures to sustain the sustainability of this inland fishery. Some part-time or seasonal inland fishermen were not involved full-time in fisheries; instead, their main economic activity was processing, rice farming, logistics, rubber tapping and other service sectors.

To reduce the dependence and exploitation by the middlemen who have control over credit and fish marketing, the Mukim Sidam Kanan Inland Fishermen Association take the initiative to develop and establish their product branding on fish products. The current setup will help to generate the financial resources of the fishermen in the rural area that can be used to develop innovative seafood products and improve their livelihood. The Department of Fisheries located far away from the rural area makes it difficult for the fishermen communities to receive the necessary training on fishery-related activities such as aquaculture, fish drying, net mending, boat making and boat repairing.

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