



UNIVERSITI PUTRA MALAYSIA

***CONDITION FACTOR, CATCH PER UNIT EFFORT, ENVIRONMENTAL
CONDITION AND MIGRATORY PATTERN OF *Thynnichthys thynnoides*
(BLEEKER, 1852) FOR FISHERIES MANAGEMENT AT RUI RIVER,
PERAK, MALAYSIA***

MOHAMAD RADHI BIN AMONODIN

FPAS 2017 5



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By

MOHAMAD RADHI BIN AMONODIN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfillment of the Requirements for the Degree of Master of Science**

March 2017

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Master of Science

CONDITION FACTOR, CATCH PER UNIT EFFORT, ENVIRONMENTAL CONDITION AND MIGRATORY PATTERN OF *Thynnichthys thynnoides* (BLEEKER, 1852) FOR FISHERIES MANAGEMENT AT RUI RIVER, PERAK, MALAYSIA

By

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March 2017

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This study had been carried out to find out the condition factor, environmental condition and migratory pattern of tiny scale barb *Thynnichthys thynnoides* in the Rui River, Gerik, Perak. Eight sampling sites were chosen and located in the main channel of the Perak River and its tributary, Rui River, comprising the upstream, middle stream and lower stream of the river system. The water quality parameters were determined by using the standard methods. *Thynnichthys thynnoides* were captured between May and October 2015 by using two fishing gears consisting four sets of gill net with various mesh sizes (2.5, 5.0, 7.6 and 10.0 cm) and a scoop net. A total of 238 individuals of *T. thynnoides* were collected during this study with mean total length (TL) of 18.95 ± 2.48 cm and weight of 63.39 ± 20.05 g. Catch per Unit Effort (CPUE) escalated in October (7.75/scoop/hour) compared to September (2.05/scoop/hour) indicated the peak migration month of this species. Growth parameters ($a = 0.00824$, $b = 3.0238$, $R^2 = 0.9448$) of *T. thynnoides* derived from logarithmic relationship between body weight (g) and total length (cm) indicated an isometric growth. Overall water quality parameters do not have significant variance between spawning and non-spawning seasons except for turbidity ($F = 13.23$, $p < 0.05$). Despite Rui River was polluted with suspended particles with mean TSS concentration of 77.2 mg/L during spawning season, *T. thynnoides* still migrate to upper stream of Rui River. Habitat assessment scoring indicated that physical habitat structure of Rui River fell into suboptimal category which most likely able to support fish population and thus provide suitable habitat for *T. thynnoides* during spawning season. Conclusively, it was observed that *T. thynnoides* population was dependent with environmental conditions.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Sarjana Sains

FAKTOR KONDISI, TANGKAPAN PER UNIT USAHA, KEADAAN ALAM SEKITAR DAN CORAK MIGRASI *Thynnichthys thynnoides* (BLEEKER, 1852) UNTUK PENGURUSAN PERIKANAN DI SUNGAI RUI, PERAK, MALAYSIA

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Kajian ini telah dijalankan untuk mengetahui faktor kondisi, kondisi alam sekitar dan corak migrasi *tiny scale barb Thynnichthys thynnoides* di Sungai Rui, Gerik, Perak. Lapan tapak persampelan telah dipilih merangkumi hulu, tengah dan hilir Sungai Perak dan anak sungainya, Sungai Rui. Parameter-parameter kualiti air telah diuji menggunakan kaedah standard. *Thynnichthys thynnoides* telah ditangkap antara Mei dan Oktober 2015 menggunakan dua alat menangkap ikan iaitu pukat insang yang mempunyai berlainan saiz (2.5, 5.0, 7.6 and 10.0 cm) dan juga sauk. Sebanyak 238 ekor *T. thynnoides* telah ditangkap mempunyai purata panjang 18.95 ± 2.48 cm dan berat 63.39 ± 20.05 g. Tangkapan per unit usaha (catch per unit effort) telah mencapai tahap maksimum pada bulan Oktober (7.75/sauk/jam) berbanding bulan September (2.05/sauk/jam) menandakan kemuncak migrasi spesies ini. Parameter-parameter tumbesaran ($a = 0.00824$, $b = 3.0238$, $R^2 = 0.9448$) *T. thynnoides* yang diperolehi daripada perkaitan logaritma antara berat badan (g) dan panjang total (cm) menunjukkan tumbesaran isometrik. Kualiti parameter air keseluruhan tidak mempunyai varian yang berbeza antara musim membiak dan musim bukan membiak kecuali kadar kekeruhan ($F = 13.23$, $p < 0.05$). Walaupun Sungai Rui mempunyai paras pepejal terampai yang tinggi semasa musim membiak (kepekatan TSS 77.2 mg/L), tetapi *T. thynnoides* masih bermigrasi ke hulu Sungai Rui. Skor penilaian habitat fizikal menunjukkan struktur fizikal habitat Sungai Rui berada dalam kategori suboptimal. Struktur fizikal habitat tersebut mampu untuk menampung populasi dan seterusnya menyediakan habitat yang sesuai untuk *T. thynnoides* semasa musim bertelur. Kesimpulannya, populasi *T. thynnoides* amat bergantung kepada keadaan alam sekitarnya.

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I certify that a Thesis Examination Committee has met on 14 March 2017 to conduct the final examination of Mohamad Radhi bin Amonodin on his thesis entitled "Condition Factor, Catch Per Unit Effort, Environmental Condition and Migratory Pattern of *Thynnichthys thynnoides* (Bleeker, 1852) for Fisheries Management at Rui River, Perak, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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LIST OF ABBREVIATIONS

>	greater than
<	less than
μS	micro second
°C	Celsius
am	Ante meridiem
ANOVA	Analysis of Variance
BOD	Biological Oxygen Demand
Bq	Becquerel
CDFG	California Department of Fish and Game
cm	centimeter
COD	Chemical Oxygen Demand
CPUE	Catch per Unit Effort
CWT	Clean Water Treatment
DID	Department of Irrigation and Drainage
DO	Dissolved Oxygen
DOE	Department of Environment
DOF	Department of Fisheries
et al.	et alia
g	gram
GIS	Geographic Information System
GSI	Gonadosomatic Index
H ₀	Null hypothesis
H ₁	Alternative hypothesis
i.e.	id est

IUCN	International Union for Conservation of Nature
K	Fulton's condition factor
kg	kilogram
km	kilometer
L	liter
LWR	Length-weight relationship
m	meter
mL	milliliter
mm	millimeter
mg	milligram
N	number
NTU	Nephelometric Turbidity Units
NWQS	National Water Quality Standard
pm	Post meridiem
s	second
sp.	species
TDS	Total Dissolved Solid
TL	Total Length
TSS	Total Suspended Solid
WQI	Water Quality Index

CHAPTER 1

INTRODUCTION

1.1 Background of Study

There are 2,243 species of fish in Malaysia, in which 413 of those species are freshwater species (Zarul *et al.*, 2012). One of the freshwater species is tiny scale barb, or scientifically known as *Thynnichthys thynnoides* (*T. thynnoides*) (Bleeker 1852). It is also locally known as Lomah (Ambak *et al.*, 2010). IUCN Red List Status categorized *T. thynnoides* as one of the least concern species. Chong *et al.* (2010) classified *T. thynnoides* as medium threat due to several factors such as overfishing, habitat degradation, and pollution. It is anticipated that fishing pressure on *T. thynnoides* increases as this species is selectively targeted during spawning season. River alteration poses an alarmingly threat to fish population habitat especially *T. thynnoides* in Rui River, Gerik, Perak. Through fish monitoring, this study provides fundamental baseline of *T. thynnoides* health condition at Rui River, Gerik, Perak.

Thynnichthys thynnoides is a relatively small riverine cyprinid species inhabiting river basin and lake (Ali & Lee, 1995; Thuok & Sina, 1997; Vidthayanon *et al.*, 1997). This migratory species has been spotted to spawn in Rui River, Gerik, Perak but the details of distribution and spawning activity are not adequately acquired presently (Amal *et al.*, 2015). *Thynnichthys thynnoides* is found in Chenderoh Reservoir, Perak (Kah-Wai & Ali, 2001), Pahang River of Maran (Zulkafli *et al.*, 2014), and Temerloh districts (Zulkafli *et al.*, 2015). This species can also be found in Tasik Chini. *Thynnichthys thynnoides* also exists in Brunei Darussalam, Cambodia, Indonesia, Laos, Myanmar, Thailand, and Vietnam (Ambak *et al.*, 2010). Furthermore, *T. thynnoides* is recognized as an important species of fishery in both Khone Falls, Cambodia and Chenderoh Reservoir, Perak, Malaysia (Ali & Lee, 1995; Bishop, 2002).

Thynnichthys thynnoides grows up to 25 cm total length (TL), with silvery white body and small scale with dark upper surface scale (Rainboth, 1996). *Thynnichthys thynnoides* is microphagous, which feeds mainly on phytoplankton and periphyton with lesser amounts of bottom algae and small zooplankton (Vann *et al.*, 2005). It is a fecund species total spawner with absolute fecundity, which ranges from 26962 ± 1484 to 173520 ± 127420 egg fish⁻¹ (Ali & Kadir, 1996). This species spawns in the flooded littoral zone (Ali & Kadir 1996; Rainboth, 1996; Warren, 2000) and the eggs are released near submerged macrophytes (Ali & Kadir 1996). It is a pelagic spawner, producing buoyant or semi-buoyant eggs (Warren, 2000). *Thynnichthys thynnoides* is very sensitive to volume of water discharge. This species is caught only within the range of 2,500 and 12,500 m³/s (Baran, 2006). There is a relationship between high water level and spawning period (Ali & Kadir, 1996; Rainboth, 1996). A study on the abundance of this species was conducted by Welcomme *et al.* (2014) in Tonle Sap – Great Lake system, with an estimated catch of 515 tonnes or 2.8 % from the total catches from 1994 to 1995 whereas from 2008 to 2009, the catch recorded 245 tonnes or 2.4 % from the total catches.



Figure 1.1 : *Thynnichthys thynnoides* (*T. thynnoides*) caught in Rui River

1.2 Problem Statement

In Rui River, Gerik, Perak, there are three major concerns that may potentially affect the condition and migratory patterns of *T. thynnoides*, which are (1) overfishing, (2) water pollution, and (3) habitat degradation. As observed by the Department of Fisheries (DOF) Malaysia, overfishing causes significant decrease of *T. thynnoides* landing in Hulu Perak. The annual average landing of *T. thynnoides* in Hulu Perak steadily increases from 2010 to 2013 (Figure 1.2) (DOF, 2013). In 2013, *T. thynnoides* landing was about 5,880 kg as compared to 2010, which recorded about 3,410 kg. These values indicated the significance of this study on the species as part of conservation effort towards sustainable fisheries practice, especially in Rui River.

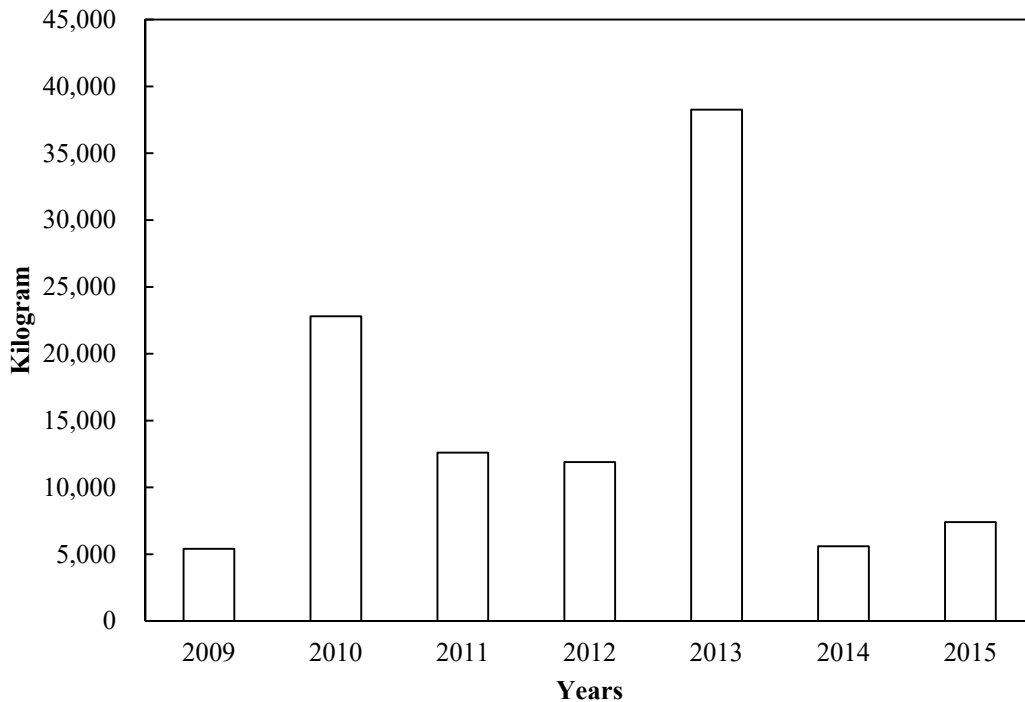


Figure 1.2 : *Thynnichthys thynnoides* landing in Hulu Perak, Perak from 2010 to 2015 (Source: DOF, 2015)

Tin mining activity affects the water quality of Rui River. One of the identified causes is the in-river water treatment compound at Kepayang River, a tributary of Rui River. The mining company directly introduces lime into the river water to reduce the water pH from acidic to normal range. During heavy rainfall, accumulated lime sediment is then flushed into Rui River. In 2014, an occurrence of fish kill in Rui River becomes a concern to the fishermen as their income source is affected since the consumption of the fish particularly *T. thynnoides* was doubtful (Dolasoh, 2014). The tin mining company was accused to be responsible for the incident.

The river has undergone physical changes due to natural and anthropogenic activities. The cut down of forest for agricultural purposes increases sedimentation. Heavy rainfall creates run-offs and introduces sediment loads into the river. Undoubtedly, this situation increases turbidity and total suspended solids in river, resulting to sedimentation. The changes of physical characteristics of the river pose threats to aquatic organisms inhabiting the river. Understanding the contributing factors and condition factors of the targeted species is essential in response of overfishing and environmental pollution generally. The inadequate biological and ecological knowledge of the targeted species may contribute to uninformed decisions and actions among the fisheries managers. So far, study on *T. thynnoides* have been accomplished on specific aspect such as; fecundity by Ali & Kadir, (1996) at Chenderoh Reservoir, Perak and Amal *et al.*, (2015) at Rui River, Perak. No study on condition factor and environmental condition have been carried out on *T. thynnoides* at the Rui River. Therefore, this study provides the crucial information and knowledge on *T. thynnoides* at the Rui River, Gerik, Perak.

1.3 Research Objectives

1. To determine catch per unit effort, condition factors, and length-weight relationship of *T. thynnoides* in Rui River, Gerik, Perak
2. To assess the environmental conditions of habitat for *T. thynnoides* in Rui River, Gerik, Perak
3. To determine the migratory patterns of *T. thynnoides* in Rui River, Gerik, Perak using Geographic Information System (GIS)

1.4 Significance of Study

This study is an effort to contribute to the body of knowledge regarding freshwater fish species in Malaysia. Information on the condition, health and wellbeing, as well as the surrounding environment of *T. thynnoides* from this study benefits conservation conscious society and researchers generally. The research outcome from this study is expected to inform various governmental agencies namely, the Department of Fisheries (DOF), Department of Environment (DOE), district councils, and other stakeholders regarding *T. thynnoides* species and its environmental status in Rui River. This study provides relevant information in assisting the stakeholders' decision-making process while they constitute regulation or governance matter on Rui River, especially for *T. thynnoides*. Inevitably, decisions made by these stakeholders affect, both direct or indirectly, local communities that depend on fisheries as their source of income. Besides that, future generations would benefit from sustainable fisheries with the continuous effort to protect the environment, maintain source of income, and conserve life quality in the sense of economic and aesthetic value of Rui River. The sustainable fisheries would provide improved and sustained life status of the local communities.

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