

INTRODUCTION

The Mekong River Basin, which is the largest river basin in Southeast Asia, extends from the Tibetan Plateau to the South China Sea, and runs through Myanmar, China, Lao PDR (hereafter referred to as Laos), Thailand, Cambodia, and Vietnam. The Mekong Basin covers a large part of the Indochinese region, with an area of approximately 810,000 km² and a length of 4,909 km (Rainboth *et al.*, 2012: 2). The geological, climatological, hydrological, and biogeographical aspects of the Basin have been well documented by previous researchers (*e.g.*, Taki, 1974, 1975, 1978; Kottelat, 1989; Rainboth, 1996; Rainboth *et al.*, 2012); these studies are not repeated here in detail.

The Mekong River Basin (hereafter referred to as Mekong) is well known by its great diversity of aquatic organisms, particularly the fishes. To date, although few reports have investigated euryhaline fishes (those which adapt to a wide range of salinities), Hurtle (2009) estimated that about 1,100 species of fishes are found in the Mekong. Rainboth (1996) and Rainboth *et al.* (2012) also reported a similar range of 1,100 to 1,200, with the following note: "This estimate will undoubtedly increase over time as additional taxonomic studies and fish surveys are completed" (Rainboth *et al.*, 2012: 13). The fish species diversity in the Mekong is one of the richest among the river basins throughout the world; it is reputed to be surpassed by only the Amazon Basin and possibly the Congo Basin (Rainboth *et al.*, 2012: xv).

The rich fish species diversity in the Mekong may be best understood by looking at the fish markets around the Basin; in these markets showcases, various types of freshly-collected, dried, and/or fermented fishes are abundantly seen. Typical example is able to be seen in the markets around Tonle Sap Lake (Great Lake), the largest freshwater lake in Southeast Asia; this lake contributes 57–62% of the total inland fish production in Cambodia where the world's most intensive inland fishery, in terms of catch per person, is found (Baran, 2005). Some photographs of the fish markets in the Mekong region are shown in this book.

Since ancient times, people have relied on natural resources obtained from the rivers and the related environments in this region; the rich aquatic harvest is fundamental to the viability of natural resource-based rural livelihoods. On the other hand, various kinds of wild flora and fauna flourish in a habitat closely related to human activities, such as paddy fields, reservoirs, irrigation canals, and grazing fields. These artificially-modified environments play an important role in providing refuges, nurseries and other critical habitats for various kinds of aquatic organisms. Such favorable

relationships between humans and the other organisms seem to have supplementally contributed to sustaining the rich species diversity in this region.

The Mekong encompasses a fairly large area of the Indo-Burma region, which is one of the 36 regions of the biodiversity hotspots in the world (*e.g.*, Conservation International, 2020); the fauna and flora in this region are rich, irreplaceable and considerably threatened. Actually, as in many parts of the world (in particular within the hotspots), a marked decrease in biodiversity/harvest has recently been noted in the Indochinese Mekong region. The threats are presumed to be multifactorial. For the aquatic organisms, examples include: uncontrolled modification of natural flows due to dykes, road network, and small and large dams, overfishing and habitat loss/fragmentation due to a steep population growth (*e.g.*, Roberts, 2001a, b; Baran, 2005). In order to maintain sustainable use of natural resources with an effective policy, the appropriate scientific understanding of wildlife and their habitats is critical.

Recently, great contributions have been made regarding the knowledge of fish fauna in the Mekong, *e.g.*, Rainboth (1996, for the Cambodian Mekong), Kottelat (1998, 2000, 2001, 2009, 2011, for the Laotian Mekong), Vidthayanon (2008, for the Mekong Delta), and Rainboth *et al.* (2012, for the "Greater Mekong Ecosystem", including the entire region directly affected by the Mekong). However, a comprehensive inventory of the Mekong fishes is not yet available. In addition to our immature understanding of fish fauna in the brackish estuaries, as well as in some remote areas where no ichthyological survey has been documented,



A little girl watching *Nothobranchius notopterus* (Ratanakiri, Cambodia, photo: KS)

there are numerous "gray" (poorly evidenced and/or merely expected) records of fishes from the region in the literatures (see, *e.g.*, Motomura *et al.*, 2002; Motomura & Tsukawaki, 2006, 2007).

In order to properly evaluate the species diversity in this region, a specimen-based inventory is undoubtedly crucial, as suggested by Motomura *et al.* (2002). If the voucher specimens could be re-examined by the fish-taxonomy experts, many of the "gray" records could be clarified. To date, however, the effort has been insufficient. Previous records with no indication of (or lacking) voucher specimens from the region render the re-confirmation of the identification difficult. Also, many important collections of the Mekong fish specimens were historically deposited abroad by leading foreign researchers, leaving no noteworthy collections remaining in/around the Indochinese region, except for a few in Thailand.

The NEF project

In 2006, Nagao Natural Environment Foundation (NEF), a Japanese non-governmental organization dedicated to promoting nature conservation in developing countries, launched a new scheme, "Comprehensive Programme for Conservation Research and Activities". The scheme, hereafter referred to as "NEF project", was originally planned as a five-year program (from April 2006 to March 2011), aimed at promoting nature conservation together with local researchers/residents. For this scheme, the NEF targeted on aquatic fauna and flora in the region of the Mekong and Chao Phraya basins, and entitled a series of activities under this scheme as "Basic Study on the Aquatic Fauna and Flora and Conservation Activities Participated in by Local Residents in the Mekong-Chao Phraya Region."

The NEF project comprised 2 major activity sections: research and conservation. The former section conducted extensive field surveys to gather information on the current status of aquatic/semiaquatic fauna and flora in the Mekong-Chao Phraya region together with local researchers, and the latter section comprised various programs, such as environmental education for elementary school students in Laos.

The research section focused mainly on the fishes. The other aquatic/semiaquatic fauna and flora, particularly the ones consumed by local people, were also surveyed together with experts of the Japan Wildlife Research Center (Tokyo, Japan). In the fish research, fishes were recorded primarily based on the voucher specimens collected from the field surveys. The specimens were housed in the collection rooms installed in respective institutions involved in the NEF project; computer databases of fish specimens and photographs were also developed for each collection.



At least 28 researchers belonging to the following institutions were involved in the fish research in the NEF project (see also pp. viii–ix):

- **Cambodia:** Inland Fisheries Research and Development Institute (IFReDI), Fisheries Administration (FiA), Phnom Penh.
- **Laos:** Faculties of Science and Agriculture, National University of Laos (NUOL), Vientiane.
- **Thailand:** Faculty of Science, Srinakharinwirot University (SWU), Bangkok; Faculty of Fisheries, Kasetsart University (KU), Bangkok; Faculty of Fisheries Technology and Aquatic



A girl collecting fishes using four-arms net (called "Sa dung") at floodplain in Savannakhet, Laos (photo: KS)

Resources, Maejo University (MJU), Chiang Mai; Faculty of Agriculture, Ubon Ratchathani University (UBU), Ubon Ratchathani.

► **Vietnam:** College of Aquaculture and Fisheries, Can Tho University (CTU), Cần Thơ.

As a result, more than 235,000 specimens of *ca.* 540 fish species, as well as numerous photographs of freshly-collected specimens, were obtained from our field surveys in the Mekong. All of these fish specimens and photographs are now preserved in the respective institu-

tions for scientific researches and educational purposes. Some photographs have already appeared in our previous publications (e.g., Tran *et al.*, 2013, 2014; So *et al.*, 2019; Praxaysombath *et al.*, 2020). The PDFs of the publications, including this book, may be downloaded from the NEF website (<http://www.nagaofoundation.or.jp/e/publication/index.html>). An online database of freshwater fishes in mainland Southeast Asia (<http://ffish.asia/>), originally derived from the specimen/photograph databases produced by the NEF project, is also available (see Kano *et al.*, 2013).



The NEF project also contributed to the human resource development; during the course of the activities, for example, the participating researchers had an opportunity to receive the on-the-job training in various technical matters, including the practical methods for field research, making preserved specimens, photography, and management of the fish-specimen collections.

The NEF project continued after April 2011 as its 2nd phase (to April 2016) with some modifications in the activities. The activities, including those in both 1st and 2nd phases, will be presented in detail in forthcoming publication(s) currently being prepared by the NEF.

Scope of this book

This book was written as one of publications derived from outcomes of the 1st phase of the NEF project, primarily aiming to aid in the identification of fish species commonly seen in the Indochinese Mekong. Species identification is the first step for every kind of field-oriented biological research. Diversification of the preferable guidebooks for regional fauna and flora will contribute to promoting various research and conservation activities.

This book contains 568 fish species found in fresh- and brackish-water areas of the Indochinese Mekong;

fishes of the other areas surveyed by the NEF project (e.g., Chao Phraya Basin) will be shown in our coming publication(s). This book is actually not a comprehensive guide for the fishes of the Mekong, where *ca.* 1,100 species are presumably found (e.g., Hurtle, 2009), but it does include almost all of the species commonly seen in the region. The photographs of fishes shown in this book are based on the specimens collected by the participating researchers during field surveys of the NEF project, unless otherwise noted; namely, these fishes were actually collected from the inland waters of the Mekong. As noted above, all of these specimens are deposited in the participating institutions to make them available for future scientific studies. It is possible to make a re-confirmation based on the voucher specimen(s), if there is the need to confirm the identification. Fishes are shown with high-quality photographs (sharply-defined photographs based on freshly-collected, well-dressed specimens) and some selected diagnostic characteristics that distinguish the species from resembling species; distribution, habitat, and some taxonomic issues are also noted in brief.

We hope that this book will contribute to various aspects of activities performed by researchers, students, fisheries officers, fishermen and all the others who are interested in the inland-water fishes in the Indochinese Mekong.

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