



长江水生生物多样性保护系列丛书
农业部水生野生动植物保护办公室

1

长江上游

珍稀特有鱼类国家级自然保护区

科学考察报告



危起伟 等 著



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长江水生生物多样性保护系列丛书
Series of Aquatic Biodiversity Conservation in the Yangtze River

长江上游珍稀特有鱼类国家级 自然保护区科学考察报告

Scientific Investigation Report on National Nature Reserve for the Rare
and Endemic Fishes in the Upper Reaches of the Yangtze River

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农业部水生野生动植物保护办公室
Office of Aquatic Fauna and Flora Conservation, Ministry of Agriculture



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内 容 简 介

2006~2010年,对长江上游珍稀特有鱼类国家级自然保护区及其周边的社会环境等进行了全面深入地调查发现,保护区河流生境条件特殊且多样性丰富,水质总体状况良好,能维持较自然的水文状况,是众多珍稀、特有鱼类唯一的或重要的栖息和繁育场所。保护区共有鱼类199种,其中70种为特有鱼类,38种被列入各级保护名录。其他水生生物包括浮游植物403种,浮游动物431种,底栖生物296种,周丛生物141种,大型水生高等植物28种。航道建设、航运、采砂、污染物排放、捕捞等涉水人类活动是影响保护区保护目标和功能的重要因素。本书建议从强化监督管理等9个方面加强对保护区的管理,以实现长江水生生物资源的可持续利用。

本书可供从事水生生物自然保护区管理建设及相关工作的科研人员、政府管理人员参考。

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序

长江三峡水利枢纽兴建,使长江上游 3 种珍稀鱼类和数十种特有鱼类所适应的生境在 600 余千米的库区江段消失,栖息地面积显著减少,种群规模缩小。同时,金沙江和雅砻江梯级水电开发所引起的径流、水温等生态要素自然节律的改变,使这些鱼类正常生活受到干扰,以致其生存受到威胁。为了保护长江上游的珍稀、特有鱼类,使物种不致绝灭,国家专门建立了“长江上游珍稀特有鱼类国家级自然保护区”。

生物多样性保护是造福于子孙后代的伟大事业,任重道远。建立自然保护区仅仅是为物种保护提供了可能性,而各种珍稀、特有鱼类能否得到切实保护,尚需职能部门依法进行有效的管理和得到全社会的关注、理解、支持。为此,编制一本全面介绍保护区现状的科学考察报告,是十分必要的。本书的作者们对长江上游珍稀特有鱼类自然保护区及其周边的社会环境、自然生境、水生生物、人类活动等进行了全面的调查,获取了大量的第一手资料和数据。这些资料和数据,是实施保护区管理的科学依据,也是开展保护区水生生物种群动态监测的基础,具有重要的科学价值。当然,有一些水生生物方面的数据,如有关上游鱼类最重要饵料生物着生藻类和底栖无脊椎动物的种类及生物量,尚须做更深入的补充调查。

长江上游珍稀特有鱼类国家级自然保护区包括长江干流和支流,总长度超过 1000 km,沿岸有重庆、宜宾、泸州、合川、赤水等大小不同的城市,人口稠密,航运繁忙,人类涉水活动频繁。即便是保护区的缓冲区和核心区,也无法阻止船舶航行。因此,在江河上建立的以保护珍稀、特有鱼类及其栖息地为目的的自然保护区,就难以按照《中华人民共和国自然保护区条例》所规定的“禁止任何人进入自然保护区的核心区;在自然保护区的核心区和缓冲区内,不得建设任何生产设施”的条文执行。在这种情况下,似有必要补充制定一些针对江河特点的相关规定或条例,以协调保护和发展的关系。

显然,不能因为在江河上建立的保护区遇到一些难以按保护区条例执行的困难,就放任自流,无所作为。长江上游的这个国家级保护区,明确指出其保护对象是达氏鲟、白鲟和胭脂鱼 3 种珍稀鱼类及圆口铜鱼、长鳍吻鲟、岩原鲤、厚颌鲂、长薄鳅等几十种特有鱼类。这些鱼类中的部分种类,被当成美味,价格飙升,危害鱼类资源的渔具渔法屡禁不止,与建立国家级自然保护区的初衷背道而驰,这是不能允许的。应进一步采取措施,坚决取缔电鱼、炸鱼等渔法和密眼网具,组织渔民转产转业,引导养殖户饲养特有鱼类供应市场。不捕捞、不出售、不食用保护区内的野生鱼类,让它们在保护区水域内繁衍生息,为我们的子孙后代保存下这些物种,是我们义不容辞的责任。

中国科学院院士



2012 年 10 月

Summary

The Yangtze River is the longest river in China. From its source on Geladandong Mountain in the Tanggula Mountain Range in the eastern Qinghai-Xizang Plateau it flows through the provinces of Qinghai, Xizang, Yunnan, Sichuan, Chongqing, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, and Shanghai to the East China Sea. The Yangtze River drains a vast area of diverse landscapes extending, from east to west, across three levels of topography: western plateaus and mountains, central moderate and low mountains, and eastern hills and plains.

Complex topography has created a rich and varied habitats with high species diversity in the Yangtze River valley. The abundant fish resources occupy a major position in the world in both variety and quantity. There are 423 species of which 318 are freshwater species, the highest of any Chinese river system. It is the cradle of China's freshwater fishery, a treasury of fish genes, a stock base for aquaculture, and a model of biodiversity. The Upper Yangtze above Yichang is an exceptional aquatic ecosystem with unique geology, topography, and climate. It is the breeding area for a wide variety of aquatic organisms, and the fish fauna is particularly abundant, with up to 286 species. It is the habitat for China's internationally-known rare fish species and many fishes are endemic to this area.

The creation, in April 2000, of the National Reserve of Yangtze Rare Fish Species (He Jiang to Leibo Section) by the General Office of the State Council of the People's Republic of China was enormously significant for the conservation of rare fish populations in the Upper Yangtze. In April 2005 the reserve was designated the National Nature Reserve for the Rare and Endemic Fishes in the Upper Reaches of the Yangtze River, and its scope was expanded to extend across Sichuan, Yunnan, Guizhou, and Chongqing provinces. It is the most extensive riverine nature reserve in China, including the main stem of the Yangtze between Xiangjiaba Dam and Masangxi Bridge with branches such as the Chishui and Minjiang Rivers, and has a total length of 1162.61 km and an area of 33 174.21 hm². The major species protected objectives are for the Chinese paddlefish (*Psephurus gladius*), Dabry's sturgeon (*Acipenser dabryanus*), and Chinese sucker (*Myxocyprinus asiaticus*), along with another 67 endemic species of the Upper Yangtze.

The National Nature Reserve for the Rare and Endemic Fishes in the Upper Reaches of the Yangtze River (hereafter the reserve) represents a typical aquatic ecosystem of the Upper Yangtze. The physical aspects of the river are little changed and, considering habitat fragmentation due to intensive hydropower development, are indispensable as a breeding habitat to maintain the aquatic biodiversity of the Upper Yangtze, and of great significance for sustaining China's freshwater fishery and the preservation of many rare and endemic fish species.

With the establishment of the reserve and its management organization, the management capability and authority were greatly improved, and the populations and habitat of rare and endemic fish species have been protected. However, lack of understanding of the aquatic organisms and the natural habitat in the reserve has hindered progress. Earlier studies on the reserve are scattered in research papers and reports of varying subject topics, employing a range of

methods, making it difficult to obtain an overall view of conditions in the reserve. To compound the problem, the constant development of the economy and society, the influence of escalating human activity in the reserve and its surroundings raises new and greater demands for strengthening management of the reserve.

The situation became urgent. In April, 2006 the Office of Aquatic Fauna and Flora Conservation, Ministry of Agriculture of China (OAFFC) organized a start-up meeting of the program of Comprehensive Investigation of Aquatic Organisms and Natural Environment in the National Nature Reserve for the Rare and Endemic Fishes in the Upper Reaches of the Yangtze River in Wuhan city, Hubei Province. The meeting resulted in a joint investigation team organized by OAFFC comprising the Administrative Office of Fishery Resource Management Committee of the Yangtze River (FRMCYR); four provincial administrations (Sichuan, Guizhou, Chongqing, Yunnan); the Yangtze River Fisheries Research Institute; the Chinese Academy of Fishery Sciences (YFI); the Institute of Hydrobiology; the Chinese Academy of Sciences (IHB); the Institute of Hydroecology; the Ministry of Water Resources and Chinese Academy of Sciences (IHE); and the Department of Water Environment, China Institute of Water Resources and Hydropower Research (DWE). The meeting reviewed the plan for implementation of the program, assigned areas of responsibility to each participating agency, and appointed YFI to lead the compilation of the program report and prepare a monograph, with Prof. Wei Qiwei as the program principal.

All participating organizations have been engaged in research into the management and protection of Yangtze River fishery resources for many years and have undertaken programs involving natural reserves, laying a sound working foundation. The participating organizations cooperated through a division of labor and specialized according to their unique skills. The Office of Aquatic Fauna and Flora Conservation and FRMCYR undertook program coordination. Four provincial administrations of the reserve were responsible for investigating natural resources, social conditions and human activity, and management of the reserve and its surroundings (Chapter 1, 2, 6). The Yangtze River Fisheries Research Institute addressed liaison work and completed the investigation of water quality and fish habitats in the reserve, as well as rare and endemic fish species and other aquatic organisms in the Sichuan section of the reserve (Chapter 3, 4, 5). The Chinese Academy of Sciences investigated fish species, aquatic organisms, and habitats in the Chishui River (Chapters 3, 4, 5). Institute of Hydroecology carried out the investigation of rare and endemic fish species and their habitats, along with other aquatic organisms, in the Chongqing section of the reserve (Chapters 3, 4, 5). The department of Water Environment conducted investigation of the natural environment and river habitat conditions in the reserve and its surroundings (Chapters 1 and 3).

From 2006 to 2010, the team carried out comprehensive and in-depth assessment of the social environment, natural habitat, aquatic organisms, and human activity in and around the reserve. Historical data and related research on the ecosystem, and its aquatic organisms were analyzed. The main conclusions were as follows:

(1) The unique river habitat of the reserve in the Upper Yangtze was formed through more than one million years of geological evolution by the effects of neotectonic movement and climate change since the Neogene. The river channel occupies many polygonal sandbars and central sandbars, the river valley varies in width, and the river bed depth fluctuates to a great extent. Due to the complex topography, flow is highly turbulent. Normal bend flow, boil-vortex flow, back flow, and converging flow are common and have high intensity. Since it flows through

mountainous areas, the riverbed is constrained within the boundaries of its course, the riverbank is stable, and the riverbed erosion-accretion evolution was mainly marked by riverbed changes. These features result in high river habitat diversity and keep it relatively stable over extended time periods. Both the trunk and branch streams in the reserve contain abundant water, and hydrological regimes are primarily natural. During the periods of fish breeding, growth, and overwintering, all water quality indices were relatively stable and met or exceeded government standards. River habitat in the reserve is unique and with abundant diversity, maintaining relatively natural hydrological conditions, and is important habitat and the sole breeding site for most rare and endemic fishes. Maintaining river habitat diversity in the reserve is critical to the conservation of rare and endemic fish species in the Upper Yangtze.

(2) 138 fish species were investigated. The fish species of the reserve were listed based on historical data and investigation results. The reserve supports 199 fish species, 70 of these are endemic, 38 are listed as protected species of different levels, including three nationally protected: the Chinese paddlefish, Dabry's sturgeon, and the Chinese sucker. Large mouth gudgeon (*Coreius guichenoti*), Darkbarbel catfish (*Pelteobagrus vachelli*), and more than 10 additional species are dominant in the fish community of the reserve. Fish habits are highly adapted to the ecology of the reserve. Most species inhabit the turbulent benthic areas, lay sticky eggs, and feed on zoobenthos and adherent algae. There are more than 20 fish species in the reserve that lay drifting eggs. All fish species present spawn within the reserve, with the exception of large mouth gudgeon. The reserve shows high species diversity, which is representative of fish fauna in the Upper Yangtze. Rare and endemic fish are numerous and have extremely high conservation value.

(3) A total of 403 phytoplankton species, 431 zooplankton species, 296 benthos species, 141 periphyton species, and 28 species of aquatic macrophyte were collected in the reserve. Bacillariophyta are dominant in phytoplankton; zooplankton is mainly composed of protozoa; and aquatic insects occupied a high proportion of zoobenthos. The biomass and density of phytoplankton and zooplankton are low in the reserve, while those of zoobenthos are higher with varying distributions in different reaches. Tributaries such as the Chishui River have significantly higher biomass levels than the main stem of the Yangtze. Aquatic macrophytes are low in species number and consist mostly of hygrophytes. On the whole, the aquatic biodiversity is high in the reserve. Zoobenthos are particularly abundant. Phytoplankton and zooplankton are rich in species but low in quantity, and aquatic vascular plants are scarce. These population characteristics reflect adaptation to the river habitat.

(4) The reserve is located in southwest China, extending across Yunnan, Guizhou, Sichuan, and Chongqing provinces, and involves 25 districts and counties (cities). It is a low socio-economic area, and the level of development varies throughout the region. The area bordering the Yangtze main stem is urbanized, while the Chishui River valley is relatively undeveloped. Anthropogenic activities such as waterway construction, shipping, sand mining, pollution, and fishing are major factors affecting the conservation targets and functions of the reserve. With the development of China's western regions, human activity will expand, and undoubtedly affect the reserve. Coordination of the economic and social development with conservation and management of the reserve will be a major challenge confronting the reserve in the future. Recommendations with respect to nine aspects including enforcement, supervision, and management are proposed to strengthen the reserve management and achieve the sustainable development of aquatic organism resources in the reserve area of the Yangtze River.

前 言

长江是我国第一大河,发源于青藏高原唐古拉山脉的各拉丹冬雪山,流经青海、西藏、云南、四川、重庆、湖北、湖南、江西、安徽、江苏及上海 11 个省市(自治区、直辖市),注入东海。长江横贯我国东西部地区,地跨我国地貌的三大阶梯,流域面积广大,地貌类型多样,可划分为西部高原山区(第一大地貌阶梯)、中部中山低山区(第二大地貌阶梯)及东部丘陵平原区(第三大地貌阶梯)。复杂多样的地貌地形造就了长江流域丰富的生境多样性及物种多样性,其中鱼类资源尤为丰富。长江鱼类资源无论种类还是数量都在世界上占据重要地位,长江水系有 423 种鱼类,其中纯淡水鱼类 381 种,居我国各水系之首,是我国淡水渔业的摇篮、鱼类基因的宝库、经济鱼类的原种基地、生物多样性的典型代表;就鱼类资源数量而言,长江水系一直居我国各水系之冠(李思发,2001)。宜昌以上的长江上游地区,是长江流域大生态系统中一个特殊的水域生态系统,具有特殊的地质、地貌、气候和自然生态环境,孕育了丰富多样的水生生物,其中鱼类资源尤为丰富,达 286 种,并栖息有我国著名的珍稀鱼类和长江上游众多的特有鱼类。

2000 年 4 月国务院办公厅以国办发[2000]30 号文批准建立“长江合江—雷波段珍稀鱼类国家级自然保护区”,对保护长江上游珍稀鱼类资源具有重要的意义。2005 年 4 月,保护区正式更名为“长江上游珍稀特有鱼类国家级自然保护区”(国办函[2005]29 号),并对其范围进行了调整。调整后的保护区地跨四川、云南、贵州和重庆三省一市 4 个省级行政区,是我国最长的河流型自然保护区,包括向家坝至马桑溪大桥间的长江干流以及赤水河、岷江等支流河段,总长度 1162.61 km,总面积 33 174.21 hm²,主要保护对象为白鲟、达氏鲟、胭脂鱼以及其他 67 种长江上游特有鱼类。

长江上游珍稀特有鱼类国家级自然保护区(以下简称“保护区”),在长江上游水域生态系统中具有代表性和典型性,特别是在长江上游地区密集的梯级水电开发、生境片段化之后,该 1162.61 km 自然河流生境相对完整,是保存长江上游水生生物多样性不可或缺的栖息繁殖地,对我国淡水渔业的可持续发展和众多珍稀、特有鱼类的物种延续意义重大。

该保护区具有丰富的生物多样性,除鱼类、浮游动植物、底栖生物外,还有大鲵、龟、中华鳖等两栖、爬行类,苍鹭、白鹭等水鸟,以及水獭等珍稀兽类。丰富的水生生物多样性将为渔业的引种、驯化及遗传育种等提供材料,为渔业可持续发展提供物种基础。该区域还涵盖了长江上游丰富多样的水域生态类型,以及独特的河流地质、地貌和水文动力学环境,具有非常典型的生态意义。其中赤水河干流是为数不多的尚未进行水电开发的河流,在鱼类原始生境方面具有极为重要的保留价值。保护区珍稀、特有鱼类为生物地理学、遗传学和系统生物学等学科提供了研究材料,具有巨大的科学研究价值。保护区独特的自然地理条件,孕育了中国唯一的美酒长河,贵州茅台、宜宾五粮液、泸州老窖、古蔺郎酒、习水习酒等著名白酒均产于该区域。保护区内人文和自然景观资源丰富,为我国乃至世界宝贵的文化和自然遗产。

对于保护区所在区域的社会经济和自然生态环境状况,过去进行过零星的调查和研究,但由于这些研究多局限于某一物种或某一水域的专题性调查,研究的深度和广度都较为有限;同时,由于这些研究一般都已经完成多年,随着长江流域社会经济的发展、人类活动加剧以及自然环境条件的

不断变化,必然导致该区域社会经济状况、水域自然生态环境以及水生生物状况发生较大的改变。因此,开展保护区调查工作,掌握保护区本底资料,对指导保护区的建设和管理,实现保护区建设的最终目标具有重要意义。

为摸清保护区水生生物种类、分布的现状及其生存的自然环境和社会环境现状,探讨保护区的渔产潜力和保护潜力,为保护区的建设提供理论依据,“长江上游珍稀特有鱼类国家级自然保护区资源与环境综合调查”项目对保护区自然环境、生物资源、保护区周边的社会环境进行了综合调查,此项调查于2007~2008年进行,并在2006年进行了部分内容的预调查,2009年、2010年对部分内容进行了补充调查。项目组在调查结果的基础上,结合历史文献资料,完成此专著。

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