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好奇心书系
图鉴系列

DRAGONFLIES AND DAMSELFLIES OF CHINA

中国蜻蜓大图鉴

— 张浩淼 著 —

HAOMIAO ZHANG

上册 Vol.1



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内容提要

本书收录了中国蜻蜓3亚目23科175属820种,占中国已知蜻蜓物种总数的83.42%。其中束翅亚目13科65属293种,间翅亚目1科1属3种,差翅亚目8科106属524种。本书参照了最新的蜻蜓目分类系统,以中英双语的文字编排,分成上、下两册,包括“蜻蜓概述”和“中国蜻蜓图鉴”两大部分,内容覆盖了蜻蜓的形态学、生物学和分类学等多方面知识,每个物种配有简洁而精准的概括性描述,结合生态照片和必要的分类特征图像,为读者提供了简单快速的鉴定方法,另附有一份系统全面的“中国蜻蜓名录”。书中共选用彩色图片3500余幅,全面展示了蜻蜓迷人绚丽的生态影像,也是全球蜻蜓文献中收录蜻蜓种类最多的彩色图鉴。

本书可供昆虫学、动物学、生态学、生物学等相关专业的教师和学生,农林牧渔、环境保护、野生动物保护、艺术研究与鉴赏等专业人员与管理人员,以及蜻蜓爱好者、自然爱好者等人士在工作、学习和欣赏中借鉴与参考,是一本兼具科学性、实用性和艺术性的大型工具书和科普读物。

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Foreword 1

In China, people have long associated dragonflies with prosperity and harmony. They are also regarded as harbingers of good luck. Dragonflies were (and still are) also used in traditional medicine and thus several dragonfly groups were recognized and given Chinese names in an early pharmacopoeia published in China hundreds of years ago. However, from a scientific perspective, the beginning of the formal classification of Chinese dragonflies was the brief description of *Libellula chinensis* by Carolus Linnaeus in the 10th edition of his *Systema naturae* published in 1758, this name refers to the superb green-winged demoiselle damselfly, now known as *Neurobasis chinensis*. Actually Linnaeus himself never saw specimens of this insect himself, basing his description on a rather crude painting of a male specimen kept in a private collection in England. Not having examined the specimen Linnaeus failed to see that the species was related to his other demoiselle species, *Libellula virgo* (the present *Calopteryx virgo*), but considered it as what we would now regard as an anisopteran species.

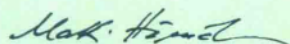
The first scientific publications dedicated specifically to the Chinese dragonfly fauna were brief papers by Edmond de Selys Longchamps (1886), Robert McLachlan (1894, 1896) and W.F. Kirby (1900) on dragonflies collected in Beijing, Sichuan and Hainan, respectively. These were followed by the publication of a much more substantial work: *A manual of the dragonflies of China* (1930) by the American entomologist James G. Needham, who spent a year in China in 1927-1928. This handsomely printed book, with 20 plates of pen and ink drawings, was based on the author's studies of various collections both in China and elsewhere, on his own collections and on all previously published records. The book covered a total of 266 species in 89 genera, no fewer than 63 new species were described, of which 43 are presently considered valid.

The first Chinese entomologists to describe new dragonfly species were Hsiu-fu Chao and Chin-Wen Chen, both describing their first new species (in the genus *Megalestes*) in the same journal issue published in December 1947. Chen named only three other new species in 1950, but Chao continued his odonatological research and became a world renowned expert of the family Gomphidae. His series of papers on Chinese Gomphidae (1953-1955) and his later work on these insects, culminating in his famous book *The gomphid dragonflies of China* (1990), made this group the best known

family among Chinese Odonata. With the help of Chao's contributions, many other Chinese odonatologists also studied this family and published new species. During the last 15-20 years, interest in dragonflies has greatly increased among Chinese entomologists. This has led to a steady stream of research publications, including descriptions of numerous new species. Several books on local dragonfly faunas have been published, some of them illustrated with excellent photographs taken in the field. Several foreign scientists have also contributed significantly to the recent increase in knowledge of the Chinese Odonata fauna.

No doubt, the most productive local odonatologist in the continental China during the last few years has been the author of this book, Dr Hao-miao Zhang. Besides having undertaken very active field work in many provinces, most recently in the species-rich Yunnan, he has also authored and co-authored several important research papers on the taxonomy of the Chinese dragonflies. His studies on Aeshnidae, Chlorogomphidae and Calopterygoidea are especially noteworthy, but his work covers virtually all groups. In this book, the first of its kind for China, he presents an overview of the dragonfly diversity of the whole country with exquisite color photographs taken from living individuals either in the field or laboratory. This magnificent, colourful exposition will surely greatly increase the interest in dragonflies and their fascinating life history among both entomologists and insect hobbyists in China and elsewhere.

China, with its vast area, contains a great variety of landscapes and climates ranging from tropical rain forests in southern Yunnan to the deserts in the north-west. Mountains and hills cover over 40% of the landscape, this results in a great variety of freshwater habitats that support an enormously diverse dragonfly fauna. Over 900 species of Odonata have already been recognized, many of which are still undescribed, more species are expected to be found in remote, poorly studied areas, especially in Yunnan. Unfortunately due to the over-exploitation of natural resources by the ever increasing human population, forest streams and other fresh water habitats have suffered great degradation in most parts of China, many dragonfly species have lost their habitats and unfortunately this trend continues. Hopefully this work will raise social awareness of the beauty and wonder of these insects and the need to preserve them for future generations, especially within protected nature reserves.



Matti Hämäläinen
University of Helsinki, Finland

推荐序一

Foreword 1

中国人一直把蜻蜓作为繁荣、和谐和好运的象征。早在几百年前蜻蜓就被中医入药并记入药典，因此人们很早就开始认识蜻蜓并给予它们中文名字。但从科学的角度看，中国最早被认识的蜻蜓是一种翅上具有绿色金属光泽的豆娘，发表在林奈1758年出版的《自然系统》（第10版）中，当时被命名为*Libellula chinensis*，即我们今天所熟知的华艳色虻。然而林奈本人并未见过这种蜻蜓标本，而是根据英国一个私人收藏的绘画来描述的。由于没有检查标本，林奈没有发现华艳色虻与他所描述的另一种束翅亚目的色虻十分相似，因此错误地把它当成一种差翅亚目的种类。

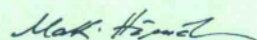
最早有关中国蜻蜓区系的研究报告包括Edmond de Selys Longchamps在1886年发表的北京蜻蜓、Robert McLachlan在1894年和1896年发表的四川蜻蜓以及W. F. Kirby在1900年发表的海南蜻蜓，然而这些报告非常简要。随后美国昆虫学家James G. Needham在1930年出版了《中国蜻蜓手册》，是他根据1927至1928年在中国的考察所获。这部精美的专著，包含了20个手绘图版，是他根据世界各地的蜻蜓收藏以及他在中国的采集和历史记录编写而成。这本书收录了中国蜻蜓89属共266种，包括63个以上新种，其中43种为有效种。

中国最早发表蜻蜓新种的昆虫学家是赵修复和陈锦文，他们在1947年12月31日同一期刊上描述了绿综虻属新种，之后陈锦文仅在1950年又发表了3个蜻蜓新种，赵修复继续从事蜻蜓研究，并成为了春蜓科的世界顶级专家。从1953至1955年，赵修复发表的一系列春蜓科研究报告以及在1990年编写的著作——《中国春蜓分类》使中国的春蜓成为所有中国蜻蜓成员中最先被认知的类群。在赵修复的指导下，许多其他的中国蜻蜓学家开始关注并研究春蜓，更多的新种被发表。在过去的15~20年，中国投身于蜻蜓研究的昆虫学家数量迅速增加，大量的研究报告被发表，其中包括大量的蜻蜓新种。地区性的蜻蜓专著也陆续出版，一些彩色图鉴制作精美，附有野外拍摄的蜻蜓彩照。很多国外的科学家也投身于中国蜻蜓的研究队伍中，为中国蜻蜓学的发展作出了贡献。

毫无疑问，在当今中国研究成果最显著的蜻蜓学家是本书的作者——张浩淼博士。张博

士具有非常丰富的野外工作经历，尤其是最近几年在云南省的考察意义非凡，已经发表了一系列非常重要的蜻蜓分类报告，在蜓科、裂唇蜓科和色螽总科取得了非常重要的研究成果，他的研究领域涉及整个蜻蜓目。作为第一本非常全面的中国蜻蜓彩色图鉴，本书结合野外拍摄和实验室获得的彩色图片，细致地描述了整个中国异常丰富的蜻蜓多样性。这本华丽的彩色图鉴必定会大大提升中国乃至全世界的昆虫学家和爱好者对蜻蜓的兴趣。

中国幅员辽阔，从云南西部的热带雨林到西北地区的荒漠，涵盖了各种复杂多变的地形和气候，中国国土中有超过40%是山地，淡水栖息环境的多样化也缔造了丰富的蜻蜓区系。目前中国已经发现超过900种蜻蜓，但在研究匮乏的地区，尤其云南，仍将有大量的新种被发现。然而由于人口增长造成的自然资源的不合理开发，森林小溪和许多蜻蜓赖以生存的淡水生态环境正在逐渐消失，许多蜻蜓由于丧失了栖息环境正面临严峻的生存威胁。希望借此书呼吁社会给予更多的关注，使更多的人看到蜻蜓的美丽和奇妙，保护蜻蜓和它们的生存环境。



Matti Hämäläinen
赫尔辛基大学，芬兰

推荐序二

Foreword 2

自幼，我就对昆虫有着浓厚的兴趣，蜻蜓自然是主要的关注点之一。从6到16岁，我的生活中心曾经位于北京城北某高校的校园内。夏日，硕大的足球场是蜻蜓集群飞舞的场所，而那两个并不很大的花园，更是我喜欢的去处。钻进花园，常常可见数十只黄蜻排队栖息在枝条上，三两只黑丽翅蜻犹如黑蝴蝶般在树梢翩翩飞舞，竖眉赤蜻在半人高的草丛中飞来飞去，很多都是多年之后再难见到的场景，至今令人难以忘怀。

1989年，我在全国集邮展览中展出了我的昆虫邮集《六足四翼，飞翔于天地之间》。这部邮集的名字出自《战国策·楚策》，庄辛说楚襄王：“王独不见夫蜻蛉乎？六足四翼，飞翔乎天地之间，俛啄蚊虻而食之，仰承甘露而饮之。”这是我国早期对蜻蜓的记载之一，不仅对蜻蜓这种昆虫的形态有着准确的描述，而且对其生活习性也了如指掌。不过，翻看早期的文献史料，国人对蜻蜓的了解也多半局限于六足四翼、取食蚊蝇以及蜻蜓点水等最基本的特征和习性。

真正对中国蜻蜓的分类学研究始于外国学者，比利时动物学家Edmond de Selys Longchamps在1886年发表了关于北京蜻蜓的文章，美国人James G. Needham更是在1930年编写了中国蜻蜓的学术专著《中国蜻蜓手册》。

中国人最早的两本蜻蜓著作是1986年由隋敬之和孙洪国编写的《中国习见蜻蜓》，以及1990年赵修复教授编写的《中国春蜓分类》。这两本书我都是在其出版后第一时间购买的，也是我青年时代对蜻蜓最初的认识。

日本蜻蜓专家朝比奈正二郎曾高度评价赵修复教授的研究：“研究亚洲的蜻蜓区系，没有中国的资料，等于胡闹。”但由于时代和年龄的限制，赵修复教授的研究仅仅止步于春蜓，对中国蜻蜓分类研究，不得不说是憾事！

在赵修复教授的当代继任者中，浩淼无疑是最为出色的！

我跟浩淼相识已有七八年的时间，一开始都是在网上联系。浩淼可以说是一个网络中的

蜻蜓专家，对爱好者的问题，往往都能迅速准确地解答。后来有机会见面才发现他是一个非常阳光的大男孩！

浩淼的专业水准是毋庸置疑的，他与世界著名的蜻蜓专家都有着密切的往来。这些专家给了他极大的帮助，也使得他的研究更加国际化和令人信服。他不仅对世界各地的蜻蜓了如指掌（我曾多次拿欧美等地拍摄的蜻蜓照片来试探他），而且非常努力地去探索未知的蜻蜓世界。他每年在野外的时间长达半年以上，几乎可以这样形容他：不在野外，就是在去野外的路上！

浩淼的感染力也非同小可，在他关于中国蜻蜓的微信群里，有一大批蜻蜓爱好者，紧密地团结在他的周围，大家每天互通情报，交流蜻蜓观察的动向。我也曾受到他的感染，自告奋勇独自去云南山区，搜寻一种罕见的蜻蜓，最终无功而返，但虽败犹荣！

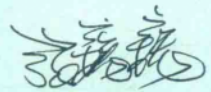
浩淼的优势还在于他的摄影技术，作为一个蜻蜓专家，他拍摄的蜻蜓生态照片，不仅构图精美、色彩逼真，而且鉴定特征清晰，容易辨识，充分体现了他在蜻蜓学和摄影两个方面的专业水准。

正因为这两方面的超常专业水准，以及非凡的组织协调能力，才使得这本世界规模最大的蜻蜓图鉴得以出版。

这本精美的《中国蜻蜓大图鉴》，不仅具有很强的科学性，而且具有很高的科普价值。对科研工作者来说，这是一本很好的研究专著；对爱好者以及青少年来说，这是一本不可多得的鉴定宝典。

目前，自然观察和博物教育在国内越来越受到重视，而昆虫无疑是最为贴近生活的动物类群，这其中蜻蜓必然是不可或缺的。

我坚信，随着本书的出版发行，“一起去观察、拍摄蜻蜓”，终将成为一种新的时尚！



2018年3月31日于重庆

作者序

与蜻蜓同行

我和蜻蜓的缘分或许与我的名字有关，“浩淼”既有水势浩大的含义，也预言了我的一生都将与水为伴。自幼年起，就常常溜到河边。家乡的牡丹江不算宽，却是一条生命之河。5岁时在野外的一次经历，开启了通往蜻蜓王国的旅程。那是我第一次见到蜻蜓在野外羽化，一次“丑小鸭变天鹅”的华丽变身，一只体型硕大、具有金属光泽的蜻蜓，深深触动了我。然而直到20岁时，我才知道了它的真正名字——圆大伪蜻。

2018年，我与蜻蜓结缘满30年，是个值得庆祝的时刻！然而这30年的蜻蜓之路走得十分曲折和艰辛。我从8岁起学习美术和音乐，在近10年的学习中，我似乎并没有特别深的造诣。随后放弃了艺术之路开始专攻学业。从小学到大学，蜻蜓几乎占据了我所有的时间。有时上学路上故意绕到江边，寻觅待羽化的蜻蜓幼崽，带到学校的书桌里羽化。时间久了，我对这些神秘昆虫的兴趣越来越浓。到大学以后，就经常利用空闲之余远足旅行去寻找和观察蜻蜓，也逐渐开始接触到了专业知识。本科和硕士阶段，我在大连工业大学接受的是化学工程和造纸工程方面的教育，直到有一天我的命运被完全改变。那是一个名为“蜻舞菲扬”的蜻蜓作品展，成为我人生的“变身”时刻。蜻蜓作品展最大的收获是让我认识了中国的蜻蜓学家江尧桦先生。他多次寄给我重要的蜻蜓文献，教我认识蜻蜓，并推荐我到华南农业大学攻读昆虫学博士学位。在造纸工程专业硕士学习阶段的第二年，我开始为转入昆虫学专业备考。2008年3月，我第一次踏入华南农业大学的校园与我的恩师童晓立教授见面，他的出现对我的一生都有着深远的影响。童老师曾给我单独授课，讲昆虫分类，讲命名法规，让我充实各种基本理论。广东省无比优越的地理位置和气候条件，也为学习蜻蜓提供了充足的研究内容。2012年获得博士学位后，我继续到中国科学院水生生物研究所从事蜻蜓研究，师从蔡庆华研究员。我和蔡老师经常一起聊蜻蜓，他除了给予鼓励和支持，更重要的是给了我一个可以任性发展的空间。这期间，我开始学习生态学的相关知识，包括蜻蜓用于环境监测的研究方法，并开展在湖北省神农架林区和云南省的蜻蜓野外考察，尤其是在云南省的野外考察

使我对大自然有了更深的感悟，也领略到了生物多样性热点区域的震撼力。

踏入专业领域10年，幸运地得到了多位国际蜻蜓学家的鼎力帮助。从我的第一份蜻蜓研究报告开始，就得到了芬兰著名蜻蜓学家Matti Hämäläinen博士的指导。我们曾多次见面，一起到野外考察，一起讨论蜻蜓，一起发表研究报告，他曾对我的博士学位论文提出了重要意见。澳大利亚的Albert Orr博士是国际蜻蜓学报和蜻蜓学杂志的主任编辑，在我的多篇重要研究报告中，他都给予了关键的修改意见，并经常协助新种的命名、英文的校正等工作。此外我们经常展开蜻蜓行为学方面的讨论。著名的美国蜻蜓学家Rosser W. Garrison博士，一直关注着我的工作，他多次为我寄来珍贵的蜻蜓文献和野外考察所需的工具。我和几位世界蜻蜓大师几乎每天都有书信来往，一起讨论蜻蜓学的各类疑难杂症。3位老友也都以审稿人的身份，投入到了这本图鉴的撰写工作中。

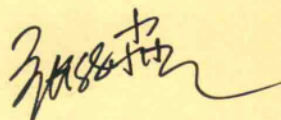
一个索尼的随身听，装满了王菲的歌曲，狂放在野外寻找蜻蜓，是我年少时最难忘的经历。时常追忆那些刺激的野外探索，无数次的一个人旅行，虽然无法挽留在田野里消逝的青春年华，但能与这些神秘的丛林精灵一次次地近距离接触，满足而骄傲。生命之河，蜿蜒流淌，有生之年，与蜻蜓结缘，是最大的荣幸。

这本彩色图鉴，从2009年开始筹备编写，耗时近10年。我把近30年在野外观察蜻蜓和10年里对蜻蜓分类学的研究成果全部汇入此书。从一个蜻蜓爱好者到专业研究者，角色变了，但不变的是对蜻蜓无比的热爱和执着。本图鉴收录了中国地区蜻蜓目昆虫共计820种，是目前全球同类图鉴中收录蜻蜓种类最多的一部。所包含的千幅彩照则是从超过20万幅生态照片中经过细致的考虑筛选出的最佳影像，从不同角度展示物种，结合简洁精准的概况性描述，有助于快速识别物种。分类特征图像，包括翅脉、肛附器、次生殖器等都是根据个人收藏的标本进行实体拍摄和编制。从图片筛选到中英双语的文字编写，是一项繁重而复杂的工作。有时从早忙到晚，既要编写文字，又要检查标本，几乎是连续12小时的工作状态。然而书稿还有很多需要进一步完善和改进之处，而且随着野外考察工作的继续，更多的新种和新记录种会被陆续发现，中国也将成为世界首个突破千种的蜻蜓大国。期待这本彩色图鉴可以在世界范围提升中国蜻蜓区系的热度。

大数据时代，蜻蜓的研究手段和方法已大幅提升。借助先进的地理信息系统和全球定位系统可以搜寻到更多藏匿在深山的蜻蜓栖息环境。结合分子生物学的研究手段，可以更准确地把握它们的分类学地位及系统发育关系。中国蜻蜓学的发展急需更多的研究力量。愿本书可以号召更多的爱好者投入到研究队伍中，把对蜻蜓的热爱转化成科研力量，让这个小众的科研领域能够延续生命。

唤醒沉睡亿年的自然之美，把转瞬即逝的自然之魂化为永恒！谨以此书，献给所有支持蜻蜓研究工作的朋友们！

致读者



2018年3月18日于昆明



Preface

Living with dragonflies

It may be that by virtue of my name I was fated to study dragonflies. The Chinese word “Haomiao” means “plenty of water”, perhaps predicting that I should have some affinity with aquatic ecosystems for the rest of my life. As a child, I often went to the river bank. The river called “Mudanjiang”, the same name as my hometown, is not so wide but is “a river of life”. At the age of five, I was enchanted and touched by the sight of the emergence of a large metallic insect. Not until I was 20 years old did I finally come to know its name: *Macromia amphigena*.

Now in 2018, I have been with my beloved dragonflies for 30 years; a moment to celebrate. But working with dragonflies was never an easy pursuit. I began to study fine arts and music when I was eight years old but after ten years of study, I realized this was not my vocation. Therefore I abandoned my career in the arts and turned to studying science and technology. Dragonflies continued to interest me from primary school to university and I devoted all my spare time to studying them. Sometimes on the way to school I detoured to the river bank where I found larvae which I took to my desk, observing their emergence. My interest in these mysterious insects grew as time passed. As a undergraduate student I often went to the field to search for dragonflies, and gradually began to acquire a professional knowledge of them. Although I studied chemical engineering for my Bachelor’s and paper making for my Master’s degrees, my interest in dragonflies remained as passionate as ever. Then, one day I hold a dragonfly exhibition called “Qingwufei yang”. This was an important event that was to change my life. By that exhibition, I became acquainted with the Chinese odonatologist, Mr Yaohua Jiang who provided me with many useful papers and taught me the essentials of odonatology. He then recommended me to study for a PhD in entomology at South China Agricultural University. At that time in my second year of postgraduate study towards a Master’s degree in paper making, I began preparing for the entrance examination of entomology. In March of 2008, I went to the university and met my supervisor, Professor Xiaoli Tong, for the first time. He was to have a profound impact on my life. He instructed me in insect systematics, principles of Zoological nomenclature, as well as other aspects of entomology. I was also fortunate to be located in Guangdong Province, which, with its superior geographical location and climatic

conditions provided me with ample material for study. I received my PhD in 2012 and then continued to work on dragonflies at the Institute of Hydrobiology, Chinese Academy of Sciences, under the guidance of my collaborative supervisor, Professor Qinghua Cai. We talked about dragonflies very often, he giving me much encouragement and support, as well as space to facilitate my eclectic development. At that time I began to study ecology of dragonflies, including the use of dragonflies as environmental indicators. Meanwhile I conducted extensive explorations in Shennongjia forest in Hubei and many parts of Yunnan. The fieldwork in Yunnan gave me a better understanding of natural history. I was amazed by its rich biodiversity.

I have been very lucky to receive much help from several eminent international odonatologists during the last ten years of professional Odonata study. Ever since my first dragonfly report, Dr Matti Hämäläinen (Finland) has freely given his time, help and special attention to me. We have met many times collecting in the field, discussed many aspects of dragonfly systematics and co-authored many papers. Dr Albert Orr (Australia), a subject editor of the journal *International Journal of Odonatology* and associate editor of *Odonatologica* provided many critical comments in my papers, and often helped me with the name of a new species, English expression, etc. Additionally we often discussed dragonfly behavior. The American odonatologist, Dr Rosser W. Garrison has helped me with literature and tools for ongoing fieldwork. I correspond with these well known authorities frequently and discuss problems in various dragonfly groups. These three old friends have all joined in the editorial work of the book as reviewers and English language editors.

Listening to my favorite songs by Faye Wong and collecting dragonflies were the abiding passions of my youth and remain so still. I have a rich fund of unforgettable and exciting memories of times in the field which I often recall-the many times I was alone with them. Although I can't keep my youth forever, nor go to the field so often, I will always feel enormous satisfaction and pride to had the intimate acquaintance of these beautiful and mysterious insects. From dragonfly enthusiast to professional odonatologist, my love and admiration for these insects has never waned.

I began to prepare this field guide in 2009, this work has taken almost ten years. It brings together field observations of dragonflies and the results of taxonomic studies. A total of 820 species from all over China are illustrated, more than in any comparable book worldwide. The thousands of beautiful photos have been carefully selected from over 200000 shots. They are chosen to show a species in the best view and help the readers to quickly identify species with the help of the generalized identification text. Diagnostic photos, including wing venation, anal appendages, secondary genitalia, etc., are taken

from specimens in my collection. It was a difficult and complex task to select photos from my large photo library and edit both Chinese and English languages. However, this book is still not complete, for with continuing fieldwork, more new species and new records will be discovered, China will probably be the first country to have over a thousand dragonfly species. Hopefully this colourful field guide will stimulate further interest in the fascinating Chinese odonate fauna.

The Age of Big Data, methods for studying dragonflies have been greatly improved. We can now find more habitats with the aid of hand-held GPS, Google Earth and GIS applications. And the application of molecular techniques continues to enhance the study of these insects, to give a better understanding of their status and phylogenetic relationship. However, odonatologists in China are few, and more attention needs to be directed to the study of this ancient insect group. May this book bring more enthusiasts into the research team, transforming their love of dragonflies into scientific power, and keep this fascinating research area alive.

Awakening the beauty of nature sleeping for hundreds of millions of years, turning the fleeting spirit of nature into eternity! I dedicate this book to all my friends, family members as well as the dragonfly lovers all over the world.

To all my readers

Haomiao Zhang

18 March, 2018, Kunming



中国蜻蜓大图鉴
DRAGONFLIES AND
DAMSELFLIES OF CHINA