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“十二五”国家重点图书出版规划项目

中国海洋物种和图集 下卷

中国海洋生物图集

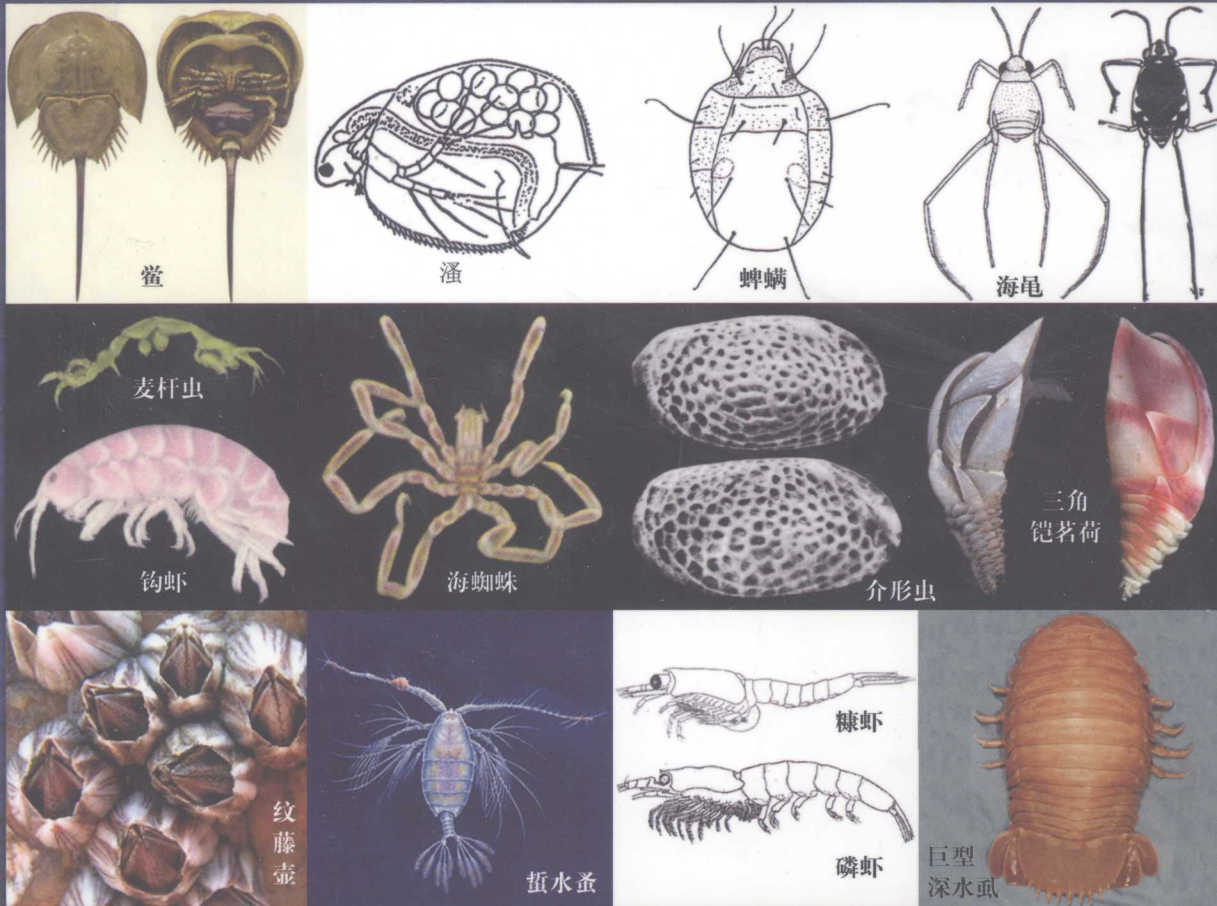
主编 黄宗国 林 茂

第五册

动物界 (3)

节肢动物门 (1)

肢口纲 海蜘蛛纲 蛛形纲 昆虫纲 甲壳纲 (1)



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郑州大学 *040107929762*

中国海洋物种和图集 下卷
The Living Species and Their Illustrations in China's Seas (Part II)

中国海洋生物图集

AN ILLUSTRATED GUIDE TO SPECIES IN CHINA'S SEAS

主编 黄宗国 林茂
Editors-in-Chief Huang Zongguo Lin Mao

第五册

Vol. 5

动物界 (3)
节肢动物门 (1)
肢口纲 海蜘蛛纲 蛛形纲 昆虫纲 甲壳纲 (1)



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内 容 简 介

《中国海洋物种和图集》是“我国近海海洋综合调查与评价”(908专项)成果集成任务(908-ZC-II-02)的成果,也是《中国海洋生物种类与分布》(1994年初版、2001年英文版、2008年增订版)的延续与深入;是至今收录中国海洋物种最多、图文并茂的书;是国内外44家单位的112位专家共同劳动结晶。

这部书分上、下两卷。上卷《中国海洋物种多样性》,含28 000余种物种,分上、下两册。下卷《中国海洋生物图集》,含1.8万物种的原色图或黑白图,分8册。按五界分类编排,与上卷的物种相呼应。供海洋、水产及涉海人员参考应用。

“The Living Species and Their Illustrations in China's Seas” is the achievement of the “Chinese Offshore Investigation and Assessment” and is also an expanded continuation of “Marine Species and Their Distributions in China's Seas” (first published in 1994, English version in 2001, revised and expanded version in 2008), covering the largest number of marine species and is the best illustrated and most comprehensive among similar works in China. This book is the product of the collective effort of 112 people (national and international experts) from 44 organizations participated.

This treatise comprises two parts. Part I, “The Living Species in China's Seas”, covers more than 28 000 species in two volumes. Part II, “An Illustrated Guide to Species in China's Seas”, comprises 8 volumes of color and black and white illustrations of 18 000 species arranged according to the five-kingdom classification scheme, with correspondence to the species list published in Part I. This 10-volume book intended for reference by personnel in the marine, aquaculture and maritime industries.

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序

《中国海洋物种和图集》这部书，分上、下两卷10册。

上卷《中国海洋物种多样性》，记载2.8万余种，分上、下两册。

下卷《中国海洋生物图集》，刊出1.8万物种的形态图，分8册。

上卷是《中国海洋生物种类与分布》1994年初版、英文版和2008年增订版的继续和深入。由原有的2.2万余种增加至2.8万余种，每种包括原有的中名、学名、订名人、地理分布和参考文献号；本书增加了订名年份、联合国粮农组织的英文名以及在下卷的相应图号。

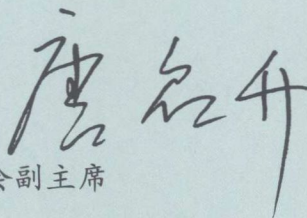
下卷《中国海洋生物图集》刊载1.8万物种的（2.5万种次）原色或点线形态图和部分生态生物学图。从原核生物界至动物界，约2 800个图版。每种力求刊出颜色和形态等的分类特征，便于鉴定分类使用，同时顾及到美观和节省篇幅。8个分册独立编页码、图号和属名及中名索引，便于查找。

这部书体现了全面、科学和实用；收集了19世纪以来国内外已记录的中国海洋物种，尽量删除淡水种和化石种。用当今最经常应用的生物五界分类法编排，界或门以下的分类阶元，尽量尊重各门类专家的意见，求同存异；也注意连续性和稳定性。本书力求对物种分类、鉴定，生态生物学研究，环保和外贸、商检人员有帮助。

这部书图文并茂，在国内是首次，国际上也不多见；以往各大门类中已有一些图鉴及名录，但本书集成出版和未出版的各门类名录和形态图，是创新的体现。

这部书是国内外专家集体劳动的结晶：主持单位多年来深入开展这项研究，并组织了国内外许多专家共同研究。这次就有112位编委，包括中国内地、台湾、香港及英国和澳大利亚的专家。

这部书的出版，将进一步促进中国海洋物种多样性的研究，推动这个领域的科技进步。



中国科学技术协会副主席

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2010年7月19日

Preface

“The Living Species and Their Illustrations in China's Seas” comprises 10 volumes in two parts.

Part I, entitled “The Living Species in China's Seas”, reports more than 28 000 species in two volumes.

Part II, entitled “An Illustrated Guide to Species in China's Seas”, comprises 8 volumes and publishes morphological diagrams and plates covering 18 000 species.

Part I is the in-depth continuation of “Marine Species and Their Distribution in China's Seas” (first published in 1994), its English edition and the revised and improved edition published in 2008. The total number of species reported has increased to more than 28 000, with the original Chinese name, scientific name, authority, geographical distribution and references provided for each species. Also in this version, the date of first description and the English common name adopted by the United Nations Food and Agricultural Organisation are reported, together with a plate number for cross-referencing with part II.

Part II presents colour plates and line drawings of the morphological and selected ecological habit at illustrations of 18 000 species, with a total of 25 000 species. Twenty-eight hundred illustrations describe organisms from prokaryotic kingdom to animal kingdom. To facilitate identification and taxonomic research, distinguishing features including colouration and morphology of each species are highlighted, while consideration is also given to overall presentation and economy of space. Separate page and plate numbering as well as indices to scientific name of genus and Chinese names of species are provided in each of the eight volumes to aid searches.

This comprehensive book is comprehensive and has high scientific and practical values. All marine species recorded from China's Seas by the national and international literature since the 19th century have been incorporated, while effort is made to remove fossil species. Taxonomic arrangement follows the popular five-kingdom approach; Taxonomic units adopted below kingdom or phylum are the result of considered decisions based on the views of the respective authorities, with particular reference to the issues of continuity and stability of nomenclature. This book strives to be a valuable asset to species identification and taxonomy, ecological research, as well as personnel involved in environmental protection, foreign trade and quarantine work.

This comprehensive and well-illustrated treatise is not only the first one in China, but also a rare effort internationally. While there exist pictorial guides and checklists for the major groups, this collation of published and unpublished checklists and morphological diagrams of the various groups is an embodiment of innovation.

This treatise also crystallizes the collective effort of national and overseas experts, bearing the fruit of many years of in-depth research by the coordinating unit as well as the collaboration of many national and international experts. This effort is reflected by the 112-member editorial team, which includes experts from the mainland, Taiwan, Hong Kong, as well as Britain and Australia.

The publication of this book will further enhance research on the marine biodiversity of China and promote the progress of science and technology in this field.

Professor Tang Qi-sheng

19th July 2010

前 言

在“我国近海海洋综合调查与评价”(908专项)成果集成任务(908-ZC-II-02)的支持下,来自两岸三地44家研究所、院校和相关海洋机构的112位科学家,基于908专项调查研究成果,共同完成了《中国海洋物种和图集》上卷和下卷的编纂。《中国海洋物种和图集》上卷由《中国海洋物种多样性》上册和下册组成;《中国海洋物种和图集》下卷由《中国海洋生物图集》第一册至第八册组成。这部书也是《中国海洋生物种类与分布》(1994年初版、2001年英文版、2008年增订版)的延续与深入,体现了全面、科学和实用。

《中国海洋生物图集》中的每个物种以形态图为主,少数种还辅以生态和生物学自然景观图;物种形态图含原色图和黑白点线图,两者异曲同工,都是为了实用,也注意美观。除原核生物界以生化(DNA、RNA、同功酶等)为主要手段进行分类鉴定、仅给出部分图外,其他4个界,从科以上阶元都有形态图。若该分类阶元物种数少,或者是经济种和有害种,尽量全部编图。有些物种,还同图刊载原色图和分类特征图。

采用了国内外已出版的大量论文和著作,包括已出版的《中国动物志》和《中国海藻志》以及一些专科论著,如:金德祥1965年、1982年和1991年的中国海洋硅藻,曾呈奎1983年的中国常见海藻原色512种。齐钟彦等的中国海贝1661种原色图。徐凤山等2008年的中国海产双壳类图志916种原色图。陈天任等1986年的台湾原色对虾图鉴、1993年的龙虾、2007年的寄居蟹、2008年的虾蛄、2009年的蔓足类等。刘锡兴2001年的污损苔虫1190种电镜图。沈世杰等1993年的台湾鱼类志2028种原色图。马敬能(Mackinnon, J.) 2000年的中国鸟类野外手册。也参考了日本的几本图志:濑川宗吉1974年的原色日本海藻图鉴、内海富士夫1964年的原色日本海岸动物图鉴、山路勇1976年的日本海洋浮游生物图鉴、Sakai 1976年的日本及附近海蟹类、时冈隆等2000年的新日本动物图鉴。

在各大类的图集前,包括界、门、纲及部分目,都有中、英文简介,概述其进化地位、主要形态特征、经济意义,列表展示各类图件的种数、图号和页码,便于读者概览和查找。列出全部图件使用的文献名称和网址,以尊重作者的开创性劳动。图版按五界分类系统、从低等到高等、分8册,各册独立编排图版号、页码和属名及中名索引。各册的原色图和黑白图按分类系统混合编排。查找物种,可通过各册索引,也可通过上卷各物种后面的图号。鉴定物种时还可通过所列文献进一步查找原始文献。

图件的初步编排由黄晓松和吴小柳执行,正式图版由史劲松完成。英文翻译由张肇坚、李成业负责。

对入编图件的所有作者、绘图和摄影者深表谢意,有这些图件才有本图集。因主编学识所限和影像讯息的时代限制,存在缺点敬希指正。

主 编

2010年10月于厦门

Introduction

“The Living Species and Their Illustrations in China's Seas” including two parts is the achievement of the “Chinese Offshore Investigation and Assessment”. This effort is reflected by 112 contributors from 44 organizations participated, which includes experts from the mainland, Taiwan, Hong Kong, as well as Britain and Australia. Part I, entitled “The Living Species in China's Seas”, comprises 2 volumes. Part II, entitled “An Illustrated Guide to Species in China's Seas”, comprises 8 volumes. “The Living Species and Their Illustrations in China's Seas” is also an expanded continuation of “Marine Species and Their Distributions in China's Seas” (first published in 1994, English version in 2001, revised and expanded version in 2008). This compendium embodies comprehensiveness, as well as scientific rigor and application values.

In “An Illustrated Guide to Species in China's Seas”, morphological illustration forms the main description of each species, but complementary ecological and biological natural history illustrations are also provided for selected species. Both black and white as well as colour diagrams are included, with the common goal of high practical and aesthetic quality. Apart from a reliance on biochemical (DNA, RNA, allozymes, etc.) traits as the main approach to classifying and identifying prokaryotic kingdom (thus only a limited number of illustrations for this kingdom), taxa above family in the other four Kingdoms are all illustrated with morphological diagrams. Effort was made to ensure diagrams are available for species-poor, commercially important, or pest taxa. Colour plates and illustrations showing distinguishing taxonomic features are included in the same diagrams for selected species.

A large number of journal articles and other published works from national and international sources have been consulted, including published volumes of “Fauna Sinica” and Flora “Algarum Marinarum Sinicarum”, and specialised treatises.

Chinese and English introductions summarising the evolutionary position, major morphological features and economic value precede the illustrated guide for every kingdom, phylum and class, and selected order for all major taxa. Tables display the number of species, plate and page numbers for each plate to assist browsing and searching by the reader. All references cited in the guide are listed to acknowledge the innovation effort of all authors. The 8-volume guide is arranged from the low to high taxa according to the five-kingdom classification scheme. Independent plate numbers, page numbers, scientific name of genus and Chinese names of species are provided in each volume. Colour and black and white diagrams are arranged in mixed order in each volume. Searches for individual species can be made using the index to each volume, or the plate numbers provided with taxa descriptions in the part I. Relevant primary literature can be found in the reference list for species identification.

This illustrated guide owes its existence to the plates and illustrations drawn and photographed by many authors, to whom gratitude is acknowledged. Comments on any shortcomings and errors due to the editor-in-chief's lack of knowledge or historical constraints in imaging technology would be appreciated.

Editors-in-Chief
Xiamen, October 2010

目次 CONTENTS

动物界 ANIMALIA (3)

节肢动物门 Arthropoda(1)	1
肢口纲 Merostomata 图5.1-5.5, 4 spp.	3
海蜘蛛纲 Pycnogonida 图5.6, 12 spp.	10
蛛形纲 Arachnoida	12
蜘蛛目 Araneida 图5.7, 5 spp.	13
蜱螨目 Acarina 图5.8-5.16, 36 spp.	14
昆虫纲 Insecta	23
水表面昆虫 图5.17-5.18, 4 spp.	24
红树林昆虫 图5.19-5.23, 51 spp.	26
甲壳纲 Crustacea(1)	31
鳃足亚纲 Branchiopoda 图5.24-5.25, 30 spp.	33
介形亚纲 Ostracoda	36
浮游介形类 图5.26-5.49, 143 spp.	37
现代沉积物介形类 图5.50-5.53, 82 spp.	61
桡足亚纲 Copepoda 图5.54-5.148, 852 spp.	65
蔓足亚纲 Cirripedia 图5.149-5.201, 298 spp.	169
软甲亚纲 Malacostraca	223
糠虾目 Mysidacea 图5.202-5.230, 112 spp.	224
涟虫目 Cumacea 图5.231-5.233, 21 spp.	253
原足目 Tanaidacea 图5.234, 6 spp.	257
等足目 Isopoda 图5.235-5.251, 123 spp.	259
端足目 Amphipoda 图5.252-5.340, 385 spp.	277
磷虾目 Euphausiacea 图5.341-5.348, 48 spp.	367
属名、中名索引 Index	376
1-8册总目次 Total contents	399

节肢动物门 Phylum ARTHROPODA

节肢动物门是动物界最大的一个门，种数极多，分布极广，约占动物界100多万种中的85%，主要特点是：

1. 身体分头、胸、腹三部，附肢分节。
2. 具几丁质外骨骼及脱皮现象。
3. 体腔为混合体腔，腔中充满血，又称血腔（hemocoel）。具横纹肌的肌肉束。

根据呼吸器官、身体分区及附肢等的不同，通常分为3个亚门7个纲及全海生的海蛛纲，共8个纲。

一. 有鳃亚门（BRANCHIATA）绝大多数水生，用鳃呼吸，有1—2对触角。

1. 三叶虫纲Trilobita：全为化石种。
2. 甲壳纲Crustacea：多数水生。触角2对，头部和胸部愈合为头胸部，背侧有头胸甲（carapace）。如虾、蟹。

二. 有螯亚门（CHELICERATA）

3. 肢口纲Merostomata：全海产，头胸部附肢包围在口的两旁，用腹部附肢内侧的书鳃呼吸。如鲎。
4. 海蜘蛛纲Pycnogonida：全海产，体细长，有吻，各体节有长的附肢。如海蜘蛛。
5. 蛛形纲Arachnida：陆生多、海生少。头胸部有螯肢及脚须和4对步足，腹部附肢退化。用书肺或气管呼吸。如蜘蛛，海生螨。

三. 气管亚门（TRACHEATA）

6. 原气管纲Prototracheata：全陆生，身体蠕虫形，体外分节不明显。如栉蚕。
7. 多足纲Myriapoda：全陆生。身体分节明显，每节具1—2对附肢。如蜈蚣。
8. 昆虫纲Insecta：陆生多、海生少。动物界种数最多的纲。体分头、胸、腹三部。胸部具3对步足，一般具2对翅。如蜻蜓、海龟。

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This is the largest phylum in the animal kingdom. There are numerous species with worldwide distributions. It includes 85% of the one million species in the animal kingdom. Major characteristics include:

1. Body is divided into head, thorax and abdomen; appendages are jointed.
2. Chitinous exoskeleton with molting.
3. Coelom is mixocoel filled with blood, so it is also called hemocoele; muscle bundles consist of striated muscles.

Based on differences in respiratory organs, body regions and appendages, this phylum is divided into three subphyla and eight classes including the exclusively marine Class Pycnogonida.

Subphylum BRANCHIATA

most are aquatic, with gills for respiration and 1 to 2 pairs of antennae:

1. Class Trilobita: all are fossilized species.
2. Class Crustacea: Most are aquatic with 2 pairs of antennae; head and thorax are fused to form the cephalothorax with carapace on the dorso-lateral side, e.g., shrimp and crabs.

Subphylum CHELICERATA

3. Class Merostomata: all species are marine; appendages of the cephalothorax surround the mouth; respiration is carried out by book gills of the inner side of abdominal appendages, e.g., horseshoe crabs.

4. Class Pycnogonida: all species are marine; body is long and slender; with proboscis; each body segment bears long appendages; e.g., sea spiders.

5. Class Arachnoida: most of them are terrestrial but a few species are marine; cephalothorax has chelicerae, pedipalps and four pairs of walking legs; abdominal appendages are reduced; respire using book lungs or trachea, e.g., spiders, sea mites.

Subphylum TRACHEATA

6. Class Prototracheata: all are terrestrial; body is worm-like; no conspicuous external segmentation, e.g., *Peripatus*.

7. Class Myriapoda: all are terrestrial; clear body segmentation; each body segment has one to two pairs of appendages, e.g., centipedes.

8. Class Insecta: most of them are terrestrial but a few species are marine; it is the class with the largest number of species in the animal kingdom; body is divided into head, thorax and abdomen; thorax has three pairs of walking legs; many species have two pairs of wings, e.g., dragonflies, marine flies.

肢口纲 Class MEROSTOMATA (鲎)

肢口纲因前部附肢基部的刺具咀嚼食物功能，故称肢口，中名称鲎。头胸甲马蹄形，国外称马蹄蟹（horseshoe crab）或王蟹（king crab），但与蟹的形态和进化关系相差很大。它是节肢动物形态很特异的一类，4亿多年前即出现，称活化石。

鲎体呈棕绿色，分头胸部、腹部及尾三部分：（1）头胸部马蹄形，背面隆起，腹面凹陷。不分节，具6对附肢。头腹甲背面中线有一对单眼，两侧有一对复眼。头胸甲前缘光滑、圆形或具2个凹陷。（2）腹部略似六角形，两侧有可动的倒刺。有6对附肢，第一对左右联合，盖住生殖孔，称生殖盾（genital operculum）。其余各对腹肢的外肢节内侧都有150–200片薄板状的书鳃（book gill）。（3）尾长，呈三角形。鲎雌雄异体，繁殖季节常成对活动，雌鲎背负雄鲎，在潮间带高、中潮区沙滩挖穴产卵，雄鲎将精液撒于卵上，经5–6周孵化出不具尾的三叶幼虫（trilobite larva），第一次蜕皮后才长出尾剑，当年蜕皮7次，往后每年蜕皮二次。经13–14次蜕皮才达性成熟。每年11月开始由浅海游向深水越冬，翌年4–5月返回岸边，在沙滩产卵。

鲎血制剂是检测内毒素的高灵敏度药品，美国1971年开始生产鲎试剂，我国1978年也在厦门等建立鲎试剂厂。80年代初我国年产鲎80–100t，目前已大为锐减，有些地方甚至绝迹，是亟待加强保护的珍稀物种。

全世界现生鲎仅鉴定4种，美洲鲎 *Limulus polyphemus* 仅分布在大西洋沿岸从美国Main至墨西哥Yacatan；其他3种分布在西北太平洋沿岸，我国都有。广东、广西北部湾沿岸1984–1985年捕到20多万对、逾90万kg，其中三刺鲎占90%，圆尾鲎占6%，南方鲎占4%，还有一种当地称黄皮鲎占2%，估计该年度的捕获量仅占资源量的1/4。

Class Merostomata has got its name because it chews food using bristle spines at the base of the appendages. Its common name is horseshoe crab or king crab because of its horseshoe-shaped carapace. However, it is very different from crabs in terms of the morphology and evolutionary relationship, and has a very peculiar morphology among arthropods. It first appeared 400 millions years ago so it is called a “living fossil.”

The body of horseshoe crab is brownish-green and divided into carapace, abdomen and tail: (1) Carapace is horseshoe-shaped with the dorsal side sticking out and ventral side hollow. No segmentation, with six pairs of appendages. A pair of simple eyes is found on the median ridge on the dorsal side of the carapace whereas a pair of compound eyes is located on the dorsolateral side. The anterior margin of the carapace is smooth, rounded or with two depressions. (2) The abdomen is hexagonal in shape with movable abdominal spines. There are six pairs of appendages; the fused first pair forms the genital operculum bearing the two genital pores on the underside. The inner side of the exopodite of the remaining five pairs of appendages bears 150–200 thin sheets of book gill. (3) Tail is long and rectangular or circular in cross-section. Horseshoe crabs are unisexual and mating pairs are commonly found during the reproductive season with the male clinging to the back of the female. The female digs a hollow on the upper or middle intertidals and lays the eggs in this hollow, the male then releases sperm on the eggs. The eggs take 5 to 6 weeks to hatch into trilobite larva. The tail will appear after the first molting. A trilobite larva will molt 7 times in the first year and 2 times every year starting the second year. It becomes sexually mature after molting for 13–14 times. Every year in November they will migrate from shallow waters to deep sea for overwintering and go back to the shore and spawn in April/May next year.

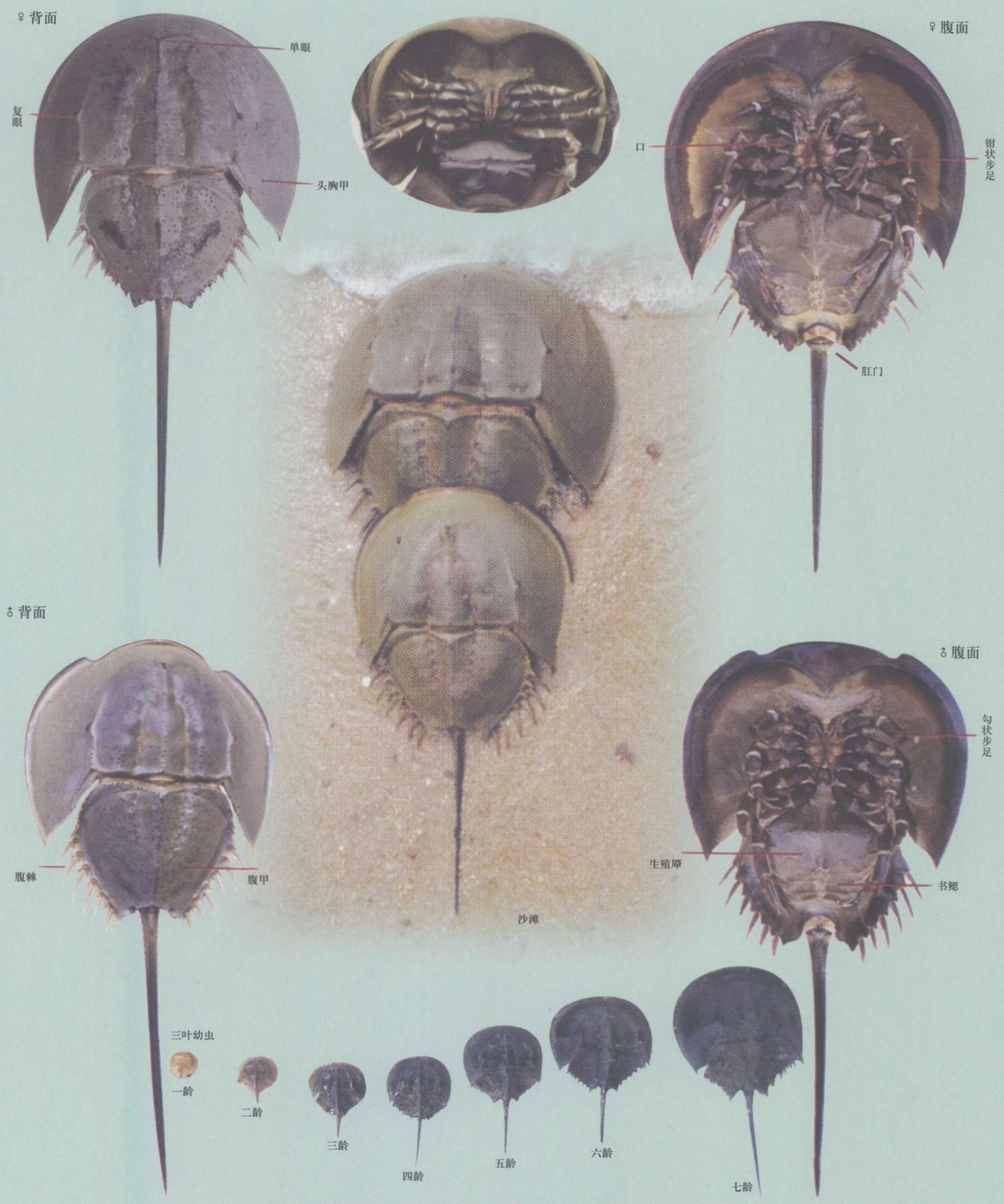
Limulus amoebocyte lysate (LAL) and *Tachypleus amoebocyte lysate* (TAL) are highly sensitive drugs for detecting endotoxin. It started to produce in 1971 in US and in 1978 in Xiamen, China. About 80–100 tons of horseshoe crab were harvested in 1980s but the production has dropped dramatically in recent years and became extinct in some areas in China. Conservation effort should be strengthened to save this endangered species.

Four extant species have been identified worldwide. The American species *Limulus polyphemus* is distributed only along the western coast of Atlantic Ocean from Maine, USA to Yacatan, Mexico whereas the other three species are distributed along the western coast of Pacific Ocean including China. In 1984–1985, 200 thousand pairs of horseshoe crabs, which weighted 900 thousand kilograms, were harvested in Guangdong and Beibu Gulf of Guangxi Province. Among them, 90% were *Tachypleus tridentatus*, 6% *Carcinoscorpius rotundicauda*, 4% *Tachypleus gigas*, and 2% a species called “yellow skin horseshoe crab” by local people. The estimated harvest in that year was estimated to be 1/4 of the resources available.

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第一年蜕皮7次的七龄幼体体全长 ♀ 40cm, ♂ 30cm; 体重 ♀ 4.0kg, ♂ 1.8kg

图5.1 节肢动物门 肢口纲 三刺鲎[中国鲎](1)及幼体 厦门湾 (仿文献1-5)
Horseshoe *Tachypleus tridentatus*

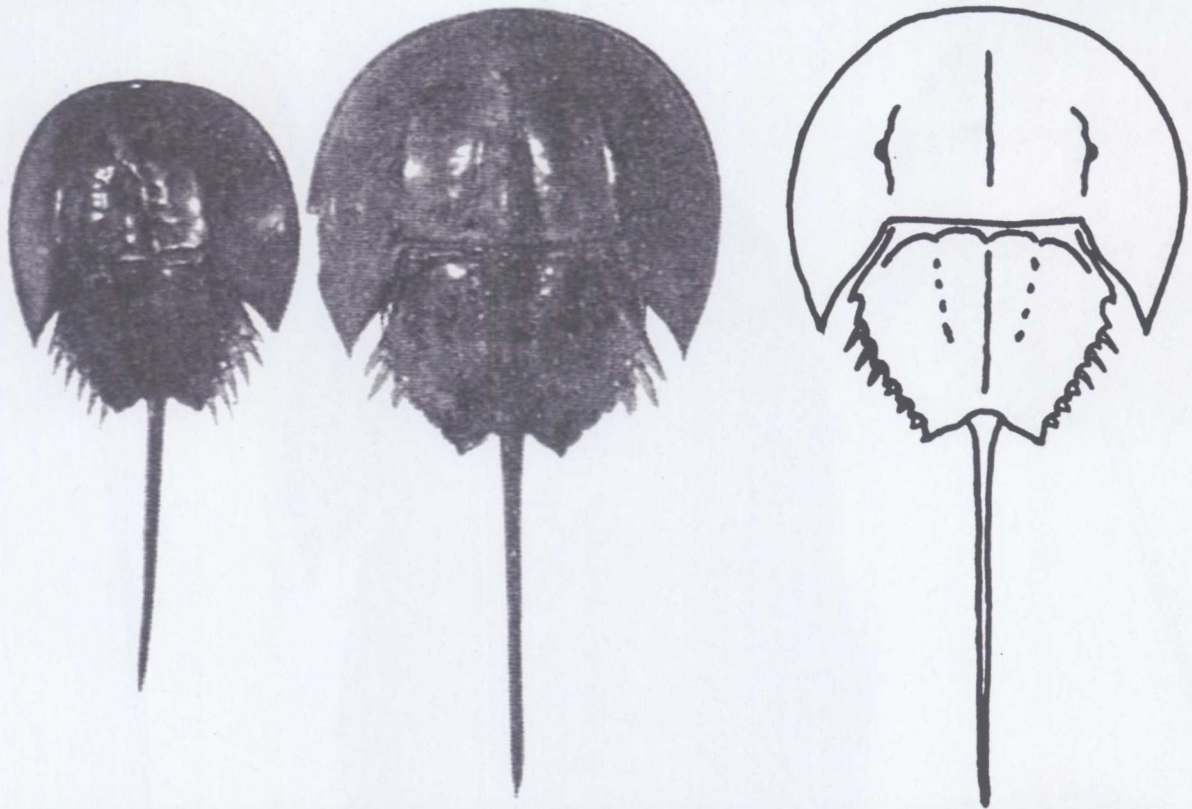


图5.2 三刺鲎 (2) 香港 (张肇坚 摄)
Horseshoe T. tridentatus

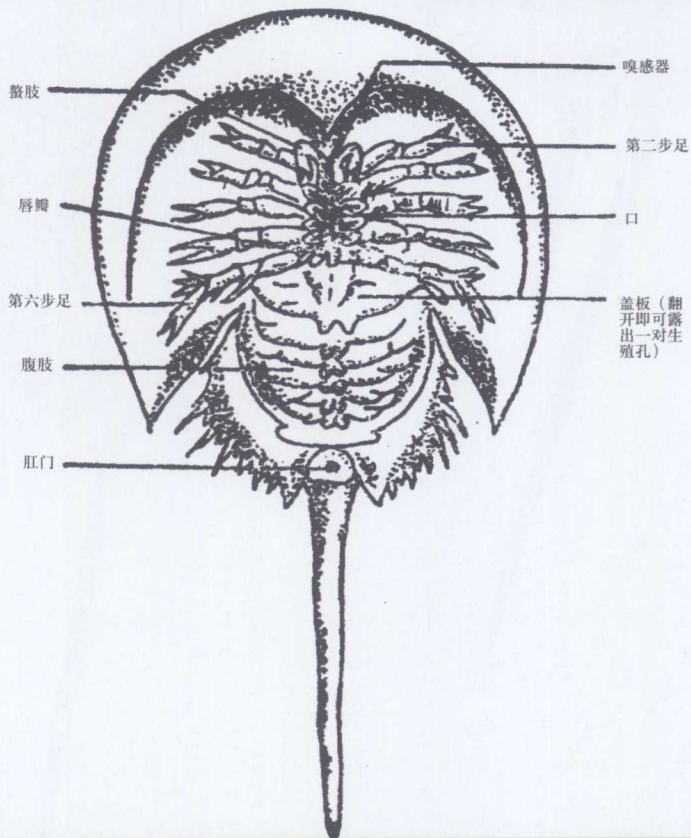


体长 ♀ 31cm, ♂ 26cm

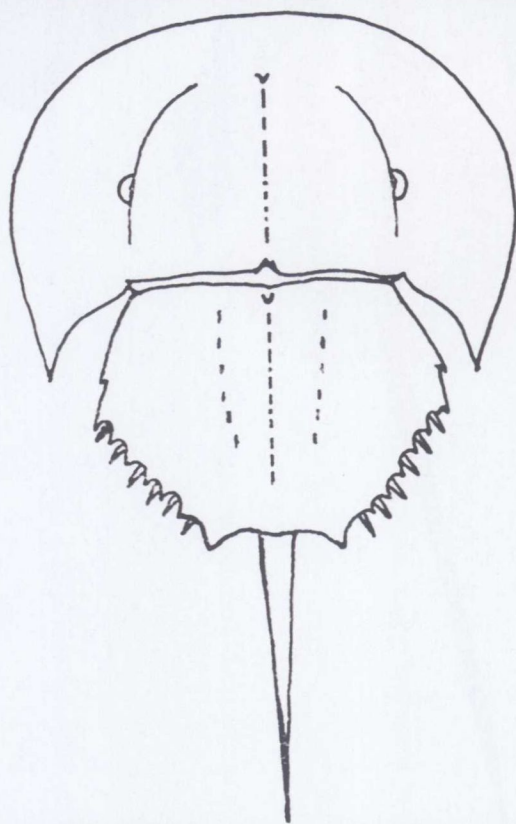
图5.3 圆尾鲎 香港 (张肇坚 摄)
Horseshoe *Carcinoscorpius rotundicauda*



南方鲎 *Tachypleus gigas* 体长30-42cm, ♂ 14.5-16.4cm



三刺鲎 *Tachypleus tridentatus*



圆尾鲎 *Carcinoscorpius rotundicauda*

图5.4 节肢动物门 肢口纲 南方鲎及其他两种鲎形态

Horseshoe