

Book Review: “The Biology of the Medaka” (in Japanese)

by Takashi Iwamatsu

Published in 1993 from Saien-chisuto-sha (Yamazaki Bldg., Kanda-Surugadai 3-2, Chiyoda-ku, Tokyo 101, Japan.

Phone 03-3253-8992, Fax 03-3255-6847)

324 pages (B5), ¥8,500

Kenjiro Ozato

Department of Natural Environment Sciences, Faculty of Integrated Human Studies, Kyoto University, Kyoto 606-01, Japan

This is a book on the biology of the medaka written by T. Iwamatsu, professor of Aichi University of Education. The Japanese title is “Medaka gaku”. “Gaku” means a system of knowledge based on a definite principle and corresponds to -ics or -logy in English. In this sense, it is apparently unusual to call the biology of an animal species “gaku”. In the postscript, the author mentions that he initially intended to entitle his book “Biology of Medaka”, but he could not do so, because this title had been already used in another book before his book was published. However, it may be recognizable soon that this book befits the description of “gaku”.

The biology of the medaka is collectively introduced in this book, contents of which are listed below. Here, medaka is described from various points of view ranging from biological research, natural history, and teaching materials among others. In terms of biological research, studies which have been conducted since medaka was first used for biological research in Japan in early 1900s are found in this book with 2,000 references listed. From these, we recognize the number of studies accomplished in diverse fields of biology using this tiny fish as a convenient experimental animal. We also notice that many of such studies have been abandoned in recent years for the reason that they are not applicable to cellular and molecular approaches. The book suggests that many interesting and attractive problems exist in such classical studies. For example, the “Systematics and Geographical Distribution” (Chapter 1) is one of the most interesting topics in this book. There are 14 species in the genus *Oryzias*, distributed among in the Asian rice crops from India to Japan. The mechanism of speciation has been investigated in various aspects of morphology, karyotype analysis and molecular biology. As an

example of morphological studies, variations of the male anal fin in 8 species are summarized on page 33 (shown on the third page of this article). Fish fins are simple models to study the morphogenesis in developmental biology. These variations of the anal fin in different species may be a useful model for combining speciation and developmental biology.

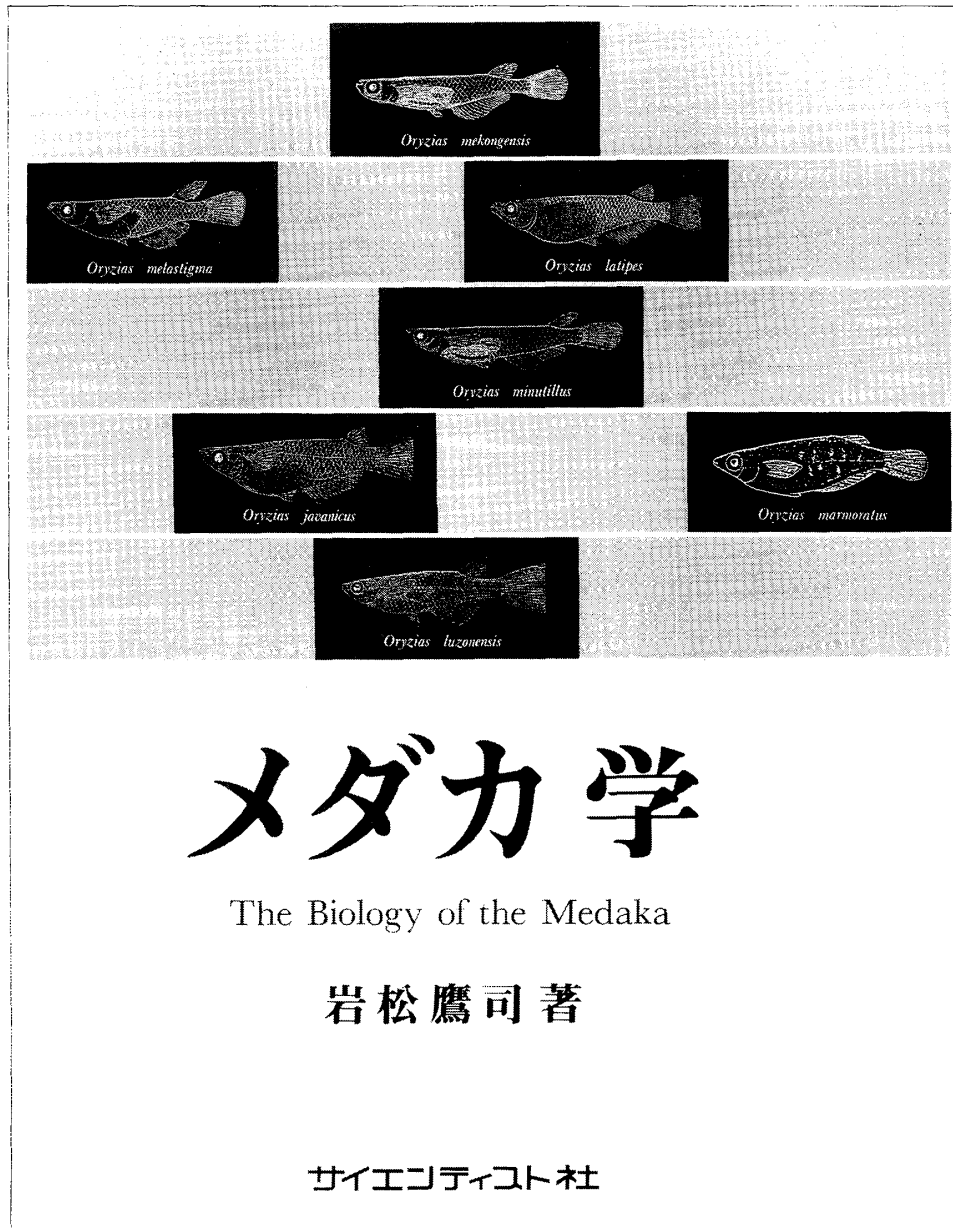
In contrast to the precise description of older studies, the more recent studies are not covered completely. For readers who want more information on the recent advances of medaka studies, it is recommended that the “Biology of Medaka” (eds. N. Egami, K. Yamagami, and A. Shima, 1990; Tokyo University Press, in Japanese) be read together with this book.

Many chapters are devoted to explanations of basic knowledge in morphology, physiology and developmental biology including methods of observations and experiments. These explanations are simple and impressive because they are based on the author’s own experiences and studies. They are helpful not only for beginners of research, but also teachers who want to use medaka as a teaching material.

The book contains 224 figures, most of which are originally drawn by the author. A representative example is shown in a series of figures of the developmental stage (pp. 216–238). These figures are helpful not only for understanding explanations, but also provide us with visual pleasure. Readers may feel that science and art are splendidly merged in these figures. This may be due to the fact that the scientific attitude of the author is based on his love to medaka. The book is recommended for every researcher, teacher, and amateur who is interested in biology and medaka. An English version should be prepared as soon as possible for foreign readers.

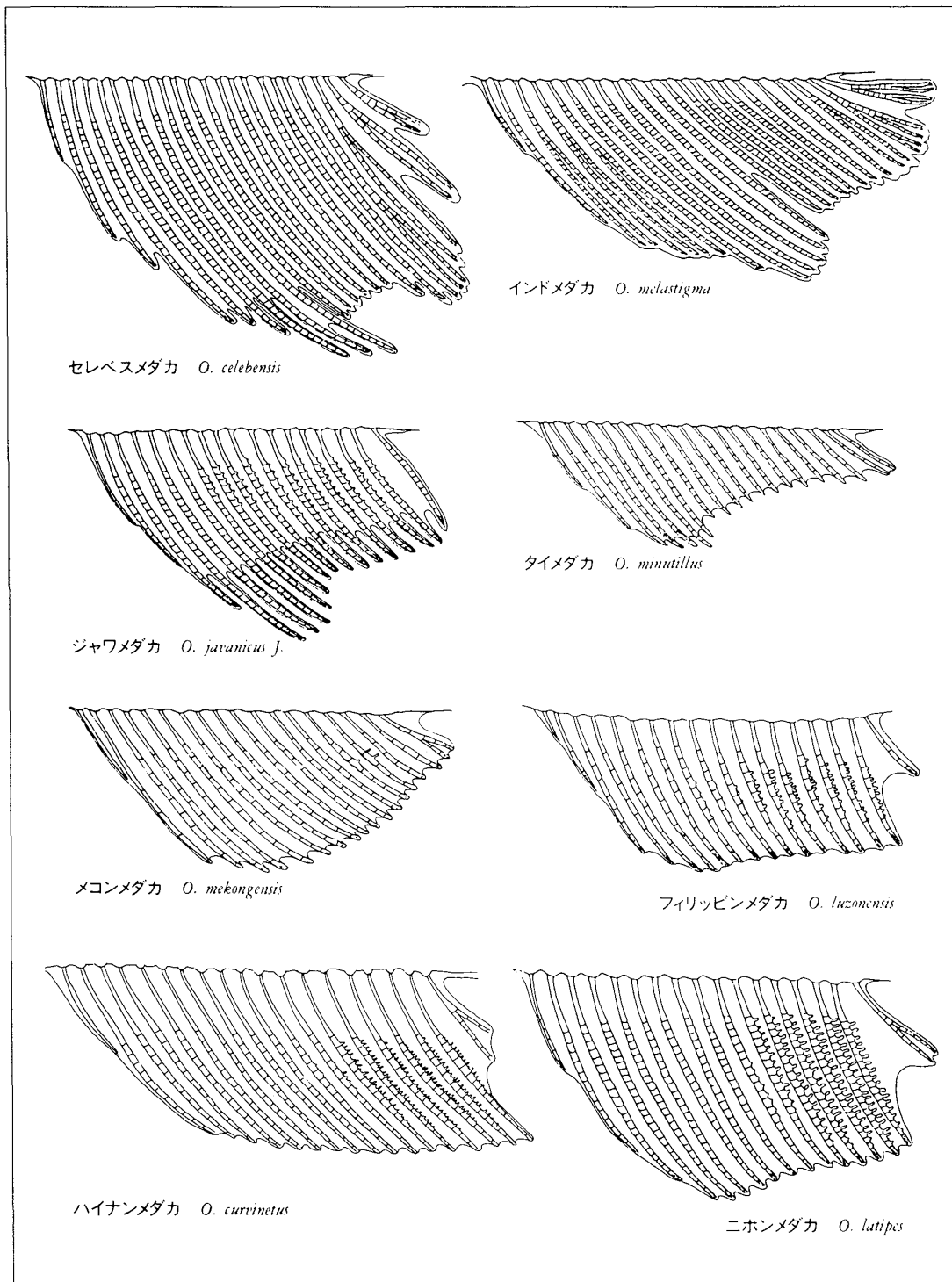
Contents

1. Systematics and zoogeography
 - Taxonomy
 - Origin and distribution of genus *Oryzias*
 - Change of the scientific name of medaka
 - Distribution and differentiation of *Oryzias*
 - Geographical variations of *Oryzias latipes*
2. Breeding and maintenance
 - Acquisition and transportation
 - Breeding facilities and aquaria
 - Water
 - Change of water
 - Feeding
- Density of fish in breeding
- Management for reproduction
- Diseases and treatments
- Experimental tumors
- Inbreeding of strains
3. Techniques for experiments
 - Anesthesia and measurements of the body
 - Removal of tissues
 - Administration of hormones
 - Collection and experiments of eggs
 - Observation of chromosomes and cell culture
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4. Morphology and physiology



- General morphology
- Morphological differences between females and males
- Secondary sexual characters
- Body color
- 5. External and internal morphology
 - External features
 - Viscera system
 - Vascular system

- Muscle system
- Skeleton system
- 6. Reproduction
 - Reproduction
 - Sex differentiation
 - Development of ovary
 - Maturation of oocytes and ovulation
 - Spawning and morphology of mature eggs
 - Development of testis



p. 33 of the book “The Biology of the Medaka”, illustrating morphological variations of the male anal fin of the genus *Oryzias*.

7. Development
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 - Hatching
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 - Eating behavior
 - Behavior and vision
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 - Acidity resistance
 - Biological environment
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11. Activity of heart and respiration
 - Pulsation of heart
 - Respiration
12. Lifespan and effects of radiation