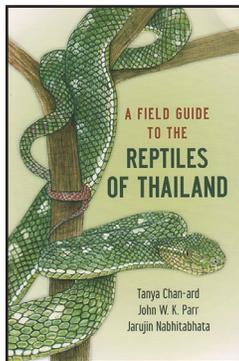


## BOOK REVIEWS

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### A Field Guide to the Reptiles of Thailand

Tanya Chan-ard, John W. K. Parr, and Jarujin Nabhitabhata. 2015.  
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During the last two decades the known Thai herpetofauna has much increased due to new species descriptions and to additions of species recorded from neighboring countries, and species are still regularly added today (Kunya et al. 2015; Pauwels et al. 2015; Sumontha et al. 2015). The Thai reptile list is also still going through important taxonomic changes (see the most recent change by David et al. 2015). Under these circumstances, one might wonder if this was the best time to produce a field guide. On the other hand, existing guides on the Thai herpetofauna are really outdated or incomplete (David et al. 2004; Pauwels and David 2005, 2011), and an easily accessible update on the current status of knowledge on the reptiles of Thailand would certainly be good support for further research and conservation management.

This courageous task of compilation has been jointly attempted by three authors. Tanya Chan-ard has dedicated his whole career to the study of the reptiles and amphibians of Thailand, and his field knowledge on these faunas is unrivalled. John Parr is a conservationist with experience in Southeast Asia but is not a herpetologist, hence his participation in such a challenging enterprise is a surprise. Jarujin Nabhitabhata was one of the leaders in herpetological research in Thailand, but he tragically died during minor surgery in 2008 (Chan-ard et al. 2009), i.e., seven years before the guide under discussion here was published.

The guide's size makes it easy to bring in the field, with good quality binding and paper. It is divided into six main parts: an unnamed section (pp. i–xxix) including a glossary and a key to the major groups of Thai reptiles; an introduction (pp. 1–17) containing a history of herpetology in Thailand; a half-page section

on physiography; very general sections on habitats (without figures), zoogeography, and conservation; species accounts (pp. 18–298); a selected bibliography (pp. 299–306); an index of scientific names and an index of common names. The authors included keys to genera for most families, and keys to species within each multiple-species genus.

The glossary does not include a number of terms that are used in the identification keys (alveolar rim, amphicoelian, cornified, entoplastron, pentadactyl, pores, precentral scute, pterygoideum, etc.). Some of the glossary's definitions are erroneous or misleading (for example “anal plate” is defined as the “terminal ventral scale or scute” while the drawing on page xxix mentions that the last ventral precedes the anal; “scansorial” is defined as “both arboreal and terrestrial;” “superciliary” is defined as “small scale bordering orbit”). No methodology is provided to explain how to count supralabials, infralabials, lizard midbody scales, etc. There is no distinction made between snake preventrals and ventrals (see drawing p. xxviii). The way shown to measure the plastron length (p. xxv) is erroneous.

The section on the history of herpetology in Thailand is a major disappointment. The guide being co-authored by two Thai herpetologists, one would have hoped to find much information on the contributions by their compatriots. However, after long paragraphs dedicated to the biography of foreign herpetologists, including only information already available in the literature, the single thing said about Thai herpetologists is “currently, there are about 20 Thai nationals with a keen interest in herpetology supported by a network of more than 100 experts in particular field of herpetological [sic] taxonomy”! Not a single word about pioneers such as the late Wirot Nutphand who wrote the first Thai reptile guides and described several taxa including the iconic *Chitra chitra*, Kumthorn Thirakhupt who trained a large part of the current generation of Thai herpetologists, Lawan Chanhome who made significant progress in the study of Thai snake venoms and husbandry, Piboon Jintakune who initiated an important snake reference collection at the Thai Red Cross, Yodchaiy Chuaynkern or Montri Sumontha, to mention a few. There is not even a mention of the fact that Jarujin died in 2008!

The habitats and zoogeography sections of the introduction are very general and make a single reference to reptiles (“turtle”) but refer five times to mammals; it seems like these sections have been just copied and pasted from a general guide on Thai mammals. The map showing the Thai provinces is outdated, and Bueng Kan Province, cited in the guide, won't be found on the map.

Within the families, the order of genera seems more or less random, as does the order of species within genera, making it very impractical to find a given taxon. The text for the family Typhlopidae has been placed by mistake in the Sauria section. The introduction to Agamidae tells us that this family includes the genus *Takydromus*!

The key to the major groups of Thai reptiles states that in lizards “the tail is equal to or longer than snout-vent length (unless regenerated);” this obviously does not always apply, for example, to *Dibamus* and some *Isopachys*. The keys to trionychid and skink genera are largely based on osteological characters, inappropriate for a field guide. The key to genera of the Geomydidae lacks an entry to couplet 4, and the key is partly based on osteological characters. The key to the genus *Malayemys* erroneously states that the front of the upper jaw of *M. subtrijuga* has three vertical lines, while it actually has three pairs of vertical lines. The key to the lizard families erroneously states that all legless skinks have an ear-opening and implies that Anguidae do not. The keys to trionychid genera, agamid genera (*Acanthosaura*, *Calotes*, *Draco*, *Pseudocalotes*), gekkonid genera (*Cnemaspis*, *Cyrtodactylus*, *Dixonius*, *Ptychozoon*), skink genera (*Eutropis*, *Isopachys*, *Scincella*, *Sphenomorphus*), *Dibamus*, *Boiga*, *Oligodon*, *Crotalidae*, *Disteira*, homalopsid genera, *Asthenodipsas*, etc., contain numerous mistakes regarding character variation, with considerable discrepancies between variation given in the species accounts, variation given in the keys, and characters visible on the drawings. One of many examples is that the character “no gular fold or pouch” leads to *Aphaniotis* in the key to agamid genera, but the species account for *A. fuscus* mentions “the gular pouch is black.” The first choice in the agamid genera key is between “body depressed” and “body compressed”—the first leads, after some additional steps, to *Leiolepis*, while the account for that genus states “members of this genus have a compressed body,” in complete contradiction with the key. The last point of the key for *Bronchocela* leads to *B. cristellata*, the last point of the key to *Xenochrophis* leads to *X. flavolineatus*, while these two species don't exist. There is no key to snake families nor to colubrid genera. There is no drawing nor definition to explain the peculiar head scales of the scolecophidians, rendering the use of their key very difficult. The key to Hydrophiidae lacks an entry to couplet 11, and does not include the genus *Praescutata*, which is, however, recognized by the authors. The key to *Dendrelaphis* does not include *D. subocularis*, which is, however, included in the guide. These very numerous mistakes and missing keys will make the identification of sea turtles, terrapins, softshell turtles, skinks, and of all snakes particularly challenging. It should be noted that the body lengths of *Laticauda colubrina* and *Trimeresurus sumatranus* are erroneously indicated at 360 cm and 256 cm, respectively.

Relative species' sizes within genera are often inconsistent. For example *Lycodon fasciatus* is said to have a body length of 89.5 cm and be a medium-sized snake, while *L. cardamomensis* is said to have a body length of 89.6 cm and be a small snake. *Oligodon catenatus* is said to have a body length of up to 60.7 cm and to be “one of the larger Kukri snakes,” while *O. fasciolatus* is said to have a body length of up to 80.7 cm and to be a “small Kukri snake.”

A number of important references cited in the text are not included in the literature section. The literature section includes 156 references (one is listed twice), i.e., only a small part of the existing literature on Thai reptiles. The arrangement of references is not consistent: it is sometimes purely by alphabetical order, sometimes by chronological order within a series of references with the same first author, thus not following strict alphabetical order. The selection of references is mysterious, as many major revisions and herpetofaunal inventories are missing, while many obsolete and insignificant contributions were included, even several publications that deal exclusively with Thai amphibians. The

introduction of the guide explains that it “includes species accounts for all of the 352 reptile species currently with confirmed records in Thailand as of December 31, 2010.” However, there is only one reference for 2010—the revision of the Thai *Cnemaspis* by Grismer et al., in which seven new species were described, of which only one, *C. narathiwatensis*, was included in the guide! For 2009 there is also only a single reference listed, the description by Bauer et al. of *Cyrtodactylus erythropis*, a species that was, however, not included in the guide! For 2008, the authors listed only five references (not repeated in the literature cited below), including Bauer et al. (2008) who described *Gekko nutaphandi* from Kanchanaburi Province, David et al. (2008) who described *Oligodon pseudotaeniatus* from central Thailand, and Grismer et al. (2008) who described *Cnemaspis biocellata*—but none of these species was included in the guide! The authors also listed Murphy et al. (2008) who rediscovered and redescribed *Paratapinophis praemaxillaris* giving a maximal known snout-vent length of 770 mm, while in the guide it is stated “a very small snake ...body length: up to 22.7 cm”! With only two references for 2009 and 2010 combined, and five references for 2008 that have not been integrated in the text, it would thus have been more honest to write that the literature was included until the end of 2007, even if many important references are also missing for that year. The authors gave the number of Thai protected areas “as of December 2008.” Thus, there is a gap of about seven years between the finalization of the guide contents and its publication.

The guide is totally outdated regarding snake and lizard classification, having not benefitted from the numerous phylogenies and revisions published in the 2010s. For example, snake genera like *Aplopeltura*, *Pseudoxenodon*, *Sinonatrix* and even *Xenodermus* are still included in the Colubridae in the guide and the anguid *Dopasia gracilis* is still under *Ophisaurus*. The classification used in the guide thus gives an outdated picture of the currently recognized taxonomic diversity of Thai reptiles.

Among the 352 species presented, 22 (ca. 6%) were not illustrated (*Draco haematopogon*, *Sphenomorphus grandisonae*, *S. helenae*, *S. lineopunctulatus* and *S. mimicus*, *Argyrophis roxanae*, *Indotyphlops ozakiae*, *Lycodon butleri*, *Oligodon jintakunei*, *Acalyptophis peronii*, *Chitulia bituberculata*, *C. inornata* and *C. lamberti*, *Disteira nigrocincta*, *Hydrophis obscurus*, *Microcephalophis cantoris*, *Polyodontognathus caerulescens*, *Thalassophis anomalus*, *Enhydryis chanardi*, *Opisthotropis spenceri*, *Xenochrophis punctulatus*, and *Plagiopholis blakewayi*). Drawings vary greatly in quality from one species to another, probably because they were executed by three different artists (there is no indication as to which artist made what drawings). Sometimes several specimens are illustrated for a single species, differing from each other, but as there are no figure captions, one does not know if the differences correspond to age, sexual dimorphism, breeding condition, subspecific or individual variation. The drawings of pitvipers, *Boiga* spp. and cobras are superb and deserve special mention. The drawing for *Cyrtodactylus sumonthai* definitely does not illustrate that species. *Gonyosoma floweri*, a brown morph of *G. oxycephalum* (David et al. 2004), is however recognized as a distinct species in the guide, but illustrated with a drawing of *Orthriophis taeniurus ridleyi*. The drawings of *Gonyosoma longicauda* and *Liopeltis tricolor* have been mixed up, as well as the drawings of *Oligodon joysoni* and *O. taeniatus*. These are obvious, but there may be others, as there are very numerous discrepancies between the color descriptions in the species accounts and the drawings. In the era of digital photography, drawings should be used only if they offer something more than

photographs, such as accurate scalation outlines or color variations that are not available on photographs.

Species missing in the guide include at least the agamids *Acanthosaura cardamomensis*, *Pseudocalotes kakhienensis*, and *P. khaonanensis*, the gekkonids *Cnemaspis biocellata*, *C. channardi*, *C. huaseesom*, *C. kamolnorrnanathi*, *C. niyomwanae*, *C. omari*, *C. punctatounuchalis*, and *C. vandeventeri*, *Cyrtodactylus astrum*, *C. auribalteatus*, *C. doisuthep*, *C. dumnuui*, *C. erythropros*, *C. inthanon*, *C. khelangensis*, *C. kunyai*, *C. lekaguli*, *C. macrotuberculatus*, *C. phuketensis*, *C. ranongensis*, *C. saiyok*, *C. samroiyyot*, *C. sanook*, *C. surin*, and *C. wangkulangkulae*, *Gekko lauhachindai* and *G. nutaphandi*, *Hemiphyllodactylus chiangmaiensis*, and *Ptychozoon kaengkrachanense* (see, for example, Grismer et al. 2010, 2012, 2014), the skinks *Jarujinia bipedalis*, *Larutia nubisilvicola*, *Lygosoma angeli*, and *L. frontoparietale* (this last species is in the identification key for the genus, but its species account has been omitted), the colubrids *Dendrelaphis nigroserratus*, *Lycodon ophiophagus*, *Oligodon pseudotaeniatus*, and *Ptyas nigromarginata*, the homalopsids *Cerberus schneiderii* and *Homalopsis mereljcoxi*, the natricids *Amphiesma boulengeri*, *A. leucomystax*, and *Sinonatrix yunnanensis*, and the viperids *Trimeresurus cardamomensis* and *T. phuketensis*. There is no mention of the emydid *Trachemys scripta elegans* and the trionychid *Pelodiscus sinensis*, although both have been abundantly released in the wild in Thailand, and are possibly locally reproducing (Vidthayanon 2005).

*Leiolepis ocellata*, regarded as a subspecies of *L. belliana* in the guide, was raised to species level by Pauwels and Chim-sunchart (2007). Without any justification, a number of subspecies are not recognized in the guide, such as those of *Oreocryptophis porphyraceus*. *Dryocalamus davisonii tungsongensis* is recognized in the guide as a subspecies of *D. subannulatus*, while these taxa had been synonymized in a work coauthored by Tanya Chan-ard (Pauwels et al. 2006). There are many more taxonomic comments that could be made, but this would go far beyond the scope and the space allowed for a book review.

The section "Identification of Reptiles" states that the "international conservation status is provided at the end of each species account," while this section appears in only 44 (12.5%) of the species accounts. For these species this section only mentions the IUCN and/or the CITES category, without any comment, thus not explaining what threatens the species face. In some cases the IUCN conservation status attributed has been made up ("Insufficiently Known" p. 23 [presumably "Data Deficient"]). The guide, thus, does not provide any new information on the conservation status of Thai reptiles and does not even present the data already available on the subject, with the exception of the CITES and IUCN listings as they were in 2007.

Based on the available published literature, it is obvious from the first look that more than a fourth of the maps presented in the guide are grossly incomplete or erroneous. There are numerous contradictions between the text and the maps; one among many examples is found in *Batagur borneoensis*, where the text says it inhabits in Peninsular Thailand as far north as Bangkok while the map shows a distribution in Thailand limited to Yala Province.

There are serious mistakes in the behavior and habitat sections within some species accounts. For example *Cyrtodactylus tigroides* is indicated as a cave-dweller (this mistake is also in the identification key for the genus); its common name is even given as "Tiger Cave Gecko." Regarding *Draco blanfordii*, the authors stated "prefers hilly habitats, although young are found at lower

elevations." *Leiolepis* are presented as insect-eaters, there is no mention of the fact that their diet also includes plants.

The index to common names is extremely impractical. For example, the Selangor Striped Skink can be found only under "Skink, Striped, Selangor"; there is no entry under Striped or Selangor. In the conservation section of the introduction, the common names for seven species differ from the ones used in their respective species accounts; only the latter names are in the index. In the index to common names, a number of common names differ from the names appearing in the species account, among others the Slender Blind Snake name found in the species account is replaced by the Doi Pui Blind Snake in the index. The common name Malayan Snail-eating Turtle is applied to *Malayemys subtrijuga* in the introduction, and to *M. macrocephala* in its species account; in the latter case it is definitely an inappropriate common name given the species' distribution. Other inappropriate common names include "Tailed Skinks" for *Plestiodon*, "Western Legless Skink" for *Isopachys borealis*, or "Clouded Pit Viper" for *Trimeresurus nebularis*, the two latter being based on misunderstandings of the species' scientific epithets. The common name "Common Softshell Turtle" is given for the genus *Amyda* which contains a single species, but that species receives the name "Asiatic Softshell Turtle," none of these names appear in the index. Throughout the guide there is a disturbing lack of consistency regarding the common names when they are used without the corresponding scientific name, making it often impossible to deduce what species the authors were writing about. The index to scientific names is badly designed, with entries to genera then species within genera, not entries to species, which makes it more difficult for readers who do not know to which genus a species they are looking for currently belongs.

Oxford University Press is to be held responsible as much as the authors for the numerous shortcomings of the guide. Even a very superficial review of the manuscript by a non-specialist would have revealed that the data are seven years old and thus mostly outdated, that mistypings, not limited to scientific names, are numerous (more than 280), that all figure captions are missing, that many of the references cited in the text are not in the bibliography, that 79% of the references in the bibliography are not mentioned in the main text, that some numberings within identification keys are wrong, etc. A slightly more careful review would have shown that even the 2008 status of knowledge on Thai reptiles is not properly reflected in the guide. Because about 50 species from at least seven families are missing, many identification keys are erroneous or obsolete, the taxonomy and the conservation data are outdated and many maps are incomplete or erroneous, and in spite of the obvious efforts the authors have put into the making of this good-looking book, we definitely cannot recommend the use of this guide. We hope that a new, completely revised version will soon be produced.

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#### LITERATURE CITED

- BAUER, A. M., K. KUNYA, M. SUMONTHA, P. NIYOMWAN, N. PANITVONG, O. S. G. PAUWELS, L. CHANHOME, AND T. KUNYA. 2009. *Cyrtodactylus erythropros* (Squamata: Gekkonidae), a new cave-dwelling gecko from Mae Hong Son Province, Thailand. *Zootaxa* 2124:51–62.
- CHAN-ARD, T., M. COTA, AND J. MURRAY. 2009. Jarujin Nabhitabhata (1950–2008). *Hamadryad* 34(1):191–198.

- DAVID, P., M. J. COX, O. S. G. PAUWELS, L. CHANHOME, AND K. THIRAKHUPT. 2004. When a bookreview is not sufficient to say all: an in-depth analysis of a recent book on the snakes of Thailand, with an updated checklist of the snakes of the Kingdom. *Nat. Hist. J. Chulalongkorn Univ.* 4(1):47–80.
- , O. S. G. PAUWELS, T. Q. NGUYEN, AND G. VOGEL. 2015. On the taxonomic status of the Thai endemic freshwater snake *Parahelicops boonsongi*, with the erection of a new genus (Squamata: Natricidae). *Zootaxa* 3948(2):203–217.
- GRISMER, L. L., M. SUMONTHA, M. COTA, J. L. GRISMER, P. L. WOOD, O. S. G. PAUWELS, AND K. KUNYA. 2010. A revision and redescription of the rock gecko *Cnemaspis siamensis* (Taylor 1925) (Squamata: Gekkonidae) from Peninsular Thailand with descriptions of seven new species. *Zootaxa* 2576:1–55.
- , P. L. WOOD, S. ANUAR, A. RYANTO, A. NORHAYATI, M. A. MUIN, M. SUMONTHA, J. L. GRISMER, K. O. CHAN, E. S. H. QUAH, AND O. S. G. PAUWELS. 2014. Systematics and natural history of Southeast Asian rock geckos (genus *Cnemaspis* Strauch, 1887) with descriptions of eight new species from Malaysia, Thailand, and Indonesia. *Zootaxa* 3880(1):1–147.
- , E. S. H. QUAH, S. ANUAR, M. A. MUIN, M. SUMONTHA, N. AHMAD, A. M. BAUER, S. WANGKULANGKUL, S., J. L. GRISMER, AND O. S. G. PAUWELS. 2012. A phylogeny and taxonomy of the Thai-Malay Peninsula bent-toed geckos of the *Cyrtodactylus pulchellus* complex (Squamata: Gekkonidae): combined morphological and molecular analyses with descriptions of seven new species. *Zootaxa* 3520:1–55.
- KUNYA, K., M. SUMONTHA, N. PANITVONG, W. DONGKUMFU, T. SIRISAMPHAN, AND O. S. G. PAUWELS. 2015. A new forest-dwelling Bent-toed Gecko (Squamata: Gekkonidae: *Cyrtodactylus*) from Doi Inthanon, Chiang Mai Province, northern Thailand. *Zootaxa* 3905(4):573–584.
- PAUWELS, O. S. G., AND C. CHIMSUNCHART. 2007. Die Augenfleck-Schmetterlingsagame *Leiolepis ocellata* Peters, 1971 in Thailand. *Elaphe* 15(1):60–62.
- , AND P. DAVID. 2005. Book review. Checklist of amphibians and reptiles in Thailand, by Jarujin Nabhitabhata, Tanya Chan-ard, and Yodchaiy Chuaynkern. *Herpetol. Rev.* 36(3):341–343.
- , AND ———. 2011. Book review. A Field Guide to the Reptiles of South-east Asia. *Russ. J. Herpetol.* 18(4):325–328.
- , ———, AND T. CHAN-ARD. 2006. *Dryocalamus davisonii tung-songensis* Nutphand, 1986 and *Lycodon suratensis* Nutphand, 1986 (Serpentes: Colubridae): translation of their original description and taxonomic status. *Hamadryad* 30(1–2):114–120.
- , ———, AND ———. 2015. First confirmed record of the stream-dwelling snake *Amphiesma leucomystax* (Squamata: Natricidae) in Thailand. *Russ. J. Herpetol.* 22(2):136–138.
- SUMONTHA, M., O. S. G. PAUWELS, N. PANITVONG, K. KUNYA, AND L. L. GRISMER. 2015. A new lowland forest Bent-toed Gecko (Squamata: Gekkonidae: *Cyrtodactylus*) from Ranong Province, peninsular Thailand. *Zootaxa* 3911(1):106–118.
- VIDITHAYANON, C. 2005. Aquatic alien species in Thailand (Part 1): biodiversity. In D. M. Bartley, R. C. Bhujel, S. Funge-Smith, P. G. Olin, and M. J. Phillips (eds.), *International Mechanisms for the Control and Responsible Use of Alien Species in Aquatic Ecosystems*, pp. 113–117. Food and Agriculture Organization of the United Nations, Rome.

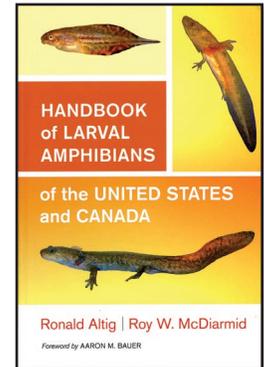
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## Handbook of Larval Amphibians of the United States and Canada

Ronald Altig and Roy W. McDiarmid. 2015. Comstock Publishing Associates, Cornell University Press, Ithaca, New York ([www.cornellpress.cornell.edu](http://www.cornellpress.cornell.edu)). xvi + 345 pp., 130 illustrations. Hardcover. US \$75.00. ISBN 978-0-8014-3943-8.

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One can't help but marvel at a scholar who can stick with a challenging project for close to half a century. In 1970, Ronald Altig published "A key to the tadpoles of the continental United States and Canada" in the journal *Herpetologica*. The key was neither perfect nor complete. Altig was determined to make it better. Now, after 45 years of commitment, his original 27-page paper has expanded into a 368-page book. This volume culminates a productive career and is a profoundly comprehensive work.

Altig's co-author on the book, Roy McDiarmid, has not spent his career so singly focused on amphibian larvae, but has spent much of the last 20 years studying tadpoles. The collective devotion of Altig and McDiarmid was first demonstrated by their important reference book, *Tadpoles: The Biology of Anuran Larvae*, published 16 years ago (McDiarmid and Altig 1999).

Many more species are included in this new book than in Altig's 1970 key. Most of those result from legitimate revisions or discovery of cryptic species. Other species are exotics that now make their home not only in the continental United States, but also in Hawaii.

The title of this book does not do justice to its depth and breadth. For example, it doesn't mention the 40 pages dedicated to a key to the eggs and embryos of amphibians. The book also includes a detailed glossary and a huge literature cited section. Species accounts for all amphibian taxa currently recognized in North America are included, organized by family. Each species account includes information under the headings: Identification, Natural History, Range, and Citations. Within the Citations for each species the references are clustered under the subheadings: General, Development/Morphology, Reproductive Biology, and Ecobehavior. For well-studied species, the accounts fill a page or so largely because of the extensive list of references. For lesser-known species, the accounts run a third to half a page in length.

Illustrations are included for every species that can be visually distinguished from other species. Not only are there photos of the larvae in lateral view, but also photos (and some line drawings) of key body parts, most notably the oral disc of tadpoles. Some accounts include images of the eggs and labial teeth. Habitat shots are included for a few species. All those illustrations are black-and-white, but the book also contains 12 colored plates, each showing 12 species.

Two working principles were used in developing the key to the larvae in this *Handbook*: 1) the keys are not necessarily dichotomous; and 2) to identify the taxa one has to know where

the larvae were collected. Both principles are practical realities of what one must accept to identify amphibian larvae in much of the USA, for there are simply too many taxa that have tadpoles that look alike.

The problem of keying out tadpoles has not become easier since Altig's first effort to construct a key back in 1970. If anything, identifying tadpoles has become even more challenging because many more taxa that are morphologically similar have been identified by molecular methods. Another challenging fact that has been increasingly appreciated over the last decade or two is that amphibian larvae, in particular tadpoles, have considerably more phenotypically plastic morphology than was appreciated in the past (Relyea 2001). Not a lot of attention is given to these problems in the *Handbook*, nor will I linger on them here. Rather, much like the authors, I accept them as unavoidable noise in the system.

Without a doubt my biggest criticism of this book relates to the illustrations. In trying to obtain images of the larva of every taxon, the authors searched widely, and some 70 people are acknowledged for contributing photographs to the project. But sadly most of the black and white photographs are frankly terrible. Presumably some cost constraint and/or production principle required a standardized dull gray background for all the black and white photos. The result is a multitude of dreary, blurry photographs. Collectively, the photographs take the life out of the larvae and the vigor from the volume. I fear that such washed-out images will do little to inspire folks raised in the world of endless amounts of animated color images to want to study tadpoles. It's sad that so much diligence went into this encyclopedic work yet so few of the photographs draw one's attention in a positive way.

It is odd that the authors accepted such poor quality photographs for their book considering that they provide in their *Tadpole* volume a treatise on how to take good photographs of tadpoles. Perhaps the authors were trapped by cost constraints from the publisher to accepting poor quality images. Perhaps they trapped themselves by trying to produce at a relatively low cost a single handbook that covered the larvae of all amphibians in the United States and Canada.

From the practical view of field biology, it is unlikely that many naturalists will ever need to identify tadpoles from across the continent. As such, this single volume could have been split into four or five smaller volumes that covered more restricted geographic regions, such as those identified on the landform map of the United States and Canada provided in this book. That map identifies the broad geographic regions used in the keys. The keys distinguish, for example, whether one is east or west of the Rockies, in the Mississippi Embayment, on the Southeast Coastal Plain, etc. If I were a herpetologist working in any of those regions, I think I would have been happier to buy a guide for the amphibian larvae restricted to my region. I would have been willing to pay \$30 or more for the smaller handbook for my region with the understanding that the high price was used to provide high quality photographs and illustrations in the regional guide. The whole set would, of course, be priced much above the \$75 that is the list price for this single massive volume. But it could then have included higher quality illustrations and photographs.

Altig and McDiarmid use throughout their *Handbook* the contemporary names for North American taxa following Frost et al. (2006). Thus we have *Lithobates*, *Anaxyrus*, and *Rhinella* rather than *Rana* and *Bufo*. I have no problem with the newer

names. But I think that a Handbook as exhaustive as this would have benefited from a table giving both the old and new names. Without that in immediate reach, those new to herpetology and working with older field guides for the adult amphibians, might be slowed down a bit as they assure themselves that what older volumes call *Rana catesbeiana* is indeed *Lithobates catesbeianus*.

Given the many decades it took to compile the massive amount of information in this volume, one cannot realistically expect the co-authors to produce a second edition expanded to include, say, the table just mentioned and, more importantly, better photographs. So this raises the question of how one could build upon this volume to produce a resource that is both more inspirational and more effective as a field guide. In that regard, I hope that the authors, or others following in their footsteps, make an effort to link the book's contents to a website where additional information, particularly better images, could be posted.

The authors, in fact, have a website "Tadpoles of the United States and Canada: A Tutorial and Key" ([www.pwrc.usgs.gov/tadpole/](http://www.pwrc.usgs.gov/tadpole/)) that has many lovely color photographs and a very good primer to help neophyte herpetologists get started in keying out tadpoles. But that website is limited to anuran larvae and the taxonomy is not up to date.

One could envision, though, information in both the *Handbook* and on that website linked to a database like AmphibiaWeb ([www.amphibiaweb.org](http://www.amphibiaweb.org)). AmphibiaWeb already includes videos of live animals in the field. Having video of the larvae in the wild would be an aid not just in identifying the larvae, but for gaining a sense of the organisms' behavior and ecology. It is in that field setting, for instance, that one can tell whether a larva's color pattern is cryptic or aposematic. Such information may be accessible from the papers cited in this *Handbook*, but being able to just click on a link that immediately brings up a good video would help bring the information in the *Handbook* into the 21<sup>st</sup> century.

In truth, when many of us approach a body of water in search for amphibian larvae, we are beginning to identify those organisms before we even see them. We are attentive, for example, to the landscape that we are in, the type of vegetation in the area, how fully canopied the water bodies are; how deep, wide, still or flowing the water is. We are on the lookout for tadpole predators. We are listening for frog calls that may give us a clue as to what species are breeding now or might have bred recently at that site. We use all of that information in a gestalt fashion to predict what tadpoles we might see once we get to look in the water. In a similar way, it would be great if the factual information in this book could be embellished with all that additional information. And it certainly can be done with audio and video tracks accessible via the Internet.

To go one step further, because so much of the ability to distinguish morphologically similar taxa depends on one's location, one can imagine a smartphone app that turns the Altig and McDiarmid encyclopedic volume into a convenient field guide. Right now the book is too big and too reliant on library-based information to fill that role. But one could build that field resource for one's smartphone from information in this book. I can imagine an app that takes into consideration my GPS coordinates, the time of year, the type of aquatic body before me, and perhaps the acoustical environment around me, and then gives me a list of the amphibian larvae that most likely to be in the water before me at that time.

Bird guide apps with this sort of information have been available for some time. The *Handbook* has the core information that one would need to start to build such a useful application.

Writing this review gave me a chance to reconsider where I think tadpole taxonomy is likely to go in the next decade or two. When I consider how difficult it was to identify amphibian larvae in the field back in 1970 and realize that the problem has not gotten any easier with the proliferation of species, I have little faith that greater attention to morphological detail will resolve the problem. I'm optimistic, however, that we will be moving toward the ability to do genetic screening in the field and that will certainly be a help for biologists, who have to know for sure what species they have at hand. As noted in an essay I wrote built around the first book on tadpoles that Drs. McDiarmid and Altig co-produced, tadpoles are typically more numerous than adult anurans and often easier to find and catch (Wassersug 2000). As such, when we get to the point that we can do genetic identification of amphibians in the field, it is as likely that biologists will be getting tissue for testing from larvae as well as adults. In that regard, the app that I have envisioned above may be particularly useful in narrowing down the number of taxa to be considered at any particular site at any particular time.

In sum, this book has a historic feel to it, and, given its prodigious bibliography, can lead one back to pretty much all that is known about the natural history of North American amphibian larvae acquired over the last two-hundred years. It also can be used to build a much more powerful tool for identifying amphibian larvae in the future.

## LITERATURE CITED

- ALTIG, R. 1970. A key to the tadpoles of the continental United States and Canada. *Herpetologica* 26:180–207.
- FROST, D. R., T. GRANT, J. FAIVOVICH, R. H. BAIN, A. HAAS, C. F. B. HADDAD, R. O. DE SA, A. CHANNING, M. WILKINSON, S. C. DONNELLAN, C. J. RAXWORTHY, J. A. CAMPBELL, B. L. BLOTTO, P. MOLER, R. C. DREWES, R. A. NUSSBAUM, J. D. LYNCH, D. M. GREEN, AND W. C. WHEELER. 2006. The amphibian tree of life. *Bull. Amer. Mus. Nat. Hist.* 297:1–370.
- MCDIARMID, R. W., AND R. ALTIG (eds.). 1999. *Tadpoles: The Biology of Anuran Larvae*. University of Chicago Press, Chicago, Illinois. 444 pp.
- RELYEA, R. A. 2001. Morphological and behavioral plasticity of larval anurans in response to different predators. *Ecology* 82(2):523–540.
- WASSERSUG, R. 2000. Tadpoles: The Biology of Anuran Larvae [review]. *Copeia* 2000(4):1125–1134.

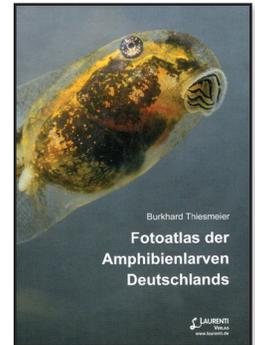
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## Fotoatlas der Amphibienlarven Deutschlands

Burkhard Thiesmeier. 2014. Laurenti Verlag, Bielefeld, Germany (www.laurenti.de). 128 pp. Hardcover. €39,00 (approx. US \$43.00). ISBN 978-3-933066-53-4.

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The last couple of decades have seen an increasing number of high quality guides to the amphibians and reptiles of many parts of this world. Even tadpoles, which have long lingered in comparative obscurity, have recently been the subject of comprehensive, lavishly produced guides (e.g., Channing et al. 2012; Anstis 2013; Ambrogio and Mezzadri 2014). Continuing this trend, Burkhard Thiesmeier has produced a pictorial atlas to the larval amphibians of Germany. Now, compared to other parts of the world, the German amphibian fauna can be considered well known with plenty of guides available. Even for tadpoles a dedicated guide exists that is currently in its eleventh edition (Beringhausen 2012), which leaves the question whether this new book really offers anything new. The answer to that is simple: it absolutely does!

Compared to conventional guidebooks, the pictorial atlas follows a somewhat different concept. It is not so much a stand-alone guide but is rather meant to supplement other guides to help identify live larvae in the field, although it should be sufficient in most cases. As such, it does not contain much traditional information, for instance labial keratodont formulae of tadpoles are not provided, and the verbal description is limited to just a couple of short paragraphs highlighting the most significant characters observed in living larvae and some pertinent information on size, distribution, or general ecology. The focus is instead on providing detailed photographs and it is here that the book excels. Altogether, more than 500 photographs of consistently very high quality depict larvae at various stages throughout their development, usually covering about ten to twelve different stages per species from hatching to the end of metamorphosis. Often multiple photographs of different specimens of the same stage and/or different views of the same individual are provided. For most species, additional pictures are provided of specimens from different localities or different habitats, which give some idea about the range of natural variation in pigment patterns etc.

The atlas covers all German amphibians, except the viviparous Alpine Salamander (*Salamandra atra*). All species are treated in separate accounts, except *Lissotriton helveticus* and *L. vulgaris*, which are very similar and easily confused. Larvae of these two species are depicted side by side and seeing them this way really highlights the subtle, but distinct, differences between them. One of my favorite illustrations is found here, a plate of sixteen rather charming portraits of larvae of different ages of both species. Some other remarkable pictures include an image of a squirming mass of freshly hatched *Rana temporaria*

tadpoles with exceptionally long external gills, making them almost look like newt larvae, or of *R. arvalis* tadpoles with rather beautiful gold flecking.

Although the book is written in German, there is little text and for these parts it is easy to understand (or to translate), and anyone with a modest command of the language should have no trouble. All covered species are more or less widespread throughout Europe, so this book should be of use not only to herpetologists working in Germany, but well beyond her borders. Furthermore, anyone with an interest in amphibians and their larvae will appreciate this book and enjoy the beautiful photographs.

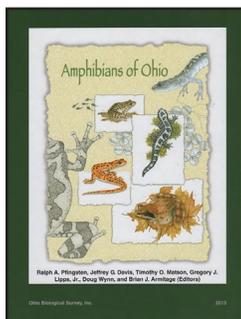
## LITERATURE CITED

- AMBROGIO, A., AND S. MEZZADRI. 2014. Grini d'Italia – Tadpoles of Italy. Gavia Edizioni, Piacenza, Italy. x + 102 pp.
- ANSTIS, M. 2013. Tadpoles and Frogs of Australia. New Holland Publishers, London, UK. 829 pp.
- BERNINGHAUSEN, F. 2012. Welche Kaulquappe ist das? NABU, Hannover, Germany. 42 pp.
- CHANNING, A., M.-O. RÖDEL, AND J. CHANNING. 2012. Tadpoles of Africa. Chimaira, Frankfurt am Main, Germany. 402 pp.

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## Amphibians of Ohio

Edited by Ralph A. Pflingsten, Jeffrey G. Davis, Timothy O. Matson, Greg J. Lipps, Jr., Doug Wynn, and Brian J. Armitage. 2013. Ohio Biological Survey Bulletin New Series, Volume 17, Number 1 ([www.ogiobiologicalsurvey.org](http://www.ogiobiologicalsurvey.org)). xiv + 899 pp. Hardcover. US \$90.00. ISBN 978-0867271645.



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When I first received a copy of *Amphibians of Ohio*, the first thing that hit me was the size of this volume. At 916 pages and a mass of over 3.5 kg, this beast certainly won't be accompanying any but the most masochistic of herpetologists in their field

pack. With this massive volume, Ohio joins the ranks of states that have been producing quality publications on their native herpetofauna over the last decade that target herpetologists but can also serve the novice herp enthusiast. It has been over a quarter-century since Pflingsten and Downs published the *Salamanders of Ohio* (1989) and nearly 80 years since C. F. Walker's *Amphibians of Ohio. Part I. The Frogs and Toads* (1946). Such a complete and comprehensive guide to Ohio's amphibians has been long overdue.

This book begins with a brief Abstract, Preface, Dedications, Acknowledgements, Editors and Contributors, and a very brief description of the maps. This page also provides a very useful map of Ohio's Lake Erie Islands. As mentioned on this page, included with the volume is a pull-out map of Ohio's townships and counties. This map is also reproduced on the final four pages. The book is then broken down into 12 sections: Introduction, History of Herpetology in Ohio, the Ohio Environment, Amphibian Systematics, Salamanders, Frogs and Toads,

Potential Occurrences and Exclusions, Developing Priorities for Conservation of Ohio's Amphibian Diversity, Amphibian Conservation, Ohio Amphibian Distributions, Environmental Applications, and Summary and Outlook. Following these sections are two Appendices, a Glossary, Literature Cited, and finally the Index.

The Introduction is short and comprehensive. Of greatest interest to me were the tables breaking down the exhaustive work conducted by each of the editors over the years that ultimately contributed to this volume. To produce a volume such as *Amphibians of Ohio* takes a massive amount of work and I can't recall seeing a book such as this providing detailed information on the effort put into gathering the data to produce it. I think a great many take for granted the sheer amount of work and dedication it takes to pull off something like this.

Section II reviews the history of herpetology in Ohio, which is quite storied. This includes a short synopsis of how our own international Society for the Study of Amphibians and Reptiles began as The Ohio Herpetological Society. Included as well are contacts for all of Ohio's extant herpetological societies. Given the general decline in herpetological societies over the years, it is nice to see that Ohio still has several up and running.

Section III and its six subsections describe all aspects of the environments in Ohio. These are straightforward, yet detailed enough to provide the reader with more than just the brief overview found in some guides. Section IV covers amphibian systematics. There is also an introduction to the species chapters, which make up the majority of the book.

The next two sections cover salamanders and frogs (Sections V and VI, respectively). Each section begins with a detailed discussion of each order's biology. This portion also includes a key for all species of Ohio salamanders and frogs. Section VI also includes a very detailed discussion on anuran calls. There are written descriptions of each species calls, including the various kinds of call that may be produced (advertisement, aggressive, etc.). There are even sonograms of each species' advertisement call, which is a nice detail missing from many state guides. Then the sections move into the real meat of this tome, the species chapters, of which there are 37. The authors have made every effort to make each chapter as detailed as possible. For example, the chapter on the relatively poorly known Four-toed Salamander (*Hemidactylium scutatum*) by Timothy A. Herman is over 19 pages long. Each chapter also includes a number of quality color photographs, although there are a handful that appear a bit grainy or somewhat pixelated (e.g. Fig. 33-1 C and D, Fig. 33-2, and F33-7). Thankfully, it is a small number of images and detracts little from the overall book.

Section VII includes potential occurrences and exclusions. The one potentially occurring species, the Southern Leopard Frog (*Lithobates sphenoccephalus*), is discussed with the same care and within the same format as the regular species chapters. In most state guides, potentially occurring species are covered with little more than a short paragraph. The exclusions were interesting to me as I have not seen a guide that goes out of the way to point out species that do not occur in the state. However, the section makes perfect sense as all of these species live nearby in surrounding states and had been previously claimed as possibly entering Ohio.

Section VIII, titled Developing Priorities for Conservation of Ohio's Amphibian Diversity, is valuable for those wanting to know how species are ranked for research and conservation needs within a state. The methods and materials are laid out

clearly. This is followed by Section IX which discusses conservation of Ohio's amphibians and the threats faced. Section X discusses the distribution of amphibians in Ohio in a contextual way, pointing out the fact that many of the state's amphibians are at periphery of their ranges. Section XI has three subsections discussing amphibians as indicators of wetland quality and using salamanders to classify headwater streams.

Section XII rounds out the book with a summary of what lead to the creation of this book as well as comments on the future of amphibian work in Ohio. The two appendices are very useful, covering field techniques, proper documentation, and preparation of voucher specimens. Included is a photo-documentation form that can be copied and used by those in the field to turn into the Ohio Department of Natural Resources Division of Wildlife. Directions on where to send it, something that many amateur herpers are often unsure of when they make a potentially new observation, are also provided. There are also recommendations for the photo-documentation of each species. Following this are the Glossary and the Literature Cited, which is a whopping 72 pages! In my estimation, this massive reference section is almost worth the price of the book on its own.

If you work with, or have more than a passing interest in, any of the species covered in *Amphibians of Ohio* you would do well to purchase this masterpiece no matter what part of that species' range you are in. Even if you are extralimital, this is a fantastic addition to any herp library. And of course, if you are a herp enthusiast at any level residing in Ohio, this book should definitely be on your bookshelf. You are unlikely to find a better referenced or more thorough treatise on any state's amphibians. What makes *Amphibians of Ohio* even more of a triumph is that while massive and incredibly detailed, it is as accessible to the amateur field herper or naturalist as it is to the most seasoned of herpetologists. *Amphibians of Ohio* is well worth the cost and I eagerly await the upcoming sister volume on the reptiles of Ohio.

#### LITERATURE CITED

- PFINGSTEN, R. A., AND F. L. DOWNS, EDS. 1989. Salamanders of Ohio. Ohio Biol. Surv. Bull. New Ser. 7(2). Columbus, Ohio. 315 pp.
- WALKER, C. E. 1946. The amphibians of Ohio. Part 1. The frogs and toads. Ohio St. Mus. Sci. Bull. 1(3):1-109.
- .....