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Book Review

Aquatic Plants of Pennsylvania. A Complete Reference Guide by T. A. Block and A. F. Rhoads. 2011. ISBN: 978-0-8122-4306-2 (Cloth US$59.95 + shipping [$5.00, media mail]). xii + 308 pp. University of Pennsylvania Press, Philadelphia. [Illustrated by Anna Anisko]

I heartily welcomed this book given that prior to its appearance, only two earlier treatments (both written over 40 yr ago) dealt specifically with the aquatic flora of Pennsylvania. Neither of the former works (Brezina et al. 1971; Wingard et al. 1977) compares in scope to the far broader coverage provided by the present publication. Furthermore, the earlier publications were not of a taxonomic emphasis, but focused more on the control of aquatic weeds with herbicides.

First of all, the production quality is excellent, highlighted by the dark green linen boards decorated with a gold spine title. The thick pages have a semi-gloss surface texture, which produces crisp text and richly colored images. Moreover, the binding is excellent, with pages sewn into signatures, which then are stitched and glued to a paper-backed cloth band. Because of the quality binding, the book will stay open on its own when laid flat, even up to the glossary (page 291). The dust jacket also is of exceptional quality and features an attractive, glossy cascading image of water lilies.

Organizationally, the book is divided into eight chapters followed by a glossary, reference section and taxonomic appendix. I always give the glossary close scrutiny, because that's where students often learn definitions. Overall it is not bad, but there are some problems. "Abaxial" is defined as "the side away from the stem axis," which is fine provided one knows what is meant by a "stem axis" (not in glossary). What about a leaf axis? "Axil" also is not defined correctly. It is given as "the junction of leaf and stem", which more properly defines the "node." The axil (here the leaf axil) is the *angle* formed between the leaf and the stem. "Acuminate" is defined as "forming an angle of less than 45 degrees," which is sufficient for "acute," but not exclusively for acuminate (i.e. tapering gradually to a point). "Adventitious roots" are defined as those developing "at nodes on a stem," which often is true; however, they also can form on detached leaves, etc. (i.e. arising anywhere but from the embryonic radicle). Although these criticisms might seem overly picky, a glossary should be as accurate as possible because it is used most often by those learning botanical terminology. The reference section is not extensive but contains an adequate number of citations for a work of this type and the taxonomic appendix (p. 299), is organized logically, and includes a useful indication of whether a species is native or introduced. Most names reflect current nomenclatural modifications (e.g. *Persicaria* rather than *Polygonum*); however, a few don't (e.g. *Schoenoplectus* instead of *Bolboschoenus*). There is one typesetting error in the list, where the column margins are misaligned for *Potamogeton praelongus*.

The main chapters include "Evolution and Ecology" (chapter 1) followed by Identification Keys (chapter 2) and several (chapters 3–8) that each focus on a specific life form such as "Emergent Plants," "Floating-leaf Plants," etc. In chapter 1, the authors discuss their inclusion criteria, which targeted those species found with at least their roots in permanently standing water; this approach yielded an assortment of 178 angiosperms and 14 non-flowering plant species. Although subtitled as "A complete reference guide," the inventory of 1,186 taxa included in the most comprehensive regional treatment of aquatics (Crow and Hellquist 2000a,b), clearly indicates that the coverage does not approach an inclusive list of plants that grow in or near Pennsylvania waters. I would have omitted the subtitle. Although many of the salient species are included, the included list was anomalous at times. In some cases, fairly uncommon species (e.g., *Bidens bidentoides*, *B. discoidea*, *B. laevis*) were included; whereas, some common ones (e.g., *Bidens cernua*, *B. connata*, *B. frondosa*) were excluded. Similarly, *Lobelia chinensis* (not in Crow and Hellquist 2000a) was included to the exclusion of widespread wetland species like *L. cardinalis* and *L. siphilitica*. Regardless of how one defines "aquatic," this practice makes the book less useful to students as a field guide attempting to identify the more common wetland plants.

The section on evolution and ecology is brief (19 pp.) but informative, succinctly covering many of the ways that plants adapt to life in the water. Most of the information is accurate and summarized well. However, one statement: *"All lakes … are on a trajectory that will result in filling and eventual conversion to swamp or marsh and then to dry land"* reflects a dated perspective that might ruffle some contemporary wetland ecologists, given current understanding that aquatic systems can persist for thousands of years as long as hydrologic stability is maintained, and that successional patterns often are not always unidirectional. The accompanying diagram of lake to bog succession (Fig. 1.10) is so similar to Fig. 12 in *Bogs of the Northeast* (Johnson 1985), that initially I thought it was the same. Consequently, I would have expected a reference to the latter, such as "adapted from Johnson (1985)" or the equivalent. Although bogs specifically are discussed as a type of aquatic ecosystem, it is ironic that none of the common bog indicators (e.g. *Drosera*, *Eriophorum*, *Sarracenia*) is included in the book; thus the volume will not be useful for identification of peatland floras.

A useful distributional map of Pennsylvania lakes is provided on page 11. There is a census of imperiled aquatic plants (along with their global, state and Pennsylvania Natural Heritage ranks) on pp. 16–17, and a list of 16 invasive aquatics on p. 18. I'm not sure why *Lobelia chinensis* was excluded from the latter, given that the authors describe it as "well established." *Nymphoides peltata* also is not on that list, although described as "naturalized" at several sites. "Cultivated water-lilies *Nymphaea* spp." are on the list of invasives; however, no species examples are discussed in the book (other than red-petal forms of *N. odorata*).

The identification keys begin by dividing plants into six life-form groups (e.g. emergent, floating-leaved). The keys are written assuming the appearance of a plant "under normal water levels;" however, it is difficult to imagine that a novice user would know what "normal" levels might be. Overall the keys seem to be fairly workable. I was happy to see that the authors properly characterized *Myriophyllum humile* as a species having both whorled and scattered leaves (p. 280), a distinction that helps to mitigate a substantial error in some regional treatments (e.g. Crow and Hellquist 2000a), which incorrectly describe the leaves of *M. humile* as "strictly alternate." Happily, the key to *Persicaria* does not ask anywhere to determine whether the plant

is annual or perennial, a common approach seen in other treatments that does nothing but frustrate a user.

I did find a number of problems. The general key to growth habits places the alga *Chara* among the plants "without distinguishable leaves and stems;" although that distinction is fair for the more initiated, my experience is that beginning students often regard those macrophytes as having a stem with leaves. Perhaps it should also have been included among those species just to be safe. The keys do seem to accommodate plants like *Sagittaria graminea*, which grow both as emergents or submersed. However, in one case (*Glossostigma cleistanthum*) the species is described as growing either submersed or emergent, but it is keyed only as a submersed plant. For emergent species, a breakdown of seven times the length vs. width is used to distinguish plants rather than the "10 times" criterion used by Fassett (1957) and others. Although workable, this variation makes it more difficult to evaluate ratios using a metric ruler (i.e. by comparing mm to cm). A few other mostly minor difficulties were encountered. The first lead of the couplet distinguishing *Sium suave* from *Nasturtium* (p. 23) is not contrasting; it compares plants "to 2 m tall" with those "seldom more than 0.5 m tall". Logically, any plants around 50 cm in height could easily be put into either category because there is no good way of determining what range of plant size is expected in either case. The couplet could have contrasted plants > 50 cm in height to those < 50 cm in height; however, even that change would be problematic, because under "normal" water conditions of spring, the submersed rosettes of *Sium* can be much smaller in size (< 0.5 m). Some taxa (e.g. *Peltandra* vs. *Pontederia/Sagittaria*) require inflorescence characters to proceed in the keys, where vegetative features (e.g. the unique rolled leaf tip of *Peltandra* and other Araceae) could have been used to make the keys more versatile. I also don't like conditional leads in keys such as (*Sagittaria*, p. 31): "leaf blades *rarely*, or never, sagittate" versus "sagittate leaf blades *usually* present" [my emphases]. If a plant is found with a sagittate leaf blade, then how does one determine whether it represents a rare or usual occurrence? Likewise, a non-sagittate blade could be accommodated in either lead if regarded as not reflecting the "usual" case. Again, these picky issues would cause more problems for students than they would for seasoned field botanists. However, it might be useful to try these keys out on students for a few semesters, which could disclose other issues that in my experience tend to confuse less-experienced botanists.

My biggest criticism of the book is the arrangement used. Although not clearly indicated in the preface, the arrangement of species within each of the life form categories apparently follows an alphabetical system by generic *common* name. Nothing should ever be organized in this way. For example, if the common name of "sticktight" rather than "beggerticks" is preferred for *Bidens*, then one would be lost trying to find the genus at the opposite end of the alphabet. Worse yet, some common names (e.g. bayonet rush) are alphabetized according to the second word (in this case "rush"), which would mislead a search (in the "B's") even if an agreed-upon common name was considered. It would have been much more useful to list species alphabetically by hierarchically organized scientific taxon names (i.e. family, genus, species).

Species accounts are provided with 5-color distribution maps for Pennsylvania, which feature a yellow background and show county boundaries (black), major rivers (blue) and plant locales (green dots). One problem is that there is no key indicating what any of the colors represents and it not evident that the two thick red lines represent the maximum extent of Pleistocene glaciations (vaguely alluded to on page 11 where lakes are indicated as blue dots). Even though I am familiar with glacial boundaries in the region, I at first thought that these might represent major watershed boundaries. Additional clarification should be provided in the "How to use this book" section in the Preface.

Although I have pointed out a few problems in this review, I must emphasize that overall, this is an extremely useful text and I would recommend this book to any experienced aquatic botanist as an essential reference. The book also is an outstanding value considering both the quality of the publication as well as the content. My main concern with the book is its use by students or inexperienced persons, where some of the minor oversights could present more substantial issues. In contrast to any criticisms, most of the keys work just fine and there are excellent descriptions of the included species. Likewise, the illustrations and photographs provided are of superb quality and should help users substantially as they identify plants in the region. I especially liked the dot distribution maps, which present a thorough picture of plant ranges in the state. All of these features combine to provide a useful and much-needed field guide to the aquatic flora of the region. I already have consulted it several times with respect to my own research interests!

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