



# The Water Garden

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## Winter 2020 Newsletter

Charles B. Thomas, The Symposium



**Len Freestone, Charles B. Thomas, Joe Tomocik, & Doris Freestone, (photo courtesy of Doris Freestone)**



**Charles B. Thomas, (photo courtesy of IWGS)**

**By: Joseph V. Tomocik**

**I was surprised, saddened, and feeling a bit guilty upon hearing of the passing of Charles B. Thomas on December 7, 2020. I had not communicated with Charles for years and had looked forward to surprising him with a call or email. Deepest Sympathy to family and friends.**

I think often and revel about the International Waterlily Society's (changed later to International Waterlily and Water Gardening Society) first symposium, held in 1985 at storied Longwood Gardens in Kennett Square, Pennsylvania. Difficult to overstate its importance, the symposium was educational, glamorous, exciting, and historical. The displays were expertly designed; the waterlilies superbly groomed and labeled thanks to gracious, par excellent horticulturist Patrick Nutt.

Had I died and gone to heaven? One could easily tell this was something really really special. Rolf Nelson was shaking his head wondering what I was all about: like a kid in a candy store snapping pictures, scribbling notes crazily, and making recordings of the speakers.

At the symposium, expert water gardener, nurseryman, and plant collector Walter Pagels was unanimously elected president. Honored with Hall of Fame awards for their extensive hybridizing work were Dr. G. H. Pring and Joseph Bory Latour-Marliac. Many in attendance would eventually be honored with Hall of Fame awards including myself and Colorado Water Garden Society co-founders and cherished Denver Botanic Gardens' volunteers Mary and John Mirgon.

About the pools there was chatter and laughter, sometimes loud. What was so funny? What was this about? There were stories, discussions, questions, and maybe a few disagreements. And joy and camaraderie. And still more laughter. And waterlilies. Dr. Kirk Strawn, in Santa Claus style, was passing out tropical waterlily tubers to all.

Amongst the party-goers were Gordon Ledbetter from Ireland and Ray Davies and Norman Bennett from England. Charles was beaming; proud and jubilant. He had done the canvassing, the footwork, the homework, and the cajoling. Ripples had transformed into a massive tidal wave.

The International Waterlily Society founder had masterfully and graciously crafted a mesmerizing waterlily mosaic that would soon stretch across the globe, engaging multitudes with peace, love, wonder, and joy.

Barbara Davies and I sheepishly glanced at each other from across a beautiful waterlily-laden pool wondering, "What's next?" "A lot, a whole lot. A Renaissance had begun!"

Thank you, Charles.

### Sources, Recommended Readings, and Recommended Websites

Lilypons Water Gardens "Remembering Charles Thomas." IWGS Home, 2020, [www.iwgs.org](http://www.iwgs.org)

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Thomas, Charles B. Water Gardens for Plants and Fish. T.F.H. Publications, 1988. [www.victoria-adventure.org/](http://www.victoria-adventure.org/). This publication is available in the Denver Botanic Gardens' Helen Fowler Library.

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International Waterlily and Water Gardening Society (IWGS), [www.IWGS.org](http://www.IWGS.org)

Colorado Water Garden Society. [www.colowatergardensociety.org](http://www.colowatergardensociety.org)

Denver Botanic Gardens. [www.botanicgardens.org](http://www.botanicgardens.org)

Water Gardener's International, [www.watergardenersinternational.org](http://www.watergardenersinternational.org)

## Remembering Charles Thomas



**Charles B. Thomas**, (photo courtesy of IWGS)

**By: Lilypons Water Gardens & IWGS**

**It is with great sadness that we bring you the news that Charles B. Thomas passed away on December 7th at 12:30 am this morning after suffering a stroke Saturday night.**

Charles was special to many people, both here and around the world. He touched the lives of many and is respected and endeared for his contributions to the International Waterlily Society (now the International Waterlily and Water Gardening Society: IWGS) and also to the water gardening movement in general. Charles was the driving force to bringing the IWGS into existence and was a tireless speaker traveling all over the United States promoting water gardening. In 1991, Charles received the American Horticultural Society's Commercial Individual Citation for outstanding work in the field of Horticulture and the Mail order Association of Nurseries Nurseryman of the year award.

Charles became president of Lilypons in 1978 and it was in his vision that the business would focus on water gardening and that the mission would be offering the public a true source for water gardening materials and information. He was truly passionate about water gardening and was always eager to share and educate others about the wonderful world of waterlilies.

In 1984, Charles founded the International Waterlily and Water Garden Society, and remained a pillar of the water garden community to this day. Charles was inducted into the IWGS Hall of Fame in 1991, for his outstanding dedication to the furtherance of water gardening throughout the world.

After retiring from Lilypons in 1997, Charles became a most beloved substitute teacher at the Waynesboro, PA School district where he taught from 2006 onward. He lives on in all the lives of the students he taught and inspired. Fondly known as "the best sub ever!"

The world lost a very special person in Charles. He will be greatly missed by his family, friends and all who knew him.

## Latest News About the CWGS New/Updated Website

**By: Dorothy Martinez**

**In case you haven't noticed, we have updated and substantially enhanced the CWGS website. One of the most significant changes has been the addition of the "Member Only" area. This was done because our members deserve to have added value for their membership. You should have received your Username and Password via a blast email sent out on September 13th and/or on October 20th. If you did not receive your Username or Password or have had trouble logging in, please call me ASAP and I will call you back and help you troubleshoot why you can't login. My phone number is (303) 279-3137.**

We are really trying to make the website more relevant, informative, and educational. With most of our 2020 meetings having been postponed or cancelled, having a robust website will prove to be even more important as we head into 2021.

Please let us know any positive or negative feedback about the new/updated website. We really would like to know what you think. Comments can be sent to me at [dam@johnfunk.com](mailto:dam@johnfunk.com)

## CWGS In-Person Events Cancelled Through March 31, 2021

**By: Dorothy Martinez**

**This is to inform you that all in person CWGS meetings/events scheduled between January 1, 2021 and March 31, 2021 have been cancelled due to the COVID 19 Pandemic. We plan to meet virtually via Zoom for our two Board meetings scheduled on Saturday, January 30, 2021 at 12:00 pm and Saturday, February 20, 2021 at 12:00 pm. Board meetings are open to all members, so if you wish to attend one or both of these virtual meetings, please email me at [dam@johnfunk.com](mailto:dam@johnfunk.com) to request the Zoom Meeting ID and Password information 2 – 3 days prior to the meeting dates.**

Our meeting/potluck scheduled for March 18, 2021 at 6:00 pm has been cancelled. This meeting was originally scheduled to be held at the Freyer-Newman Center within the Denver Botanic Gardens. DBG has cancelled all in-person meetings for the 1st quarter of 2021.

As always, we will always send out a blast email concerning the status of any upcoming meetings/events as well as the most up to date information will always be posted on the website Event Calendar.

## Molecular Study of Yellow Pond Lilies



**Nuphar lutea**, (photo courtesy of Baker Environmental Nursery)

**By: Donald J. Padgett, University of New Hampshire**

**[Editor's Note: This article was first published in 1996 in Volume 12-3 of the IWGS Water Garden Journal]**

### The Study of *Nuphar* DNA Confirms and Contracts Relationship Theories of *Nuphar*

The yellow pond lilies (pond lilies, spatterdocks, nuphars) include all the species assigned to the genus *Nuphar*. These perennial hydrophytes are members of the true waterlily family (*Nymphaeaceae*) and inhabit freshwater lakes, ponds, and sluggish watercourses. In nature, the yellow pond lilies are distributed in the temperate climate of the Northern Hemisphere. The species range from northeastern Mexico and Cuba to Alaska and Canada in North America, and from northern Europe and throughout Asia to Japan. There are no tropical species of *Nuphar*.

Admittedly, *Nuphar* species are not nearly as spectacular as waterlilies. Unlike flowers of true waterlilies (*Nymphaea*) or lotuses (*Nelumbo*), that come in an array of colors, *Nuphar* species produce only yellow flowers, as their common name reveals. Yet, there are species and cultivars with blossoms that are slightly reddened or even orange colored. The flowers are globose, with usually only 5 or 6, rounded, sepals. Also, unlike waterlilies, the petals of *Nuphar* flowers are seldom noticed, being relatively short and hidden between the larger sepals and numerous stamens. The leaves of yellow pond lilies are primarily floating and thick, ranging from very elongate to more or less heart-shaped. In addition, most species possess a number of thin and almost translucent leaves that remain under water.

Overall, *Nuphar* plants exhibit an enormous amount of variation in form within any given species. Species of this genus are very similar in appearance, differing primarily in size and number of floral parts and various leaf characteristics. Also, *Nuphar* species possess the capacity for natural hybridization. This close relatedness among the members, along with their inherent variability, has hindered a clear understanding of evolutionary relationships within this genus. As a consequence, the taxonomic concepts of *Nuphar* species have been very inconsistent and therefore at times confusing.

### Relationship to Waterlilies

The genus *Nuphar* is considered a member of the waterlily family, the *Nymphaeaceae*. Its near relative includes *Barclaya*, *Nymphaea*, *Euryale*, *Victoria*, and *Ondinea*. It has long been accepted that *Nuphar* belongs to this

family, based primarily on its similarity in form to waterlilies. One taxonomic interpretation, however, once placed *Nuphar* in its own family (the *Nuphaceae*), a concept not generally favored. Recent molecular studies have supported the alliance of *Nuphar* to the waterlily family, and indicate it is most closely related to the genus *Barclaya* (Les et al 1991). Both of these genera share a relatively remote relationship to *Nymphaea*, *Euryale*, and *Victoria*. The relationship of *Nuphar* and the Australian genus and the Australian genus *Ondinea* is unclear.

#### Classification Among Yellow Waterlilies

The most recent, detailed classification of *Nuphar* species has remained arguable by many botanists (Beal, 1956). Not conforming to the traditional conviction of numerous *Nuphar* species, Dr. E. O. Beal recognized only a single variable species, *Nuphar lutea*, to occur in North America and Europe. This inclusive species was represented by eight subspecies in North America and two subspecies in Eurasia. Overall, Beal did acknowledge two species. The Far Eastern *N. japonica* from Japan, remained distinct from *N. lutea* in Beal's treatment. Prior to Beal's (1956) study, 17 *Nuphar* species were proposed for North America alone.

Past systematic studies of *Nuphar*, like the one of Dr. Beal, have been limited to traditional morphological techniques. Such techniques were used to classify plants solely on the way they physically appear, not necessarily how they may actually be related. Hence, since most *Nuphar* species are superficially very similar (and appeared to intergrade) to each other, Beal was led to believe that they would be best regarded as one single species with several extreme forms. He designated these forms as subspecies. This enormous variability of form within any (or between) species consequently has rendered *Nuphar* to be problematic from a taxonomic standpoint. Fortunately, there are now many new approaches to analyzing relationships among plant groups where the emphasis is not placed on the physical characteristics of the plants. These techniques have already been very helpful in clarifying certain waterlily relationships. For example, the broad International Waterlily and Water Gardening Society Water Garden Journal P. 13 Vol. 35, No. 1 floating leaves found in both *Nelumbo* and *Victoria* by no means imply a close kinship. Instead, this similar leaf form (the so-called "lily pad") is the result of convergence, where similar features arise in unrelated groups (Les 1993).

#### Relationships of Yellow Pond Lilies

While systematic classifications of *Nuphar* species have been relatively numerous, no attempt has been made to explicitly estimate evolutionary positions of the species within this genus. Estimating the evolutionary relationships among *Nuphar* plants greatly aids in formulating an accurate taxonomic classification (i.e. one that reflects their natural relationships). Thus, the primary objective of my study was to explore the evolutionary relationships among the species of *Nuphar* from DNA evidence. By comparing them from DNA evidence. By comparing the "nucleotide" sequence of a specific segment of DNA (a gene) between every *Nuphar* species, a *Nuphar* genealogy or family tree can be reconstructed. This technique of molecular biology affords an approach in which the reliance on potentially misleading morphological similarities can be circumvented. I chose to examine a gene (known as the ITS region) that occurs in the cell nucleus.

My study of the ITS region of DNA allows us to address several questions regarding the *Nuphar* relationships. I have used the DNA genealogy to help identify features among *Nuphar* species that are helpful in indicating their kinship. More specifically, are the elongated leaved plants of *N. japonica* (of Japan) related to the elongated-leaved plants of *N. sagittifolia* or *N. ulvacea* (both of southeastern United States)? Is *N. japonica* a relative of *N. advena* (southern U.S.), since both species commonly possess emergent leaves? Are all the so-called "dwarf" species (*N. pumila*, *N. micro*, *N. pumila*, *N. microphylla*, *N. oguraensis*) closely related? What species is most closely related to them? The answers to such questions can have practical applications to yellow waterlily growers. Knowing the close relatives of desirable species can indicate what other species will potentially yield successful hybrid offspring if crossed.

Figure 1\* shows the evolutionary tree that resulted from my molecular analyses. The results of my DNA study provide very strong evidence that there are two major lineages in *Nuphar*. Interestingly, this relationship is also consistent with morphological evidence, yet it has not been contemplated previously. One lineage contains all the species native to Eurasia, but includes the North American *N. microphylla*. These species all have five sepals, smooth walled, flagon-shaped fruits with conspicuous necks, and relatively short anthers. The other major lineage consists of all the North American species (except *N. microphylla*). These taxa all share 6 - 12 sepals, ribbed walled, barrel-shaped fruits lacking necks, and relatively long anthers. The definition of these two groups represents the most important and well supported result of this molecular analysis. These results suggest that features of fruits (overall shape and surface texture), relative anther length, and the number of sepals are good indicators of relationships among *Nuphar* species. In the Eurasian lineage, the so-called "dwarf" species (*N. pumila*, *N. microphylla*, *N. oguraensis*, *N. pumila*, *N. microphylla*, *N. oguraensis*) form a natural group, descended from a common ancestor. It is interesting that *N. microphylla* is restricted to North America, yet bears Old World affinities, surely the result of some western migration at some time in history. The dwarf species appear to be most closely related to *N. japonica*. Collectively, they all possess lobed, or star-shaped, stigmatic disks. The remote relationship of *N. lutea* to the other Eurasian species is convincing since this species possesses the unique feature of an entire margined, or round, stigmatic disk. Resolution is much weaker among North American species. Greatest support is found for the basal position of *N. polysepala*. This is a plausible relationship since *N. polysepala* is the western representative of the genus in North America and is unique in having 12 sepals. Although *N. polysepala* overlaps with *N. variegata* in Alaska, northwestern U.S., and western Canada, this divergent species is relatively isolated and distinct morphologically. The branch maintaining relationships among the remaining North American species is weakly supported and virtually unresolved. The present DNA data are inadequate to elucidate further relationships among these species.

My results clearly indicate that no North American species (except *N. microphylla*) share any close degree of relationship with *Nuphar lutea*. Thus, the taxonomic treatment established by Beal (1956), acknowledging but a single species (*Nuphar lutea*) in Europe and North America is erroneous and it is inaccurate International Waterlily and Water Gardening Society Water Garden Journal P. 14 Vol. 35, No. 1 to apply the name *N. lutea* to any North American plants. In regards to the questions posed previously our evolutionary tree does provide some answers. The first question was answered above, which stated that fruit shape and sepal number are good indicators of relationships within *Nuphar*. Although they all share elongated leaves. *N. japonica* is not closely related to *N. sagittifolia* nor *N. ulvacea*, yet the latter two species appear to share a close relationship. Similarly, *N. japonica* is not related to *N. advena*, despite the shared characteristic of emergent leaves. As previously assumed, the dwarf species are all very closely related. The closest relative to the dwarfs appears to be *N. japonica*.

This analysis of DNA represents the first study to propose explicit evolutionary relationships among species of *Nuphar*. It also constitutes the first taxonomic study of this genus to utilize molecular evidence. While the ITS study remains quite informative, analyses of other genes may offer further information on relationships with *Nuphar*. I hope to perform similar studies on species of other waterlily genera and continue work on *Nuphar* utilizing different genes. I have already utilizing different genes. I have already utilized molecular evidence to

confirm the hybrid origin and parentage of one North American species.

#### Acknowledgments

I wish to thank the International Waterlily Society for funding portions of this study. I am grateful to G. Crow of the University of New Hampshire, D. H. Les of the University of Connecticut, and C. B. Hellquist of North Adams State College for their assistance.

#### References:

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Les, D. H. 1993. Studies of waterlily relationships: This analysis of DNA represents the first study a search for their roots (or should that be "rhizomes"? ) to propose explicit evolutionary relationships among Water Garden Journal 9 (4): 16-22.

\*\*Figure 1 was missing in the original publication, but a likely version of it can be found in this paper: "Phylogenetic relationships in *Nuphar* (Nymphaeaceae): Evidence from morphology, chloroplast DNA, and nuclear ribosomal DNA" by Donald J. Padgett, Donald H. Les, and Garrett E. Crow, American Journal of Botany 86(9): 1316 - 1324. 1999.

See: <https://bsapubs.onlinelibrary.wiley.com/doi/pdf/10.2307/2656779>