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**Correspondence**

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# Reappraisal of *Nymphoides coronata* (Menyanthaceae), A 100-year-lost Species Endemic to South China

YA-DONG ZHOU[1,2], KE-YAN XIAO[1], GUANG-WAN HU[1], QING-HUA ZHAN[1] & QING-FENG WANG[1*]
[1] *Key Laboratory of Aquatic Botany and Watershed Ecology, Wuhan Botanical Garden, Chinese Academy of Sciences, Wuhan, Hubei, 430074, China*
[2] *University of Chinese Academy of Sciences, Beijing 100049, China*
**Corresponding author: qfwang@wbgcas.cn*

## Abstract

In this paper, we reported and amended the morphological characters of *Limnanthemum coronatum* Dunn, which was about 100-year-lost species endemic to South China, and transferred it into *Nymphoides*, using a recombination name, *Nymphoides coronata* (Dunn) Chun ex Y.D. Zhou & G.W. Hu.

**Key words:** *Nymphoides coronata*, Menyanthaceae, Recombination, Supplemental description

## Introduction

*Nymphoides* Séguier (1754: 121) is a genus within Menyanthaceae, which contains ca. 40–50 species with worldwide distributions, especially the temperate and tropics areas (Ho & Ornduff, 1995; Tippery *et al.*, 2008; Tippery & Les, 2011). There are only 6 species of this genus occurring in China (Ho, 1988; Ho & Ornduff, 1995).

*Limnanthemum coronatum* Dunn (1912: 175–176) was originally described by Dunn based on the incomplete type specimen, *s. coll., #1651*, Hong Kong herbarium (HK), which was collected in northeast Guangdong, China (Fig. 1). Ho & Ornduff (1995) suggested it might be synonymous with *Nymphoides peltata* (Gmelin 1769: 527) Kuntze (1891: 429), but was mis-spelted "coronatum" into "cordatum" in *Flora of China*. Xia (2000) recorded it as a questionable species, *Nymphoides coronata* (Dunn) Chun ined. in *Flora of Guangdong*, because the description of the species was just based on the photo of type specimen (Fig. 1), while he had never seen any specimens or living plants.

## Materials and methods

In Dec. 2013, some specimens (*K.Y. Xiao-0162*, HIB, Wuhan, China) and living plants of *Nymphoides* collected by Ke-Yan Xiao form Wenchang, Hainan, China, were available to us. After our careful examination, it was found that the morphological characters of inflorescences and stigmas of these plants were different from *N. peltata*, and from the other *Nymphoides* taxa all around the world. In *N. peltata*, flowers always densely clustered at nodes, stigma 2-lobed, suborbicular in long styled flowers (Ho & Ornduff, 1995), while, in our plants, there were only 2 flowers per node with long pedicels (not single flower as Dunn (1912) described basing on the specimen, *s. coll., #1651*), stigma 2-lobed, fimbriate in long styled flowers (Fig. 2BH). It was found that this species was same as *Limnanthemum coronatum* in most aspects, especially in the characters of stigma and the three fimbriate appendants on the base of corolla lobes of long styled flowers (Figs. 1, 2BHJ; Xia, 2000).

## Taxonomy

After a comprehensive comparison, it was convinced that our samples were *Limnanthemum coronatum* Dunn (≡ *Nymphoides coronata* (Dunn) Chun ined.), and validly published as *Nymphoides coronata* (Dunn) Chun ex Y.D. Zhou & G.W. Hu. It was redescribed and amended based on K.Y. Xiao-0162 as the following:

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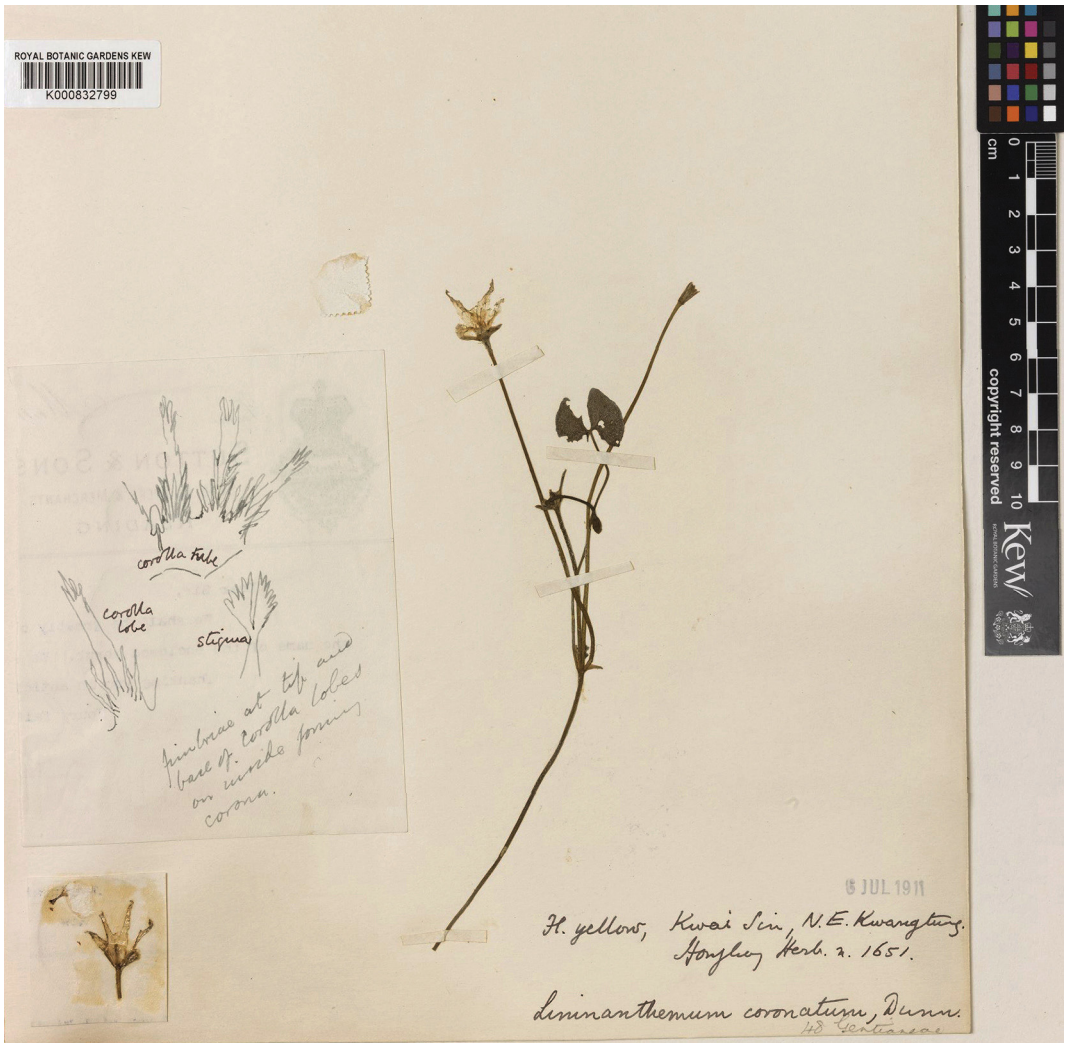


**FIGURE 1**. The type specimen of *Limnanthemum coronatum* Dunn which was collected in Kwai Sin, N.E. Kwangtung, China (form JSTOR Global Plants, http://plants.jstor.org/specimen/k000832799?s=t).

***Nymphoides coronata*** (Dunn) Chun ex Y.D. Zhou & G.W. Hu, *comb. nov.* ≡ *Limnanthemum coronatum* Dunn, *Kew Bull., Addit. Ser.* 10: 175. 1912. ≡ *Nymphoides coronata* (Dunn) Chun ined. in D.L. Wu, Q.M. Hu & Z.Y. Chen, *Flora of Guangdong*, 4: 328. 2000.

Aquatic herbs, glabrous, submerged except leaves and flowers (Fig. 2A). Rhizome short, with numerous fibrous roots. Stems slender, carmine, with purple spots, branched, segmental, sometimes producing rootlets form the nodes (Fig. 2A). Leaves floating, leaf-blade ovate to orbicular, entire, upper surface green, lower surface purplish; petioles cylindric, basal extend into an amplexicaul sheath; basal leaves 2–3 cm in diameter, with 10–20 cm long petioles; cauline leaves smaller than basal ones, and with shorter petioles (Fig. 2ADE). Inflorescences cymose, axillary or terminal; bracts lanceolate, 5–7 × 3–5 mm, 2 opposite per node (Fig. 2A). Flowers always 2 per node, with 5–7 cm long pedicels, 5-merous, distylous (Fig. 2ABC). Calyx 5-lobed near base, lobes lanceolate, ca. 5–7 × 2–3 mm. Corolla golden yellow, 5-lobed near base, corolla tube 5–6 mm long; lobes with 3 fimbriate appendants at the base, obovate, 1.3–1.5 × 0.8–1.2 mm, margin broadly membranous and fimbriate, bifid at the tip (Fig. 2BCJ). Stamens 5, insert on the corolla tube and alternate with lobes (Fig. 2BCJ). Long styled flowers: filaments up to 1 mm long; ovary 1.5–2 mm wide; style 2–3 mm long; stigma 2-lobed, lobes lamelliform, fimbriate (Fig. 2BH). Short styled flowers: filaments 2–3 mm long; ovary 2–3 mm wide; style very short; stigma 2-lobed, lobes finger-like (Fig. 2CI). Capsule indehiscent, obovate to obovate-elliptic, 8–9 × 4–5 mm, with persistent style 1–2 mm long (Fig. 2F). Seeds brownish black, ovoid to sub-globose, ca. 1 mm in diameter, 20–25 per capsule; seed coat densely spinescent (Fig. 2GK).

**Location and Habitat**: Longma Village, Wengtian Town, Wenchang, Hainan, China, 19°49′23″N, 110°52′39″E, elev. 30 m; in ponds or small ditches about 10 KM from the shore. The water level less than 0.5 m, and the basal soil is sand.


**FIGURE 2. A–K.** *Nymphoides coronata* (Dunn) Chun ex Y.D. Zhou & G.W. Hu. A. plant; B. long styled flower; C. short styled flower; D. upside of leaf; E. low side of leaf; F. fruit with persistent style; G. seeds in the fruit; H. style and stigma of long styled flower; I. style and stigma of short styled flowers; J. three fimbriate appendants on the base of corolla lobe; K. mature seeds.

## Discussion

*N. coronata* was first found in the northeast of Guangdong, China in 1912 (Dunn, 1912; Xia, 2000). Due to the impact of human activities, habitat destruction and environmental pollution, the populations became locally extinct, and no living plants or specimens were found by researchers until recently. The discovery of the 100-year-lost species will play an important role in studying the phylogeny and biogeography of *Nymphoides* of China and the world.

Our investigation indicated that the extant population of *N. coronata* in Wenchang, Hainan, was not very big (ca. 600 $m^2$ with <120 individuals) and did not get good protection (Table 1). If no attention will be given, the species might disappear in the near future. So, here we evaluated its conservation status using IUCN criteria (IUCN, 2012) based on the population area and size in Wenchang, and proposed it as Critically Endangered species (Table 1).

**TABLE 1**. Estimated area and population sizes, and proposed IUCN criteria for *Nymphoides coronata*.

| Species | Vernacular name | Estimated area with wild population ($m^2$) | Estimated population size | IUCN Red List (Proposed) |
|---|---|---|---|---|
| *N. coronata* | Haifengxingcai | ca. 600 | < 120 | CR B1ab(i,ii,iii,iv,v) |


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