The status of *Cryptocoryne annamica* (Araceae: Aroideae: Cryptocoryneae) in Vietnam

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ABSTRACT. *Cryptocoryne annamica* Serebryanyi, an endemic species from Gia Lai province in Vietnam, was first described in 1991. Until recently only two collections were known but a new collection has now been made in the Kon Ka King National Park, Gia Lai province. The species description is elaborated and notes on its biology, distribution, ecology and cultivation are given. A proposed IUCN conservation assessment is given. A key to the *Cryptocoryne* species of Vietnam is included.

Keywords. Conservation, cultivation, distribution, ecology, taxonomy

Introduction

Gagnepain (1942) recognised four species of the genus *Cryptocoryne* Fisch. ex Wydler for Vietnam, namely *C. ciliata* (Roxb.) Fisch. ex Wydler, *C. retrospiralis* (Roxb.) Kunth, *C. tonkinensis* Gagnep. and *C. balansae* Gagnep. Jacobsen (1991) reduced two of Gagnepain's species to varieties of *C. crispatula* Engl.: *C. crispatula* var. *tonkinensis* (Gagnep.) N.Jacobsen and *C. crispatula* var. *balansae* (Gagnep.) N.Jacobsen. *Cryptocoryne retrospiralis* has not subsequently been confirmed as occurring in Vietnam. Since then *Cryptocoryne annamica* Serebryanyi (1991) and *C. vietnamensis* Hertel & Mühlberg (1994) have been described. Therefore, there are four species of *Cryptocoryne* recorded for Vietnam, one of them with three varieties: *C. crispatula* var. *tonkinensis*, *C. crispatula* var. *yunnanensis* (H.Li) H.Li & N.Jacobsen, *C. crispatula* var. *balansae*, *C. ciliata, C. annamica*, and *C. vietnamensis*. Both *C. annamica* and *C. vietnamensis* are endemic to Vietnam (Nguyen, 2005). Confusion over the type locality of *Cryptocoryne annamica* was clairified by Bogner (2001) as Kon Ha Nung, K'Bang district of Gia Lai province. Recently it has become apparent that two type localities are much disturbed. Peter Boyce (then at K) and the first author exhaustively tried to relocate *Cryptocoryne annamica* at its type locality near Buon Luoi (Buoenloy) in 1996 but were unable to find it. It is likely that this species does not exist there anymore. The populations of *Cryptocoryne vietnamensis* near Ba Na have been damaged seriously by tourist activities such as cable car construction, house

building, etc. *Cryptocoryne vietnamensis* still exists near Ba Na but the plants are very scattered and it is highly threatened.

In light of the above it is good to report that a new locality for *Cryptocoryne annamica* was discovered in the Kon Ka King National Park, K'Bang district, Gia Lai province during an investigation of the medicinal plants used by the Ba Na minority in this area. Two other localities for *Cryptocoryne annamica* are known, also in Gia Lai province. In this paper the description of *Cryptocoryne annamica* is elaborated along with additional information on its distribution and habitat. An IUCN conservation assessment and a key to the Vietnamese species of this genus are included.

Key to *Cryptocoryne* in Vietnam

1a. Leaf blade linear to very narrowly lanceolate or elliptic, more than 5 × as long as wide; spathe limb few to several times twisted ..... *C. crispatula*
1b. Leaf blade ovate, lanceolate or elliptic, not longer than 2–3 × as long as wide; spathe limb straight or only once to twice twisted 2

2a. Spathe limb with cilia along the margin (Mekong delta) ..... *C. ciliata*
2b. Spathe limb without cilia along the margin 3

3a. Spathe limb straight, inside completely deep purple ..... *C. vietnamensis*
3b. Spathe limb straight to once or twice twisted, inside yellow at margin and apex, red to red-brown in centre ..... *C. annamica*

Description of the species

Cryptocoryne annamica Serebryanyi
Aqua-Pl. 16(3): 98 (1991). TYPE: Collected from a cultivated plant in Main Botanical Garden Moscow, Russia, *Serebryanyi N16,* (holotype MHA, spirit specimen); originally collected by N. Orlow in Vietnam, Gia Lai Province, Ankhe Dt, Buoenloy (now K'Bang distr.).

Rhizomatous aquatic plant 7–15 cm tall. Rhizome stout, 2–4(–10) cm long, 4–6 mm diam., covered by abundant roots and with one or two stolons per leaf tuft, these initially horizontal and creeping, 5–7 cm long, later turning upward and developing into a new plant. Leaves (4–)7–12 in a rosette, flowering specimens with several narrow triangular cataphylls, 2.5–3.5 cm long, light green to slightly reddish; petiole rather stout, 5–13 cm long, sheathed basally for (3–)5–7 cm long, lower part white (in the soil), upper portion slightly canaliculate, light to dark brown or dull grey-green in upper emergent parts but red-purple in submerged parts; leaf blade more or less elliptic, 7–10.5 cm long, (3–)4–4.5 cm wide in the middle, flat, uniformly green (more or less

pale to darker green) or sometimes with very light reddish spots, underneath light green in emergent plants but red to dark purple underneath and dark green on the upper side and bullate in submerged plants; blade acute at apex and obtuse to auriculate at base, midrib distinct, 3–4 primary lateral veins on each side. Inflorescences several in a plant; peduncle 3–6 cm long in emergent plants and up to 12 cm long in submerged plants, 2.5 mm diam., white; spathe (4–)5–7 cm long; kettle cylindrical, 1.5–2 cm long and c. 7 mm in diam., white inside and outside; tube between the kettle and the limb of spathe brown-violet to slightly reddish and narrower in diam. than the kettle; spathe limb triangular, 2–3 cm long, straight to once or twice twisted, apex cuspidate to acuminate, margin scattered with small teeth, brown-violet outside, surface inside rough, yellow at margin and apex, centre red to red-brown, collar lacking. Spadix 1.5–2 cm long; female portion 4 mm tall, sterile axis between female and male flowers slender, c. 8 mm long, smooth; male portion cylindrical, c. 2.5 mm long and 1.5 mm in diam., yellow, appendix conical, wide at base and suddenly acute apically; flap c. 2.5 mm long, yellowish. Female flowers 5–6, yellowish to cream coloured, style short, 1 mm long; stigma round; olfactory bodies roundish. Male flowers 30–50, 0.5 mm long; thecae with a horn, dehiscent by an apical pore. Chromosome number: 2n = 34. (Fig. 1).

Notes on distribution. Serebryanyi (1991) cited an additional sterile collection, *Clemens 4310*, 28 Aug. 1927 (P) from Ba Na, 25 km from Da Nang, when he described this species. However, *Clemens 4310* is *Cryptocoryne vietnamensis*. The emergent leaves of *Cryptocoryne annamica* and *C. vietnamensis* are very similar. Kobayashi (2004) reported *Cryptocoryne annamica* from near Pleiku in Gia Lai province.

Ecology. Cryptocoryne annamica grows in or along small streams in tropical, partly deciduous forests at 600–750 m. Submerged plants can be found in water of shaded streams to a depth of 50 cm. (Fig. 2).

Preliminary IUCN conservation assessment. Based on known populations and the perceived or actual threats, *Cryptocoryne annamica* can be classified as Vulnerable VU A2a; B2ab(ii,iii); C1, according to IUCN criteria (IUCN, 2001).

Additional specimens examined: VIETNAM. **Gia Lai province:** K'Bang district, Kon Ka King National Park, 5 km southwest direction from forest station No. 5 of Kon Ka King NP., *Nguyen Van Du & others CTTN 84 & 85* (HN); Kon Ha Nung, Buoenloy [Buon Luoi], 16 May 1985 *Orlov LX-VN 1994* (LE, HN); ibidem, 18 Dec 1985, *Orlov LX-VN 2756* (LE, HN).

Plants of *Cryptocoryne annamica* which grow in water and plants which grow on stream banks produce quite different leaves. The submerged leaves are red to deep purple underneath and dark green on the surface, and the surface is bullate, whereas the leaves of emergent or terrestrial plants are green in all parts and the blades are flat. (Fig. 1. A–B).

Fig. 1. *Cryptocoryne annamica* Serebryanyi. **A.** Flowering emergent plant - note the green flat leaf blades and the twisted spathe limb. **B.** Flowering submerged plant - note the bullate leaf blades, which are deep purple underneath, the purple petioles, the long peduncle, and the straight spathe limb. **C.** Rhizome with stolons and roots. **D.** Spathe of a submerged plant - note the long peduncle and the straight spathe limb which is yellow around the margin and apex, red-brown in the centre; the swollen part above the peduncle is the kettle with the spadix (not visible from outside). **E.** Section through the kettle of the spathe to show the spadix with female flowers below and the male flowers above. (Photos: Nguyen Van Du)

Fig. 2. *Cryptocoryne annamica* Serebryanyi. **A.** Emersed growing plant along a stream; note the green, flat leaf blades with red spots and the twisted spathe limb. **B.** Submersed plants growing in a stream, note the bullate leaf blades. (Photos: Nguyen Van Du)

Cryptocoryne annamica is grown as an ornamental plant in aquaria or in pots in Europe and elsewhere. The pot plants can be cultivated in a soil of leaf litter of *Fagus sylvatica* L. (Fagaceae) with the addition of sand and fertilizer, or in a sandy loam with some rough peat. It can be also kept in the aquarium with only sand on the bottom but then it also requires specialised aquatic plant fertiliser.

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