

Noteworthy Collection Records of *Lipocarpa microcephala* (Cyperaceae) and *Polygala chinensis* (Polygalaceae) from Kume Island of the Ryukyus, Japan

Atsushi Abe^{1,*}, Tadaki Nakasone² and Goro Kokubugata³

¹Okinawa Churashima Research Center, Okinawa Churashima Foundation, Ishikawa, Motobu, Okinawa 905–0206, Japan

²Tsudoi Company, Kitamae, Chatan, Okinawa 904–0117, Japan

³Department of Botany, National Museum of Nature and Science, Amakubo 4–1–1, Tsukuba, Ibaraki 305–0005, Japan

*E-mail: a-abe@okichura.jp

(Received 12 February 2016; accepted 23 March 2016)

Abstract Two threatened plant species namely *Lipocarpa microcephala* (Cyperaceae) and *Polygala chinensis* (Polygalaceae) were found on Kume Island of the Ryukyus, Japan. *Lipocarpa microcephala* had not reported since 1937 in the Okinawa island group of the central Ryukyus. This is the first record of *Polygala chinensis* from Kume Island.

Key words : Kume Island, *Lipocarpa microcephala*, *Polygala chinensis*, the Ryukyus.

Introduction

Kume Island belongs to the Okinawa island group of the central Ryukyus of the Ryukyus Archipelago (thereafter the Ryukyus), Japan (Fig. 1). This island is ca. 90 km westward from Okinawa Island, and has an area of 58.5 km² with the highest point of 309.5 m altitude (Mt. Uegusuku-dake). Previously a flora of this island was reported to compose of 749 vascular plant species including noteworthy species from phylogeographic and conservation biology perspectives, for example *Polygala longifolia* Poir. (Polygalaceae) and *Digitaria mollicoma* (Kunth) Henrard (Poaceae) which occur at only Kume Island in Japan (Hatusima and Amano, 1974). Much of the natural vegetation of Kume Island has been lost due to human activities such as the construction of woodland paths, development and shore protection, and it has the sixth density of threatened plant species in Okinawa Prefecture (Yokota *et al.*, 2003). The threatened species

Cassytha pergracilis Hatusima (Lauraceae) which was described based on a type specimen collected from this island (the Japanese Ministry of Environment, 2015) is considered extinct from this island (Kokubugata *et al.*, 2012). The threatening processes to the vegetation have not diminished and this island still requires further field surveys for not only improving the overall flora check list, but also understanding the current status of threatened species in relation to their continued existence on this island. In this study, we report the two noteworthy records of *Lipocarpa microcephala* (an annual herb in Cyperaceae) (Hoshino and Masaki, 2011) and *Polygala chinensis* (a perennial herb in Polygalaceae) (Hatusima, 1971) from Kume Island.

Materials and Methods

Two field surveys were conducted on September 21 and November 8, 2014 on Kume Island. In the field surveys, the habitat, number of indi-

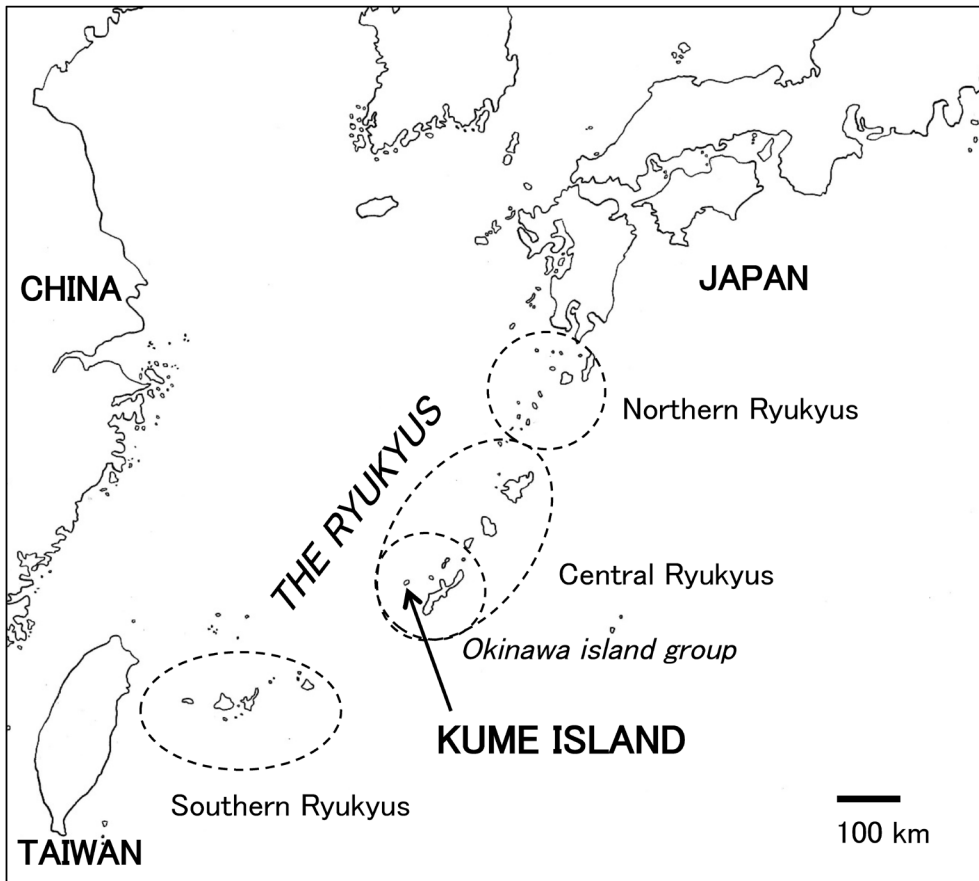


Fig. 1. Map showing Kume Island of the Ryukyus and its allied regions.

viduals and associated plant species in the populations of the two species were investigated. Voucher specimens from this study were deposited in the herbarium of the Okinawa Churashima Research Center, Okinawa Churashima Foundation. Locality information of each species was not detailed in this paper due to conservation sensitivity of these plants on this island.

Results and Discussion

Lipocarpha microcephala (R.Br.) Kunth (Cyperaceae) (Fig. 2A)

Japanese common name: *Hinji-gayatsuri*

Voucher specimen: *A.Abe 20141108-1* (on November 8, 2014).

One population of *L. microcephala* was found at the edge of a lowland forest mainly consisting

of *Hibiscus makinoi* Jotani et H.Ohba (Malvaceae), *Macaranga tanarius* (L.) Müll.Arg. (Euphorbiaceae) and *Pandanus odoratissimus* L.f. (Pandanaceae). The habitat was sunny, flat and with slightly moist soil. One hundred-five individuals of *L. microcephala* were confirmed within 1.5 × 5.0 m square. In the population, *L. microcephala* was closely associated with *Thelypteris acuminata* (Houtt.) C.V.Morton (Thelypteridaceae), *Ipomoea indica* (Burm.) Merr. (Convolvulaceae) and *Commelina diffusa* Burm.f. (Commelinaceae).

Yokota (2006) reported this species widely distributed from the tropics to temperate areas of East Asia: Honshu, Shikoku, Kyusyu, the northern and central Ryukyus in Japan; Taiwan, China, India, Malaysia and in the southern hemisphere from Australia. In the central Ryukyus, *L. micro-*

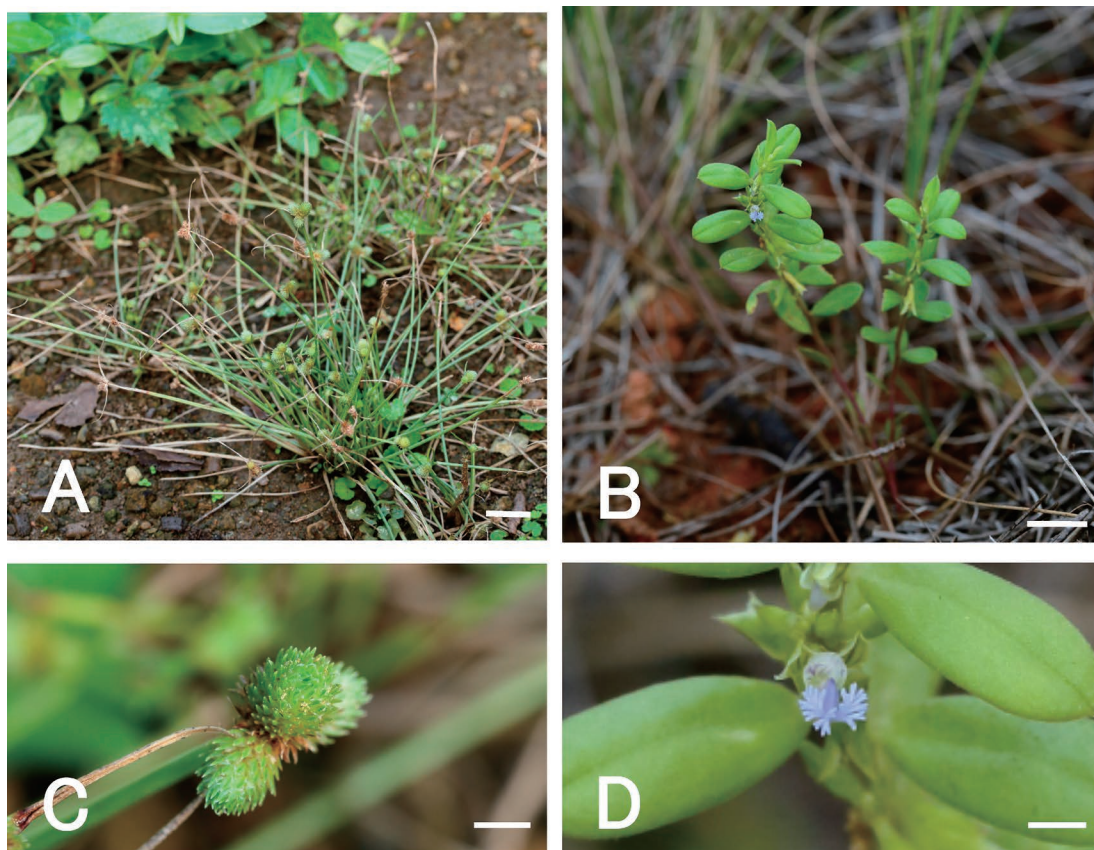


Fig. 2. Plants of *Lipocarpa microcephala* and *Polygala chinensis* on Kume Island of the Ryukyus. A, B. Plants. C, D. Flowers. A, C. *Lipocarpa microcephala*. B, D. *Polygala chinensis*. Bars indicate 1 cm for A and B; 2 mm for C and D.

cephala was first reported from Nago being situated at middle part of Okinawa Island (*T.Kinjo 106* in RYU; Yokota, 2006), and the present collection is the second after 77 years absence since the first collection in 1937 in the central Ryukyus. It is the first report of this species from Kume Island.

At moment, we do not have enough data to hypothesize the origin of the plants in Kume Island. They may have historically originated from northward (Kyusyu and the northern Ryukyus) or southward (Taiwan), and thus further phylogenetic studies using molecular data are required to clarify this issue.

Polygala chinensis L. (Polygalaceae)

Japanese common name: *Shinchiku-himehagi*

Voucher specimen: *A.Abe 20140921-1* (on September 21, 2014).

One population of *P. chinensis* was found on an open hill slope. The habitat was sunny and somewhat dry with argillaceous soil. In the population, 112 individuals of *P. chinensis* were confirmed within a 5.0×5.0 m square. *P. chinensis* occurred in close association primarily with *Pinus luchuensis* Mayr (dwarf plants; Pinaceae), *Gahnia tristis* Nees, *Rhynchospora rubra* (Lour.) Makino (Cyperaceae), *Aristida takeoi* Ohwi, *Ischaemum aristatum* L. var. *aristatum* (Poaceae) and *Helicteres angustifolia* L. (Malvaceae).

Yokota *et al.* (2006) reported that *P. chinensis* was widely distributed in Amami (as the northern

most locality), Tokuno-shima, Izena and Okinawa Islands of the central Ryukyus, and Ishigaki and Iriomote Islands of the southern Ryukyus in Japan; and Taiwan, China, the Philippines, Indonesia and Caroline Islands. Although Monro (2003) reported this species as distributed in northern parts of Australia, Kerrigan (2012) determined the Australian material as being misapplied to *P. polifolia* C.Presl. *P. chinensis* is newly reported from Kume Island in the present study.

Yamazaki (1973) treated the Ryukyu plants of *P. chinensis* sense Hatusima (1971) as *P. polifolia* (as “polyfolia”), and this concept was supported by Yang and Chen (2013) who distinguished the two species respectively by keel morphology: keel of the former had bipinnate to tripinnate deer horn-like appendages; that of the latter had two groups of brush-like appendages. In the present study, the keel of the plant from Kume Island was morphologically more similar to that of *P. polifolia* as reported by Yang and Chen (2013) (Fig. 2D). Yang and Chen (2013) stated that there was a clear difference in anther morphology between the two species, but we did not observe anther morphology.

Acknowledgments

We thank M. Yokota (RYU) for providing valuable comments. This study was supported by a project of “Studies of Threatened Plant Species in the Okinawa Islands” conducted by the conducted by the Okinawa Churashima Foundation.

References

Hatusima, S. 1971. Flora of the Ryukyus. Okinawa Association of Biology Education, Naha (in Japanese).

- Hatusima, S. and Amano, T. 1974. Flora of Isl. Kume, Ryukyus. Report of the Society of Okinawa Natural Research 1: 11–39 (in Japanese).
- Hoshino, T. and Masaki, T. 2011. Illustrated Sedces of Japan. Heibonsha, Tokyo.
- Japanese Ministry of the Environment. 2015. Red Data Book 2014—Threatend Wildlife of Japan. Vol. 8, Vascular Plants. GYOSEI Corporation, Tokyo (in Japanese).
- Kerrigan, R. A. 2012. A treatment for *Polygala* of northern Australia. Australian Systematic Botany 25: 83–137.
- Kokubugata, G., Nakamura, K., Forster, P. I., Wilson, G. W., Holland, A. E., Hirayama, Y. and Yokota, M. 2012. *Cassytha pubescens* and *C. glabella* (Lauraceae) are not disjunctly distributed between Australia and the Ryukyu Archipelago of Japan — evidence from morphological and molecular data. Australian Systematic Botany 25: 364–373.
- Monro, A. 2003. Systematics of the Australian Polygalaceae and Xanthophyllaceae. PhD Thesis, Australian National University, Canberra.
- Yamazaki, T., 1973. Supplement of the flora of Ryukyu and Formosa (11). Journal of Japanese Botany 48: 141–142.
- Yang, T. Y. A and Chen, C. 2013. A revision of the genus *Polygala* L. (Polygalaceae) in Taiwan. Taiwania 58: 156–162.
- Yokota, M. 2006. *Lipocarpha microcephala* (R.Br.) Kunth. In: Okinawa Prefecture (ed.), Red Data Okinawa, revised version, p. 231. Okinawa Prefecture, Naha (in Japanese).
- Yokota, M., Kanemoto, T. and Kokubugata, G. 2003. Endangered plant species in the Ryukyu Archipelago I. What endangered species in the Ryukyus? In: Ishida, G., Iwashina, T., Konishi, T., Kurashige, Y., Oikawa, J. and Yukawa, T. (eds.), Conservation of Plant Diversity in Japanese Botanic Gardens, pp. 220–225. Japan Association of Botanical Gardens, Tokyo; Tsukuba Botanical Garden of National Science Museum, Tsukuba; and Botanic Gardens Conservation International, Richmond.
- Yokota, M., Nakada, E. and Yasuda, K. 2006. *Polygala chinensis* L. In: Okinawa Prefecture (ed.), Red Data Okinawa, revised version, p. 109. Okinawa Prefecture, Naha (in Japanese).