Indian Journal of Natural Products and Resources
Vol. 9(4), December 2018, pp. 336-341

Status, threats and conservation strategies of genus *Nervilia* Commerson ex Gaudichaud-Beaupre in Malwa Region of India

K.L. Meena*, J. Singh and N.R. Keer

Department of Botany, M. L. V. Government College, Bhilwara-311001

Received 18 May 2018; Revised 30 September 2018

The present paper deals with occurrence, threats and conservation strategies of the genus *Nervilia* Commers. ex Gaud-Beaupre in the Malwa region. The genus *Nervilia* is represented by three species in this region. This paper provides a key to species, descriptions along with data on phenology, distribution and notes on the ecology of all the three species.

Keywords: Conservation, India, Malwa, *Nervilia,* Threats.
IPC Code; Int. cl. (2015.01)-A61K 36/00, A61K 36/898

Introduction

The genus *Nervilia* Commerson ex Gaudichaud-Beaupre (Orchidaceae) comprises about 80 species distributed in tropical Africa, Asia, and Australia and also in Pacific islands[1]. In India, this genus is represented by 16 species[1]. Most species of the genus develop flowers and leaves at different times hence it is not always easy to match the leaves with the flowers, particularly in herbarium collections. As a result, the taxonomy of this group is difficult. Flowers of all species are ephemeral and often overlooked during field surveys. Therefore, their inventory in local floras often remains incomplete. This is illustrated by the present discovery of one more new species for Malwa region, *Nervilia aragoana* with very delicate, short lasting, unattractive flowers and small membranaceous leaves evolving and disappearing in a few weeks after flowering. New species represents "*Nervilia aragoana* Gaud." link in latitudinal series of miniature 1-flowered local endemics which connects "Himalayan" and "E. Asian" groups of closely related species. Description and available data of newly discovered species are below. From the Madhya Pradesh so far, this taxon has not been recorded from the Malwa region[2-11].

Nervilia is an important medicinal plant used among the tribes of Malwa region, especially Hoshangabad district of Madhya Pradesh, India. The parts of the plant mainly used are underground rhizome. The species of this genus having properties as cooling, diuretic and tonic, useful in uropathy, lithiasis, colic, agalactia, mental instability, hemoptysis etc. The tuber is used as a medicine for the treatment of epilepsy, in urinary complaints, diarrhoea and asthma. The tubers of *Nervilia* are excessively consumed by Shepherd boys during grazing of animals and destruction of habitats is affecting the population of this rare and threatened species. Hence protecting the whole habitat, restricting the consumption by shepherd boys should be undertaken.

Materials and Methods

Study Site and vegetation

The study area Malwa region lies between 21°10′N to 25.16°N Latitude and 73°45′E to 79.23°E Longitude and occupies a plateau in Western Madhya Pradesh and South-Eastern Rajasthan with Gujarat in the west. To the South and East is the Vindhya Range and to the north is the Bundelkhand upland. Being located towards the northern part of the Deccan Plateau, this region is mainly a land of plateaus and mountain ranges. Towards the northern side of the river Chambal, lie the medium highland. The vegetation of the study area is virtually a junction of the forest of representative types prevailing in the State. It is a natural junction of two most important timber species viz. Teak and Sal. The entire forest can be broadly classified into three major types viz. moist deciduous, dry deciduous, central Indian subtropical hill forest (Plate 1).

*Correspondent author
Email: kanhaiyameena211@yahoo.com
Mob: 09414978534

Plate 1 — *Nervilia* prefers the high moist as well as litter contents in the soils.

Extensive field surveys conducted in various localities covering high altitudes in different seasons from 2014 to 2017. Various parameters such as habit, habitat, altitude, forest types and associated species were recorded.

Identification of plant

After an extensive survey of the Malwa region, three species of *Nervilia* were collected particularly, from hilly forests. The collected specimens were studied and processed into mounted herbarium Sheets[13] in the laboratory and identified using available literature including[1] and identity of specimens has been confirmed by Dr. S. L. Meena Scientist D, BSI, Jodhpur valuable suggestions. Finally, all the Voucher specimens were deposited in the Herbarium of MLV Government College, Bhilwara (Voucher no. 8017, 10231 and 12057).

Result

Enumeration of Taxa

All the recorded species are arranged alphabetically along with their description, ecological notes, phenology, distribution and reference to the voucher specimens.

Key to the species

1a. Leaves not flat on the ground, petiole 10 - 15 cm long .....*N. aragoana*

1b. Leaves flat on the ground, petiole up to 2 cm long … 2

2a. Leaves hairy … *N. plicata*

2b. Leaves glabrous … *N. prainiana*

***Nervilia aragoana* Gaud.**

Nervilia aragoana Gaud. in Freyc., Voy. Bot. 422, t. 35. 1829; Khanna, Fl. Madhya Pradesh 3: 53-54. 2001. *Epipactis carinata* Roxb., Fl. Ind. 3: 452. 1832. *P. carinata* Lindl., Gen. Sp. Orchid, Pl. 414. 1840; Hook. f., l.c.; Wight, Ic. t. 172. 1851. *P. nervillia* Blume, Mus. Bopt. 1: 32. 1849. *Pogonia flabelliformis* Lindl., Gen. Sp. Orchid. 415. 1840; Hook f., Fl. Brit. India 6: 121. 1890. *P. scottii* Rchb. *f.* in Flora 55: 276. 1972; Hook. *f.* Brit. India 6: 120. 1890. *Nervilia scottii* (Rchb. *f.*) Schlechter in Engl., Bot. Jahrb. 45:404. 1911. (Plate 2)

Synonyms-*Epipactis carinata* Roxb., *Pogonia flabelliformis* Lindl., *P. carinata* Lindl., *P. scottii* Rchb. *f., Nervilia scottii* (Rchb. *f.*) Schlechter, *P. nervillia* Blume.

Type-India, Malwa Region, Dhana Pagara 12057, Meena KL 8017, Herbarium MLV Government College, Bhilwara.

Terrestrial tuberous herb. Tuber white, globose or sub-globose. Petiole 10–15 cm long. Leaves broadly ovate, 8–15 cm across, base cordate, apex abruptly caudate, margins undulate, glabrous. Inflorescence, few to many flowered drooping racemes. Flowers in lax pedicellate, pedicel short. Bracts, linear-lanceolate, glabrous, deflexed. Sepals linear, subequal, acute, entire, glabrous, 3-nerved. Petals green, similar to sepals, sometimes narrower at the base. Labellum obovate, 12 mm long, 3-lobed; mid lobes embracing the column. Column about 7 mm long, dilated above.

Ecological notes- Rare, occurs on the forest floor under the shade of understorey vegetation of forests.

Fl.& fr.- July – October.

Distribution- Throughout India (Madhya Pradesh and Maharashtra) except N.W. India.

Specimens examined (photographic)- Dhana Pagara 12057 (Herbarium MLV Government College, Bhilwara)

***Nervilia plicata* (Andr.) Schltr.**

Nervilia plicata (Andr.) Schltr., Bot. Jahrb. Syst. 45: 403. 1911; Khanna, Fl. Madhya Pradesh 3: 54. 2001. *Arethusa plicata* Andr., Bot. Reg. 5: t. 321. 1803. *Pogonia discolor* (Blume) Blume, Ann. Mus. Bot. Lugduno-Batavum. 1:32. 1849. *P. pulchella* Hook. f., Bot. Mag. 41: *t. 6851*. 1885. *P. plicata* (Andr.) Lindl., Gen., Sp. Orchid. Pl. 415. 1840; Hook. *f.,* Fl. Brit. India 6: 119. 1890. *P. velutina* Par. & Rchb. *f.* in Trans. Linn. Soc. London 30: 142. 1874; Hook. *f.,* l.c., *P. biflora* Wight, Icon, Pl. Ind., Orient. 5 (1): t. 1758; Hook. *f.,* l.c.,

Plate 2 — *Nervilia aragoana*Gaud. a)Habitat and habit, b) Inflorescence, and c) Flowers.

Nervilia discolor (Blume) Schltr., Bot. Jahrb. Syst. 45: 403. 1911. *N. plicata* (Andr.) Schltr. *var. purpurea* (Hayata) S.S. Ying (Hayata) S.S. Ying, Coll. Ill. Indig. Orch. Taiwan 2: 276. 2: 276. 1990. *N. purpurea* (Hayata) Schltr., Repert. Spec. Nov. Regni Veg. 10: 6. 1911; Liu & Su, Fl. Taiwan 5: 1069. 1978. *N. discolor* (Blume) Schltr. *var. purpurea* (Hayata) S.S. Ying, Col. Ill. Indig. Orch.Taiwan. 1: 253. 1977. (Plate 3 & fig.1)

Synonyms-*Arethusa plicata* Andr., *Pogonia discolor* (Blume) Blume, *P. pulchella* Hook. f., *P. plicata* (Andr.) Lindl., *P. velutina* Par. & Rchb. *f*., *P. biflora* Wight, *Nervilia discolor* (Blume) Schltr., *N. plicata* (Andr.) Schltr. var. *purpurea* (Hayata) S.S. Ying, *N. purpurea* (Hayata) Schltr., *N. discolor* (Blume) Schltr. var. *purpurea* (Hayata) S.S. Ying.

Type- India, Malwa Region, Hawai pati 10231, Meena KL 8017, Herbarium MLV Government College, Bhilwara.

Terrestrial herb, up to 20 cm tall, leafless during flowering. Tuber whitish, globose to ellipsoid, 0.5-2 cm across, with 2–3 nodes. Leaves appearing just

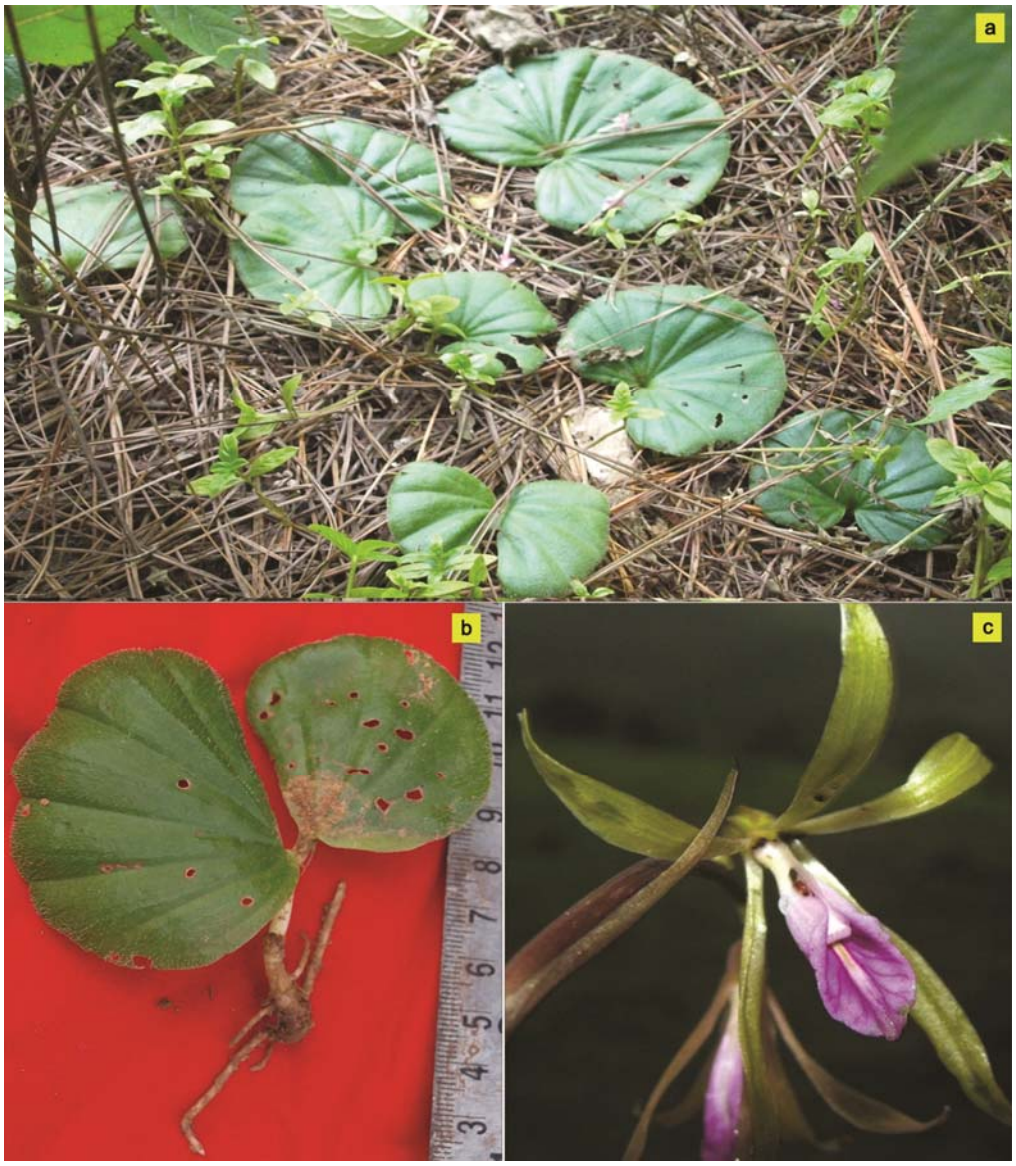

Plate 3 — *Nervilia plicata* (Andr.) Schltr. a) Habitat, b) Habit, and c) Flower

above the ground, short petiolate, orbicular-cordate, 4–12 cm across, rounded and short apiculate at apex, cordate at base, slightly wavy or nearly entire along margins, sometimes irregularly denticulate microscopically; upper surface pale green to dark green, often decorated with dark purple blotches, setulose, seta transparent and appearing whitish, sparse between veins, dense on veins; lower surfaces purplish, especially along veins; petiole 1.5–2.5 cm long. Peduncle pale green sometimes tinged purple, 8-15 cm tall, 2 mm in diam., with 2 sheaths below, sheaths lanceolate, 2–3 cm long. Inflorescence 2–3 flowered racemes. Flowers bracteate, erect or suberect on floral axis. Bracts ovate-lanceolate, entire. Sepals oblong-lanceolate, apex acute; lateral ones slightly oblique and keeled dorsally toward the apex. Petals oblong-lanceolate, entire, acute; lip light purple on the upper surface, with dark purple hue near middle veins, whitish on the lower surface, rhombic-ovate, obscurely 3-lobed or nearly unlobed; lateral lobes erect and embracing column, apex or mid lobe spreading, obtuse, often with longitudinal plica near the tip. Labellum rounded, entire or slightly cleft at the tip, slightly saccate at base. Column clavate at apex, 7–10 mm long, distinctly dilated at the apex. Anther white; pollinia clavate, 1.2 mm long; stigma rectangular, concave; rostellum nearly rectangular, truncate at apex.

Ecological notes- Grows on the moist forest floor under the shade of understorey vegetation of sal forest.

Fl .&fr.: July – September

Distribution- Australia, China, India, Malaysia, Myanmar, Papua New Guinea, Philippines and Thailand.

Specimen examined (Photographic)- Hawai pati 10231 (Herbarium MLV Government College, Bhilwara)

***Nervilia prainiana* (King & Pantl.) Seid. & Smit**

Nervilia prainiana (King & Pantl.) Seid. & Smit., Orch. Thailand 730. 1964; Seidenf. in Dansk. Bot. Ark. 32(2):149. 1978; Khanna, Fl. Madhya Pradesh 3: f. 5. 54-56. 2001. *Nervilia monantha* Blatt. in *J. Bombay nat. Hist. Soc.* 35: 724. 1932. *Pogonia prainiana* King & Pantl. in *J. Asiat. Soc. Beng.* 65: 129. 1896 (Plate 4)

Synonyms- *Pogonia prainiana* King & Pantl, *Nervilia monantha* King & Pantl., *Nervilia monantha* Blatt.

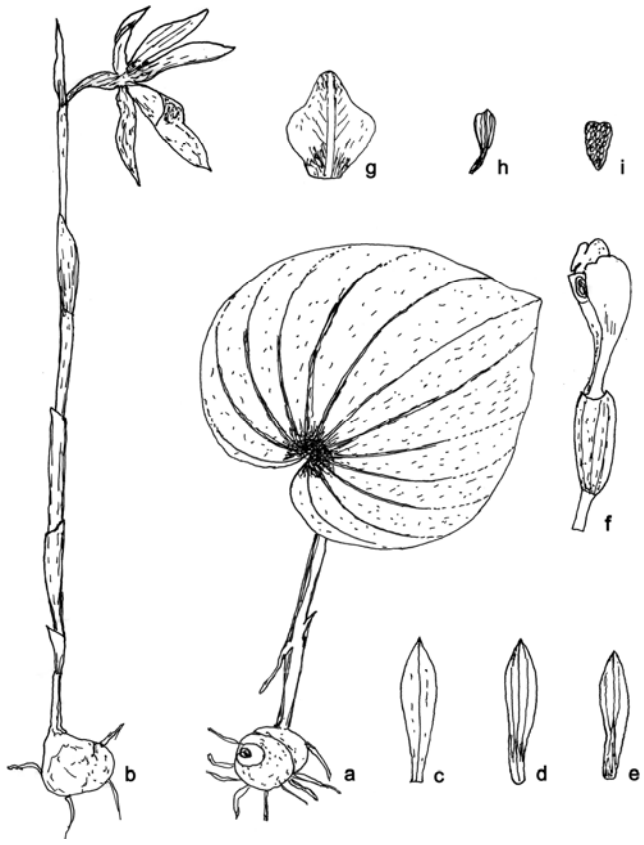

Fig. 1 — *Nervilia plicata* (Andr.) Schltr.: a) Vegetative habitat, b) Flowering habit, c) Dorsal sepal, d) Lateral sepal, e) Petal, f) Column with intact anther, g) Lip, h) Ovary, and i) Pollinia.

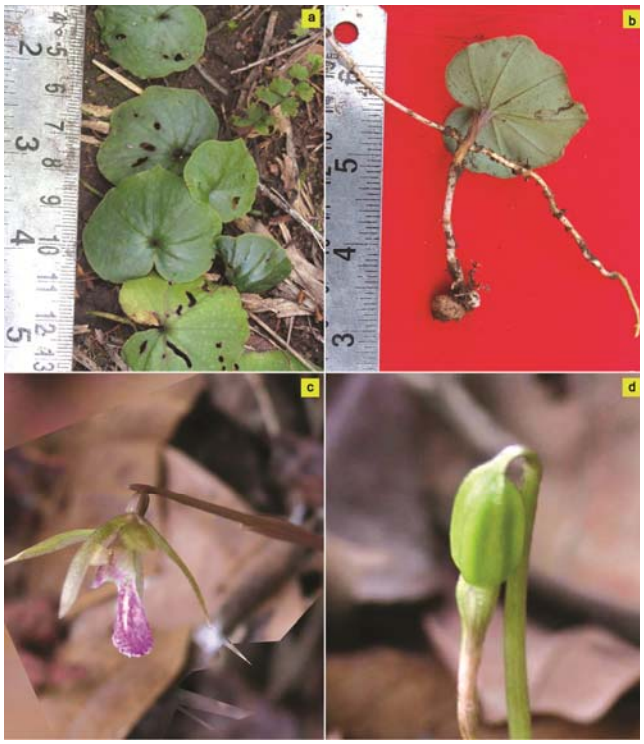

Plate 4 — *Nervilia prainiana* (King & Pantl.) Seid. & Smit. a) Habitat, b) Habit, c) Flower and d) Fruit.

Type- India, Malwa Region, Padmini lake, Meena KL 8017, Herbarium MLV Government College, Bhilwara.

Terrestrial tuberous herb. Tuber ovate. Leaves flat on the ground, reniform-cordate or broadly infundibuliform, 4–7 cm across. Flower solitary on 5–7 cm long peduncles. Bracts triangular small. Sepal greenish white. Petal purplish with white blotch at the base of lip. Labellum pale pink, more or less tubular, obscurely 3-lobed, and rarely saccate, mid lobe connive around the column. Column clavate, glabrous. Capsules broadly fusiform, ribbed.

Ecological notes- Grows as undergrowth of Sal forest.

Fl.& fr.- July–October.

Distribution- Peninsular & N.E. India, Himalaya.

Specimen examined (Photographic)- Padmini lake 8017 (Herbarium MLV Government College, Bhilwara).

Discussion

Based on the botanical excursions of the Malwa region, confirmed in this study, giving preliminary Red List assessments of LC (least concern) and EN (endangered), respectively. Although the number of confirmed localities is presently limited to fewer than 10, it is possible that the species is under-recorded given

its brief flowering period and "non-orchid-like" leaf. It is also possible that plants of *N. plicata* have been misidentified as *N. aragoana* at other localities, especially if they have only been observed in leaf. Our observations indicate that only one of the known populations is currently under threat, with construction work encroaching into the type locality in the Malwa region. We do not regard the species' distribution as "severely fragmented", with many *Nervilia* species having a similarly scattered occurrence. The habitat of *N. plicata* is generally threatened throughout the region, due to logging and establishment of exotic forestry plantations. However, *N. plicata* appears to be tolerant of moderate disturbance and can establish in secondary woodland and grassland. Tubers of related members of *Nervilia* are heavily exploited in traditional Ethnomedicine, and the spread of itinerant traders buying up wild plants in rural villages throughout the study area for export to medicine man poses a considerable threat to many purportedly medicinal orchids. The tubers also consumed by Shepherd boys during grazing of animals and destruction of habitats are affecting the population of this rare and threatened species. On the strength of current knowledge, we estimate the global population of *N. prainiana* to amount to less than 1,000 plants, although we are unable to judge the extent to which populations are made up of ramets belonging to just one or a few clones versus genetically distinct individuals all derived from seed. We therefore presently regard *N. plicata* as NT based on Red List Criterion B (geographic range[12]), with the large EOO (Species Extent of Occurrence) set against the limited number of localities known for the species, the observed decline in number of individuals and habitat quality at one site, the loss of natural forest throughout its range, and the projected impact of harvesting for the medicinal plant trade; we expect that Area of Occupancy (AOO) will rise with more detailed surveys and closer examination of populations in the region. Hence conservation measures like protecting the whole habitat, restricting the consumption by shepherd's boy should be undertaken.

Acknowledgement

The authors are grateful to forest officers of Pachmarhi Biosphere Reserve for their permission and co-operation during the fieldwork. Mr. Sahib Khan and Mr. Rakesh Kashyap Botanical guide of Pachmarhi Biosphere Reserve for their help in various ways.

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