



TWO NEW RECORDS OF *ATHYRIUM* FOR BALI

Received June 1, 2022; accepted July 1, 2022


WITA WARDANI

Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia. Kampus UI Gedung E Level 2, Jln. Lingkar Kampus Raya, Pondok Cina, Beji, Depok 16424, Indonesia.
Herbarium Bogoriense, Research Center for Biosystematics and Evolution, National Research and Innovation Agency (BRIN), Jln. Raya Jakarta-Bogor Km. 46, Cibinong, Bogor 16911, Indonesia. Email: wt.wardani@gmail.com.
 <https://orcid.org/0000-0002-0132-1354>.

BAYU ADJIE

Research Center for Biosystematics and Evolution, National Research and Innovation Agency (BRIN), Jln. Raya Jakarta-Bogor Km. 46, Cibinong, Bogor 16911, Indonesia.
Email: biobayu@gmail.com.  <https://orcid.org/0000-0003-2980-1402>.

KUSUMADEWI SRI YULITA

Research Center for Ecology and Ethnobiology, National Research and Innovation Agency (BRIN), Jln. Raya Jakarta-Bogor Km. 46, Cibinong, Bogor 16911, Indonesia.
Email: yulita.kusumadewi@gmail.com.  <https://orcid.org/0000-0002-5911-7604>.

ANDI SALAMAH

Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia. Kampus UI Gedung E Level 2, Jln. Lingkar Kampus Raya, Pondok Cina, Beji, Depok 16424, Indonesia.
Email: salamah@sci.ui.ac.id.  <https://orcid.org/0000-0002-4074-8342>.

ABSTRACT

WARDANI, W., ADJIE, B., YULITA, K. S. & SALAMAH, A. 2022. Two new records of *Athyrium* for Bali. *Reinwardtia* 21(2): 43–47. — Here we reported two species of *Athyrium* from Bali for the first time based on herbarium study and field work. We provided morphological description, voucher specimens, and taxonomic note for both species. A key to all the four known species of *Athyrium* s.l. in Bali was also provided.

Key words: Athyriaceae, *Athyrium*, new record.

ABSTRAK

WARDANI, W., ADJIE, B., YULITA, K. S. & SALAMAH, A. 2022. Dua rekaman baru *Athyrium* untuk Bali. *Reinwardtia* 21(2): 43–47. — Dua jenis *Athyrium* dilaporkan untuk pertama kalinya dari Pulau Bali berdasarkan studi herbarium dan pengamatan di lapangan. Pertelaan morfologi, daftar spesimen dan catatan-catatan taksonomi untuk keduanya diuraikan di dalam tulisan ini. Selain itu, kunci identifikasi menuju keempat jenis *Athyrium* s.l. yang telah diketahui dari Pulau Bali disajikan.

Kata kunci: Athyriaceae, *Athyrium*, rekaman baru.

INTRODUCTION

Athyrium is a terrestrial fern genus in Athyriaceae that in the broad sense would include *Cornopteris*, *Anisocampium* (Wei *et al.*, 2018) and the recently published genus *Ephemeropteris* (Moran *et al.*, 2019). This group distributes mostly in the northern Asia that extended southward to the Paleotropics areas and some species are known to the neotropics (Hassler, 2004–2022). In the Malesian region, based on published literatures and initial examination of specimens, there are more than 20 recognized species of *Athyrium* s.s. (Wardani & Adjie, 2018; Hassler, 2004–2022), one *Anisocam-*

pium (Liu *et al.*, 2011) and five *Cornopteris* (Kato, 1979 & 1986). There has no *Athyrium* s.s. been recorded in Bali so far. Although there are three species known to the nearby Lesser Sunda Islands *i.e.*, *A. puncticaule* from Lombok, *A. erythropodum* from Flores, and *A. nigripes* from Timor, and eight species known to Java (Wardani & Adjie, 2018).

During a trip to Mount Batukaru, Bali, we found two populations of Athyriaceae along a trail on the southeast slope at around 1,800 m asl. Subsequent herbarium study revealed that these two populations belong to two *Athyrium* s.s. species. The detail results are presented here.



Fig. 1. A. *Athyrium erythropodum*. B. *A. nigripes* found in Mt. Batukaru, Bali. Photos by Wita Wardani.

MATERIALS AND METHODS

Herbarium specimen of *Athyrium s.l.* stored in BO and photographs from L, K, and BM were gathered for observation and sorted based on their morphological characters. Two specimens (Fig. 1) were obtained in a short trip to Mount Batukaru, Bali, at 8°20'22.2" S 115°5'49.2" E. Detail examination were carried using Olympus stereo microscope SZ61 equipped with long arm, calibrated eyepiece and camera. In addition, photograph of specimen housed in PE and TAIF that available online, as well as photographs of specimen provided by various herbaria accessible through JSTOR Global Plant are also consulted for comparison.

RESULTS

TAXONOMIC TREATMENT

1. *ATHYRIUM ERYTHROPODUM* Hayata – Icon. Pl. Formosan. 4:233, t.163. (1914).

Stipes stramineous ± 20 cm long, basal part dark, covered with dark scales with pale margin, scales 4–5 mm long 0.3–0.6 mm wide. *Fronde*s to 30 cm

long, apex sometimes long acuminate, rachises partly purplish, especially on the upper part, covered with short hairs (Fig. 2). *Pinnae* opposite or sub-opposite at basal, alternate upward; second or third basal pinnae the longest, 10–11 cm long 2.4–2.5 cm wide, acuminate; pinnae rachises purplish, fleshy projections present on pinnae rachises (Fig. 3). *Pinnules* largest at basal pinnae, about 1.5 cm long and 0.75 cm wide, anadromous, cuneate-truncate at base, auricled, rounded to acute apex, margin serrate, shallowly lobed except at basal acroscopic part that sometimes incised almost to the costae. Only basal pinnules of basal pinnae are distinctly stalked. No spine on the midrib. *Sori* elongates, close to the midrib, 1.4–1.7 mm long, indusium fimbriate.

Distribution. Taiwan, Philippine, Java, Lesser Sunda Islands (Bali, Flores). In Bali only known from south east slope of Mt. Batukaru as reported here.

Habitat. In the forest at high altitude, 1,800 m asl.

Note. This species was thought to be Taiwan endemic until Liu *et al.* (2008) who recorded the species from the Philippines and provided a detail

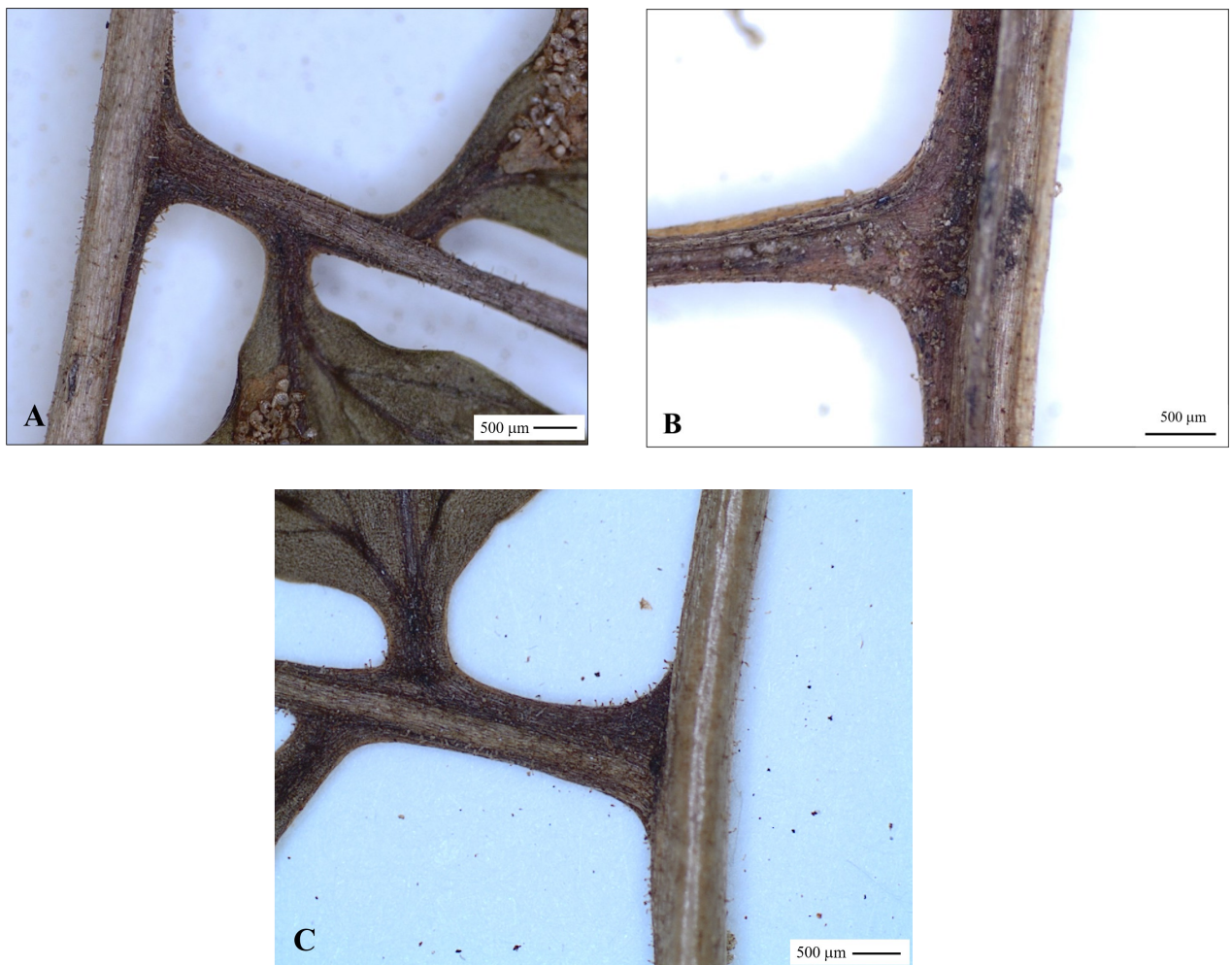


Fig. 2. Comparison of rachis of the two specimens from Bali. A. *Athyrium erythropodum*, WT 1404b, with short hair. B. *A. nigripes*, WT 1404a, glabrous. As reference. C. *A. erythropodum* M.A. Donk P25 from Java. Photos by Wita Wardani.

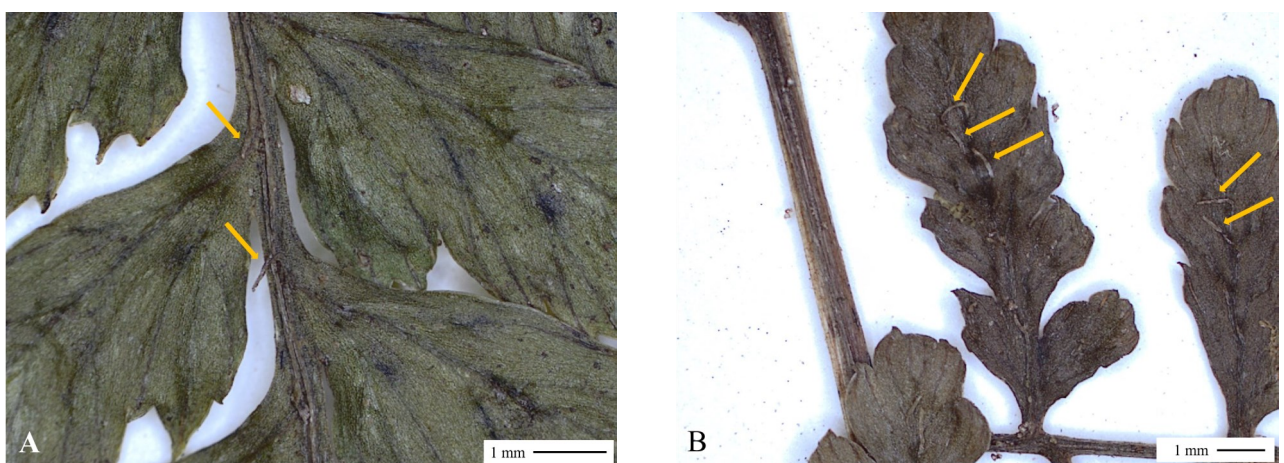


Fig. 3. Fleshy projection and "spine" in A. *Athyrium erythropodum*, the projection on pinnae rachis is more prominent toward apex. B. *A. nigripes* distinctly has long spine on the midrib. Photos by Wita Wardani.

Identification key to *Athyrium s.l.* in Bali

1. a. Lamina pinnate without fleshy projections (spines) on the ridge of costae groove, lowland species *Anisocampium cumingianum*
- b. Lamina pinnate to bipinnate with fleshy projection (spine) on the ridge of pinnae rachis, costae or midrib groove, high altitude species 2
2. a. Sori exindusiate, lamina bipinatifid (except basal lamina that partly pinnate), equilateral pinnae base ..
..... *Cornopteris opaca*
- b. Sori indusiate, lamina bipinnate, inequilateral pinnae base 3
3. a. Scales on stipes dark, some with pale margin, axis with short hairs, pinnules with strongly serrate margin, no spine on the midrib *A. erythropodum*
- b. Scales on stipes pale, axis glabrous, pinnules margin crenate, long spine on the midrib *A. nigripes*

comparison between *A. erythropodum* and similar species. In 2014, Y.C. Liu visited Bogor Herbarium and reidentified several *Athyrium* specimens from Java as *A. erythropodum*, and these specimens were served as our reference in identification.

Specimens examined. INDONESIA, Bali, Mt. Batukaru, 22 March 2022, *WT1404b* (BO). Flores, o. helling G. Mandasawoe, 17 November 1932, *Posthumus 3364* (BO). Java, West Java, Tjibodas, 1915, *Sapiin 2768* (BO); Tjibeureum-Tjibodas, 12 April 1941, *M.A. Donk P25* (BO); Gede, Tjibodas, no date, *T. Nakai s.n.* (BO); G. Patoeha, 25 September 1941, *M.A. Donk P695bis* (BO); East Java, z. helling G. Anjasmoro, 19 July 1936, *Posthumus 3968* (BO); w. helling G. Welirang, 31 July 1933, *Posthumus 3611* (BO).

2. *ATHYRIUM NIGRIPES* (Blume) T.Moore – Index. Fil. 49 (1857).

Stipes stramineous, 15–17 cm long, clothed with pale scales 6–7 mm long, 0.3–0.5 wide, darker toward basal and rhizome. *Fronde* 25–30 cm long, apex acuminate, upper part of rachis dark, glabrous (Fig. 2). *Pinnae* alternate, second basal is the longest, 8–9 cm long, 2.2–2.6 cm wide, basal pinnae distinctly wider and ovate compare to the next, pinnae rachis dark. Only basal pinnule at basal pinnae have stalk. *Pinnules* longest at basal pinnae, 1.5–2 cm long, 0.5 cm wide, with rounded apex, cuneate base, auricled, deeply lobed that gradually less incised toward apex, distance between pinnules 0.5–0.7 mm long, anadromous. Spine present on abaxial part of the midrib (Fig. 3). *Sori* indusiate, short elongate, 0.9–1.3 mm long.

Distribution. Java, Lesser Sunda Islands (Bali, Timor). In Bali only known from south east slope of Mt. Batukaru as reported here.

Habitat. In the forest at high altitude, 1,800 m asl.

Note. This species has a complicated taxonomy. It is often misreported from India, Sri Lanka, China and neighbouring area and confused with *A. setiferum* C.Chr. as explained in Fraser-Jenkins *et al.* (2018). In 2016, the first author visited K and examined Blume's type specimen collected from Java under microscope and documented the photographs. Our specimen conforms to Blume's type specimen in the long spines on the midrib, serrate margin, glabrous rachis, and pale scales at the base of stipes.

Specimens examined. INDONESIA, Bali, Mt. Batukaru, 22 March 2022, *WT1404a* (BO). Timor, Mutis, 15 November 1935, *de Voog 2345* (BO). Java, West Java, G. Gede, 19 September 1911, *C.A. Backer 3326* (BO); G. Gedeh boven Tjibodas, 27 May 1914, *C.A. Backer 13602* (BO); w. helling G. Patoeha, 26 March 1914, *C.A. Backer 12654* (BO); Pangerango, no date, *Raciborski s.n.* (BO); Kandang Badak, no date, *Raciborski s.n.* (BO); Pangerango, 20 March 1925, *Posthumus 176* (BO); Tjibodas, path from Tjibeureum to Kandang Badak, 12 September 1950, *A.G.H. Adelbert 165* (BO); Gede-Pangrango, Lebak Saat, November 1939, *M.A. Donk P345* (BO); G. Patoeha, 25 September 1941, *M.A. Donk P735* (BO); G. Patoeha, north slope above Tjimanggoe, 25 September 1941, *M.A. Donk P699* (BO); G. Papandajan, 30 March 1930, *C.G.G.H. van Steenis 4307* (BO); Mt. Gedeh, Tjibodas Nature Reserve, Air Panas, 21 June 1953, *W. Meijer 1518* (BO). East Java, G. Tengger, no date, *Mousset 1152* (BO); Tjemoro Kandang, G. Kawu, 17 April 1929, *Docters van Leeuwen-Reijnvaan 12345* (BO); G. Tjemoro Kandang, 9 September 1936, *Posthumus 3991* (BO). Central Java, z.o. Prahoe, 8 July 1912, *Lorzing 531* (BO); No information on location, no date, *Blume s.n.* (type) (K). Photo: West Java, Burangrang, no date, *Blume s.n.* (syntype) (L).

ACKNOWLEDGEMENTS

We thank Mr. I Nyoman Peneng and Mr. Moh. Adenan who guides and taking care of us excellently during the trip to Mt. Batukaru.

REFERENCES

- FRASER-JENKINS, C. R., GANDHI, K. N. & KHOLIA, B. S. 2018. *An Annotated Checklist of Indian Pteridophytes Part-2 (Woodsiaceae to Dryopteridaceae)*. Bishen Singh Mahendra Pal Singh. Dehra Dun (India).
- HASSLER, M. 2004–2022. *World Plants. Synonymic Checklist and Distribution of The World Flora. V13.0*; last update May 29th, 2022. www.worldplants.de. (Accessed 31 May 2022).
- KATO, M. 1979. Taxonomic study of the genus *Cornopteris* (Athyriaceae). *Acta Phytotaxonomica et Geobotanica* 30(4–6): 101–118.
- KATO, M. 1986. Two species of *Cornopteris* (Athyriaceae) in Seram and the reduction of *Neoathyrium* Ching et Wang. *Journal of Japanese Botany* 61(8): 229–237.
- LIU, Y. C., FRASER-JENKINS, C. R., AMAROSO, V. B., CHIOU, W. L. 2008. *Athyrium erythropodum* (Woodsiaceae, Pteridophyta) a new Philippine record. *Blumea* 53: 447–451.
- LIU, Y. C., CHIOU, W. L. & KATO, M. 2011. Molecular phylogeny and taxonomy of the fern genus *Anisocampium* (Athyriaceae). *Taxon* 60: 824–830.
- MORAN, R. C., HANKS, J. F. & SUNDUE, M. 2019. Phylogenetic relationship of Neotropical lady ferns (Athyriaceae) with a description of *Ephemeropteris*, gen. nov. *Taxon* 68(3): 425–441.
- WARDANI, W. & ADJIE, B. 2018. The genus *Athyrium* Roth in Malesia: a checklist with working names and distributions. *Sibbaldia* 16: 39–48.
- WEI, R., EBIHARA, A., ZHU, Y. M., ZHAO, C. F., HENNEQUIN, S. & ZHANG, X. C. 2018. A total-evidence phylogeny of the lady fern genus *Athyrium* Roth. (Athyriaceae), with a new infrageneric classification. *Molecular Phylogenetics and Evolution* 119: 25–36.

