



CONTRIBUTION TO THE KNOWLEDGE OF THE GENUS *NEOHYPODISCUS* (ASCOMYCOTA) IN SOUTH AMERICA: FIRST RECORDS OF *N. CEREBRINUS* AND *N. RICKII* FROM NORTHWESTERN ARGENTINA

CONTRIBUCIÓN AL CONOCIMIENTO DEL GÉNERO *NEOHYPODISCUS*
(ASCOMYCOTA) EN SUDAMÉRICA: PRIMER REGISTRO DE *N. CEREBRINUS* Y
N. RICKII EN EL NOROESTE DE ARGENTINA

Patricia V. Medina¹ & Esteban B. Sir^{2,3,4*}

1. Fundación Miguel Lillo, Instituto Criptogámico-Sección Micología, San Miguel de Tucumán, Argentina
2. Instituto de Bioprospección y Fisiología Vegetal-INBIOFIV (CONICET-UNT), San Miguel de Tucumán, Argentina
3. Consejo Nacional de Investigaciones Científicas y Técnicas de Argentina (CONICET), Argentina
4. Facultad de Ciencias Naturales e Instituto Miguel Lillo, Universidad Nacional de Tucumán, San Miguel de Tucumán, Argentina

*sirestebanbenjamin@gmail.com

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SUMMARY

Background and aims: *Neohypodiscus* was established to replace *Hypodiscus*, a later homonym of an angiosperm. The genus is restricted to the Americas and is characterized by massive stromata with non-amyloid unitunicate asci and brown septate ascospores. Although currently classified within the order Boliniales, its taxonomic position within the Sordariomycetes remains uncertain. In this article, we contribute to the understanding of *Neohypodiscus* in the context of the Southern Cone of South America.

M&M: Specimens were collected from both protected natural areas in the northwest of the country and urban areas. The study was conducted using conventional mycological techniques and both light and epifluorescence microscopy.

Results: *Neohypodiscus cerebrinus* and *N. rickii* are described and thoroughly illustrated with photographic images. Taxonomic notes and observations on host preference are provided. In addition, preliminary observations on the interaction between a fungicolous fungus and the stromata of *N. rickii* are presented.

Conclusions: This study expands the known distribution of *Neohypodiscus* species in the Southern Cone of South America. In particular, *N. cerebrinus*—although widespread across the Americas—appears to be rare within Las Yungas, where it may exhibit host specificity for *Ocotea porphyria*. In contrast, *N. rickii* occurs on diverse native and exotic plant species, and its stromata are frequently colonized by a fungicolous basidiomycete. The findings suggest a dual ecological role for *Neohypodiscus* as both a saprobe and a mycohost

KEY WORDS

Funga, new records, Sordariomycetes, Yungas.

RESUMEN

Introducción y objetivos: *Neohypodiscus* fue establecido para sustituir al nombre genérico *Hypodiscus*, un homónimo posterior de un género de angiosperma. El género está restringido al continente americano y se caracteriza por presentar estromas masivos con ascos unitunicados no amiloides y ascosporas castañas septadas. Aunque actualmente está clasificado en el Orden Boliniales, su posición taxonómica en la clase Sordariomycetes es incierta. Este trabajo contribuye al conocimiento actual de *Neohypodiscus* en el Cono Sur de Sudamérica.

M&M: Los especímenes fueron colectados en áreas naturales protegidas del noroeste argentino y en zonas urbanas. El estudio se realizó siguiendo técnicas micológicas convencionales y microscopía óptica y de epifluorescencia.

Resultados: Se describen a *Neohypodiscus cerebrinus* y *N. rickii*, aportando notas taxonómicas, observaciones sobre la preferencia de hospedadores e ilustraciones fotográficas detalladas. Además, se presentan observaciones preliminares e imágenes fotográficas de la interacción de un Basidiomycota fungícola con estromas de *N. rickii*.

Conclusiones: Este estudio amplía la distribución conocida del género *Neohypodiscus* en el Cono Sur de Sudamérica. En particular, *N. cerebrinus* está ampliamente distribuido en América, sin embargo, es una especie rara en el ecosistema de Las Yungas, donde parece mostrar especificidad con *Ocotea porphyria*. Por el contrario, *N. rickii* está relacionado con diversas especies vegetales, y sus estromas están frecuentemente colonizados por un Basidiomycete fungícola. Estos hallazgos sugieren un doble rol ecológico de *Neohypodiscus*, como saprobio y micohospedador.

PALABRAS CLAVE

Funga, nuevos registros, Sordariomycetes, Yungas.

INTRODUCTION

In 1923, Lloyd proposed the segregation of two new genera from *Hypoxylon* Bull., based on the restriction of the hymenial layer to the disc: *Sarcoxylon* Cooke and *Hypodiscus* Lloyd. However, the latter name was already in use for an angiosperm genus described by Ness. Therefore, Rogers *et al.* (1994) introduced *Neohypodiscus* J. D. Rogers, Y. M. Ju & Læssøe as a valid replacement. Initially, they classified it to the family Amphisphaeriaceae G. Winter *sensu lato*, based on the absence of an apical ring in the asci and the presence of ascospores with germ pores. Kang *et al.* (1999), in their study on the Amphisphaeriales D. Hawksw. & O. E. Erikss., noted that the presence of a pulvinate stromata and a conspicuous refractive apical ring in *Neohypodiscus* are strong morphological traits that distinguish it from both Amphisphaeriaceae and Clypeosphaeriaceae. The taxonomic placement of *Neohypodiscus* remains under debate, mainly due to the absence of supporting molecular data (Untereiner *et al.*, 2013). It is currently regarded as part of Boliniaceae because of its morphological traits, which resemble those of *Camarops* P. Karst. and *Apiorhynchostoma* Petr. (Andersson *et al.*, 1995; Huang *et al.*, 2021).

Three species, *N. cerebrinus* (Fée) J. D. Rogers, Y. M. Ju & Læssøe, *N. irradians* (Mont.) J. D. Rogers, Y. M. Ju & Læssøe, and *N. rickii* (Lloyd) J. D. Rogers, Y. M. Ju & Læssøe, comprise this genus. They are morphologically defined by subglobose, pulvinate to irregular stromata with a fibrous to woody texture and distinctive appearance, often described as “grotesque”. Their asci possess a refractive, non-amyloid apical ring, and the brown ascospores are one-septate, featuring hyaline polar appendages and occasionally a pore at one end. The asexual morph remains unknown in all members of the *Neohypodiscus* (Rogers *et al.*, 1994).

The distribution of *Neohypodiscus* spans the tropical and subtropical areas of America, including the Atlantic Forest in Brazil and the Peruvian Andes in South America, which are currently the southernmost limits of its known range (Rogers *et al.*, 1994). In this report, we describe *N. cerebrinus* and *N. rickii* for the first time in Argentina, based on specimens collected in the provinces of Jujuy, Salta, and Tucumán. These findings significantly expand the known geographic range of the genus in the Southern Cone of South America.

MATERIALS AND METHODS

Sampling was conducted in various nature reserves within the Yungas region of Argentina, located in the provinces of Jujuy, Salta, and Tucumán. In Tucumán, additional fresh material was collected from two sites Percy Hill Park, in the Yerba Buena Department, and the botanical garden of the Fundación Miguel Lillo, in the Capital Department.

Microscopic structures in wet mounts were examined by preparing distilled water, potassium hydroxide solution (3 % and 5 % KOH), and 1 % phloxine. Melzer’s iodine reagent was used to evaluate the amyloid reaction (Sir, 2021). Calcofluor (0.05 % mixed in sodium phosphate buffer, pH 8) was also used to observe the samples under epifluorescence microscopy (EFM) (Romero & Minter, 1988). Taxonomic validation was carried out following established criteria by Rogers *et al.* (1994).

Names of the authors of the fungal and plant species were taken from Index Fungorum (<https://indexfungorum.org>) and Tropicos (<https://www.tropicos.org>), respectively. The reference collections were deposited in the fungario of LIL herbarium. (acronyms are from Index Herbariorum, <http://sciweb.nybg.org/science2/IndexHerbariorum.asp>).

RESULTS

Neohypodiscus cerebrinus (Fée) J. D. Rogers, Y. M. Ju & Læssøe, *Mycologia* 86: 686. 1994. TYPE: BRAZIL. 1863, Desmazieres 8 (*holotype* PC, as *Sphaeria cerebrina* Fée, *Sphaeria cerebrina* Mont., and *Xylaria cerebrina* Desm., not observed). Fig. 1.

Stromata subglobose to hemispherical to pulvinate, with narrow to broad connection to substrate, 6-15 mm diam., 3-7 mm thick, surface roughened with conic warts, sepia to blackish with brown or grey tones. Outer peritheciium-bearing layer 1-1.4 mm thick, carbonized, hard. Inner layer below perithecia fibrous to woody. Perithecia ovoid, 0.4-0.85 mm high, 0.3-0.7 mm broad, ostioles umbilicate, lying in valleys between warts. Asci cylindrical, 8-spored, 161-214 µm x 10-13 µm, the spore-bearing part 107-158 µm, stipes 39-107 µm, with minute apical ring not staining

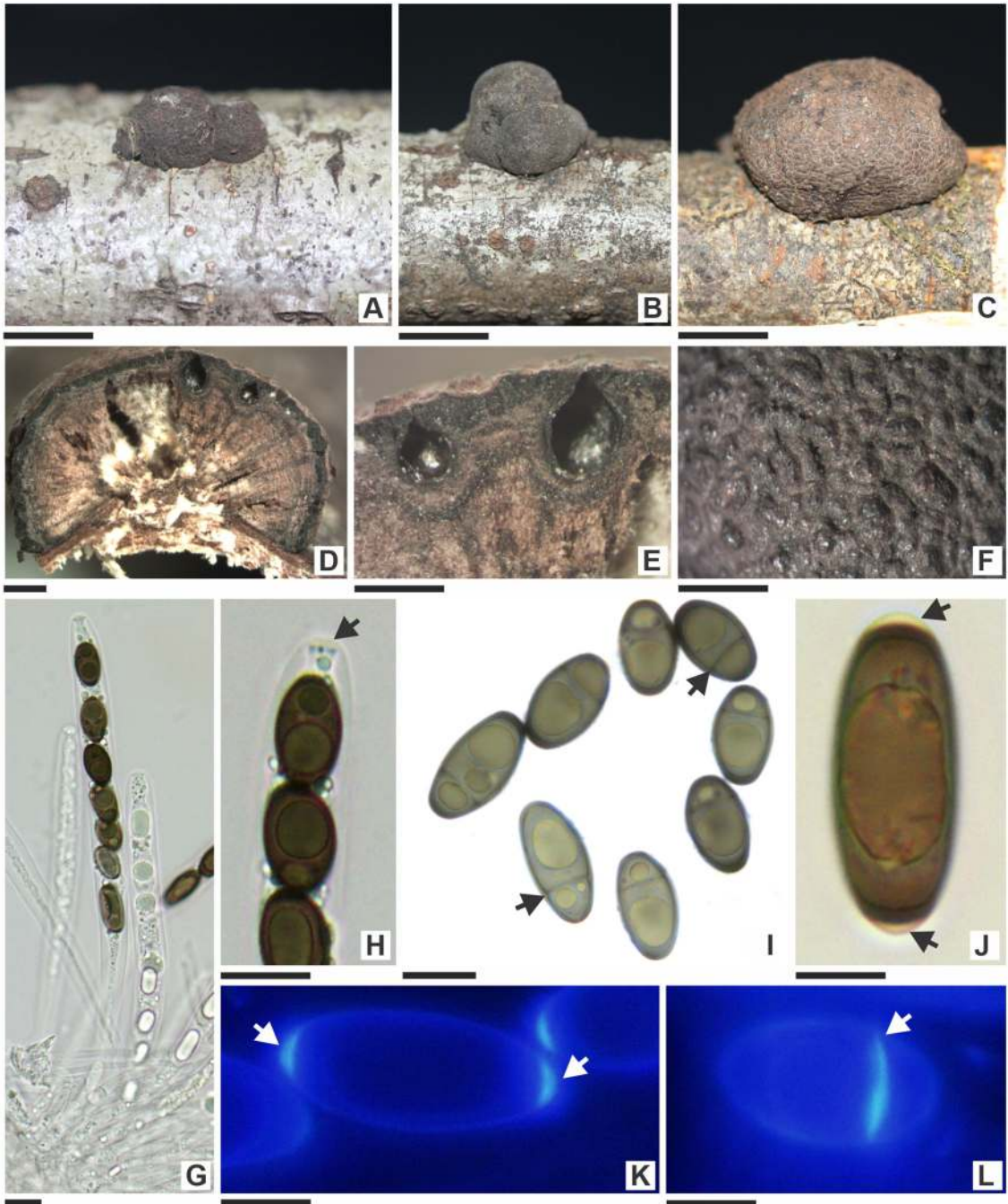


Fig. 1. *Neohypodiscus cerebrinus*. **A-C:** Stromata. **D:** Outer perithecium-bearing layer, inner layer below perithecia with layer composed of alternating zones and longitudinal radii of fibrous to woody tissue. **E:** Perithecia ovoid. **F:** Surface roughened with conic wart. **G:** Asci 8-spored, cylindrical. **H:** Minute apical ring not staining in Melzer's iodine reagent (arrow). **I:** Ascospores showing septum (arrows). **J:** Ascospores with apical thickening and noncellular appendage on each end (arrows). **K:** Ascospores with apical thickening and noncellular appendage on each end on calcofluor (arrows). **L:** Ascospores showing septum on calcofluor (arrow). Scales= A-B: 1 cm; C: 5 mm; D-F: 1 mm; G-I: 10 μ m; J-L: 5 μ m. (Sir & Hladki 216, LIL161057).

in Melzer's iodine reagent. Paraphyses abundant, septate, mostly unbranched, much longer than asci, 2-8 μm broad. Ascospores ellipsoid to somewhat ellipsoid-inequilateral to nearly rectangular, one-celled or unequally two-celled, (14.1) 16.3-20.4 (21.1) $\times$ (7.0) 8.2-10.5 (10.9) μm ($N = 40$, *av.* 18.3 $\times$ 9.3 μm); smooth, many with apical thickening or noncellular appendage on each end, with a germ pore at one end, brown. Anamorph unknown.

Material examined. ARGENTINA. Salta Prov.: *Anta Dept.*, Parque Nacional El Rey, 24° 43' 36.47" S, 64° 40' 00.39" W, 975 m a.s.l., 14-V-2012, *Sir & Hladki* 216 (LIL161057). Tucumán Prov.: *Yerba Buena Dept.*, Parque Sierras de San Javier, 26° 46' 50.8" S, 65° 20' 07.6" W, 800 m a.s.l., 21-V-2013, *Sir & Hladki* 443 (LIL161058).

Distribution and habitat. *Neohypodiscus cerebrinus* is a widely distributed fungus in the Americas. In South America, it has been recorded in tropical and subtropical regions, including Brazil (Rio de Janeiro), Guyana, Peru, and Surinam. In Central America, it has been cited in Cuba, the Dominican Republic, Jamaica, and Trinidad. In

North America, it has been reported in the USA for the states of California, Florida, and Oregon (Rogers *et al.*, 1994; Herrera & González, 2004). In Argentina, this fungus is encountered on dead fallen branches, most likely from *Ocotea porphyria* (Griseb.) van der Werff (Lauraceae) (Fig. 2).

Comments. *Neohypodiscus cerebrinus* is distinguished by its globose to hemispherical stromata, with fibrous to woody internal tissue and a hard, roughened surface. Its ascospores are sometimes one-septate, ellipsoid to somewhat ellipsoid-inequilateral with apical thickening or noncellular appendage on each end. In contrast to the description provided by Rogers *et al.* (1994), the specimens from Las Yungas show smaller stromata (0.6-1.5 $\times$ 0.3-0.7 cm vs 1-6 cm $\times$ 1-4 cm), longer asci (161-214 vs 160-170 μm) and shorter ascospores [(14.1) 16.3-20.4 (21.1) vs (14.5-)18.5-25.5(-34.0) μm].

Neohypodiscus rickii (Lloyd) J. D. Rogers, Y. M. Ju & Læssøe. *Mycologia* 86: 685. 1994. TYPE: GUYANA. On wood, Leprieur 231 (*Holotype* PC; *Isotype*: FH; not observed). Figs. 3-4.

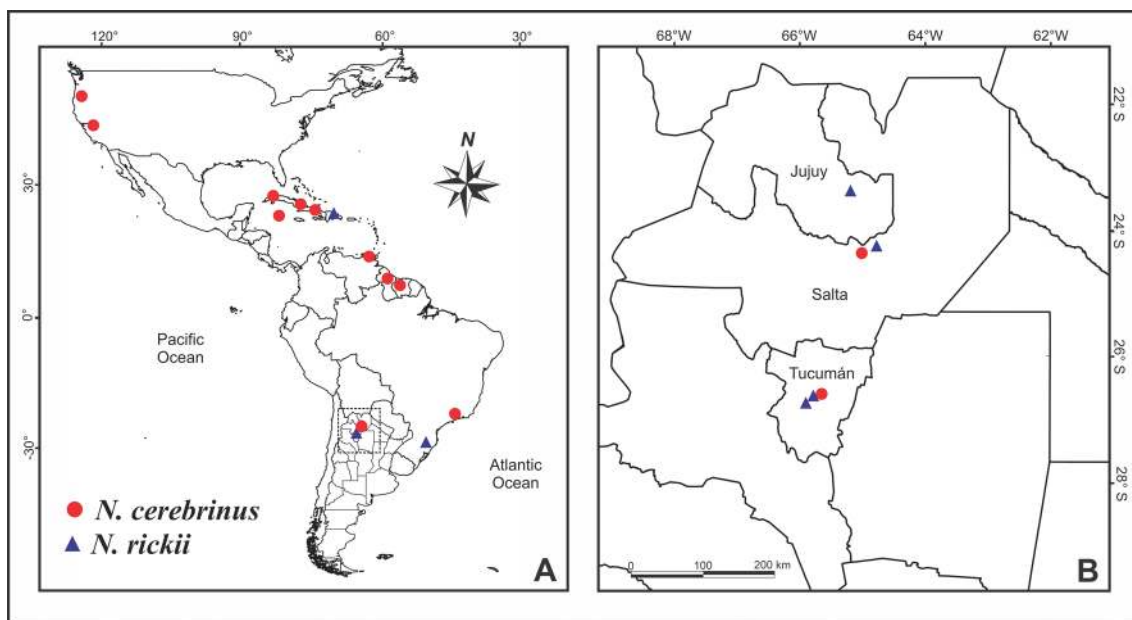


Fig. 2. Distribution maps. **A:** Distribution of *Neohypodiscus* species in the Americas. **B:** Collection sites in northwestern Argentina.



Fig. 3. *Neohypodiscus rickii*. **A-B:** Mature stromata on substrate. **C:** Surface of young stromata. **D:** Brown cellular hairs in young and mature stromata. **E:** Surface of mature stromata. **F:** Perithecia. **G:** Mature and immature asci in water. **H:** Apical ascus showing a non-amyloid apparatus (arrow). **I:** Ascospores in water. **J:** Ascospores showing noncellular appendages (black arrows) and septum (grey arrow). **K:** Ascospores with noncellular appendage on each end (white arrows) and septum (grey arrow) on calcofluor. Scales= A-B, F: 1 cm; C, E: 3 mm; D, G: 25 μ m; H-K: 10 μ m. (Sir & Hladki 031, LIL161059).

Stromata hemispherical, subglobose to angular, confluent in mass up to 15 cm broad, with narrow to broad connection to substrate, 1-4 cm high, 1-4 broad, usually on old stromata. Surface brown to dull brown with veins of dull orange and brown cellular hairs in young and mature stromata, smooth and black in old stromata. Outer perithecium-bearing layer 0.8-2.7 mm thick, had. Inner layer below perithecia fibrous to woody, ostioles umbilicate or slightly raised. Asci cylindrical, 8-spored, 193-232.5 μm length,

10.7-13 μm broad, the spore-bearing part 118-191 μm , stipes 32-44 μm , with minute apical ring not staining by Melzer's iodine reagent. Paraphyses abundant, septate, mostly unbranched, much longer than asci, 2-8 μm broad. Ascospores ellipsoid-inequilateral to crescentic, septate near one end or sometimes two-septate, (19.5) 23.1-29.7 (32.6) $\times$ (6.3) 6.8-8.6 (9.5) μm , (N= 60, av. 26.5 $\times$ 7.5 μm), smooth with an apical thickening or noncellular appendage on both ends, with a germ pore at one end, brown. Anamorph unknown.

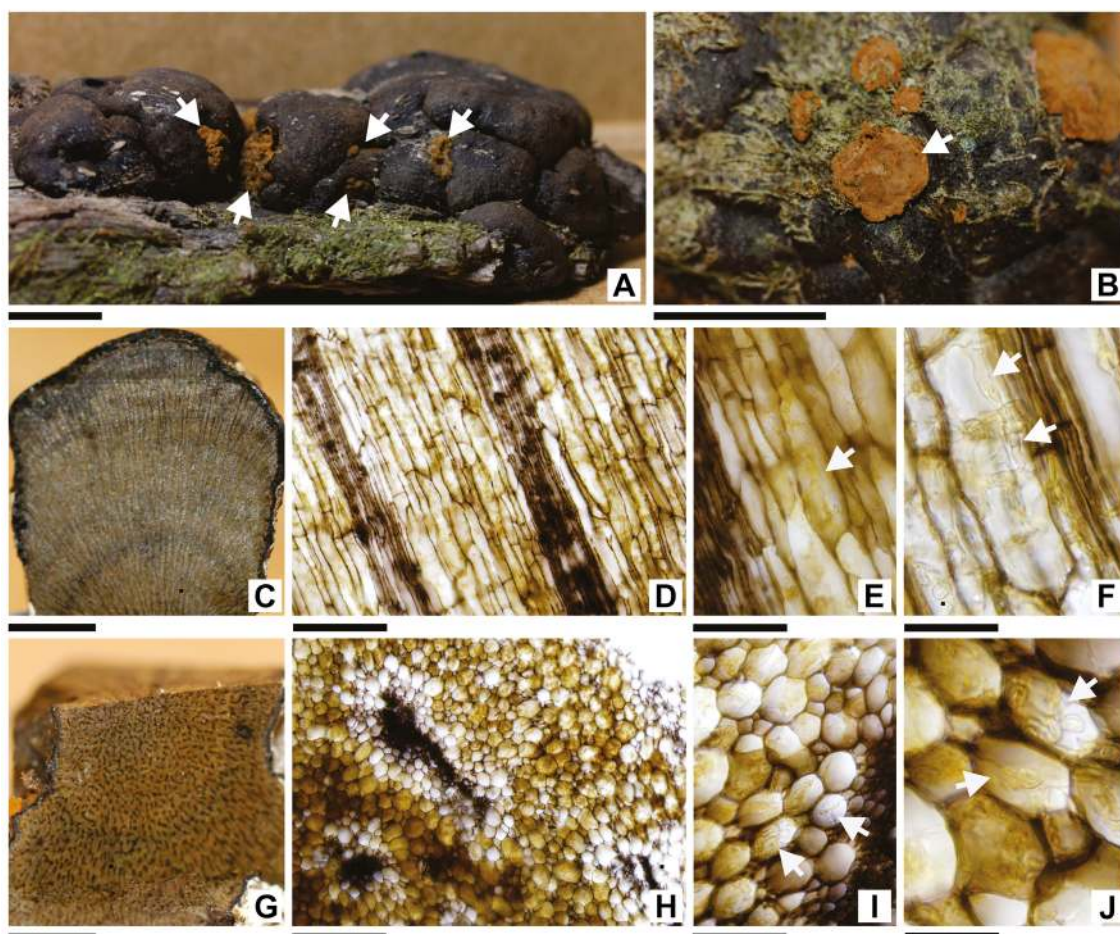


Fig. 4. Stromata of *Neohypodiscus rickii* associated to fungicolous fungi. **A-B:** Basidiomes (arrows) over stromata. **C:** Stroma in longitudinal section showing fibrous to woody tissue beneath the perithecia. **D-F:** Detail of stromata cells in longitudinal section showing internal hyphae of fungicolous fungi (arrows). **G:** Stromatal tissue in transversal section. **H-J:** Stromata tissue in transversal section shows intracellular hyphae (arrows). Scales= A-B: 1 cm; C, G: 2 mm; D, H: 50 μm ; E, I: 15 μm ; F, J: 5 μm (Sir & Hladki 031, LIL161059).

Material examined. ARGENTINA. Jujuy Prov.: *Ledesma Dept.*, Parque Nacional Calilegua, on dead trunk of *Ocotea porphyria*, 23° 43' 49.96" S, 64° 52' 20.97" W, 809 m a.s.l., 11-V-2012, *Sir & Hladki 031* (LIL161059). Salta Prov.: *Anta Dept.*, Parque Nacional El Rey, on dead trunk of *O. porphyria*, 24° 43' 33.4" S, 64° 39' 51.9" W, 973 m a.s.l., 29-IV-2014, *Sir & Hladki 754* (LIL161060); *Ibid.*, 28-V-2015, *Sir & Hladki 931* (LIL161062). Tucumán Prov.: *Capital Dept.*, Jardín Botánico – Fundación Miguel Lillo, on dead trunk, 26° 49' 50.1" S, 65° 13' 09.6" W, 331 m a.s.l., VII-2021, *Sir s/n* (LIL161063). *Yerba Buena Dept.*, Parque Sierras de San Javier, on trunk of *O. porphyria*, 26° 46' 50.8" S, 65° 20' 07.6" W, 800 m a.s.l., 9-V-2016, *Sir 1021* (LIL161064); *Ibid.*, Cuesta Vieja, on dead branches of *Morus* sp., 26° 46' 50.8" S, 65° 20' 07.6" W, 800 m a.s.l., 27-XI-2017, *Sir 1087* (LIL161065); *Ibid.*, El Funicular, on dead branch of *O. porphyria*, 26° 47' 06.5" S, 65° 19' 55.3" W, 692 m a.s.l., 27-XI-2017, *Sir 1096* (LIL161066); *Ibid.*, Parque Percy Hill, on indeterminate dead trunk, 26° 48' 35" S, 65° 16' 59" W, 500 m a.s.l., VII-2021, *Sir s/n* (LIL161068).

Distribution and habitat. *Neohypodiscus rickii* has been scarcely recorded worldwide; to date, it has been documented for Rio Grande do Sul (Brazil), Guyana, and Puerto Rico (Rogers *et al.*, 1994). In the Northwest Argentina montane forest, *N. rickii* is commonly associated to old, dead trunks of *Ocotea porphyria* (Griseb.) van der Werff (Fig. 2). Some specimens were also found on recently dead trunk of *Terminalia trifolia* Spreng., *Jacaranda mimosifolia* D. Don, and *Morus* sp.

Comments. This fungus is recognised in the field by its hemispherical or globose to angular stromata, aggregated in an irregular stroma mass. Both young and mature stromata are frequently found growing over older ones.

Rogers *et al.* (1994) noted that *N. irradians* and *N. rickii* (Lloyd) J. D. Rogers, Y. M. Ju & Læssøe exhibit remarkable similarity. They suppose that the spore length range is likely a sufficient character to distinguish them (26.5-32 vs. 21-26.5 µm). However, they also suggested that these species might be conspecifics. The specimens from Las Yungas exhibit spores with a broad length range (19.5-32.6 µm), providing further support for their possible conspecific.

Remarkably, all specimens encountered in the region exhibit an association with a basidiome of a presumed polypore fungus (Fig. 4A-B). Microscopic examinations of stromatal cross sections show extensive colonization by yellowish, septate hyphae, likely from the associated Basidiomycete (Fig. 4D-J).

DISCUSSION AND CONCLUSIONS

Our study provides an updated record of the distribution and ecology of the *Neohypodiscus* genus in the Southern Cone of South America, highlighting its presence in a new territory and its possible affinity with native species in the Argentinean Yungas. Although the genus is distributed and documented throughout the Americas, information about its host preferences remains remarkably scarce (Rogers *et al.*, 1994; Herrera & González, 2004). The constant incidence of these species on dead trunks or dead branches of *Ocotea porphyria* (Lauraceae) in this ecosystem suggests a potential host specificity in the region.

Neohypodiscus cerebrinus is the most widespread and frequent species of the genus on the American continent, with specimens recorded from the United States to northern Argentina (Herrera & González, 2004). However, its presence in the latter region appears to be limited, as only two specimens have been collected over more than a decade of intensive mycological surveys. In contrast, *N. rickii* is the most common species in Las Yungas, and unlike *N. cerebrinus*, this fungus has a broader host range. It is commonly found on *O. porphyria*, but its stromata have also been observed growing on other native species belonging to Bignoniaceae and Combretaceae, as well as on exotic species of Moraceae. The seasonal persistence and aggregated growth of stromata in *N. rickii* probably account for its higher frequency and the relative ease with which it is encountered in the region. In contrast, the stromata of *N. cerebrinus* occur in isolation, and their internal tissues appear to disintegrate readily under the environmental conditions of the Yungas ecosystem, which would limit their local occurrence.

It is noteworthy that several stromata of *N. rickii* are associated with basidiomes, whose hyphae appear to colonize and probably

parasitize the stromatal tissues. Among the Basidiomycota, fungal parasitism is a well-recognized ecological strategy, with over 200 species described as fungicolous fungi (Sun *et al.*, 2019). Our preliminary observations suggest that *N. rickii* may have two ecological roles in Las Yungas ecosystem: a) as a saprobe on woody substrates and b) as a mycohost for other fungal species occupying similar trophic niches. Further collections and research are needed to elucidate the nature of these interactions and the trophic dynamics between the associated fungi.

AUTHOR CONTRIBUTIONS

PVM: writing, editing of the original draft and provision of resources. EBS: resources, taxonomic analyses, writing, and editing of the original draft and figures. Both authors reviewed and approved the final manuscript.

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