



A, B. Sporocarps, habit, showing colour variation (bars = 1 mm). C. Spores (bar = 10 μ m). [Photographs: A. Michaud]

Physarum lakhanpalii Nann.-Bremek. & Y. Yamam., *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen Series C, Biological and Medical Sciences* **90**(3): 335 (1987). [*IndexFungorum* 130410; *Physaraceae, Physarales*]

Diagnostic features. Most similar to *Physarum decipiens* M.A. Curtis from which it can be distinguished by its clustered spores.

On natural substratum. *Plasmodium* appearance not known. *Hypothallus* delicate, colourless, not prominent at the base of sporocarps. *Sporocarps* predominantly plasmodiocarps sessile on a narrow base, \pm vermicular, simple or sparingly branched, often subglobose-confluent, 0.5 mm wide and up to 10 mm long, rough, rugose, yellow. *Stalk* absent. *Peridium* appearing single, consisting of two closely adherent layers dehiscing as one, the inner membranous, colourless, the outer containing lime agglomerations forming numerous scaly, yellow, irregularly confluent protruberances; dehiscence with an irregular, \pm apical

longitudinal crack. *Capillitium* a dense, reticulate, colourless net, with numerous, rounded or spiky, irregularly elongate, in part confluent yellow lime nodes. *Columella* absent. *Spores* dark brown *en masse*, violaceous brown in transmitted light, adhering in clusters of mostly 4–6, subglobose, (10–)11–12.5(–14) µm diam., densely, rather evenly, minutely warted.

ASSOCIATED ORGANISMS & SUBSTRATA: *Plantae*. *Aloë* sp. (leaf); *Cinnamomum camphora* (L.) J. Presl (bark); *Cocos nucifera* L. (leaf, stem); *Cryptomeria japonica* (Thunb. ex L. f.) D. Don (bark); *Euphorbia* sp. (bark); *Juniperus chinensis* L. (bark); *Liquidambar formosana* Hance; *Metasequoia glyptostroboides* Hu & W.C. Cheng (bark); *Morus* sp. (bark); *Musa* sp. (spathe); *Plantae* indet. (bark, liana); *Plumeria alba* L. (bark); *Podocarpus macrophyllus* (Thunb.) Sweet (bark); *Ravenala madagascariensis* Sonn. (leaf); *Terminalia microcarpa* Steud. (bark). **Associated organism of type specimen.** *Plantae* indet. [as ‘bark of dead branch’].

INTERACTIONS & HABITATS: Most information about this species is based on sporocarps and spores (the dispersal phase), and observed associations with other organisms usually only indicate the physical substratum on which sporocarps form. Other observations are rare, particularly of trophic phases (myxamoebae and swarm cells [individual haploid amoeba-like cells], and plasmodia [multi-nucleate, diploid, and often extensive cytoplasm]), and dormant phases (microcysts and sclerotia). As a result, very little is known about nutrition and interactions beyond broad statements that myxomycetes feed on living bacteria and fungi, and on non-living organic material (MARTIN & ALEXOPOULOS, 1969). A study of bark microenvironments for myxomycetes in Japan, including the present species, found that higher calcium levels in bark and neutral bark pH determined abundance of *Physarum* species (TAKAHASHI, 2014). This species has been recorded on living bark, bark of dead branches, and leaf litter. Nothing is known of the habitats it occupies. Beyond what is known generally about the nutrition of *Physarum*, there is no information about any specific associations with animals, fungi or micro-organisms.

GEOGRAPHICAL DISTRIBUTION: AFRICA: Madagascar, Tanzania. CENTRAL AMERICA: Panama. NORTH AMERICA: Mexico. SOUTH AMERICA: Ecuador. ASIA: China (Hong Kong, Hunan), Japan, Laos, Philippines, Taiwan, Vietnam. AUSTRALASIA: Australia (Northern Territory). CARIBBEAN: Martinique. EUROPE: France, Germany, Greece, Ireland, Norway, Spain. INDIAN OCEAN: La Réunion, Seychelles. Further unconfirmed records from Canary Islands (Tenerife), and India (NANNENGA-BREMEKAMP & YAMAMOTO, 1987). Largely warm-temperate to tropical. Apparently native throughout its known range. Records up to 900 m above sea level in Madagascar and 470 m above sea level in France.

ECONOMIC IMPACTS: Studies in Japan including this species suggest that myxomycetes may be useful as indicators of environmental pollution (TAKAHASHI, 2014). No other evaluation has been made of any possible positive economic impact of this organism (e.g. as a recycler, as a source of useful products, as a provider of checks and balances within its ecosystem, etc.). No reports of negative economic impacts have been found.

INFRASPECIFIC VARIATION: No subspecific taxa have been described [*SpeciesFungorum*, accessed 23 August 2017].

DISPERSAL & TRANSMISSION: Primarily by airborne spores, particularly for longer distances; some local dispersal may also occur by movement of myxamoebae and plasmodia.

CONSERVATION STATUS: **Previous evaluations.** None. **Information base.** Over 130 records (specimens, databases and bibliographic sources combined, excluding duplicates) from at least November 1974 to June 2016, with observations in February, April, May, June, July, August, September, October, November and December. **Estimated extent of occurrence** [calculated using <http://geocat.kew.org>]. Over 12.4 million km² (Africa including La Réunion and Seychelles: 2.2 million km²; Asia: 4.8 million km²; Australasia: insufficient data; Caribbean, Central America and North America: 1.7 million km²; Europe: 3.7 million km²; South America: insufficient data). **Estimated area of occupancy** [calculated using <http://geocat.kew.org>]. Well over 120 km². The method for estimating area of occupancy has

produced an artificially low figure. The species is likely to be under-recorded, despite the admirable and well-organized enthusiasm of often amateur myxomycete experts, because compared with recording of flowering plants and vertebrates, so few people have the skills to search for and identify it. Some of the plants with which it is associated are common and widespread species. **Threats.** *Pollution.* Studies in Japan indicate that this and other species of *Physarum* are sensitive to acid air pollution (TAKAHASHI, 2014). Insufficient information to enable other threats to be identified. **Population trend.** In general, not known. Rare in Vietnam (TRAN *ET AL.*, 2014). Of datable records, c. 0% are pre-1961, 80% post-1960 but pre-2001, and 20% post-2000. **Evaluation.** Using IUCN criteria (IUCN SPECIES SURVIVAL COMMISSION. 2006 *IUCN Red List of Threatened Species* [www.iucnredlist.org]. Downloaded on 15 May 2006), the species is assessed globally as Least Concern. **In situ conservation actions.** None noted. **Ex situ conservation actions.** *Physarum* species grow readily in culture and, using simple techniques, can be induced to sporulate. There are, however, no living strains of this species listed by the Straininfo website [www.straininfo.net, accessed 4 August 2017]. Two partial nucleotide sequences of small subunit ribosomal RNA were found in a search of the NCBI GenBank database [www.ncbi.nlm.nih.gov, accessed 13 August 2017].

NOTES: This species seems to be largely tropical. For further help with identification, the excellent keys provided by POULAIN *ET AL.* (2011) should be consulted.

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- *Fungus Conservation Trust CATE2 Database* [www.abfg.org].
- *GBIF* [www.gbif.org].
- *Google* [www.google.co.uk].
- *Landcare Research New Zealand* [<http://nzfungi2.landcareresearch.co.nz>].
- *Mycportal* [www.mycportal.org].
- *Mycotaxon Regional Checklists in Downloadable Format* [www.mycotaxon.com/resources/weblists.html].
- *National Center for Biotechnology Information* [www.ncbi.nlm.nih.gov].
- *Nomen.mycetozoa.com - an online nomenclatural information system of Eumycetozoa* [<http://eumycetozoa.com>].
- *USDA Fungal Databases* [<https://nt.ars-grin.gov/fungalatabases>].

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Issued by CABI, Bakeham Lane, Egham, Surrey, TW20 9TY, UK

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