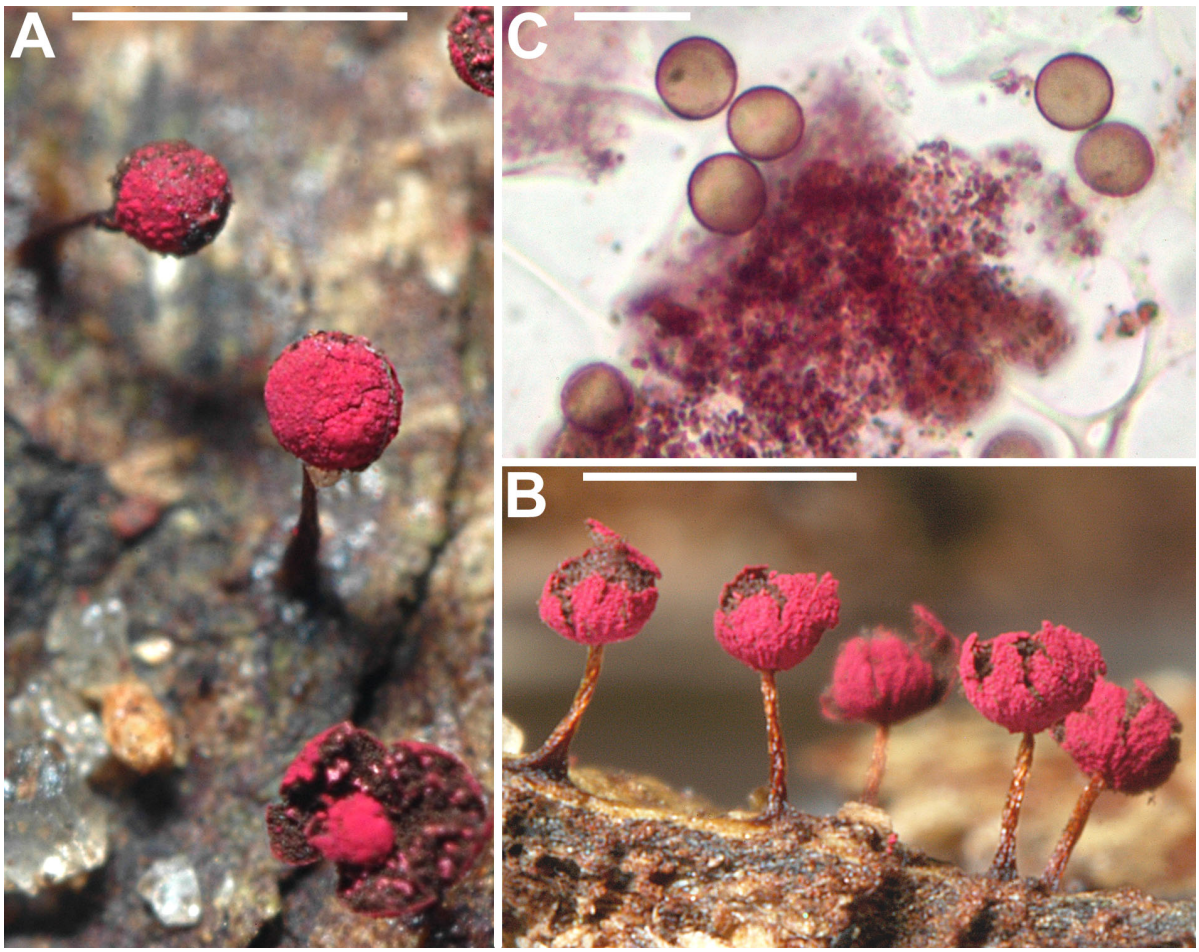

A, **B**. Sporocarps, habit (bars = 1 mm). **C**. Spores (bar = 10 µm). [Photographs: A. Michaud]

Physarum roseum Berk. & Broome, *Journal of the Linnean Society* Botany **14**(no. 74): 84 (1873, publ. 1875). [*IndexFungorum* 243061; *Physaraceae*, *Physarales*]

Lignydium roseum (Berk. & Broome) Kuntze, *Revisio Generum Plantarum* **3**(3): 490 (1898). [*IndexFungorum* 526943]

Physarum roseum var. *discocephalum* Yamash., *Journal of Science of the Hiroshima University* Series B, Division 2, Botany **3**: 29 (1936). [*IndexFungorum* 528802]

Physarum roseum var. *racemosum* Yamash., *Journal of Science of the Hiroshima University* Series B, Division 2, Botany **3**: 30 (1936). [*IndexFungorum* 276799]

Vernacular names. Japanese: *akamojihokori*.

Diagnostic features. Sometimes similar to *Physarum pulcherrimum* Berk. & Ravenel, but more reddish, and with translucent stalks which are free from lime.

On natural substratum. *Plasmodium* maroon or bright red. *Hypothallus* membranous. *Sporocarps* stalked sporangia, grouped or scattered, bright pink to red purple or red scarlet. *Sporothecae* globose, fragile, (0·1–)0·2–0·3(–0·6) mm diam. *Stalk* slender, cylindrical, erect, longitudinally wrinkled, concolorous or paler, ochraceous brown, dark brown, limeless, without calcium carbonate, translucent, expanded at the base, (0·4–)0·7–1(–1·2) mm long. *Peridium* membranous, scarlet or bright purplish red, almost smooth, with included clusters of purplish red lime globules, dehiscence irregular to petaloid. *Capillitium* reticulate, open, formed by a net of filaments with large reddish to purple nodes, the nodes few, large, bright red, angular or irregularly branched, connected by pale pinkish tubules. *Columella* absent. *Spores* purplish black *en masse*, pale pinkish brown in transmitted light, minutely spinulose, the warts rather dispersed and irregularly distributed, with scattered clusters of darker warts, 7–10 µm diam.

ASSOCIATED ORGANISMS & SUBSTRATA: **Animalia**. *Sylvilagus brasiliensis* L. (dung). **Fungi**. *Fungi* indet. [as 'lichen of living tree'] **Plantae**. *Albizia saman* (Jacq.) Merr. [as *Enterolobium saman* (Jacq.) Prain and *Samanea saman* (Jacq.) Merr.] (bark, twig, wood); *Carya hunanensis* C.C. Cheng & R.H. Chang, *Carya* sp. (bark); *Castanopsis cuspidata* (Thunb.) Schottky; *Cinnamomum verum* J. Presl (leaf); *Euphorbia* sp. (leaf); *Gramineae* indet. (leaf); *Lindera erythrocarpa* Makino; *Mangifera indica* L.; *Muscopsida* indet.; *Nephrosperma van-houtteanum* (H. Wendl. ex Van Houtte) Balf. f. (leaf); *Persea borbonia* (L.) Spreng. (leaf); *Pinus densiflora* Siebold & Zucc. (wood), *Pinus* sp. (twig); *Plantae* indet. (bark, leaf, liana, log, stump, trunk, twig, wood); *Poinciana* sp. (bark); *Quercus glauca* Thunb., *Q. variabilis* Blume; *Rhizophora* sp. (bark); *Syzygium jambos* (L.) Alston (trunk). **Associated organism of type specimen**. *Plantae* indet. [as 'dead bark'].

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 temperate secondary forest in Japan, including the present species, showed that myxomycete diversity is greater when leaf litter is derived from more than one tree species and from tree species with different peaks for leaf fall (TAKAHASHI, 2013). A similar study, in warm temperate forest, also in Japan, investigated seasonality in myxomycete sporocarp production, and noted a pronounced peak of sporocarps of the present species in early October (TAKAHASHI & HADA, 2012). There is some evidence that this species prefers broadleaf wood to conifer wood in Japan (TAKAHASHI *ET AL.*, 2009). There are observations of this species on dead bark, dead leaves, decaying wood, lianas, and dung. It has been recorded from the following habitats: amenity & protected areas (including shrines); mangroves; ruderal (including rubbish tips); woodland (including pine forest). Beyond what is known generally about the nutrition of *Physarum*, and single records of this species on dung and on lichen of a living tree, there is no information about any specific associations with animals, fungi or micro-organisms.

GEOGRAPHICAL DISTRIBUTION: AFRICA: Angola, Democratic Republic of Congo, Madagascar, Nigeria, South Africa. CENTRAL AMERICA: Costa Rica, El Salvador, Panama. NORTH AMERICA: Mexico, USA (Alabama, Arkansas, Colorado, Florida, Georgia, Louisiana, Maryland, Mississippi, New Jersey, North Carolina, Pennsylvania, Texas, Virginia). SOUTH AMERICA: Brazil (Maranhão, Pernambuco, Rio Grande do Norte, São Paulo, Sergipe), Colombia, Ecuador, Paraguay. ASIA: China (Fujian, Guangdong, Guangxi, Hunan, Jilin, Liaoning, Shaanxi, Shandong), India (Assam, Madhya Pradesh, Manipur, Tamil Nadu, Uttar Pradesh, Uttarakhand), Indonesia, Japan, Korea, Malaysia, Papua-New Guinea, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam. ATLANTIC OCEAN: Spain (Canary Islands). AUSTRALASIA: Australia (Queensland). CARIBBEAN: Cuba, Dominica, Jamaica, Puerto Rico. EUROPE: France, Spain. INDIAN OCEAN: La Réunion, Mauritius, Seychelles. PACIFIC OCEAN: Japan (Bonin Islands), New Caledonia, USA (Hawaii), Vanuatu.

Warm-temperate to tropical. Apparently native throughout its known range. Records up to 2870 m above

sea level in USA, 2400 m above sea level in Colombia, 1460 m above sea level in El Salvador, 1200 m above sea level in Dominica, 1100 m above sea level in Madagascar, 1050 m above sea level in India, and 400 m above sea level in Australia.

ECONOMIC IMPACTS: No evaluation has been made of any possible positive economic impact of this fungus (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: Two subspecific taxa have been described. Both are treated by *SpeciesFungorum* [accessed 25 August 2017] as synonyms of *P. roseum*.

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 350 records (specimens, databases and bibliographic sources combined, excluding duplicates) from at least January 1860 to July 2012, with observations in January, February, March, April, May, June, July, August, September, October and December. A study in Thailand showed inconclusive evidence of seasonality in appearance of sporocarps (KO *ET AL.*, 2011). **Estimated extent of occurrence** [calculated using *http://geocat.kew.org*]. Over 59·1 million km^2 (Africa: 6·3 million km^2; Asia: 30·6 million km^2; Australasia: insufficient data; Europe: insufficient data; Indian Ocean: 0·2 million km^2; North America: 11·5 million km^2; Pacific Ocean: 2·6 million km^2; South America: 7·9 million km^2). **Estimated area of occupancy** [calculated using *http://geocat.kew.org*]. Well over 364 km^2. 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**. *Habitat destruction*. At least one site for this species has been destroyed now by a housing development. Mining operations may also threaten some populations of this species (REA-MAMINTA *ET AL.*, 2015). Insufficient information to enable other threats to be identified. **Population trend**. In general not known. Abundant in high elevation forests, and common in mango plantations and middle elevation forests in Thaiwan (TRAN *ET AL.*, 2008). Common in Taiwan (LIU *ET AL.*, 2013). Occasional in both Himachal Pradesh and south India [state unspecified] (STEPHENSON *ET AL.*, 1993). Occasional to abundant in Vietnam (TRAN *ET AL.*, 2014). Of datable records, *c.* 15% are pre-1961, 70% post-1960 but pre-2001, and 15% post-2000. Reported as rare in the USA (HAGELSTEIN, 1939). **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 explicitly directed at this species, but many of the sites from which it has been recorded are protected, for example as nature reserves. ***Ex situ* conservation actions**. *Physarum* species, including the present species (CLARK, 1995) 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]. Four 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: The reproductive system of this species has been studied in pure culture, and it has been shown to be nonheterothallic and presumed apomictic. The same research was the first report of successful completion of life cycle *in vitro* for this species (CLARK, 1995; CLARK & HASKINS, 2010). *Physarum roseum* is one of a number of myxomycetes which have been recorded from forest patches on volcanic and ultramafic soils, and research has begun on the likely relationships between those species and the heavy metal environments in which they have been found. This research is exploring both the potential for myxomycetes to play a part in bioremediation of heavily polluted sites, and the possible threats which such specialized organisms face from mining operations (REA-MAMINTA *ET AL.*, 2015). For further help with identification, the excellent keys provided by POULAIN *ET AL.* (2011) should be consulted.

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T.I. Kryvomaz[1], **D.W. Minter**[2] & **A. Michaud**[3]

[1]*Kyiv National University of Construction and Architecture, Kyiv, Ukraine*

[2]*CABI Europe, Egham, UK*

[3]*La Croizette, F-38360 Engins, France*

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