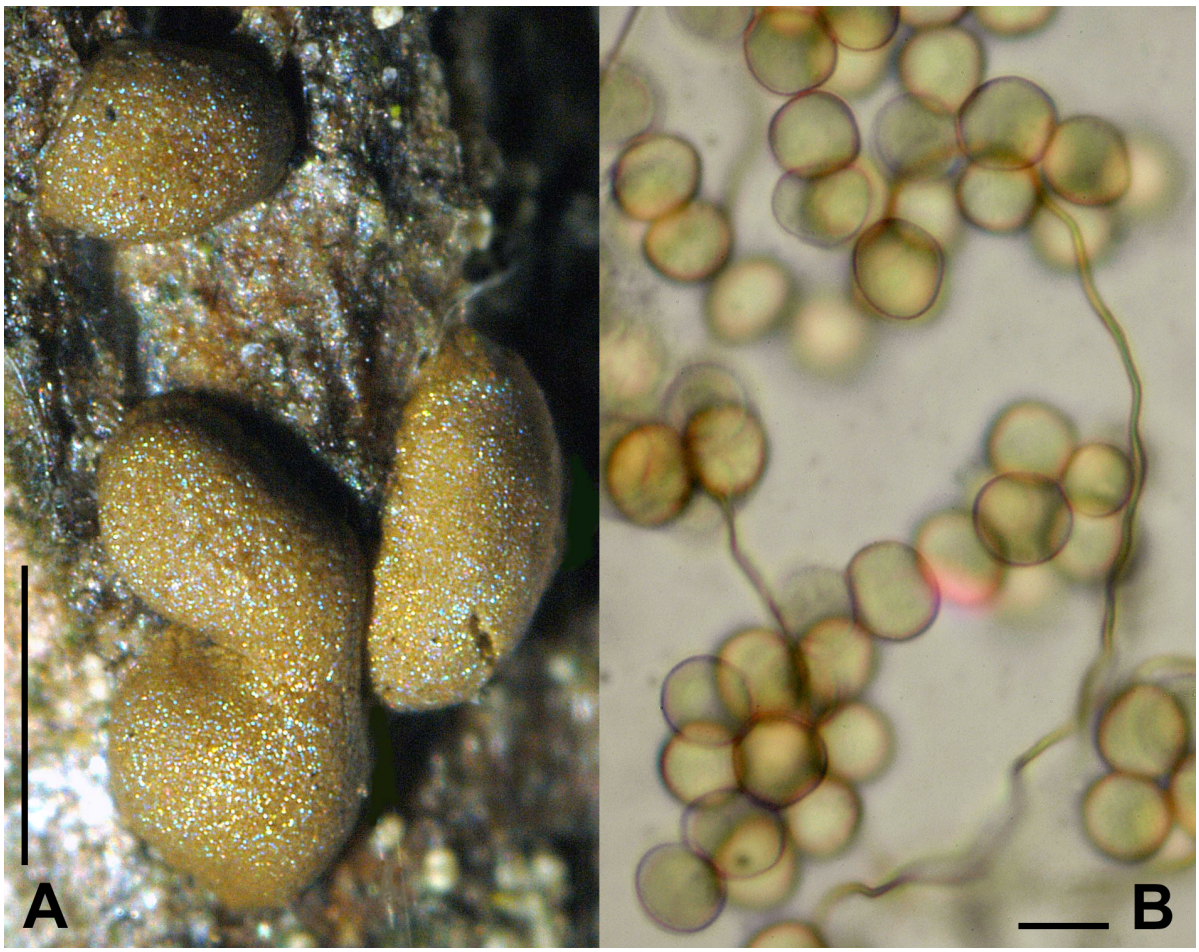
IMI Descriptions of Fungi and Bacteria
No. 1914

CALOMYXA METALLICA



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

Calomyxa metallica (Berk.) Nieuwl., *American Midland Naturalist* **4**: 335 (1916). [*IndexFungorum* 100143]

Physarum metallicum Berk., *Magazine of Zoology and Botany* **1**: 49 (1837). [*IndexFungorum* 227338]

Cornuvia metallica (Berk.) Rostaf., *Śluzowce (Mycetozoa) Monografia* Supplementum 1: 35 (1876). [*IndexFungorum* 210004]

Margarita metallica (Berk.) Lister, *A Monograph of the Mycetozoa*: 203 (1894). [*IndexFungorum* 356583]

Oligonema aeneum P. Karst., *Bidrag till Kännedom Finlands Natur och Folk* **4**: 131 (1879). [*IndexFungorum* 219287]

Perichaena krupii Racib., *Hedwigia* **28**(2): 124 (1889). [*IndexFungorum* 243196]

Perichaena plasmodiocarpa A. Blytt, *Forhandlinger i Videnskaps-Selskabet i Christiania* **2**: 10 (1892). [*IndexFungorum* 144048]

Margarita metallica var. *plasmodiocarpa* (A. Blytt) R.E. Fr., *Svensk Botanisk Tidskrift* **6**: 800 (1912). [*IndexFungorum* 569093]

Margarita pictoviana C.L. Moore, *Proceedings & Transactions of the Nova Scotian Institute of Natural Science* **12**: 196 (1902). [*IndexFungorum* 569094]

Margarita metallica var. *intermedia* Meyl., *Bulletin de la Société Vaudoise de Sciences Naturelles* **46**: 56 (1910). [*IndexFungorum* 250600]

Cornuvia metallica var. *intermedia* (Meyl.) Sacc. & Trotter, *Sylloge Fungorum* **22**: 814 (1913). [*IndexFungorum* 137202]

Calomyxa metallica var. *megaspora* Y. Yamam. & Nann.-Bremek., *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen* **93**(3): 265 (1990). [*IndexFungorum* 127886]

Diagnostic features. The pinkish olive spore mass, iridescent peridium and coiled, simple threads sculptured with abundant, faint warts or spinules make this an easy species to identify. The superficially similar *Prototricha metallica* (Berk.) Massee has capillitial threads marked with spiral bands.

Habit. On dead wood and bark. *Plasmodium* watery white or clear, translucent peachy pink. *Sporocarps* as sessile sporangia and/or plasmodiocarps, dispersed or in small groups, opalescent rosy lilac when fresh, changing to beige or moderate yellow, golden yellow, greyish orange, green or blue-green to deep greenish yellow, coppery or pearly pinkish grey with a brilliant iridescence, with bronze, gold and red reflections. *Hypothallus* inconspicuous. *Stalks* not observed. *Sporangia* comprising sessile or sub-sessile plasmodiocarps on a small base, solitary or gregarious, globose, subglobose, spherical, slightly pulvinate or terete, up to 0·5 mm wide and 3 mm long. *Plasmodiocarps* short, curved, up to 0·5 mm wide and 3 mm long. *Peridium* single, membranous, thin and translucent, shining, pale ochraceous to pale greenish yellow by transmitted light, the inner surface either smooth or minutely punctate, with faint papillae, persistent or evanescent, dehiscence apical and irregular. *Capillitium* an abundant web of long, uniform, elastic grey threads, yellow, pale greenish yellow to colourless by transmitted light, 0·5–2 µm diam., very long, tangled and looped, simple or sparsely branched, profuse, flexuose, with loops, not bi-refringent in polarized light, with few connexions to the peridium; threads protruding elastically and covered with small spirally-arranged faint spinules or wartlets (visible in oil-immersion), running around the thread in a long spiral; free ends blunt, slightly bulbous. *Spores* in mass rosy when fresh then beige, pinkish yellow, yellowish, greenish yellow, olivaceous or pearl grey, fading to dull ochraceous yellow in dried preserved collections; individually free, subglobose, pale greenish yellow to colourless by transmitted light, covered with small spines or warts, (9–)10–11(–12) µm diam.

ASSOCIATED ORGANISMS & SUBSTRATA: **Plantae**: *Castanea sativa* Mill. (bark); *Cedrus deodara* (Roxb.) G. Don; *Eucalyptus* sp. (bark); *Pinus canariensis* C. Sm. (bark, wood), *P. halepensis* Miller (bark, wood), *P. pinaster* Aiton (bark, wood), *P. sylvestris* L. (bark, wood); *Plantae* indet. (bark, wood); *Platanus orientalis* L. (branch, wood); *Pyrus communis* L. (bark); *Quercus cerrioides* Willk. & Costa (bark), *Q. faginea* Lam. (bark), *Q. robur* L. (bark, wood).

INTERACTIONS & HABITATS: Nothing specific is known about interactions between *Calomyxa metallica* and other organisms, but myxomycetes in general, in their plasmodial state, are known to feed on bacteria, yeasts and other single-celled organisms, and they themselves provide food for insects, particularly beetles, and other animals. Some beetle species are known only from myxomycetes, and for some of these there may be a close symbiosis. Myxomycetes may also be found in association with fungi, and some fungi have been found only on myxomycete sporocarps and, presumably, derive their nutrition from them either as parasites or as saprobes. *Calomyxa metallica* sporocarps are generally found on living and dead parts of plants, using the plant material as a substratum, but probably not as a nutrient source. The species is rather common and very widely distributed, but is rarely collected in the field, being more frequently encountered on bark samples placed in moist chamber cultures. When observed *in vivo*, it is found mainly on the bark of large broad-leaved trees, but may also occur on litter, including petioles, leaves and twigs almost always of broad-leaved woody plants, on rotten wood, and on bark of living trees.

GEOGRAPHICAL DISTRIBUTION: AFRICA: Kenya, Morocco. CENTRAL AMERICA: Puerto Rico. NORTH AMERICA: Canada (Manitoba, Nova Scotia, Ontario), México, USA (Alaska, Arizona, California, Colorado, Iowa, Florida, Georgia, Michigan, South Dakota, Texas, Washington, West Virginia). SOUTH

AMERICA: Chile. ANTARCTICA: Danco Coast. ASIA: China, India (Himachal Pradesh), Israel, Japan, Kazakhstan, Pakistan, Philippines, Russia (Chukotka autonomous okrug, Krasnoyarskyi krai, Sverdlovsk oblast, Tiumen' oblast), Taiwan, Turkey. ATLANTIC OCEAN: Ascension Island. AUSTRALASIA: Australia (Victoria, Western Australia), New Zealand. CARIBBEAN: Cuba, Jamaica. EUROPE: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Poland, Russia (Bashkortostan, Komi autonomous republic, Krasnodarskyi krai, Republic of Karelia, Saratov oblast, Voronezh oblast), Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom. PACIFIC OCEAN: USA (Hawaii), Solomon Islands.

ECONOMIC IMPACTS: No evaluation has been made of any possible positive economic impact of this myxomycete (e.g. as a source of useful products, as a provider of checks and balances within its ecosystem, or of other ecosystem services such as recycling, etc.). No reports of negative economic impacts have been found.

INFRASPECIFIC VARIATION: *Margarita metallica* var. *plasmodiocarpa* (A. Blytt) R.E. Fr., *Margarita metallica* var. *intermedia* Meyl. and its obligate synonym *Cornuvia metallica* var. *intermedia* (Meyl.) Sacc. & Trotter, and *Calomyxa metallica* var. *megaspora* Y. Yamam. & Nann.-Bremek. are all taxa described as differing from typical *C. metallica* at varietal level. KOWALSKI (1975) reported that Fries's variety *plasmodiocarpa* did not differ from Meylan's earlier variety *intermedia*, though possibly differing from typical *metallica* 'by being plasmodiocarpous and by having a thick, opaque, brittle, almost cartilaginous peridium'. The distinctions on which all of these varieties were based have not, however, received widespread acceptance, and all are listed above as synonyms of *C. metallica* (Berk.) Nieuwl.

DISPERSAL & TRANSMISSION: Nothing specific is known about *Calomyxa metallica*. Myxomycete spores are produced in dry dusty masses inside sporocarps. The sporocarp outer wall fragments to expose the spores which are then, most probably, primarily dispersed by wind. This dispersal is likely to be totally random unless there is a strong prevailing wind in the vicinity. Insects are known to graze on myxomycete sporocarps, and spores have frequently been found in their faeces. This is therefore also likely to be an important part of their dispersal mechanism. Insect dispersal has the potential to be less random than wind dispersal, but there seem to be no studies of how long spores may remain in an insect digestive tract or of insect movements in relation to myxomycete spore dispersal. After the spores have landed on plant material, each may germinate to produce a single-celled zoospore with one or two flagella. This zoospore may then use its flagella to disperse locally. The zoospores subsequently transform into amoeba-like cells which reproduce by mitosis and aggregate, forming groups which are sometimes sufficiently large as to be seen with the unaided eye. These groups, which are called plasmodia, can also migrate, often in response to light. For almost the whole life cycle, therefore, myxomycetes are mobile organisms, with only the sporocarp stage being fixed in a single location. Unlike members of the kingdom *Fungi*, myxomycetes do not form hyphae, and do not derive nutrition from the plant substrata on which they are found. As a result, it is not meaningful to describe them in terms of transmission. There is no infection stage, and no colony formation inside plant material. Instead, the individual amoebae derive their nutrition by engulfing bacteria, yeasts and other single-celled organisms.

CONSERVATION STATUS: **Information base**. More than 300 records (specimens, databases, bibliographic sources and field observations combined, excluding duplicates) from 1837 to 2008, with observations in January, February, March, April, May, July, August, September, October, November and December, with a main northern hemisphere fruiting season from September to April suggesting that this species may prefer colder periods for fruiting. The species is widely regarded as rather common. Most if not all of its known associated organisms are common and likely to be classified as Least Concern by the IUCN. **Estimated extent of occurrence** [calculated using *http://geocat.kew.org*]. Nearly 57 million km^2 (Africa: insufficient data; Central America: insufficient data; North America: 15·6 million km^2; South America: insufficient data; Asia: 32·7 million km^2; Australasia: 0·6 million km^2; Caribbean: insufficient

data; Europe: 8·1 million km^2; Pacific Ocean: insufficient data). **Estimated area of occupancy** [calculated using *http://geocat.kew.org*]. About 264 km^2. The method for estimating area of occupancy has probably produced an artificially low figure. **Population trend**. Not reported, but sufficient records may exist for some analysis to be possible. **Threats**. No specific threats have been identified. **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. Some recent records, however, originate from protected areas. ***Ex situ* conservation actions**. No sequences were found in a search of the NCBI GenBank database [*www.ncbi.nlm.nih.gov*]. No living strains of this species were found in a search of the ATCC, CABI, CBS and ICMP culture collection on-line catalogues.

NOTES: Distributional information about this species remains rather fragmentary and insufficient for a proper understanding of its specific ecological requirements. The fruiting season of this species is wider than for most other myxomycetes, and it is very often found in cold months of the year.

The distribution map of this species on the *Eumycetozoan Project* website [*http://slimemold.uark.edu*] provides further georeferenced records but some errors may have occurred in allocating latitudes and longitudes. The record on that map, apparently from the Azores, is in reality from West Virginia.

LITERATURE & OTHER SOURCE MATERIAL: ARAMBARRI, A.M. & SPINEDI, H.A. Antarctic myxomycetes. *Contribuciones del Instituto Antártico Argentino* Buenos Aires **365**: 12 pp. (1989). CAMINO, M., MORENO, G., CASTILLO, A., MITCHELL, D.W. & MINTER, D.W. Additions to the myxomycete biota of Cuba. 1. *Mycotaxon* **106**: 75–102 (2008). EMOTO, Y. *The Myxomycetes of Japan* (Tokyo, Japan: Sangyo Tosho Publishing): 263 pp. (1977). ING, B. *The Myxomycetes of Britain and Ireland* An Identification Handbook (Slough, UK: Richmond Publishing): 374 pp. (1999). KRZEMINIEWSKA, H. Śluzowce Karpat Wschodnich [Slime moulds of the eastern Carpathians]. *Kosmos* Warsaw **59**: 207–223 (1934). LADO, C. & PANDO, F. Myxomycetes, I. *Ceratiomyxales*, *Echinosteliales*, *Liceales*, *Trichiales*. *Flora Mycológica Ibérica* Real Jardín Botánico Madrid **2**: 323 pp. (1997). LISTER, A. *Monograph of the Mycetozoa* A Descriptive Catalogue of the Species in the Herbarium of the British Museum. Edn 3 (London, UK: Oxford University Press): 296 pp., 222 pls (1925). LEONTYEV, D.V., DUDKA, I.O., KOCHERGINA, A.V. & KRIVOMAZ, T.I. New and rare Myxomycetes of Ukraine 3. Forest and forest-steppe zone. *Nova Hedwigia* **94**(3–4): 335–354 (2012). KOWALSKI, D.T. The myxomycete taxa described by Charles Meylan. *Mycologia* **67**(3): 448–494 (1975). MARTIN, G.W. Taxonomic notes on Myxomycetes. III. *Brittonia* **13**: 109–113 (1961). MARTIN, G.W. Taxonomic notes on Myxomycetes. IV. *Brittonia* **14**: 180–185 (1962). MARTIN, G.W. & ALEXOPOULOS, C.J. *The Myxomycetes* (Iowa City, IA: Iowa University Press): 560 pp. (1969). NANNENGA-BREMEKAMP, N.E. *A Guide to Temperate Myxomycetes* (Bristol, UK: Biopress): 409 pp. (1991). NEUBERT, H., NOWOTNY, W. & BAUMANN, K. *Die Myxomyceten Deutschlands und des Angrenzenden Alpenraumes unter Besonderer Berücksichtigung Österreichs* **1**: *Ceratiomyxales*, *Echinosteliales*, *Liceales*, *Trichiales* (Gomaringen, Germany: Karlheinz Baumann Verlag): 340 pp. (1993). NOVOZHILOV, Y.K. [as НОВОЖИЛОВ, Ю.К.] *Определитель грибов России: отдел Слизевики* **1**. Класс Миксомицеты [*An Identification Handbook of Russian Fungi* **1**. Class Myxomycetes] (Санкт Петербург: Наука [Sankt-Peterburg: Nauka]): 288 pp. (1993). POULAIN, M., MEYER, M. & BOZONNET, J. *Les Myxomycètes* (Sévrier, France: Fédération Mycologique et Botanique Dauphin-Savoie) **1**. *Guide de Détermination*: 568 pp., 15 pls; **2**. *Planches*: 544 col. pls (2011). RAMMELOO, J. *Calomyxa metallica* Nieuwl. *Icones Mycologicae* (Meise, Belgium: Nationale Plantentuin van Belgie) Plate 25: 1–3, 8 (1981). THIND, K.S., KHARA, H.S. & SONI, J.S. The Myxomycetes of India – XXIV. *Proceedings, Indian Academy of Sciences* Plant Sciences **41**(1): 47–58 (1971).

See also the following internet pages:

- *Checklist of Fungi of the British Isles* [*www.fieldmycology.net/GBCHKLST/gbchklst.asp*].
- *Cybertruffle* [*www.cybertruffle.org.uk*].
- *GBIF* [*http://data.gbif.org/welcome.htm*].

- *Google* [*www.google.co.uk*].
- *Landcare Research New Zealand* [*http://nzfungi.landcareresearch.co.nz*].
- *Myxomycetes of Ukraine* [*www.myxomycet.com.ua/eng*].
- *National Center for Biotechnology Information* [*www.ncbi.nlm.nih.gov*].
- *Nomen.eumycetozoa.com* [*www.nomen.eumycetozoa.com*].
- *The Eumycetozoan Project* [*http://slimemold.uark.edu*].
- *USDA Fungal Databases* [*http://nt.ars-grin.gov/fungaldatabases/index.cfm*].

T.I. Krivomaz[1], **A. Michaud**[2] & **D.W. Minter**[3]
[1]*Ukrainian Ecological Society, Kiev, Ukraine*
[2]*La Croizette, F-38360 Engins, France*
[3]*CABI Europe, Egham, UK*

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