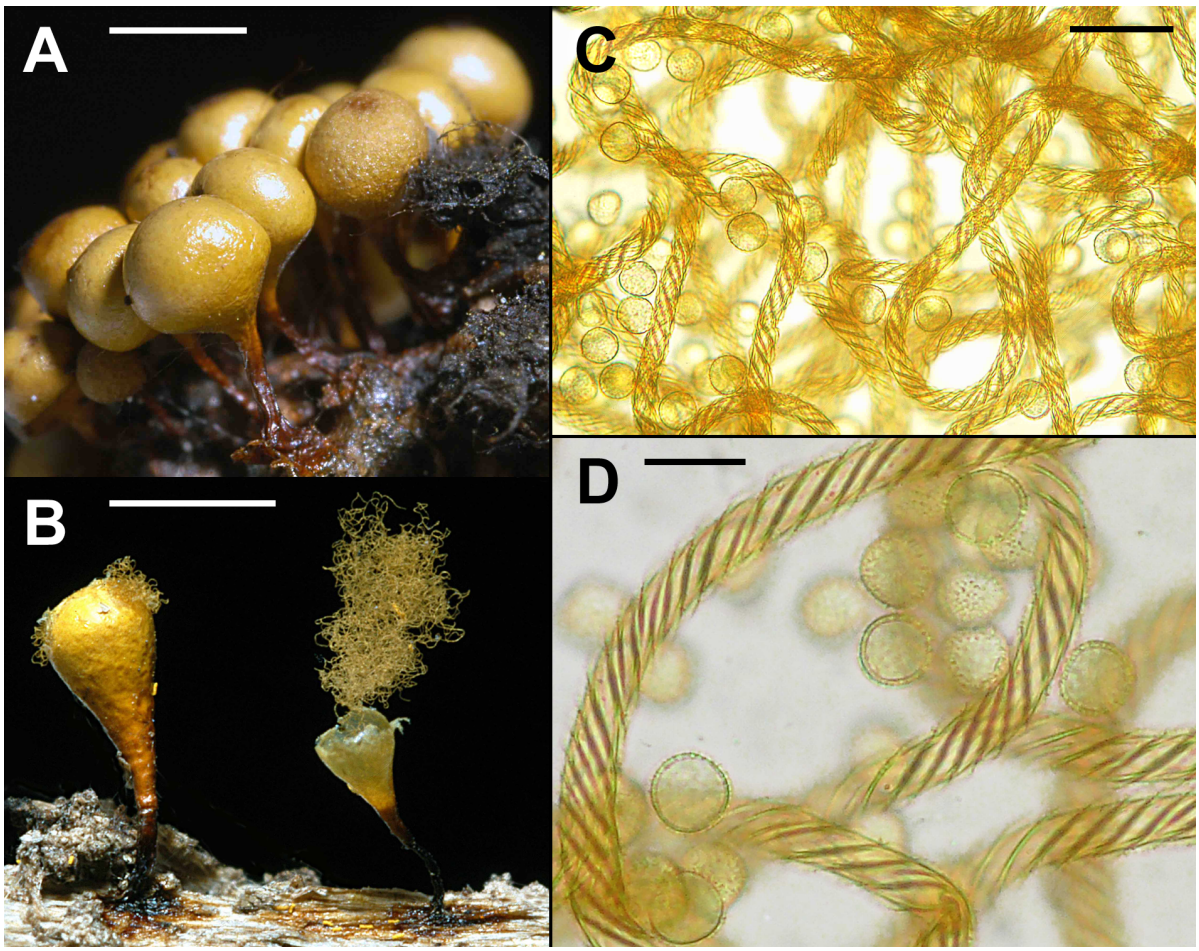
IMI Descriptions of Fungi and Bacteria No. 1915

HEMITRICHIA CLAVATA



A. Sporocarps, habit (bar = 1 mm). **B**. Sporocarps, detail showing capillitium on right (bar = 1 mm). **C**. Capillitium and spores, general view (bar = 20 µm). **D**. Capillitium and spores, detail (bar = 10 µm). [Photographs: A. Michaud]

Hemitrichia clavata (Pers.) Rostaf., *Versuch eines Systems der Mycetozoen* Strassburg: 14 (1873). [*IndexFungorum* 122205]

Trichia clavata Pers., *Neues Magazin für die Botanik* **1**: 90 (1794). [*IndexFungorum* 246896]

Hemiarcyria clavata (Pers.) Rostaf., *Śluzowce (Mycetozoa) Monografia*: 264 (1875). [*IndexFungorum* 185735]

Arcyria clavata (Pers.) Massee, *A Monograph of the Myxogastres*: 165 (1892). [*IndexFungorum* 421287]

Hyporhamma clavatum (Pers.) Lado, *Cuadernos de Trabajo de Flora Micológica Ibérica* **16**: 47 (2001). [*IndexFungorum* 372754]

Hemiarcyria ablata Morgan, *Journal of the Cincinnati Society of Natural History* **16**(1): 24 (1893). [*IndexFungorum* 569095]

Hemiarcyria funalis Morgan, *Journal of the Cincinnati Society of Natural History* **16**(1): 26 (1893). [*IndexFungorum* 193770]

Hemitrichia clavata var. *altaica* Lavrov, *Систематические Заметки по Материалам Гербария Томского Университета* [*Systematic Notes on Material of the Tomsk University Herbarium*] **4–5**: 2 (1929). [*IndexFungorum* 190525]

Diagnostic features. *Hemitrichia clavata* is sometimes difficult to distinguish from *H. calyculata* (Speg.) M.L. Farr, which is much more common. The deep cup which gradually widens from the stout stalk, the rough capillitium, white plasmodium and warty, rather than spiny, reticulation of spores separate *H. clavata* from *H. calyculata*. Very generally, *H. clavata* tends to occur in mountainous or cold-temperate regions during autumn and winter, whereas *H. calyculata* may occur more in warm-temperate or tropical climates over summer and autumn.

Habit. On dead wood and bark. *Plasmodium* white. *Sporocarps* stalked, gregarious or sometimes crowded in large groups, olivaceous yellow, brilliant yellow, or brownish orange, fading to light olive-brown, shining, 1–3 mm high. *Hypothallus* membranous, thin, dark, reddish brown to brown, inconspicuous, contiguous to a group of sporangia. *Stalk* rather short, 0·7–1·0 mm long, erect, longitudinally striate, cylindrical at the base, obconic at the apex, attenuated downwards and merging gradually above into the base of the sporangium, yellow above, shading into reddish brown below, moderate yellowish brown to dark orange-yellow by transmitted light, hollow, filled at the base with prototubes of capillitium and spore-like cells, 10–15 µm diam. *Sporangia* broadly clavate, pyriform or club-shaped, merging gradually with the stalk, 0·5–1·5 mm diam., with a goblet-shaped, obconical calyculus which has an irregular torn margin, half to two-thirds of the total sporangium size. *Peridium* single, thin, membranous, the inner surface faintly shiny and densely marked by rather coarse papillae or broken reticulations, dehiscence apical, irregular, remaining as a deep basal cup. *Capillitium* tubular, elastic, yellow or somewhat olivaceous, yellow by transmitted light, the threads 4·5–7 µm diam., flexuous, branched, entangled, bi-refringent in polarized light, with attachments to the base of the stalk, decorated with 4 or 5 closely wound spiral bands, minutely pilose, covered with fine spinules or warts (visible in oil immersion), with occasional free ends, these often swollen, blunt, obtuse or tipped with a broad-based apiculus 2–4 µm long. *Spores* deep yellow in mass, individually pale yellow by transmitted light, globose or subglobose, 7–9 µm diam., finely warted, coarsely papillate, the papillae frequently elongated into ridges which form a fine-meshed complete reticulum visible only under high magnification, the warts forming a border up to 1 µm high, visible in optical section.

ASSOCIATED ORGANISMS & SUBSTRATA: **Plantae**: *Abies sibirica* Ledeb.; *Acer campestre* L. (bark, wood); *Arbutus unedo* L. (wood); *Carpinus betulus* L. (bark, wood); *Cinnamomum zeylanicum* Breyn.; *Corylus avellana* L. (bark, wood); *Fagus orientalis* Lipsky (bark, twig), *F. sylvatica* L. (branch, wood); *Mangifera indica* L. (wood); *Muscopsida* indet.; *Picea abies* (L.) H. Karst. [as *P. excelsa* Link] (wood), *P. schrenkiana* Fisch. & C.A. Mey.; *Plantae* indet. (bark, stump, wood); *Populus tremula* L. (wood), *Populus* sp. (wood); *Quercus robur* L. (bark, wood); *Salix* sp.; *Tilia cordata* Mill. (wood).

INTERACTIONS & HABITATS: Nothing specific is known about interactions between *Hemitrichia clavata* 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. *Hemitrichia clavata* sporocarps are generally observed on dead parts of plants, using the plant material as a substratum, but probably not as a nutrient source. The species is uncommon, with a widespread but scattered distribution largely in temperate and cool temperate regions of the northern hemisphere. In the tropics and subtropics it has been recorded mostly from mountains, but also from the Cerrado area of Brazil. It is found on decaying wood, fallen trunks and branches, usually of broad-leaved trees, and is probably strongly associated with angiosperm trees.

GEOGRAPHICAL DISTRIBUTION: AFRICA: Algeria, Democratic Republic of the Congo, Kenya, Morocco, Sierra Leone, South Africa, Uganda. CENTRAL AMERICA: Nicaragua, Panamá. NORTH AMERICA: Canada (Alberta, British Columbia, Manitoba, Ontario, Québec), México, USA (Alaska,

California, Colorado, Idaho, Kansas, Michigan, Mississippi, New Hampshire, North Carolina, Pennsylvania, Utah, Washington, Wisconsin). SOUTH AMERICA: Argentina, Brazil (Goiás, Santa Catarina), Colombia, Ecuador, Venezuela. ASIA: Armenia, Bangladesh, China (Anhui, Fujian, Guangxi, Hainan, Hebei, Heilongjiang, Hunan, Jiangsu, Jilin, Qinghai, Shaanxi, Sichuan, Yunnan, Zhejiang), Georgia, India (Himachal Pradesh, Madhya Pradesh, Uttar Pradesh, West Bengal), Indonesia, Israel, Japan, Kazakhstan (Alma-Atinskaya oblast, Vostochno-Kazakhstanskaya oblast), Malaysia, Nepal, Pakistan, Russia (Altaiskyi krai, Khabarovskyi krai, Sverdlovsk oblast, Tiumen' oblast), Singapore, South Korea, Sri Lanka, Turkey. AUSTRALASIA: Australia, New Zealand. CARIBBEAN: American Virgin Islands, Anguilla, Cuba, Dominican Republic, Jamaica, Guadeloupe, Puerto Rico, Trinidad & Tobago. EUROPE: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Lithuania, Luxemburg, Moldova, Netherlands, Poland, Portugal, Romania, Russia (Kalininskaya oblast, Krasnodarskyi krai, Leningrad oblast, Orenburg oblast, Republic of Karelia, Tverskaya oblast, Volgograd oblast), Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Vatican City. PACIFIC OCEAN: USA (Hawaii), Vanuatu.

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: No varieties are currently accepted. *Hemitrichia clavata* var. *altaica* Lavrov is listed above as a synonym of typical *H. clavata*. *Hemitrichia clavata* var. *calyculata* (Speg.) Y. Yamam. and *Hemitrichia clavata* var. *stipitata* (Massee) Torrend are both currently regarded as synonyms of *H. calyculata* (Speg.) M.L. Farr, a separate species. *Hemitrichia clavata* var. *montana* (Morgan) Meyl. is also currently regarded as a distinct species, *H. montana* (Morgan) T. Macbr.

DISPERSAL & TRANSMISSION: Nothing specific is known about *Hemitrichia clavata*. 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 2000 records (specimens, databases, bibliographic sources and field observations combined, excluding duplicates) from 1794 to September 2012, with observations in April, June, July, August, September, October, November and December, with the main fruiting season in the northern hemisphere from June to October. The species is regarded as uncommon, but 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 91.9 million km^2 (Africa: 22·6 million km^2; Central America: insufficient data; North America: 13·1 million km^2; South America: 8·4 million km^2; Asia: 39·7 million km^2; Australasia:

insufficient data; Caribbean: 1·0 million km^2; Europe: 7·3 million km^2; Pacific Ocean: insufficient data). **Estimated area of occupancy** [calculated using *http://geocat.kew.org*]. About 452 km^2. The method for estimating area of occupancy has probably produced an artificially low figure. **Population trend**. Not reported, but sufficient records 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. Many recent records, however, originate from protected areas. ***Ex situ* conservation actions**. Four nucleotide 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: MARTIN & ALEXOPOULOS (1969) included this species with *H. calyculata* in an informal taxonomic category which they called the '*H. clavata* species group', but subsequent authors have generally regarded the two species as totally separate. 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 southeast Libya, is in reality from Cuba.

The binomial *Trichia erythropus* I.G. Borshch. is listed in several places as a synonym of the present species, apparently originally on the authority of ROSTAFINSKI (1875). The place of publication of that name is usually given as Borshchow's *Fungi Ingrici Novi aut Minus Cogniti, Iconibus Illustrati* St Petersburg (1857) but no exact page is cited. Dr V.A. Mel'nik of St Petersburg has kindly examined that publication and advised (*pers. comm.*) that this binomial occurs nowhere in the text. The origin of this name therefore remains unclear.

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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*].

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