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First report of sporangia of a myxomycete (*Physarum pusillum*) on the body of a living animal, the lizard *Corytophanes cristatus*

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Abstract: Myxomycetes are protists whose life cycle depends on aerially dispersed spores that germinate into motile myxamoebae, which then pair and fuse to form a larger, motile plasmodium. The plasmodium seeks out a suitable fruiting site (usually atop vegetative material or detritus) and transforms into fruiting bodies that release the spores. In this paper we report the first known instance of a myxomycete, in this case *Physarum pusillum,* sporulating on the body of a living animal, the cryptic lizard *Corytophanes cristatus,* which was collected in eastern Honduras in 2003.

Key words: *Corytophanes cristatus,* Corytophanidae, Honduras, Mosquitia, myxomycete sporulation, *Physarum pusillum,* Rus Rus Biological Reserve

Anyone who collects myxomycetes regularly begins to notice that some species seem to prefer certain substrates for fruiting. For example, in Florida in the late spring, *Dictydium cancellatum* sporangia always can be found on rotten pine logs, *Physarum cinereum* fruits on living St. Augustine grass and *P. bivalve* prefers living herbaceous plants. Martin and Alexopoulos (1969) made some similar generalizations without venturing a guess as to why this is so. Conversely, other species exhibit little preference and use any handy raised spot to form sporangia. In most cases, material of vegetable origin, such as live or dead plants or mushrooms, is the usual substrate.

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However, when collecting in Honduras, one of us (JHT) recently was surprised to discover dozens of sporangia of a myxomycete on the body of a living lizard, a unique substrate for fruiting, insofar as we have been able to determine. Myxomycete fruiting bodies have been collected on mushrooms and dead insects and other detritus, but none have been reported on a living animal of any sort (Martin and Alexopoulos 1969, S.L. Stephenson pers comm).

During 2003 a herpetofaunal survey team composed of three of the authors (JHT, LDW, JRM) traveled to the remote region of eastern Honduras known as the Mosquitia. During this trip they returned to a field site, Bodega de Río Tapalwás, in the proposed Rus Rus Biological Reserve, Departamento Gracias a Dios, which they had visited in the previous two years. This locality (hereinafter called Bodega) is a campsite used by Miskitu hunters from the town of Rus Rus and sits on a bank of the Río Tapalwás, a tributary of the Río Rus Rus, about 20 airline km NW of Rus Rus in primary and slightly disturbed lowland broadleaf forest at 190 m elevation (McCranie et al 2002).

Around 1000 h on 29 May 2003 they collected a juvenile *Corytophanes cristatus* (Merrem) in a hollow dead branch on the ground near the Bodega campsite. The lizard was covered in an unidentified fungal-like growth but otherwise exhibited typical behavior for the species by remaining motionless or by leaning toward the opposite side of the branch it was perched upon. The lizard was returned to camp and quickly photographed, euthanized, and injected with and placed in 95% ETOH in an attempt to preserve both the lizard and the fungal-like growth in a state similar to that which they were found. Upon our return from the field, the *C. cristatus* was deposited in the Florida Museum of Natural History (UF) Herpetology Collection (as UF 137168). Examination of the epizoic organism led to its identification as the myxomycete *Physarum pusillum* (Berk. & Curt.) G. Lister. Sporangia of *P. pusillum* were evident on the dorsal and dorsolateral surfaces of the body, dorsal surfaces of all four limbs, and on the nuchal crest and the lateral surfaces of the head.

Physarum pusillum is cosmopolitan in distribution, usually sporulating on leaf litter and small twigs. *Physarum* is the myxomycete genus containing the larg-

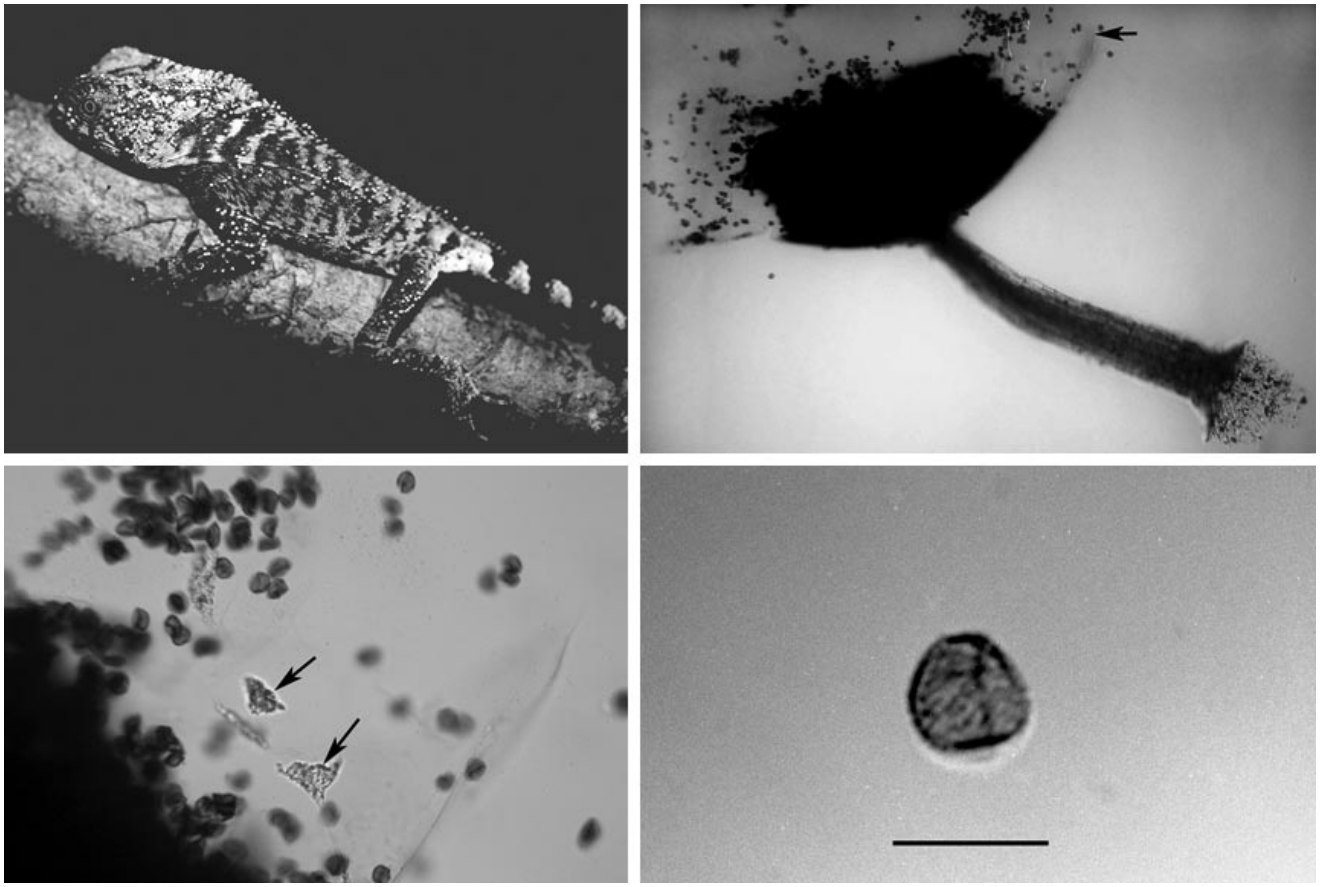

FIG. 1. (Top, left) *Corytophanes cristatus* (UF 137168) with *Physarum pusillum* sporangia present on the dorsal and lateral surfaces of the head, body and limbs. Bodega de Río Tapalwás, Depto. Gracias a Dios, Honduras (photo: JHT).

FIG. 2. (Top, right) Microscopy of sporangium of *Physarum pusillum* from the body of *Corytophanes cristatus* (UF 137168). Arrow indicates edge of cup that typically remains after peridium dehisces in this species.

FIG. 3. (Bottom, left) Portion of sporangium. Arrows indicate angular lime nodes typical of *Physarum pusillum.*

FIG 4. (Bottom, right) Spore of *Physarum pusillum* showing faint warts typical of this species. Marker = 10 μm.

est number of cosmopolitan species. Sporangia of this species are 1–2 mm in height, slightly flattened to globose, and often leave a cup at the base after the peridium breaks apart to release the spores. Members of the genus *Physarum* deposit amorphous calcium carbonate (lime) on their stalks, peridium and within the sporangia as limy knots. Because this collection was preserved in ethanol, the peridial lime had dissolved during transport to the laboratory, but field macroscopic photographs (FIG. 1) clearly show the white color of the sporangial heads typical of this species. Examination of broken sporangia under the compound microscope (FIG. 2) reveals numerous large lime deposits at capillitial nodes (FIG. 3), sometimes described as ''badhamioid,'' in reference to the characteristic large interconnected lime knots found in this genus. The characteristic cup remaining after peridial rupture is also visible (FIG. 2). Spores are 7–8 μm diam, at the lower end of the range for the species, and are marked by minute warts (FIG. 4), again as described in the literature for *P. pusillum* (Hagelstein 1944, Martin and Alexopoulos 1969).

Corytophanes cristatus is a moderate size (adults to ca. 125 mm SVL) lizard of the family Corytophanidae that is found in primary and secondary mesic forest from Chiapas, Mexico, to northwestern Colombia (Köhler 2003, Townsend et al 2004). This species uses its cryptic coloration to employ a specialized sit-and-wait foraging strategy, often remaining motionless for extended periods and feeding infrequently on large insects or insect larvae (Andrews 1979, Vitt and Zani 1998, Sasa and Monrós 2000). The stationary cryptic behavior of *Corytophanes cristatus* likely helped in facilitating the colonization of the body of UF 137168 by *Physarum pusillum.* This novel interaction between an organism such as *P. pusillum,* normally found on nonliving or vegetative substrates, and *C. cristatus* is not unique for the lizard because *C. cristatus* is also the only known vertebrate to have been reported with a cormophytic plant occurring

on its body. Gradstein and Equihua (1995) described a *C. cristatus* from Chiapas, Mexico, that had the liverwort *Taxilejeunea obtusangula* growing from a dense mat of filamentous algae on the head casque of the lizard, and Leenders (2002) reported another specimen from the Caribbean versant of Costa Rica with at least two species of *Taxilejeunea* growing on the head casque. The fact that *C. cristatus,* like all lizards, regularly sheds its skin likely would ensure that these plants would have been shed before becoming reproductive (Gradstein and Equihua 1995). *Physarum pusillum,* on the other hand, completes sporulation in 12–24 h, so that a plasmodium that has migrated onto the skin surface of *C. cristatus* could easily sporulate and disperse the spores from the sporangia atop the lizard.

Corytophanes cristatus generally is reported to be an arboreal inhabitant of the understory of tropical mesic forests; however the species also is known to use leaf litter as a microhabitat (Scott 1976, Vitt and Zani 1998). The ground-level location where the *Physarum*-covered *Corytophanes* was found was a position where it conceivably could have been exposed to the *Physarum* plasmodium for a period sufficient to let it migrate onto the skin of the lizard and sporulate. Myxomycetes also are being found in increasing numbers as collectors ascend into the trees (Keller and Skrabal 2002), and it is possible that these arboreal myxomycetes could colonize the body of a *Corytophanes* there. Regardless of the manner in which the lizard encountered the *P. pusillum* plasmodium, the choice of such a mobile substrate could certainly aid in spore dispersal, although once released and airborne, myxomycete spores could easily outdistance the slow-moving *Corytophanes*!

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