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Saprolegnia ferax (Gruith.) Thuret. (Oomycetes), New Record for Puerto Rico

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Species of *Saprolegnia* Nees, are etiologic agents of infectious diseases in plants and animals. They are also saprobes in fresh water and moist soils (Humphrey, 1893; Coker, 1923; Sparrow, 1960). *Saprolegnia* and other water molds are saprophytes and pathogens within subterranean limnological ecosystems (Kuehn and Koehn, 1988).

In Puerto Rico, water molds were first studied by Rossy-Valderrama (1956), who isolated *Saprolegnia delica* Coker from moist soil from "El Yunque." Stevenson (1975) reported *S. delica* on wet soil. A seasonal distribution of *S. torolosa* De Bary was reported by Galler-Rimm (1982) from ponds of Puerto Rico and nearby islands, *Saprolegnia ferax* (Gruith.) Thuret. was not reported in those studies. The present study documents the presence of *S. ferax* in a pond from the karst zone of the municipality of Guayanilla, Puerto Rico.

The study area was the El Convento Cave-Spring System (18°02'N, 66°'44'W), located in the middle of

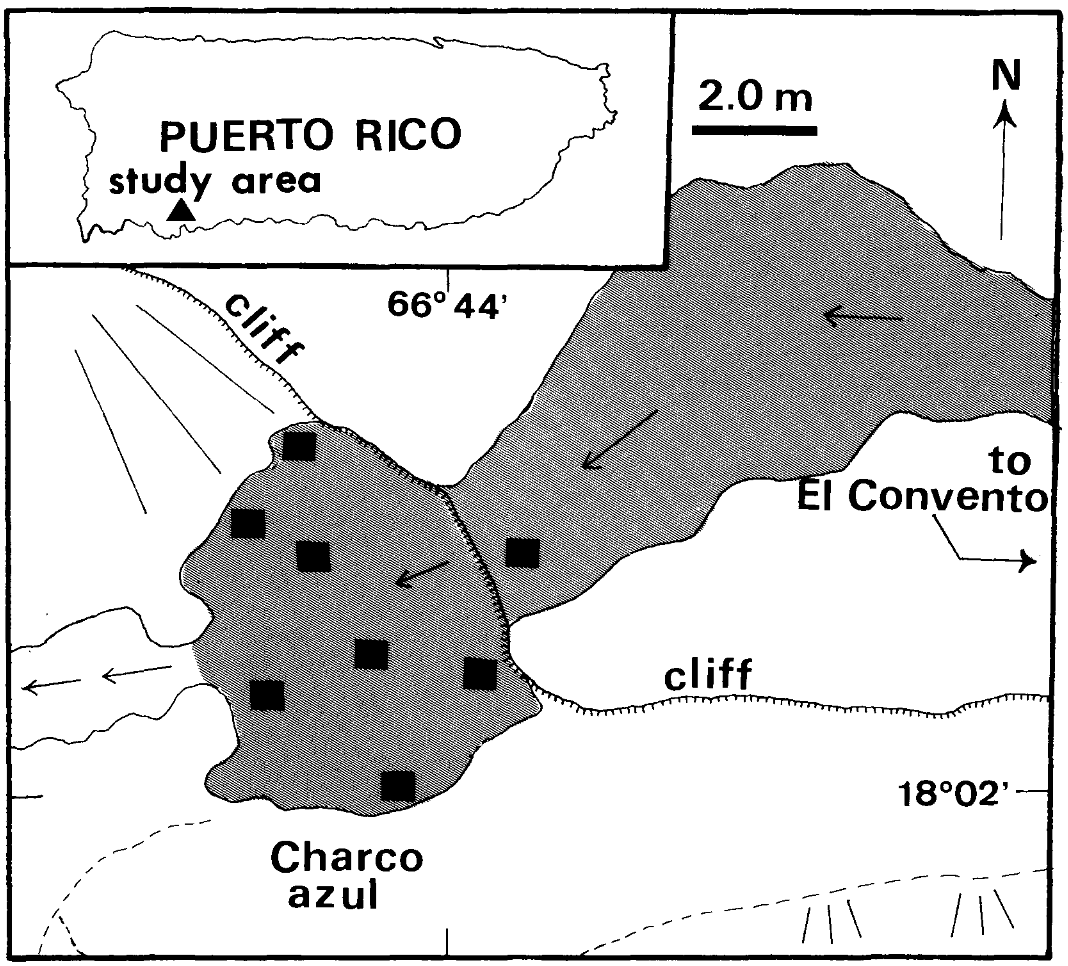

FIG. 1. Map of Charco Azul pond, El Convento Cave-Spring System, Guayanilla, Puerto Rico. Shaded area represents pond extension. Sampling locations are indicated by squares,

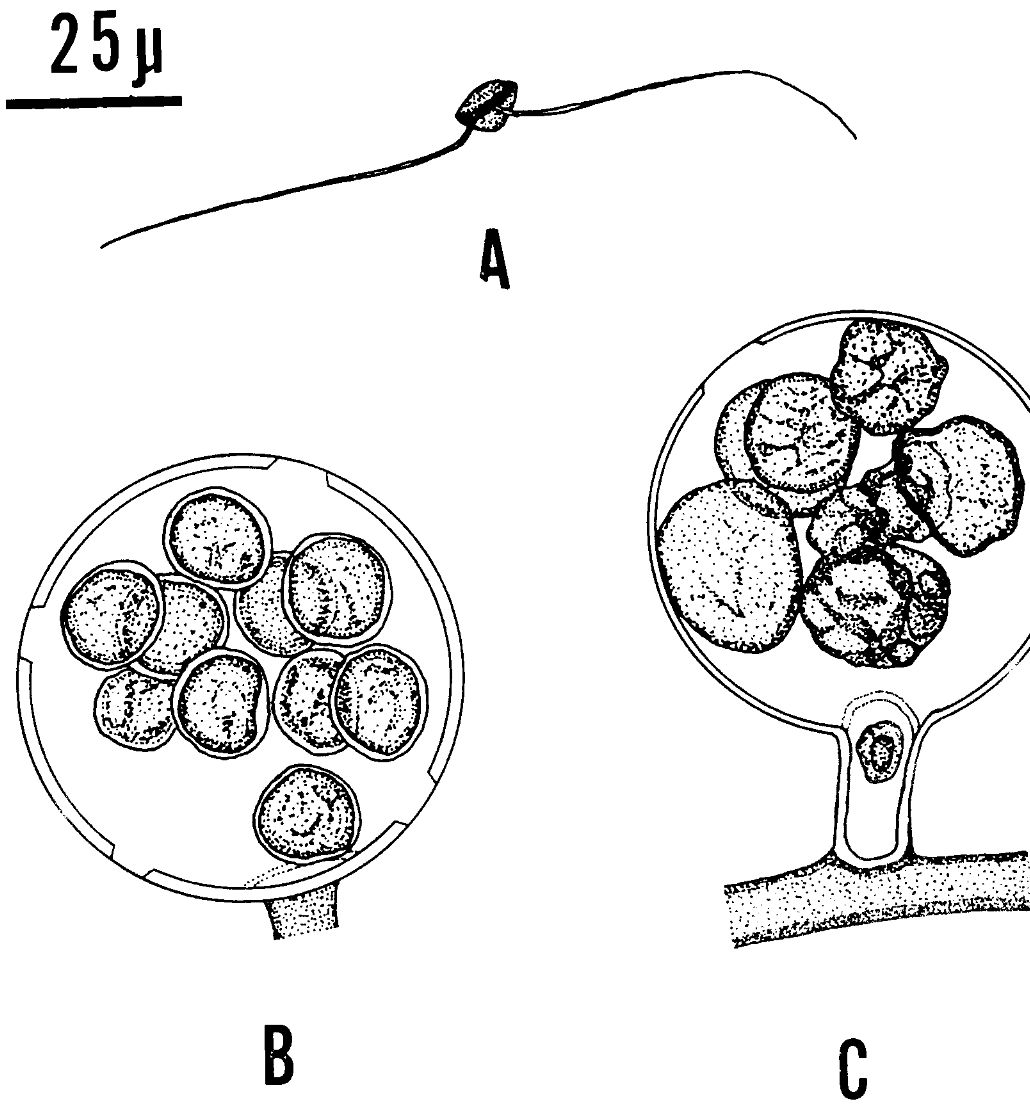

FIG. 2. *Saprolegnia ferax* (Gruith,) Thuret. A. Secondary zoospore. B. Mature oospores with thickened wall in oogonium, C. Immature oospheres in oogonium.

the Tertiary Juana Díaz formation at the head of a karstic gorge known as Los Cedros Stream, approximately 5 km ENE of Guayanilla, Puerto Rico. The underground sections of the stream, cave, and pond (called Charco Azul) can be explored for approximately 500 m. The pond is fed by Los Cedros Stream, a tributary of the Macaná River (Beck, 1974), The pond was approximately 16 m long × 5 m wide × 2 m deep.

Using Kimax bottles (Fisher, Inc.), 24 water samples per month were obtained during May-July, 1993, from Charco Azul. Eight locations were established and three samples per site were taken (Fig. 1). The mean water temperature was 17.1°C. Water molds were attracted by using sterilized *Cannabis sativa* L. seeds cut in halves (Galler-Rimm, 1982; Klich and Tiffany, 1985). Eight seeds were transported to the field in sterilized Kimax bottles. Corn meal agar (Difco 0386 and ATCC 307) (Sparrow, 1960; Fuller, 1978) supplemented with streptomycin, penicillin and crushed *C. sativa* seeds was used as the culture medium.

Cultures were incubated in petri dishes at 23-25°C in a dark incubator, and characterized when they were 2½–2 weeks old, The isolates were identified while in hemp seeds using the taxonomical keys of Coker (1923), Sparrow (1960) and Seymour (1970). Slides were prepared and isolates were observed at 40 × and

60×. Drawings were made at 40× with the aid of a drawing tube (Nikon, Inc.),

One species of *Saprolegnia* was isolated from the samples: *Saprolegnia ferax* (Gruith.) Thuret. (Fig. 2a-c)

Culture., —In CMA with *C. sativa* seeds, the colonies appeared white, dense or compact with short filaments submerged on media.

Diagnostic. —Monoic thallus, Exposed hyphae with ramifications, curved and branched; variable diameter and length, Zoosporangia 42.4 × 8.0 μ, slender-fusiform. Primary zoospores absent; with secondary reniform laterally biflagellate zoospore (Fig. 2a). Oogonia not in chains, spherical, (Fig. 2b, c) 67.0 μ in diameter, laterally formed in thallus. Oogonial walls without ornamentation; with conspicuous scars, 1.7–1.,3 μ in diameter. Mature (Fig. 2b) and immature (Fig. 2c) centric oospores. Mature oospores spherical or elliptical, 38.9 -41.2 μ in diameter. Without antheridial branches or antheridial cells,

Our isolate was compared with *S. delica, S. ferax* and *S. torulosa.* Oogonial shape was between *S. delica* and *S. ferax,* but different to *S. torulosa.* Oogonial wall showed many conspicuous scars similar in size to those of *S. ferax,* but different to those of *S. delica* and *S. torulosa.* Oospores were similar in quantity, size and shape like in *S. ferax,* but different from *S. delica* and *S. torulosa.*

Achlya americana Humphrey was found in 98% of the samples. Only 2% contained *S. ferax.* The low occurrence of *S. ferax* in Charco Azul differs from the results obtained by Kuehn and Koehn (1988) with water molds in Edwards Aquifer, Texas. However, the abundance of *S. ferax* was similar to that reported by Rossy-Valderrama (1956) and Galler-Rimm (1982) for other *Saprolegnia* species,

Deeper sampling into the El Convento Cave and at the stream sink should reveal whether the fungi reach the pool from the surrounding area, or come from surface streams above the cave.

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Preliminary Estimate of Landslide Disturbance in the Blue Mountains, Jamaica

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The disturbance regime and consequent regeneration dynamics of montane forests differ from lowland forests. In montane forests, treefall gaps are small (Murray, 1986; Lawton and Putz, 1988) and in some forests appear to be rare (Grubb and Stevens, 1976; Tanner, 1977). This is in part because the canopy height is typically quite short (< 20 m), and in some forests because trees predominantly die standing. In the Caribbean, hurricanes are a major agent of gap formation, however tree mortality even after severe hurricane strikes is frequently low (e.g., Frangi and Lugo, 1991; Bellingham et al., 1992); surviving trees rapidly refoliate through epicormic sprouts and as a consequence hurricane gaps tend to be highly transient, Large and persistent gaps are characteristically formed by landslides. We asked what is the potential importance of landslides for the regeneration of gap-dependent species in montane rainforest in Jamaica by estimating landslide disturbance and turnover rates for a section of the Blue Mountains, eastern Jamaica.

The Blue Mountains have a complex geology of igneous intrusive and extrusive rock, tertiary sandstone and shales, and limestone, Forests extend from 1300 m to the ridge crest on the leeward (southern) slopes of the range, and down to 500–1000 m elevation on the windward (northern) slopes. Slopes are steep, and the topography is highly dissected. Eight montane forest types have been identified, and are described in detail by Grubb and Tanner (1976).

Given the paucity of data on landslide occurrence in the Blue Mountains, and the lack of historical aerial photographs, we made an estimate of the area affected