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Author: Olson, Robert E.

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however, seemingly differs from the other two species. Susceptibility to pox possibly is species-specific or perhaps different strains of pox virus infect the three species, resulting in differential prevalences of infection.

Avian pox in California quail other than at the E. E. Wilson Wildlife Area, where it was suggested that the occurrence of pox was associated with the propagation of gamebirds (Crawford et al., 1979, op. cit.), was recorded for the first time. The prevalence of infection of birds from Yamhill County (12%) was less than one-half that of the shooting sample from the E. E. Wilson Wildlife Area for 1978 and 1979 (28%), but sample sizes from both areas in the comparison were small, 25 and 18 birds, respectively.

Running ability of California quail with severe infections on the feet seemed somewhat impeded, possibly increasing their vulnerability to predation. Too few marked birds were recaptured, however, to test for differential survival of infected and uninfected birds. The higher prevalence of pox among trapped quail suggests that infected birds possibly were more attracted than uninfected birds to the abundant bait at trap sites. Perhaps quail with pox were slightly less efficient at foraging. No deaths of quail, however, were attributed directly or indirectly to avian pox and considerably more information is necessary to evaluate the influence of the high prevalence of pox on populations of California quail in western Oregon.

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Robert E. Olson, Department of Fisheries and Wildlife, Hatfield Marine Science Center, Oregon State University, Newport, Oregon 97365, USA

Ichthyophonus is a fungal pathogen that has been reported to infect a variety of marine and freshwater fishes. It typically causes the formation of characteristic lesions in various internal organs, especially the highly vascular spleen, liver, kidney and heart. The taxonomic status of *Ichthyophonus* has been reviewed by Alderman (1982, *In* Microbial Diseases of Fish, Roberts (ed.), Academic Press, London, pp. 189–242), who concluded that no species of *Ichthyophonus* has been described adequately to allow unequivocal identification. The literature on the host and geographic distribution of this pathogen has been reviewed by Neish and Hughes (1980, Diseases of Fishes. Book 6: Fungal Diseases of Fishes, T.F.H. Publications, Neptune, New Jersey, pp. 61–100) and by McVicar (1982, *In* Microbial Diseases of Fish, Roberts (ed.), Academic Press, London, pp. 243–269).

Ichthyophonus has been reported to cause extensive mortalities in several species of marine fishes (Sindermann, 1958, Trans. N. Am. Wildl. Conf. 23: 349–360; McVicar, 1982, op. cit.) and in farmed

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FIGURE 1. Granulomatus lesions caused by *Ichthyophonus* in heart muscle and pericardium of a Pacific staghorn sculpin. Hematoxylin-PAS, ×40.

rainbow trout (*Salmo gairdneri*) (Rucker and Gustafson, 1953, Prog. Fish-Cult. 15: 179–198; Dorier and Degrange, 1961, Trav. Lab. Hydrobiol. Piccic. Univ. Grenoble, 1960/1961: 7–44). In spite of the wide geographic distribution of *Ichthyophonus*, no reports of the pathogen from marine fishes of the eastern North Pacific have been published. This report notes the occurrence of *Ichthyophonus* in a single Pacific staghorn sculpin (*Leptocottus armatus*) from Yaquina Bay, Oregon. The only other reports of the fungal pathogen in members of the Cottidae are those of Hendricks (1972, J. Fish. Res. Board Can. 29: 1776–1777), who found a single infected specimen of *Myoxocephalus octodecemspinosus* from the western North Atlantic and Gustafson and Rucker (1956, U.S. Fish Wildl. Serv. Spec. Sci. Rept. 166: 1–8), who experimentally infected *Cottus asper*.

The infected Pacific staghorn sculpin was part of a collection of estuarine fishes obtained by trawling in Yaquina Bay, Oregon, on 13 January 1983 and was held in a laboratory tank of flowing seawater pumped from Yaquina Bay until examined on 1 March 1983. No fishes other than those from the Yaquina Bay estuary were held in the same laboratory. The infected sculpin measured 170 mm in total length and upon examination white, macroscopic nodules (0.5–3.0 mm in diameter) were observed both on the surface and deep within the heart and liver tissue.

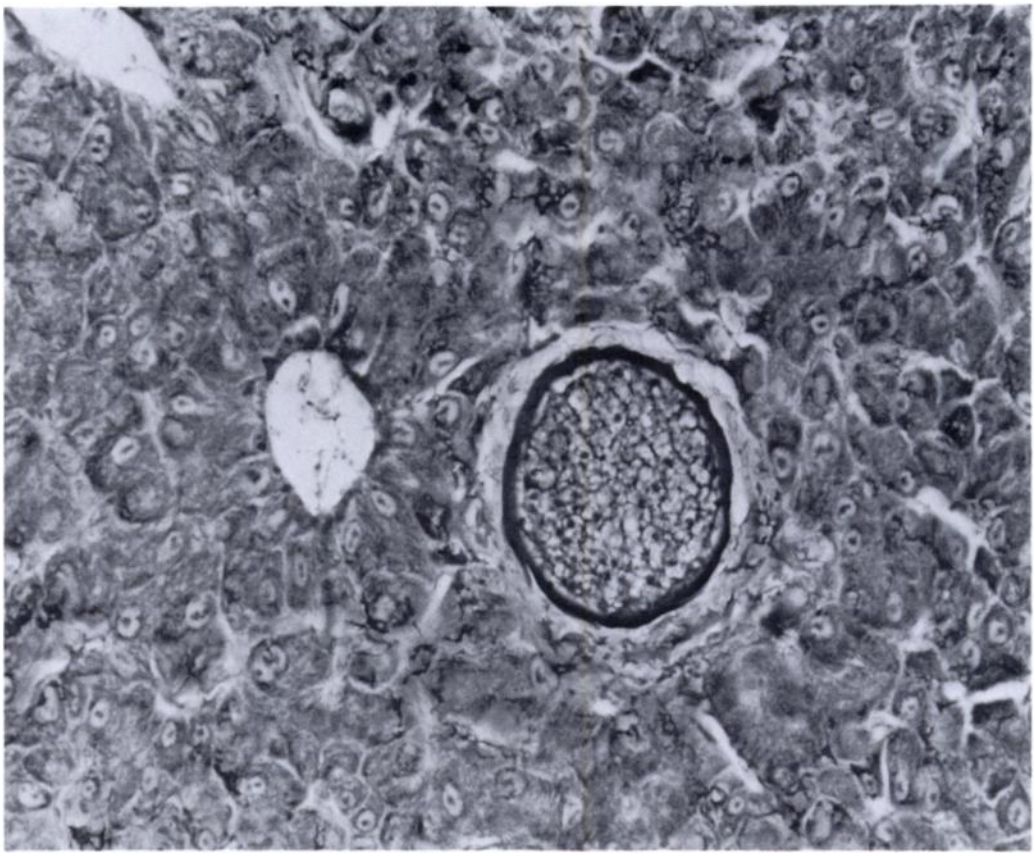

FIGURE 2. Individual *Ichthyophonus* spore in liver of a Pacific staghorn sculpin. Hematoxylin-PAS, ×400.

Macroscopic nodules were not observed in spleen, kidney, stomach or intestine and these organs were not saved. Liver and heart were fixed in Bouin's solution before routine histological processing and sectioning at 7 μm. Tissue sections were stained with hematoxylin and eosin, by the periodic acid-Schiff (PAS) method followed by hematoxylin, and for mycobacteria by the method of Tamasi (1981, App. Environ. Microbiol. 41: 311).

Microscopic examination of heart and liver tissue revealed typical *Ichthyophonus* spores both within large granulomatous lesions (Fig. 1) and individually in host tissue causing minimal host reaction (Fig. 2). Germinating spores were common within granulomas (Fig. 3). Both germinating spores and the walls of resting spores were PAS positive. Mycobacteria were not observed. According to McVicar (1982, op. cit.), *Ichthyophonus* spores germinate immediately after death of the host and fungal hyphae are produced, but a complete developmental cycle has not yet been described.

In spite of the fungal infection, the host sculpin showed no gross signs of debilitation.

None of the other 15 specimens of *L. armatus* collected at the same time contained macroscopic lesions and all were presumed to be uninfected. This is the first report of *Ichthyophonus* from wild marine fish in the eastern North Pacific in spite of the fact that numerous studies of the diseases and parasites of fishes from this area have been conducted. There have

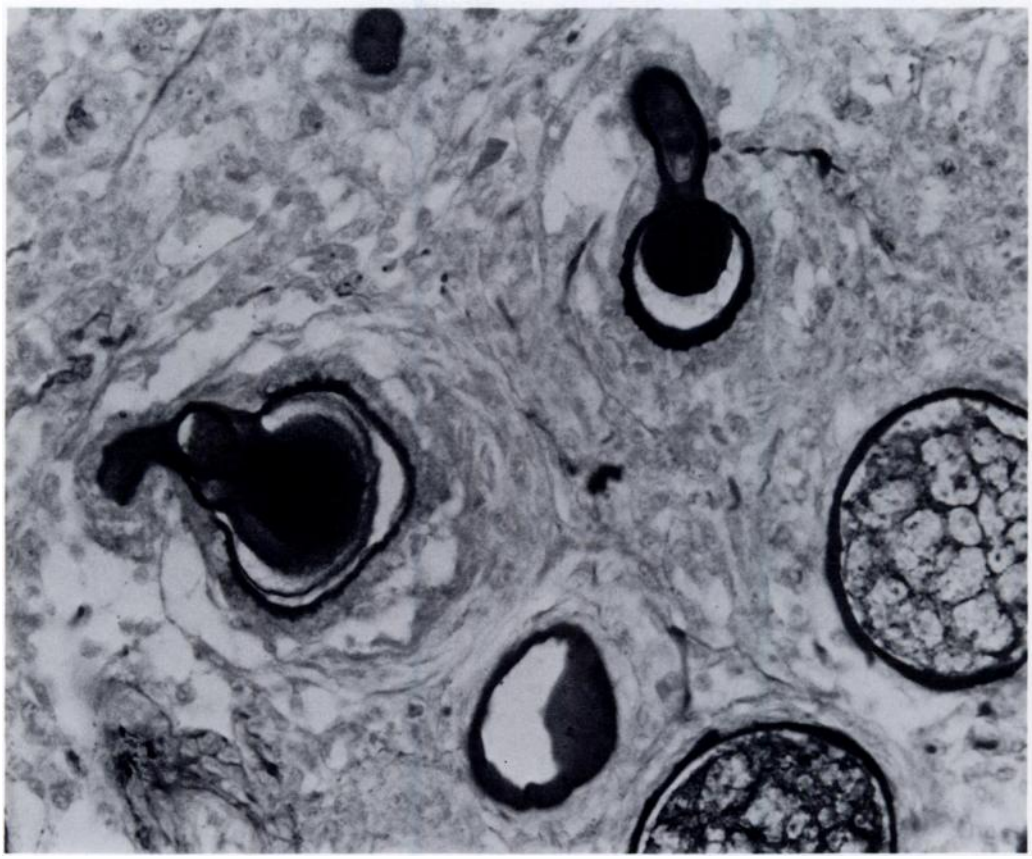

FIGURE 3. Germinating *Ichthyophonus* spores within lesion in heart muscle of a Pacific staghorn sculpin. Hematoxylin-PAS, ×400.

been reports, however, of *Ichthyophonus* in rainbow trout cultured in fresh water in western states including Washington (Rucker and Gustafson, 1953, op. cit.) and Idaho (Erickson, 1965, Prog. Fish-Cult. 27: 179–184). According to Alderman (1982, op. cit.) natural infections of *Ichthyophonus* in fresh water are uncertain and epizootics in farmed freshwater fishes are potentially due to the presence of contaminated marine fish in the diet. The current practice of pasteurizing the marine fish component of commercial trout food may have prevented the transmission of the fungus to freshwater fishes in the western United States in recent years.

The apparent rarity of *Ichthyophonus* infection in marine fishes of the eastern North Pacific indicates either an ability of the fungus to maintain itself at low intensities of infection or the possible existence of higher intensities of infection in marine fish species that have not been extensively examined for pathogens. The impact of *Ichthyophonus* on populations of marine fishes in the eastern North Pacific is unclear.

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