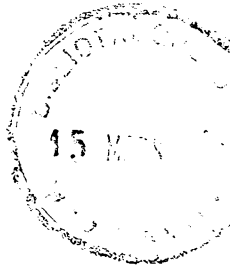


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COELOMOMYCES FUNGI, AN IMPORTANT GROUP OF MOSQUITO PARASITES

by

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Numerous naturalistic procedures for vector control were developed, with varying degrees of success, in the interval between the two World Wars. However, with the advent of DDT and other synthetic insecticides, there was a general loss of interest in this essentially long-term approach to control.

Current insecticide resistance and non-selectivity problems have led to a revival of interest in control measures utilizing biotic factors,¹ and to the supporting of related studies by the World Health Organization. This Organization's developing environmental biology programmes include basic research on biological control.

On existing knowledge, Coelomomyces fungi must be regarded as among the most promising pathogens for utilization as biological control agents against mosquitos (American Institute of Biological Sciences, 1960). At the same time, it must be remembered that a great deal of research remains to be undertaken before there can be any question of supplementing conventional control procedures by practicable ones involving the employment of these or any other parasites.

With the possible exception of certain inadequately described fungi from a Russian notonectid and a Honduran blackfly, the genus Coelomomyces (which is referable to the order Blastocladales) is known from mosquitos alone. It includes upwards of 20 species (Laird, 1959), some of them exhibiting rather strict host-

¹ Franz (1961) has distinguished such control measures from natural limitation and grouped them into two broad categories biological (involving the employment of natural enemies - pathogens, parasites and predators) and cultural (based upon the deliberate manipulation of competitors, food, etc. to the disadvantage of pests or vectors).

specificity and others parasitizing mosquitos of several genera utilizing similar types of larval habitats. Adults and pupae have not been found to harbour these parasites nearly as frequently as have larvae.

The latter suffer heavy mortality through massive destruction of organs, including the fat body and imaginal buds. Oval or (occasionally) more or less rounded fruiting bodies (sporangia) become very evident in the haemocoel (Fig. 1). They are light yellow to brownish in colour, their length ranging from under 20 to rather more than 100 microns, and commonly falling within the range of 40-60 microns. The outer sporangial wall may be smooth (Fig. 2) or variously ornamented (Fig. 3). The shape and size of Coelomomyces sporangia have occasionally led to their being mistaken for helminth eggs. However, their relatively large dimensions (they are individually distinguishable at the lowest magnifications of the microscope, or for that matter even with a good hand lens) and pronounced coloration prevent any confusion with the minute (c.3-5 microns) and pale-coloured spores of certain genera of microsporidian protozoa sometimes present in mosquitos.

Diagnosis rests upon the demonstration of sporangia, originating from a non-septate mycelium (Fig. 4). Heavily parasitized larvae are evident to the unaided eye through their distinctive yellowish-white to rusty colour, but microscopic examination is necessary for the recognition of early or very light infections.

Initial field experiments with the type species of the genus, Coelomomyces stegomyiae Keilin, sponsored by the World Health Organization and undertaken with the co-operation of the New Zealand Government, were conducted in the South Pacific in 1958-1960. (American Institute of Biological Sciences, 1960; World Health Organization, 1961). The project involved the introduction of a strain of the fungus from Singapore into Nukunono atoll, Tokelau Islands. It resulted in the establishment of the parasite in a previously disease-free population of Aedes polynesiensis, the chief vector of Wuchereria bancrofti in eastern Polynesia. Related field studies are at present (January-February, 1962) being supported by the World Health Organization in an area of Northern Rhodesia where another species of Coelomomyces is reportedly responsible for a 95 per cent. reduction of Anopheles gambiae production from rainy-season pools (Muspratt, 1946).

Knowledge of the life history of these fungi is still far from adequate, and ways of culturing them in quantity must be devised before there can be any prospect of employing them in vector control operations. Also, of course, sound ecological planning would be an essential preliminary to the introduction of selected species into areas from which Coelomomyces is as yet absent, for the control of susceptible hosts.

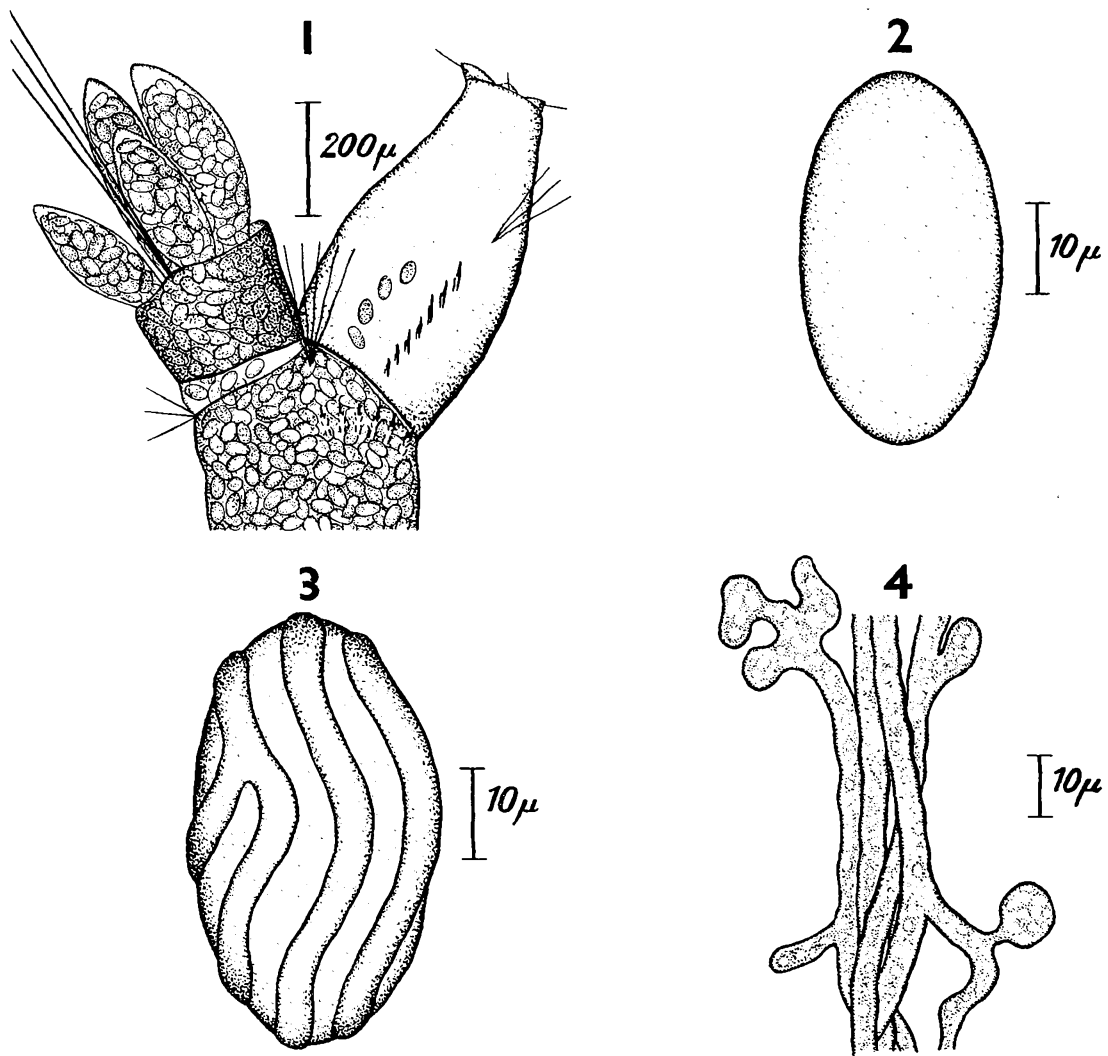
There is, therefore, pressing need for more data on the geographical distribution, host range, and ecology of all species of Coelomomyces. In this context, negative records based on careful searching are obviously as essential as positive ones. Accordingly, any relevant data would be welcomed by the Environmental Biology Unit (Division of Environmental Health, World Health Organization, Geneva). Such information could be obtained by searching reference collections of mounted larvae as well as by keeping watch for fresh infections in the field. Parasitized larvae could be forwarded to this Unit either as whole mounts on slides in any of the usual media, or as formalin-preserved specimens. Wherever possible, whole specimens whether mounted or tubed should be supplemented with slides of teased-out infected larvae in lactophenol tinted with cotton blue. Any such material, accompanied by full host-, locality-, seasonal-, and habitat-data, also any observations on fruitless searches made for these fungi in the field or in reference collections, would be of the greatest value in connexion with the research programme now being developed.

REFERENCES

- American Institute of Biological Sciences (1960) Conference on biological control of insects of medical importance, Technical Report, American Institute of Biological Sciences, Washington, D.C. (Mimeographed), 144 pp
- Franz, J. M. (1961) Definitionen in der biologischen Schädlingsbekämpfung, Zeitschrift für Pflanzenkrankheiten (Pflanzenpathologie) und Pflanzenschutz, 68, 321-329
- Laird, M. (1959) Fungal parasites of mosquito larvae from the Oriental and Australian Regions, with a key to the genus Coelomomyces (Blastocladales:Coelomomycetaceae), Canadian Journal of Zoology, 37, 781-791
- Muspratt, J. (1946) On Coelomomyces fungi causing high mortality of Anopheles gambiae larvae in Rhodesia, Ann. trop. Med. Parasit. 40, 10-17
- World Health Organization (1961) The Tokelau experiment, World Health, 14, 12-15

EXPLANATION OF THE FIGURES

All figures generalized freehand sketches. Fig. 1. Terminal segments of an Aedes larva exhibiting heavy infection with Coelomomyces. Note that while the anal papillae are packed with sporangia, very few have entered the siphon. Fig. 2. Smooth, oval type of sporangium. Fig. 3. Ornamented type of sporangium. Fig. 4. Knobbed, non-septate hyphae.



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