

Diseases of Crustaceans

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Introductory Remarks on Diseases of Crustaceans

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Cultivation of several crustaceans (crabs, lobsters, shrimp, and crayfish) is carried out commercially and for sustaining natural resources. An understanding of crustacean pathogens, natural defenses of the animals against diseases, and methods of treating and preventing diseases will lead to more efficient and effective husbandry and ultimately better management of these resources. The objective of this Symposium was to collect a group of papers dealing with diseases of crustaceans. It seems to be a very propitious time to have this Symposium, because there is an ever increasing burden on the land and the sea to support the world's burgeoning population. Because of this increased burden, man must make more efficient use of the sea and its resources. In order to exploit economically the sea and the inland waterways, large numbers of fishes and shellfish must be cultivated in a relatively small volume of water. Under such unnatural crowding it is inevitable that inimical conditions, including diseases, will be encountered. At present economics dictate that gourmet items are the most profitable to raise. Therefore, the loss of even individual animals may become a serious matter. This is especially true as the animals grow larger and reach marketable size.

For infectious diseases to occur, a potential pathogen must exist, a suitable host must be present, and the proper environmental conditions must pervade that will cause either an increased viru-

lence of the pathogen or an increased susceptibility of the host (Fig. 1, after Snieszko, 1973). Examination of the literature pertaining to cultured salmonids (salmon and trout) indicates that they are susceptible to a variety of serious diseases (Anderson and Conroy, 1968a; Cisar and Fryer, 1969; Christensen, 1972; Wood, 1968). The artificial stress conditions that include overcrowding, poor nutrition, reduced oxygen content, increased organic material, and pH and temperature changes are factors which increase the probability of disease among propagated fishes. Ander-

son and Conroy (1968b) indicate that several diseases may affect the aquaculture of English prawns (*Palaemon serratus*). Many of these probably are initiated by the numerous stresses placed upon the animals in the confinement of an aquaculture system.

Infectious diseases are found in both cultured crustaceans and those in the natural environment. At least four are serious diseases that occur in economically important crustaceans. Both bacteria and fungi are implicated in shell disease which is found in a variety of crustaceans, including crabs, lobsters,

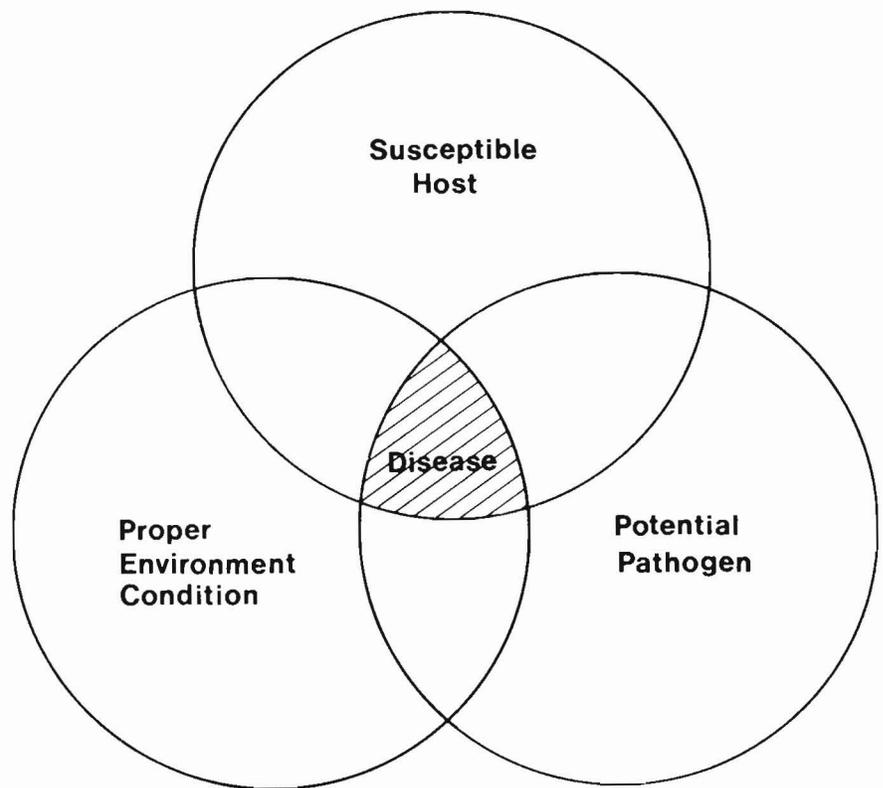


Figure 1.—Interaction of host, environment, and pathogen to produce a disease (Snieszko, 1973).

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and crayfish (Rosen, 1970). Gray crab disease, caused by a protozoan (*Paramoeba perniciosus*) is fortunately ephemeral and confined to the blue crab, *Callinectes sapidus* (Sawyer, 1969). The fungus, *Aphanomyces astaci*, has caused serious mortalities for many years among the European crayfish, *Astacus astacus* (Unestam and Weiss, 1970; Unestam and Nylund, 1972) and has been known to cause mortalities as high as 100 percent. At present, only one disease of the Crustacea has received adequate research attention and that is the fatal septicemia of lobsters caused by the bacterium, *Gaffkya homari* (Stewart and Rabin, 1970). The host-pathogen interactions are understood well in this disease.

In addition to infectious diseases, various noninfectious diseases may be important considerations in any crustacean aquaculture system. Sparks (1972) has listed several noncommunicable diseases of invertebrates that are caused by heat, cold, heavy metals, detergents, pesticides, and herbicides. Disease may also be caused by toxins produced by noncommercial animals and plants present in an aquaculture system (Sparks, 1972).

The host is capable of responding in a variety of ways to both infectious and noninfectious pathological agents. Recent interest in the immune mechanisms of crustaceans has shown that these animals respond to various disease agents in a manner different from vertebrates (Sindermann, 1971; Miller et al.,

1972; Stewart and Zwicker, 1972; Pauley, 1973). They do not possess gamma globulin or a specific anamnestic ability. However, they do possess a limited ability to discriminate between certain types of antigens. In many cases they are able to respond to disease agents much more rapidly than vertebrates. However, as in fishes and other invertebrates, the immune response of crustaceans is temperature dependent. An understanding of the immune mechanisms of crustaceans is important in the successful manipulation of cultured crustaceans. Increased knowledge of pathogen virulence and immunity in fishes has led to better control of their serious diseases. The use of vaccines (Fryer et al., 1972) and chemotherapy (Herman, 1970) are two important weapons in the prevention of fish diseases that have not been explored in crustaceans.

These observations illustrate the significance of disease in crustaceans under natural conditions and the hazards that may occur in any large-scale attempts to cultivate gourmet Crustacea. Although the study of pathology in these animals is limited to a rather small number of species, the following symposium papers will, hopefully, stimulate extensive studies of many crustacean diseases.

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