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INVERTEBRATE PATHOLOGY: A DEVELOPING AND ESSENTIAL SCIENCE FOR INVERTEBRATE CONSERVATION

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Abstract

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The captive breeding and reintroduction of endangered invertebrate species is increasingly being carried out by zoos and other conservation organisations. Veterinary involvement in the captive care of invertebrates, including disease investigation and screening for normal and abnormal micro-organisms, can result in improving not only the welfare of the animals but also the conservation value of the breeding programmes concerned.

Invertebrates comprise over 90% of the described animal kingdom and possibly greater than 99% of all animals on earth. For a variety of reasons, including a growing awareness of their ecological importance and vulnerability, endangered species of invertebrate are being increasingly kept in zoological collections. Concurrent with this is a growing requirement to improve the husbandry, including medicine, of these animals. Research into invertebrate diseases is not new, but such work has largely been in the field of pest control or of studies on basic physiology. Little attention has been paid to diagnostic pathology other than work on certain groups which are of obvious economic importance, such as certain molluscs. In these cases the approach has been to investigate disease at the level of the population rather than the individual animal. However, with the captive breeding of endangered species, the individual invertebrate may be as important as any other (vertebrate) animal in a similar situation.

The diagnosis of infectious disease is particularly difficult when working with invertebrates due to the lack of information on the normal micro-flora and -fauna of the animals. One way to help investigate this is to examine healthy free-living animals of the same species (and from the same geographical area) as those in captivity, but usually this is not possible. At the Zoological Society of London (ZSL) often we try to screen freshly wild-caught invertebrates in order to learn something of their normal commensal micro-organisms, but this also may be impractical for a variety of reasons, not least because of the costs involved, both in time and money. However, such information is very important, particularly if the animals, or their offspring, are destined for eventual release (see below). Future trends are likely to be to carry out much more of this type of fundamental work, both at ZSL and other collections.

In recent years, the Zoological Society of London has been increasingly involved in captive breeding and release programmes for endangered species of invertebrate and, at the same time, we have been developing approaches to investigating disease in our captive populations. This has involved both the development of diagnostic and therapeutic techniques and the creation of computerised record systems that enable trends in fecundity, growth rates and mortality to be analysed (Burlingham-Johnson, 1994). Such data are essential if optimum husbandry techniques are to be employed and signs of early or subclinical disease are to be detected. Although the individual treatment of animals is considered to be conventional for vertebrates, it still is regarded as unusual for invertebrates. However, at ZSL we have had some successes in the individual treatments of insects in the face of disease epidemics, such as the treatment of Olympia's ground beetles (*Chrysocarabus olympiae*) with antifungal drugs (Cunningham and Frank, 1993).

There is a growing awareness of the dangers of the accidental introduction of alien parasites when translocating animals (Cunningham, 1996), and this applies equally whether the target species has an internal or an external skeleton. The science of pathology has a major role to play in this area of wildlife conservation. For example, at ZSL we postponed a release programme for the wart-biter cricket (*Decticus verrucivorous*) when the colony destined for release was found to be infected with a fungus. Simi-

larly, the reintroduction of captive-bred English field crickets (*Gryllus campestris*) was stopped when, on routine pre-release screening of sacrificed nymphs, the animals were found to be infected with a protozoan parasite of unknown origin. Of course, should this parasite turn out to be natural to the wild population, then the release programme can be recommenced.

In conclusion, it is important that zoological collection managers and others are aware that veterinary involvement in the captive care of invertebrates can result in improving not only the welfare of the animals but also the conservation value of the breeding programmes concerned. If the commitment to wildlife conservation by such institutions is to be taken seriously then resources must be allocated accordingly. This is an exciting area for zoos and zoo vets and there is much work to be done.

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