Rearing Weta

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Introduction

The keeping of weta in captivity has been the subject of increasing interest in zoos and animal parks. The purpose of the following is to introduce the basic principles involved in rearing the insects. The first part of the article deals with weta in general. A case study is used to illustrate some of the factors that are applied in the second part. This involves the Mercury Island tusked weta *Motuweta isolata*.

Weta have been reared in captivity for a number of reasons. Some of these include the production of animals for conservation work, advocacy purposes and general research work. A very recent initiative is the desire of some people to raise certain types of weta for the purposes of feeding them out to other types of fauna. Universities, zoos, research agencies and private individuals have undertaken the rearing of weta. Although these insects are distantly related to crickets (certain species of which are well established in captive culture) their captive care differs markedly from the keeping of these insects.

The basic principles: Weta emerge from the egg fully prepared for survival. They can feed themselves, seek shelter and defend themselves (within the limits their size allows). In many ways this makes their subsequent care in captivity relatively straightforward. This relates to most of the different types. One small group within the *Hemiandrus* differs. In these animals, the newly hatched nymphs are attended to by their mother. This continues until they reach their second instars. It is very difficult (and in fact unnecessary) to raise these insects without this initial care. This article refers to non-maternal species in general. There are two major methods that are normally applicable to rearing weta in captivity. The first of these involves the use of large enclosures or exclosures for raising colonies of weta together. The second involves the intensive raising of weta using separate enclosures or containers.

Large enclosures/exclosures: The use of large enclosures or exclosures for weta, or indeed other invertebrates has a number of advantages and disadvantages. By using this type of facility a variety of objectives can be achieved for a relatively modest outlay. Weta will readily breed in large enclosures. This is provided their specific requirements are met in terms of food resources, shelter, oviposition sites and environmental conditions. It is possible to keep colonies of weta together over protracted periods of time. An enclosure measuring 3 metres by 5 metres by 2.6 metres provides ample space for up to 50 large giant weta (*Deinacrida*). The same enclosure is sufficient for over 100 smaller specimens or 60 to 80 large headed or tree weta (*Hemideina*). A key factor with this is the provision of shelter. This must be in profusion to ensure the colony can distribute itself evenly around the enclosure. Shelter must also be able to accommodate weta of differing sizes to ensure the colony can be sustained over more than one generation.

Young weta can be easily raised in large enclosures. With more space available to them, the likelihood of cannibalism is reduced. This can be a problem when raising weta, particularly while they are growing up.

Building of large enclosures for weta need not be overly expensive and they can be made from readily available materials. An enclosure of the dimensions referred to above was built for a little over $3,000 dollars at Wellington Zoo. It consisted of several beams, plywood and shade cloth. The latter covered the entire roof. Provided the internal structure is well painted there should be no concern over treated timber if this material is used. Nylon shade cloth is excellent for the provision of ventilation. Exclosures benefit from over half of the structure or more consisting of shade cloth. Any more than this is desirable also. The material must be of the interwoven type, not criss-cross as early instar weta nymphs can escape through the mesh of the latter type. The structure should be of a simple design to reduce costs and allow for maximum space. A building encompassing four flush walls, and a ceiling of mesh is really all that is required. Alternatively, commercially available shade houses of varying dimensions will also serve well for accommodating weta outside.

The enclosure should have a soil floor that is well sprinkled with leaf litter. A selection of native plants should be planted to allow for shelter, food and climbing activity for the weta. There are a number of different kinds to choose from but *Coprosma, Metrosideros*, *Melycitus* and *Myoporum* species are all ideal. A selection of locally available species can then be chosen to vary the plant material available to the insects. An enclosure can be set up to emulate the habitat frequented by the species of weta involved. Plant species would need to be carefully chosen to allow for the correct habitat structure. Any enclosure over 3 metres by 3 metres in size becomes easier for the establishment of serviceable habitat for weta. This is provided that the needs of the plants involved are met in terms of space required, light and water. An automatic sprinkler system is beneficial for ensuring the plants receive sufficient water.

Shelter for the weta should consist of a variety of resources that are normally used by the insects along with useful alternatives. Large pieces of layered bark, dead curled leaves nylon sacking placed in shrubs, purpose built shelter boxes, hollowed out flax or bamboo stalks and tied up cabbage tree leaves are all good sources of shelter. These must be distributed evenly around the enclosure, regularly monitored (many of these deteriorate over time) and in plentiful supply. Weta should not have to share shelter with others on a constant basis. There needs to be an ample supply of choices. Most of these should be elevated off the ground. Some species have quite strong terrestrial habits. The Cook Strait giant weta, *Deinacrida rugosa* is an example. Dry layered bark or leaf litter is needed on the ground for these insects.

If the enclosure is properly maintained (including the environment within), it is possible to manage a population of weta over several generations. This can also be accomplished in separate containers. For this to be achieved the habitat that is established within the enclosure needs to be managed. If the optimum requirements are being met it is simply a matter of monitoring the changes that inevitably take place and replacing shelter as it deteriorates along with proper care of the plants. This is likely to include growing on more plants, weeding of the enclosure and limiting the growth of the plants that are extant to ensure that they do not compromise the structure of the enclosure in any way.

A real advantage of using large outdoor enclosures is the time factor involved in caring for the insects. This is minimal. Provided the environment within the enclosure meets their requirements throughout the year the insects can be relied upon to look after themselves. The only work involved then is mainly related to preserving the integrity of the environment and that of the structure housing the insects. Proper monitoring of the population dynamics and addressing any issues that arise is necessary also.

The numbers of young that can be potentially raised in large enclosures is very high. There are limiting factors involved with this however. The amount of space available, environmental conditions shelter and food availability and genetic make up of the population will all influence how many young are raised.

Some of the disadvantages of using large outdoor enclosures need to be considered. They can be vulnerable to the weather. Cold weather and high rainfall can compromise the environmental conditions within the enclosure. A way of alleviating this is to ensure that the species chosen is local to the area in which it is kept. This is likely to be better for the insect involved as it will be adapted to the conditions affecting the enclosure. The genetic make up of the population is difficult to manage in a large enclosure. Where the animals are able to have access to each other without some form of constraint it is not possible to decipher categorically the parentage of any progeny. With threatened species this is often exacerbated by a low initial gene pool to begin with as the founder population is often limited in numbers.

Separate enclosures/containers: The other major method of rearing weta is to do the job intensively, using individual accommodation. This can involve a variety of methods depending on the species being kept. A relatively simple example is to keep a number of insects in a room. These are maintained in separate containers. Each container is furnished with shelter, food and other resources deemed necessary for raising the weta through to adulthood.

There are a number of advantages with rearing weta in this way. The population can be managed genetically. This is simplified by the use of animals of known parentage. The insects can be given individual care. A variety of useful data can be acquired that relates to growth strategies. Insects of known instar status can be made available at any time during the raising process.

There are some disadvantages. The time taken to maintain weta in this way may be considerable. An efficient worker can service 100 containers per hour. Any more than this and the workload increases exponentially. This may ultimately limit the number of weta raised depending on other work commitments. A variety of resources are needed. Such materials can be very specific, depending on the type of weta worked with. The use of such materials may be temporary if the project is of short duration. Such work demands considerable commitment as a result. This said, much of the equipment can be easily acquired for modest cost. This is of note when considering the provision of resources for vertebrate taxa. The environmental conditions to which the insects are exposed need to be closely monitored. If the methods and materials are well thought out this problem can be minimised. There is a need for more specific expertise in rearing weta intensively.

A rearing project for the Mercury Island tusked weta was carried out at Auckland Zoo during 1999 and 2001. This project has been selected to demonstrate intensive rearing procedures. Methods differ according to the species but this one covers the basic factors involved in the intensive rearing of weta. The species was chosen as part of the captive rearing component of the recovery programme for the species. The programme is administered to by the DoC. Primarily Mr. Chris Winks of Landcare Research, Mt Albert, Auckland, developed the methods, herewith described.

Shortly after hatching in August through to November 1999, the nymphs were transferred to 2 litre plastic containers. These featured lids with a section cut out and replaced with stainless steel insect mesh. The containers were each furnished with a layer of fine vermiculite to a depth of 50mm. A few fresh green leaves were distributed on top of the vermiculite. Two sample trays were placed on the media. One was used for water and was lined with tissue paper to avoid the possibility of the nymph drowning. The other tray was used for food. This consisted of organically grown grains (muesli) and fish food flakes. In addition to this the weta were offered a variety of small insects (chiefly caterpillars).

Sixty of the containers were maintained at Auckland Zoological Park in a room that was environmentally controlled. The windows were covered to reduce the threat posed by sunlight. This species is particularly sensitive to ultraviolet rays and heat exposure. The room was kept at a temperature range of 17 to 20 degrees Celsius in summer using an air conditioner. The facility was maintained at ambient temperatures during the winter months. At 4^{th} instar, the nymphs were transferred to 3 litre containers. This occurred at approximately 4 months after eclosion. When the 6^{th} instar was achieved by autumn and winter, 2000, the animals were moved again to 6 litre containers.

The containers were serviced approximately every four days. The process involved a visual check, replacement of food and water, removal of fungal growth, collection of faeces for analysis and recording of data. During the rearing process animals were made available for translocation to offshore islands within the Mercury Island group. This involved Red Mercury Island and Double Island. The project proved to be very successful with 97% of the original population kept at the zoo surviving at the time of writing.

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