

Keeping Insects in Their Place

Arguments For and Against the Conservation of Insects

By Nicholas Paling

Homo sapiens is just one of around 2,000,000 species currently known to live on this planet, but in evolutionary terms we stand alone as a dominant and powerful species with the power to alter our ecosystem and reap wholesale changes to the surface of the Earth. So global has the human race become that there are very few remaining areas of the earth's surface where our often destructive influence has not been felt. For many people embroiled in the day-to-day machinations of humanity there often seems to be no time to stop and wonder at the landscape of the world around us or to consider the creatures and plants we share it with.

However, our perception of other species and their value to us is clearly very important if they are to survive the impact of our activity on the particular ecosystem in which they live. It is only when we, as individuals or as a society, *do* value something in the world around us that we become willing to invest in its well being. Whether as a scientist, a conservationist, an enthusiast or just as a human being, we all have our personal motivations that drive us to act, but there are always going to be situations where perhaps we feel that the end does not justify the means or when we simply do not care enough to do anything.



Regarding Other Species

The way that we regard other species is clearly dependent upon many factors and highly complex, however, this concept is critical to our understanding of what drives conservation and how people seek to justify its value to human society. Dr. Steven Kellert of Yale University's School of Forestry and Environmental Studies has defined an elegant and insightful classification of public attitudes towards invertebrates, which I believe is actually far more widely applicable to how people regard wildlife as a whole (Kellert, 1993). Dr. Kellert's classification is summarised in the table below.

Table 1 – Dr. Kellert’s Classification of Attitudes Towards Invertebrates

| | |
|----------------------|--|
| Utilitarian | Primary interest in the practical value of invertebrates or the subordination of invertebrates for the material benefit of humans. |
| Scientific | Primary interest in the physical attributes, taxonomic classification and biological functioning of invertebrates. |
| Ecologistic | Primary concern for inter-relationships among invertebrates and other species, as well as between invertebrates and natural habitats. |
| Dominionistic | Primary interest in the mastery and control of invertebrates. |
| Moralistic | Primary concern for the right and wrong treatment of invertebrates, with strong ethical opposition to presumed cruelty towards invertebrate animals. |
| Naturalistic | Primary interest in direct outdoor recreational contact and enjoyment of invertebrates. |
| Aesthetics | Primary interest in the physical attractiveness and symbolic appeal of invertebrates. |
| Humanistic | Primary orientation one of strong emotional affection for invertebrates. |
| Negativistic | Primary orientation a fear, dislike or indifference towards invertebrates (wildlife). |

Putting a Price on Conservation

There are those who believe that the final decision of whether to conserve something or not is an economic and political one (e.g. Crozier, 1997) and I agree that when it comes to implementing conservation this is undoubtedly true. However, I actually think that it is the general public who, by exerting political and economic pressure, ultimately drive conservation and, in some cases, what species are actually to be conserved. In a 2002 English Nature Research Report, Dr. Kate Studd from UCL’s Geography Department described the huge benefit to be gained from public participation in nature conservation decision-making (Studd, 2002). She emphasised that, ‘Involving the public in the development and prioritisation of policy options not only helps those with responsibility for that decision to understand public values and priorities, but it can also help the development of solutions that are locally relevant and publicly supported.’ In addition to this point the report also suggests that better conservation outcomes can be achieved if an integrated strategy is adopted where the values of society, technical expertise and experience are all regarded as being of equal validity.

I will return to the question of integrated conservation strategies later, but initially I want to critically assess some of the key arguments that are used by conservation advocates in Dr Kellert’s different groups to justify the conservation of insects, or of any species, to those who will ultimately decide if it is to be undertaken.

The man of the street who used to question the advisability of letting men interested in bugs enjoy the same freedom as normal individuals is becoming rare. In fact, if one of the public were to ask an entomologist for an excuse for his existence today he would soon find himself so embarrassed by the economic arguments that he would feel it necessary to apologise for intruding upon the earth during the age of insects...

Royal N. Chapman

Address to the Entomological Society of America 1929

The Utilitarian Arguments

Royal N. Chapman's suggestion that the economic arguments in favour of entomology are alone sufficient to convince the public of the value of insects, is one that has been very widely expounded since he made his speech in 1929 (Chapman, 1929). Undeniably, insects do represent an enormous economic commodity in many situations, whether as pollinators, food, or producers of materials such as silk, but I am not convinced that many of these measures of worth are really good justifications for insect conservation. In my opinion, the weakness of these arguments lies in the fact that too often they do not seem to require the preservation of insect species diversity, but more the number of potential pollinators or insect producers in a particular location.

A more persuasive utilitarian argument for conservation is that which R. Crozier proposed in 1997, which stated that, 'conservation should seek to maximise the preserved information of the planet's biota, best expressed in terms of genetic information held in genes...' and that, 'Gene number is thus an important component of assessing conservation worth' (Crozier, 1997). While this argument is still not one that I personally find very appealing, when one considers the contribution that insect diversity (potentially 30,000,000 different species) makes to the planet's genetic resources, I have to admit that Crozier has presented a strong case for the conservation of insect diversity as a potentially exploitable resource. This potential is already being exploited very elegantly to solve one of the greatest medical problems we face in the 21st Century.

Insect-Derived Antibiotics

The emergence of antibiotic resistant bacterial strains represents one of the greatest threats to modern medical treatment. Recent studies have demonstrated that several insect-derived peptides have potent anti-microbial actions (Otvos, 2000; Kragol, 2002). These peptides may represent a new generation of antibiotics with the potential to break drug tolerance in nosocomial infections such as tuberculosis, which still kills around 8 million people a year worldwide and represent just one example where we are exploiting the genetic resource represented by insect species diversity.

The Scientific Arguments

It is possible to argue for the study of insects and their conservation because they are fascinating creatures displaying the elegant and spectacular traits which are so typical of the natural world. During his address in 1929 Royal Chapman asked why entomological research could not be justified on the basis of scholarship itself.

"We apologise for work that is undertaken from the standpoint of original scholarship by saying that no one knows what the economic importance the results may have at some future time. Why not justify such work on the grounds that the results sought after are significant in the realm of knowledge..."

Royal N. Chapman

Address to the Entomological Society of America 1929

This argument, which I think of as 'science for the sake of science', does have its merits, indeed, it was my own fascination with the spectacular elegance of biology that originally inspired me to become a scientist. However, although the desire to advance the fund of human knowledge is the scientific foundation that the success of the human race is built upon, in the 75 years since Royal Chapman made his address academic science has changed a great deal. Just as with conservation, the need to justify the value of any scientific research is now inescapable and the fierce competition for funding has rendered 'scholarly scientific research on the basis of scholarship itself' a rather untenable ideology. It is my opinion that scientific research, whether into insects or anything else, must be driven by need and that the findings must be applicable in order for it to be justified.

Trinidadian Guppies

The conservation of the critically endangered Trinidadian Guppy has recently been justified on the basis that it is "biologically important for evolutionary studies" (Burgess, 2004). Over 250 studies have been published over the last 25 years and yet a recent survey of Trinidadians' regard for the fish revealed that most did not even know it was there. This raises the question of how a conservation effort can have been underway for 25 years and the local population not have been told. When they were told the local people were very positive because, 'the Guppies are pretty little fish'. To me, the enthusiasm of the people of Trinidad gives the conservation of the Guppies far more meaning than just "keeping a load of scientists in work" (Burgess, 2004).

The Ecological Arguments

In the literature there is a weight of ecological evidence that is used as a justification for insect conservation. The arguments presented make particular reference to the critical role of insects as 'keystone' species in the food chain – both as food for other species, and as recyclers of nutrients from the soil and decomposing waste material. Several studies have demonstrated how the loss of certain insect species has had dramatic implications for the survival of other species in certain ecosystems and have highlighted the importance of insects as key functional elements in maintaining ecosystem balance (reviewed by Samways, 1994). These findings have coincided with a relatively new area of research based on the so-called 'biodiversity-ecosystem function (BD-EF) hypothesis' which emphasizes the importance of biodiversity in maintaining the balance of ecosystems (Srivastava, 2002; Naeem and Wright, 2003). This concept is therefore used as an argument for the conservation of insect biodiversity, as in any terrestrial ecosystem insects comprise the majority of the species diversity present.

While I accept that these arguments do present a strong case for conservation, particularly of insects, I must at this point restate my very strong opinion that practically applicable ecology is far more important to conservation than pure ecological research and that the application of biological research should be a facilitator of conservation rather than a driving force. This opinion is in accordance with that of Dr. Diane Srivastava who has expressed concern that recent biodiversity and ecosystem research has, 'reflected academic concerns more than conservation priorities', and who clearly thinks that future biodiversity research should be driven by conservation concerns and

not *vice versa* (Srivastava, 2002). Dr Srivastava even goes on to say that, 'While all of these [BD-EF studies] are academically important...few have direct relevance to conservation.'

The Cultural and Aesthetic Arguments

It is clear that there is a strong trend in the literature to justify conservation, and particularly insect conservation, by focusing on the economic, ecologic and scientific profit to be gained. There are clearly many people who believe, as Royal Chapman did, that it is only through the sheer weight of arguments like these that the conservationist can seduce the wary and cynical public. However, while these justifications are undoubtedly valid, I do feel that they represent a rather blunt, clinical estimation of conservation worth and often come across as if they are being propounded by people who are perhaps a little too desperate to convey the value of insect conservation. It is true that if insect biodiversity is lost on our arable land then essential pollinators may be lost and if an insect species goes extinct in the New Forest the balance of the ecosystem may be upset, but are these arguments which really motivate people to reach into their pockets or lobby their local government?

It seems to me that there are many examples where the cultural and aesthetic value of a species is the real justification for its conservation. For me, as a normal member of the public I am often lulled into thinking that it is not the economic benefits of biodiversity or the scientific fact of biodiversity to which I can relate, but how it translates into the richness and health of the environment in which I live my life. While it may seem a little too intangible to rationalise conservation worth in terms of poetic or romantic ideals, it has been reported that there is a strong correlation between the visual quality of a landscape and 'its richness in terms of bio-ecological factors' and that if the visual quality can be preserved then rural landscape diversity will also be protected (Angileri and Toccolini, 2002). However, while I can see the merit in this argument, it does have some rather strong ramifications for the conservation of species, such as many insect species, which play a more functional role in an ecosystem and which do not have the aesthetic, cultural or historical value all too apparent in a butterfly, a bird of prey or an iconic wildflower.

"The butterfly's attractiveness derives not only from colours and symmetry: deeper motives contribute to it. We would not think them so beautiful if they did not fly, or if they flew straight and briskly like bees, or if they stung, or above all if they did not enact the perturbing mystery of metamorphosis..."

Primo Levi, 1989

So How Do We Value Conservation?

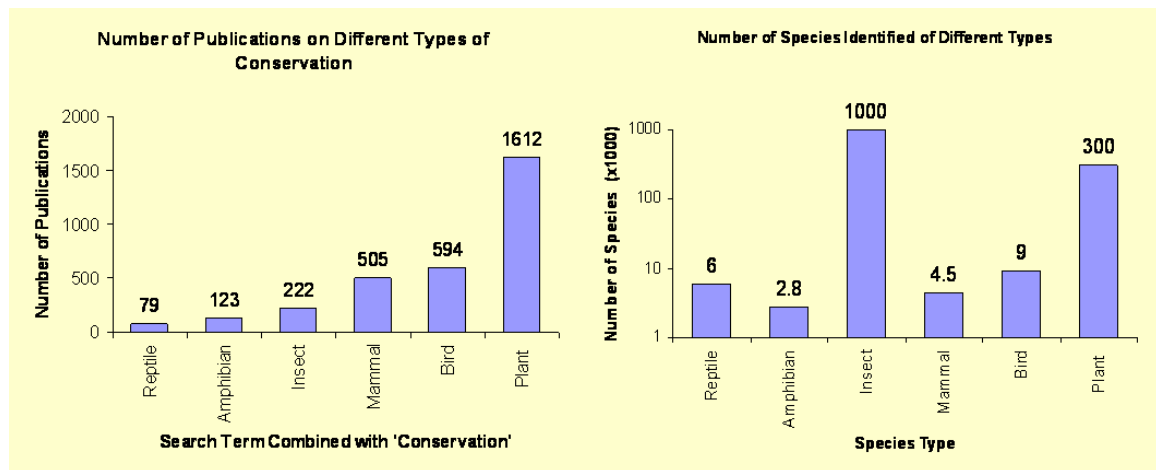
In the previous section I have assessed the arguments for insect conservation and highlighted some of their weaknesses, but what is really important is whether people are aware of them and if they are, whether they give them any credence? Several studies have been performed in an attempt to determine the preferences of the public regarding nature conservation.

A survey of public preferences in the US for various types of 'benefits associated with biodiversity' determined that ecological arguments carried the most weight, followed by utilitarian and then aesthetic and cultural arguments (Montgomery, 2002). Another survey of public preferences for nature conservation in the North York Moors National Park revealed that there was a correlation between the perceived threat to habitat and the public's willingness to pay for its conservation (White and Lovet, 1999). This theme was echoed by the findings of a survey of public attitudes to wetland conservation in Australia, which identified 'the presence of rare plants' as the most important determinant of conservation worth (Streever *et al.*, 1998). Despite the findings of these studies, which all indicated that there is a good perception of the need for conservation among the public, the problem remains that attitudes like that voiced by Primo Levi are still a major obstacle when people are assessing the conservation worth of insects? In his paper entitled 'Values and Perceptions of Invertebrates' Dr. Kellert describes how his own research into people's knowledge and feelings towards invertebrates has, "*revealed a sobering limited appreciation by the general public*" and "*a degree of displayed fear and aversion...with strong feelings of anxiety, antipathy and avoidance*" (Kellert, 1993).



A harmless hoverfly like this *Eristalis tenax* would inspire fear in many people.

When considering a subject such as insect conservation it is therefore impossible to escape the fact that there are many people who fall within Dr. Kellert's ***negativistic*** category and that this is clearly detrimental when it comes to the conservation of insect species. The negative impact of attitudes such as this, which I must admit I can feel some empathy for, is illustrated very clearly by the discrepancy between the number of insect species that have been identified and the representation of insect conservation in the scientific literature (see figure below).



Graph of number of publications referring to 'conservation' and each of the terms shown cited in the Science-Direct Database (left). Graph showing number of identified species of each type (right). Although only a crude measure, the discrepancy between the proportion of species that are insects and the proportion of conservation papers relating to insects in the scientific literature is clear.

While this shortfall must, in part, be the result of negativistic attitudes such as those of Primo Levi, it is possible that the desire of the public to conserve endangered species (as characterised in the studies I described previously) could actually help the insect conservationist to win support for his cause. Indeed, much of the insect conservation currently underway consists of species-specific projects targeting insects that have been given endangered status. The reason for this is that the British and European governments have embraced the concept that the main goal of conservation is to preserve endangered species and has built their conservation legislation around this premise. For insect conservationists, while insects are still greatly under-represented on the lists of endangered species (Black et al., 2001), this has proved rather useful as determination of a species endangered status can now be sufficient in the eyes of the law to secure its recognition as a worthy conservation target.

Future Conservation Conundrums

As I have discussed above, an insects endangered status may represent a good way to overcome the problem of the negative regard that many have for them. However, I believe that this approach only represents an acute phase response and that several long term changes will have to be affected if we are to halt the loss of insect species diversity into the future.

1. More Integrated Conservation Strategies

One common complaint from entomologists is that many conservationists believe that if more glamorous, so-called 'umbrella' species and their habitats are conserved, then the insects will take care of themselves. Such attitudes are not just prevalent among conservers of mammals and plants, even the *Butterflies Under Threat Team* of the Nature Conservancy Council stated in 1986 that, 'if you look after the butterflies, many other invertebrates will be well served' (B.U.T.T., 1986). I think that this assumption, which is clearly quite false, reflects a historical trend for conservation projects which,

while fully justified, are not constructed on a firm scientific foundation and I am in complete agreement with Dr. Clive Hambler from the University of Oxford who has asked how, 'a trivial 58 species of butterfly can indicate the requirements of 28,500 invertebrate species' (Hamblen and Speight). I believe that conservation in the future will benefit from adopting a more integrated approach in which all the key elements of an ecosystem are considered and used equally to both justify the value of the conservation project and to implement it.

"Comprehensive, competent and thorough invertebrate surveys and their correct interpretation are an important component of many environmental and conservation assessments."

Dr E. Eyre

The Entomological Monitoring Service

I strongly agree with Dr. Eyre (Eyre, 2000). I would even go on to add that a conservation project which is conceived from thorough ecological analyses and conducted in a rigorous science-driven manner, will often **have** to give the insect species in a habitat the attention they deserve by virtue of their essential functional role in that ecosystem. To illustrate this concept I will present a case study.

The Partridge and the Pheasants Eye

A long term conservation project of the Game Conservancy Trust has been to conserve the Grey Partridge (below left) – a greatly under-valued farmland bird. Research initially showed that partridges were not reproducing vigorously as there was reduced insect fauna in the arable fields where they were rearing their young. This was demonstrated to be not only the result of pesticide treatment of the fields but also because herbicide treatments were destroying the native flora, such as the endangered wild flower Pheasants Eye (below right), on which the insects were dependent for reproduction and/or food. The solution was to adopt a new habitat management procedure in which arable farmers were asked to leave a 'conservation headland' around the perimeter of their fields (Sotherton, 1992). In this area, which received a considerably lower dose of fertilisers and pesticides, wild flowers could grow at a concentration that did not significantly affect crop yield or quality, but that did improve the aesthetic appeal of the fields and did allow the insect fauna and farmland birds such as grey partridges to thrive (Moreby and Sotherton, 1997; Hawthorn *et al.*, 1998).



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This simple science-driven conservation strategy elegantly demonstrates how an integrated approach to conservation can overcome the negativistic attitudes of the public

and policy makers and achieve the successful restoration of a rich and attractive habitat in which not only the larger species are conserved, but also the insect fauna (whether butterflies or beetles) and a wide array of endangered flora are as well.

Unfortunately, it is important to note that what I have presented in this section is still very rarely the reality of a conservation situation. Often a species is so endangered that there is no time for delay and practical conservation/preservation of the few remaining individuals must begin at once. Scientific research beyond the basic ecology of the species is often a luxury that there is no time or money to indulge in.

"Often it is more important to get the conservation done – all the science niceties can follow after, but often we haven't got the time or the money."

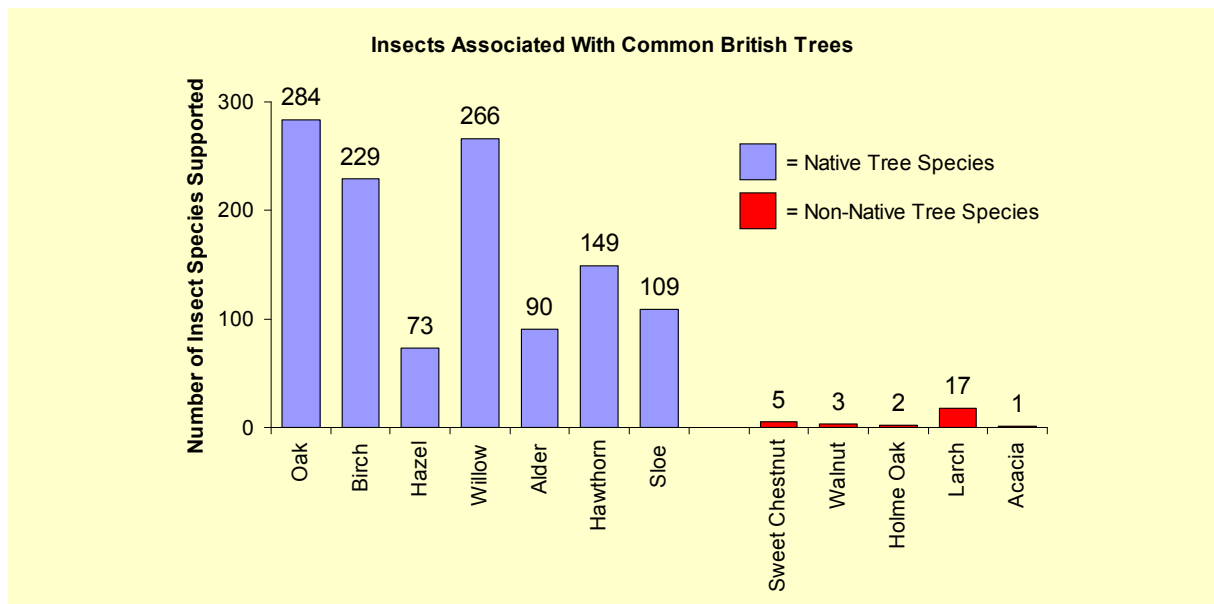
Dr. D. Sheppard
English nature
(Personal Com. 2004)

2. Proactive vs. Reactive Conservation

As I stated above, it is possible that, where an insect species is concerned, the fact that it is endangered may represent the best way of convincing people that it should be conserved. However, when you have only limited resources there are those who would query whether it is right that they are all focused on just the relatively small proportion of our biological diversity represented by endangered species (Mabey, 1980). While I am an advocate of conserving endangered species, I am also a firm believer in the implementation of **proactive** conservation strategies to stop species becoming endangered in the first instance – what Richard Mabey calls the 'small erosions' of our natural heritage (Mabey, 1980). One method that may help to achieve this and that I find appealing is the practice of wildlife gardening.

Wildlife Gardening

First popularised by Chris Baines in the 1980s, wildlife gardening represents an excellent example of a proactive, integrated conservation strategy. It is estimated that there are a million acres of private gardens in the UK, compared to 200,000 acres of official nature reserve, and unlike the barren wastes of our arable land these areas are not contaminated with the chemicals of modern agricultural practices. The premise of wildlife gardening is that if the public can be shown the benefits of gardening in a manner that is sympathetic to wildlife then they will, 'be playing a part in the whole business of saving a safe place for nature' (Baines, 2000). The potential of this approach, particularly for insect conservation, can be seen in a simple comparison between the numbers of insect species supported by native tree species compared to introduced tree species (see below) (Baines and Smart, 1991). If people could be encouraged to plant more native tree species in their gardens then think of the potential benefits for maintaining insect biodiversity.



3. Long Term Changes in Attitudes

In the modern world the public can be the conservationists' strongest ally when it comes to initiating conservation projects and their influence can tip the balance when the politicians are making a critical decision. In this essay have I essentially suggested that conveying conservation worth is often merely a question of presentation, how palatable it is made to Royal Chapman's 'man in the street', and that all it really takes is to push the right buttons for them to be convinced. What is clear is that, whether you believe in endangered species-driven conservation, integrated conservation strategies or proactive rather than reactive conservation, the education of the general public to make them aware of the importance of conservation represents the toughest obstacle faced by those of us who want to implement it. This is supported by English Nature who state that the biggest weakness of public participation in nature conservation decision-making is that often public preferences are ill-informed or not formed at all (Studd, 2002).

So how should the insect conservationist engage the public and alert them to the peril of 1059 insect species in danger of extinction in Britain today? Well I believe that the answer is education, both by conservationists and more importantly through the media. The scientists may not approve (Sheppard, 2004), but through the use of poetic and evocative common names and celebrity advocates of natural history like David Attenborough and Alan Tichmarsh, it is the media that will eventually earn insects, and the other species with which we share our planet, the value in human terms that they need in order to survive.

"...we will need to cultivate our sense of communality with all living organisms. While this must start with creatures we can empathise with readily – the larger charismatic vertebrates – eventually we will need to extend our appreciation to the grandeur found within all living organisms."

Dr. Stephen Kellert
Values and Perceptions, 1993

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