MONARCH BUTTERFLY
NZ TRUST

SUBMISSION TO

**ENVIRONMENTAL RISK
MANAGEMENT AUTHORITY**

ON THE

CONTINUED USE OF ENDOSULFAN

Application HRC07003

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on behalf of the

Monarch Butterfly New Zealand Trust

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1. This is a submission from the Monarch Butterfly New Zealand Trust to the Environmental Risk Management Authority regarding the continued use of Endosulfan in New Zealand.

HISTORY OF OUR ORGANISATION

2. The Monarch Butterfly New Zealand Trust was established to protect and enhance the overwintering site and habitat of the Monarch butterfly (*Danaus plexippus*) (kahuku) at Butterfly Bay in the Far North of New Zealand, and in so doing raise public awareness of New Zealand's endemic butterflies and of the need to increase biodiversity.
3. It was initially intended that the Monarch Butterfly New Zealand Trust would be a local action group, but so great was the interest from people all over New Zealand about the reduction in numbers of New Zealand's butterflies, that the members elected to change the objects in the deed of trust. This change came into effect in the middle of 2007.
4. Membership numbers have grown since the group's inception so that there are now some 600+ members all over the country, as well as several overseas members.
5. Throughout New Zealand, people love Monarch butterflies, and they are used in schools to create environmental awareness and teach about Nature, insect life and metamorphosis. Monarchs are familiar, well-loved insects that provide students and teachers with a comfortable, non-threatening experience with living organisms. Their easily-observed life cycle brings diverse and exciting science concepts to life, and their large size makes it easy for students to handle all life stages.
6. Working with living organisms in the classroom engages students and allows them to practise observation, measuring, hypothesis-making and evaluation skills. Using Monarchs is especially appealing because it captures the interest and attention of all students, not just those with an 'aptitude for science'.
7. Our organisation is based in Russell in the Bay of Islands. Current officeholders of our organisation are Edith Sharpe (Russell) Chair; Jacqui Knight (Russell), Secretary; with fellow trustees Gill Jackson (Russell), Mary Parkinson (Tauranga), Beverley Sinclair (Mt Albert) and Vicky Steele (Christchurch).

OUR OBJECTIVES

8. The objects of the trust are:
   a. to raise public awareness and increase biodiversity within New Zealand for the benefit of present and future New Zealanders;

   b. to maintain, protect and increase biodiversity within New Zealand, so that the natural habitat of the Monarch Butterfly and other Lepidoptera species are protected and enhanced;

c. to increase opportunities for members of communities and visitors to New Zealand to enjoy and experience the Monarch Butterfly and other Lepidoptera species as part of the natural environment;

d. to encourage members of the public within New Zealand to protect and enhance other habitats of the Monarch Butterfly;

e. to enable research groups and individuals to carry out research and education projects relevant to the Trust's objects;

f. to liaise with groups with similar objectives;

g. to seek funding support for any of the objectives of the Trust.

9. We publish four newsletters each year to help members and others with an interest in Lepidoptera. We keep in constant contact with entomologists and organisations such as DOC, Forest & Bird, and regional councils, to ensure we have the latest information available on the natural world both here in New Zealand and overseas. We encourage environmental educators by publishing resources for schools/teachers and fulfilling public speaking requests. Our website has grown hugely and is recognised as an excellent resource in this regard.

THREATS TO LEPIDOPTERA

10. The beauty and mystery of butterflies have enchanted mankind for centuries and are woven into folklore and legend. In ancient Hopi, Mayan and Aztec cultures, the butterfly was one of the most frequently represented figures.

11. Butterflies are found on every continent but Antarctica; some continents such as America host hundreds of different species. New Zealand has few butterfly species, with less than 40 (depending upon the lepidopterist that you speak to, and what they constitute as a 'species').

12. New Zealand's endemic butterflies are in decline. Scientists have added the Forest Ringlet (*Dodonidia helmsii*) to the Department of Conservation's 'Serious Decline' list. This butterfly was once found in many parts of New Zealand, including at least three Northland forests and in the hills around Wellington, but now sightings in many parts of New Zealand are rare and far between.

13. One of our members undertook a letterbox drop of landholders with properties adjacent to Mt Hikurangi (Northland) where this butterfly was common in the year 2000 – but the landholders have reported no sightings of the butterfly and in fact no longer recognise the butterfly.

14. Entomologists advise that there are probably four main reasons why our endemic butterflies seem to be disappearing, one of which is the increased use of pesticides.

15. Sadly, not only is there no concrete knowledge as to how quickly our butterflies are declining but baseline data as to the size and location of species is very hazy.

16. In 2006 the Monarch Butterfly New Zealand Trust embarked upon tagging and transects so that we could get a picture of which Lepidoptera are still found in New Zealand, and in what parts of the country. Such information will be fed into the Global Biodiversity Information Facility (GBIF) www.gbif.org for use by the scientific community worldwide.

17. We asked the Minister of Conservation what more could be done for our endemic species of butterflies. We have since met with the invertebrate ecologists of the Threatened Species Science Section, Department of Conservation and discussed the issues. Since New Zealand is butterfly poor and the species seem to be retreating from urban areas and are now rarely found in some rural areas, people no longer remember or identify them.

THE PLACE OF BUTTERFLIES IN BIODIVERSITY

18. Butterflies are recognised as key indicators of biodiversity, and are important as pollinators. The best-known pollinators are bees, and although butterflies may not be as efficient as bees in pollinating plants and crops, they also bring about seed and fruit production.

19. Butterflies are diurnal, pollinating a wide variety of flowers that open during the day. They frequent big, beautiful, brightly coloured blooms and have good colour vision sensing more 'wavelengths' than either humans or bees.

20. Butterflies probe blossoms with their proboscis. Each flower has a nectary usually hidden in narrow tubes or spurs that is suitable in length for a butterfly's proboscis. The proboscis works like a straw, drawing up nectar.

21. Butterflies are perching feeders and favour flowers with a landing platform (*labellum*), gathering pollen as they walk around flower clusters.

22. The butterfly has a four-stage life cycle – egg, caterpillar (larva), pupa and adult. After mating, females typically deposit their eggs on leaves of the plants that act as a food source for newly emerging caterpillars.

23. The adult butterflies mate, and in between mating and the females laying eggs, will search for nectar-rich flowers. Butterflies have taste sensors in their feet, and by standing on their food, they can taste it to see if it is a suitable host plant.

24. Probably the best known of our species is the orange and black patterned Monarch butterfly which was first reported in New Zealand in 1840. It is believed to have flown/blown here, and therefore is classified as a 'native'.

25. Because of the fragility of butterflies to ecological change, they are an incredible indicator of an ecosystem's condition.

26. Loss of insect life has a direct effect on the food chain – which is critical for the survival of all flora and fauna, including people.

WHAT IS AN ECOSYSTEM?

27. The physical environment along with the organisms (biota) inhabiting that same space, make up an ecosystem. Some typical examples of ecosystems include: a farm creek, a mountain gully, and kauri forest.

28. An ecosystem follows a certain sequence of processes and events through the days, seasons, and years. Processes include not only the birth, growth, reproduction, and death of biota in that particular ecosystem, but also the interactions between species and physical characteristics of the geological environment.

29. From these processes the ecosystem gains a recognisable structure and function, and matter and energy are cycled and flow through the system. Over time, better adapted species come to dominate; entirely new species may change, perhaps in a new or altered ecosystem.

THE ORGANISATION OF ECOSYSTEMS

30. The basic level of ecological organisation is with the individual, a single plant, insect or bird. The definition of ecology is based on the interactions of organisms with their environment.

31. In the case of an individual, it would entail the relationships between that individual and numerous physical (rain, sun, wind, temperature, nutrients, etc) and biological (other plants, insects, diseases, animals, etc) factors.

32. The next level of organisation is the population. Populations are no more than a collection of individuals of the same species within an area or region. We can see populations of humans, stinging nettle, or butterflies. Population ecology is concerned with the interaction of the individuals with each other and with their environment.

33. The next, more complex, level of organisation is the community. Communities are made up of different populations of interacting plants, animals, and microorganisms also within some defined geographic area. Different populations within a community interact more among themselves than with populations of the same species in other communities, therefore, there are often genetic differences between members of two different communities.

34. The populations in a community have evolved together, so that members of that community provide resources (nutrition, shelter) for each other.

35. The next level of organisation is the ecosystem. An ecosystem consists of different communities of organisms associated within a physically defined space. For example, a forest ecosystem consists of animal and plant communities in the soil, forest floor, and forest canopy, along the stream bank and bottom, and in the stream.

36. A meadow community, for example, will have various fungi and bacteria living on dead leaves and animal wastes, protozoans and microscopic invertebrates feeding on these microbes, and larger invertebrates (worms, butterflies) and vertebrates (rabbits, mice).

37. Each community functions somewhat separately, but are also linked to the others by the forest, rainfall, and other interactions. For example, the meadow community is heavily

dependent upon the grasses dying and rotting, feeding the microbes and other invertebrates. In another example, the rainfall and groundwater flow in a surrounding forest community greatly affects the amount and quality of water entering the stream or lake system.

38. Terrestrial ecosystems can be grouped into units of similar nature, termed biomes (such as a 'deciduous forest', 'grassland', 'conifer forest', etc), or into a geographic unit or landscape, containing several different types of ecosystems.

39. Landscapes and biomes (and large lakes, river basins, and oceans) are subject to global threats of pollution (acid deposition, stratospheric ozone depletion, air pollution, the greenhouse effect) and human activities (soil erosion, deforestation).

ADVERSE EFFECTS ON ECOSYSTEMS

40. While many natural forces – drought, fire, flood, frost, or species migration – can affect it, an ecosystem will usually continue to function in a recognisable way. For instance, a pond ecosystem may go through flood or drought but continues to be a pond. This natural resilience of ecosystems enables them to resist change and recover quickly from disruption.

41. On the other hand, pesticide use – especially broad-spectrum insecticides – and other non-natural phenomena can overwhelm the natural stability of an ecosystem and result in irreversible changes and serious losses.

42. Usually, adverse ecological effects take place over long periods of time or even at some distance from the point of release of a chemical. For example, DDT in North America, though banned from use for many years, is still entering the Great Lakes ecosystem through rainfall and dust from sources half way around the world; and Endosulfan levels are increasing in the Arctic region although the chemical is not used there.

ADVERSE ECOLOGICAL EFFECTS ON COMMUNITIES

43. Scientists are most concerned about the effects of chemicals such as pesticides and other pollutants on communities. Short-term and temporary effects are much more easily measured than long-term effects of pollutants on ecosystem communities. Understanding the impact of effects requires knowledge of the time course and variability of these short-term changes.

44. Pollutants may adversely affect communities by disrupting their normal structure and delicate interdependencies. The structure of a community includes its physical system, usually created by the plant life and geological processes, as well as the relationships between its populations of biota.

45. For example, a pollutant may eliminate a species essential to the functioning of the entire community; it may promote the dominance of undesirable species (weeds, trash fish); or it may simply decrease the numbers and variety of species present in the community. It may also disrupt the dynamics of the food webs in the community by

breaking existing dietary linkages between species. Most of these adverse effects in communities can be measured through changes in productivity in the ecosystem.

46. Under natural stresses (for example, unusual temperature and moisture conditions), the community may be unable to tolerate effects of a chemical otherwise causing no harm.

47. An important facet of biological communities is the number and intensity of interactions between species. These interactions make the community greater than simply the sum of its parts. The community is stronger than its populations, and the ecosystem is more stable than its communities. A seriously altered interaction may adversely affect all the species dependent on it. Even so, some ecosystem properties or functions (such as nutrient dynamics) can be altered by chemicals without apparent effects on populations or communities. Thus, an important part of research in ecological effects is concerned with the relative sensitivity of ecosystems, communities, and populations to chemicals and to physical stresses.

48. Consider the effects of spraying an orchard, market garden or playing field with a broad spectrum insecticide when butterflies, bees and other beneficial insects may be present and vulnerable to the toxicant. This practice is both economically and ecologically unsound, since it deprives all plants in the area of pollinators and disrupts control of plant pests by their natural enemies. Advanced agricultural practices, such as integrated pest management (IPM), avoid these adverse effects through appropriate timing and selection of sprays in conjunction with non-chemical approaches to insect control.

49. Effects of chemicals on communities can be measured in laboratory model ecosystem (microcosm) studies and in field trials. Thus, data gathered about effects of chemicals on processes and species can be evaluated in various complex situations that reflect the real world.

ADVERSE EFFECTS ON SPECIES

50. Most information on ecological effects has been obtained from studies on single species of biota. These tests have been performed in laboratories under controlled conditions and chemical exposures, usually with organisms reared in the laboratory representing inhabitants of natural systems. Most tests are short-term, single exposures (acute toxicity assays), but long-term (chronic) exposures are used as well. Although such tests reveal which chemicals are relatively more toxic, and which species are relatively more vulnerable to their effects, these tests do not disclose much about either the important interactions noted above or the role of the range of natural conditions faced by organisms in the environment.

51. Generally, the effects observed in these toxicity tests include reduced rates of survival or increased death rates; reduced growth and altered development; reduced reproductive capabilities, including birth defects; changes in body systems, including behaviour; and genetic changes. Any of these effects can influence the ability of species to adapt and respond to other environmental stresses and community interactions. All of these effects have been found with Endosulfan.

52. Environmental toxicology studies performed on species in the laboratory provide the basis for much of the current regulation of pollutants and have allowed major improvements in environmental quality. However, these tests yield only a few clues to effects on more complex systems. Long-term studies and monitoring of ecological effects of new and existing chemicals released into the environment are needed in order to create understanding of potential adverse ecological effects and their consequences.

TOXICITY OF ENDOSULFAN AND EFFECT ON INSECTS

53. Endosulfan is a broad-spectrum organochlorine insecticide/acaricide registered for control of a large variety of insects and mites in horticultural and agricultural crops including cereals, oilseeds, fruit, vegetables and other crops, and also in parks and reserves. It has been widely used here for over 35 years.

54. Chemicals released into the environment may have a variety of adverse ecological effects. Ranging from fish and wildlife kills to forest decline, ecological effects can be long-term or short-lived changes in the normal functioning of an ecosystem, resulting in economic, social, and aesthetic losses.

55. These potential effects are an important reason for regulation of pesticides, toxic substances, and other sources of pollution.

56. We note the statement on your website that 'Endosulfan is classified as acutely toxic to humans and very toxic to aquatic animals'. It is designed to remove insects which are considered pests. However, as such it is not selective.

57. Endosulfan is known to severely disrupt the communities, and diminish the populations, of many terrestrial species, including soil microorganisms, earthworms, beneficial fungi, and many beneficial insects – ranging from mites to lacewings to wasps. There is little literature available on the specific effects of Endosulfan on butterflies, but as Endosulfan is used to kill moth pests, it is logical that it also kills or disrupts butterflies species. There are observations that where Endosulfan is used, such as in mango orchards in India, butterflies are disappearing (http://tinyurl.com/6ll88a).

SUMMARY

58. Adverse ecological effects from environmental pollutants occur at all levels of biological organisation, but most information about these effects has been obtained with single species. The effects can be global or local, temporary or permanent, or short-lived (acute) or long-term (chronic). The most serious effects involve loss in production, changes in growth, development and/or behaviour, altered diversity or community structure, changes in system processes (such as nutrient cycling), and losses of valuable species. These ecological losses in turn may be economically, aesthetically, or socially important. Hence, ecological effects are of serious concern in regulating pollutants and a variety of tests have been devised to help evaluate the potential for adverse ecological effects. Developing an understanding of how these tests and other information can be used to prevent environmental problems caused by pollutants is the basis for ecological risk assessment research.

59. We understand that Endosulfan is one of the most toxic pesticides on the market today. (Pesticide Action Network, North America, 'Speaking the Trust Saves Lives in the Philippines and India', PAN Magazine, Fall 2006). Non-pest insects, being at the bottom of the food chain are particularly vulnerable to the negative effects of pesticides.

60. We understand that because of its high toxicity and high potential for bioaccumulation and environmental contamination, a global ban on the use and manufacture of Endosulfan is being considered under the Stockholm Convention.

RECOMMENDATIONS

61. In view of accumulated scientific evidence casting increasing doubt on its safety and revealing its high toxicity, we request that a precautionary approach be taken towards Endosulfan.

62. We seek a complete ban on all uses of Endosulfan and the deregistration of all formulations. The reasons are:

- Endosulfan is a highly toxic, persistent, and bio-accumulative organochlorine, any use of which is contrary to the principles of the HSNO Act and to the Treaty of Waitangi.
- Endosulfan is broad spectrum and we believe that its use threatens the viability of Monarch and indigenous butterflies in New Zealand, and that this risk outweighs any reputed benefits from use of the insecticide.
- There is significant recent scientific data showing the negative effects of Endosulfan. It is unacceptable to dismiss this evidence simply because it is not conclusive.
- We object to the ongoing contamination of New Zealand's own environment as a result of Endosulfan use in this country.
- We request that you take into consideration the likely contamination of New Zealand's biota, given the evidence of such contamination overseas.

63. We wish to be heard at a public meeting.

Jacqui Knight, Secretary

31 July 2008