

THE MODIFICATIONS OF THE NEW ZEALAND ENVIRONMENT BY MAN AND THEIR EFFECTS UPON ARTHROPODS

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Although little research information exists concerning this problem there is much circumstantial evidence to show that man has affected the Arthropods of New Zealand through manipulation of their environment in at least fourteen different ways.

These result from ecological changes in the environment brought about:

1. By the destruction of forests through clear felling and burning.
2. By the drainage of wet lands.
3. By the destruction of vegetation through the ravages of noxious animals, including rats and cats.
4. By the pressures generated through introduced Arthropods.
5. Through the effects of introduced birds, and
6. Introduced fish.
7. The effects of introduced pesticides and agricultural chemicals.
8. The predatory effect of collectors.
9. Economic pressures of exploitation.
10. Water pollution.
11. Changes in basic ecology brought about by the damming of rivers, irrigation works and similar works.
12. Urbanization and the spread of towns into virgin areas.
13. The spread of rubbish and litter of all kind throughout the countryside, and the development of tips.
14. The effects of city and town lights at night, arising from the widespread use of electricity for night illumination of streets and highways.

The writings of our early pioneer naturalists indicate that unspoiled New Zealand must have been densely populated with insects, soil and marine Arthropods of all kinds. My own experience recalls vividly such past phenomena as "fly night" at Lake Taupo, insect swarms on hilltops as recorded by Hudson; the dance of the mayflies over streams in the Urewera country, and elsewhere of an evening; swarms of grasshoppers in the alpine tussock lands. The wonderful richness of the insect fauna in alpine regions such as the Homer and Hollyford, and being surrounded by thousands of crabs on the beach at The Mount, Tauranga, of an evening.

Forest and tussock range destruction including alpine lands,

must have caused extensive shifts in the balance of species and possibly brought about the extinction of many before we were aware of their existence. Forest destruction and conversion of land to pasture has undoubtedly caused the most drastic ecological changes in this country since the Ice Age.

Changes in plant communities resulting from pressure exerted by browsing animals has affected populations of many species of Arthropods. The drying out of the forest floor through the destruction of undergrowth and the disappearance of the deep beds of mosses and lichens characteristic of our rain forests, has directly affected the population balance of soil Arthropods; accelerated erosion in alpine regions has brought about shifts in the population balance of rock dwelling Arthropods; the extensive draining of swamp lands has brought about the virtual extinction of some Arthropods dependent on this habitat, e.g. *Xanthorhoe cinnabaris* in Southland.

Insects introduced into New Zealand either deliberately or accidentally by man, must induce considerable ecological changes amongst the indigenous fauna, but little is known of these effects. Introduced birds similarly have exerted great pressure upon the indigenous fauna. Hudson, for instance, insisted that starlings were mainly responsible for the decline of the Micropterygidae. Introduced fish exerted profound effects upon the aquatic insect fauna of New Zealand. More than a generation ago both Tillyard and Percival were concerned about this.

Modern pesticides and other agricultural chemicals have had dramatic effects upon the insect populations of New Zealand. In my view these chemicals are responsible for the disappearance of "fly night" at Taupo, when about the 20th of February each year there used to emerge enormous numbers of caddis flies of the species *Notanatalica cognata*, *Oecetis unicolour* of the Leptoceridae, and several species of Hydroptilidae, primarily I think *Oxythira albiceps*. These used to collect under the street lights in heaps and cluster on the head-lights on cars, making driving impossible.

Interference with the lake levels by hydro-electric works, farming pollution, but I think above all D.D.T., have made these phenomena a thing of the past. D.D.T. spreads naturally and comes down in rain, and it is my view that it has spread in this way to all our mountain regions, and has been one of the primary causes of the extraordinary decline in insect populations at the Homer. It has probably also been responsible for the disappearance of phasmids from Wiltons Bush in Wellington over a long period of years, and for the disappearance of many soil Arthropods, notably Collembola, from both here and the associated Johnson's Hill Reserve. Dr. David Miller blamed D.D.T. for the difficulty he experienced in finding specimens of native insects to figure in his book. Collectors

have significantly reduced Arthropod populations, notably for instance **Peripatus** and the common weta from the hills around Wellington. Commercial fishermen have drastically reduced the crayfish populations in New Zealand, and the Chatham Islands, in an outstanding example of over-exploitation of a biological resource. In twelve years of living at Karaka Bay, pollution of Wellington Harbour has brought about considerable decreases in the availability of crabs, and other marine Arthropods. Spear fishermen have also assisted in the decline of these populations. The damming of so many of our rivers for hydro-electric purposes changes the habitat from running water to still water, and must bring about profound changes in the balance of populations of aquatic insects.

Spreading urbanization is continually destroying the pockets of native bush, and this must be detrimental to many species of our insect fauna. Enormous numbers of insects are attracted to lights at night, and thus perish from this cause. Conversely man's scattering of litter throughout the country, and the development of tipping, is stimulating the development of many undesirable species of native insects and Arthropods.

The precise effects of all these ecological shifts and pressures is unknown, and the pity of it all is that it seems to be nobody's business to find out just exactly what is happening to our Arthropods as a result of man's interference in their environment.