

HOST SPECIALISATION

of wood- and fruit-boring insect larvae in a lowland rainforest in Papua New Guinea

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Abstract

The host specificity of longhorn beetle larvae (Coleoptera: Cerambycidae) and fruitfly larvae (Diptera: Tephritidae) was studied in a species-rich lowland rainforest in Papua New Guinea. We have reared >2,000 cerambycid and more than 7,000 fruitfly larvae from numerous hosts and quantified their host selection with regards to congeneric species, confamilial genera and different families of plants.

Cerambycidae project

We studied the species richness and the host specificity of long-horned beetles (*Cerambycidae*) in the wood of lowland tropical rainforest in Madang, Papua New Guinea. Baits of freshly cut wood from selected trees are exposed in the forest to allow oviposition by cerambycids. The samples are then placed into the rearing cages (Fig.3) and the emerging beetles are collected. Fieldwork is being carried out in humid rainforest at Ohu village, Madang district, Papua New Guinea.



Fig. 1: Baits of wood in the "high shade" position.

For the study we have chosen 29 species of rainforest trees with variable phylogenetical distances (congeneric, confamilial, allofamilial species) and from both primary and secondary forest types.

Baits of 25 kg of freshly cut wood from desired trees are exposed in the forest to allow oviposition by cerambycids. After three weeks, the baits are placed in rearing cages for three months and regularly checked for emerging cerambycids. (fig. 3)



Fig. 3: Baits in the rearing cages.



Fig. 2: Checking the baits in "low shade" position.

Beetles collected from cages are then mounted, sorted into morphospecies and recorded (fig. 5). For sorting and recording we use the custom-built MS Access database, containing morphological, taxonomical and ecological description and a picture of each species, as well as detailed information about every single specimen collected.

Preliminary results

Most *Cerambycidae* are rather wide generalists even among relatively unrelated host species. For example, all species found on *Pimelodendron amboinicum* (fam. *Euphorbiaceae*) are also found on at least two of *Moraceae* species. Generally, most of the species are found on more than three host species (fig.4)

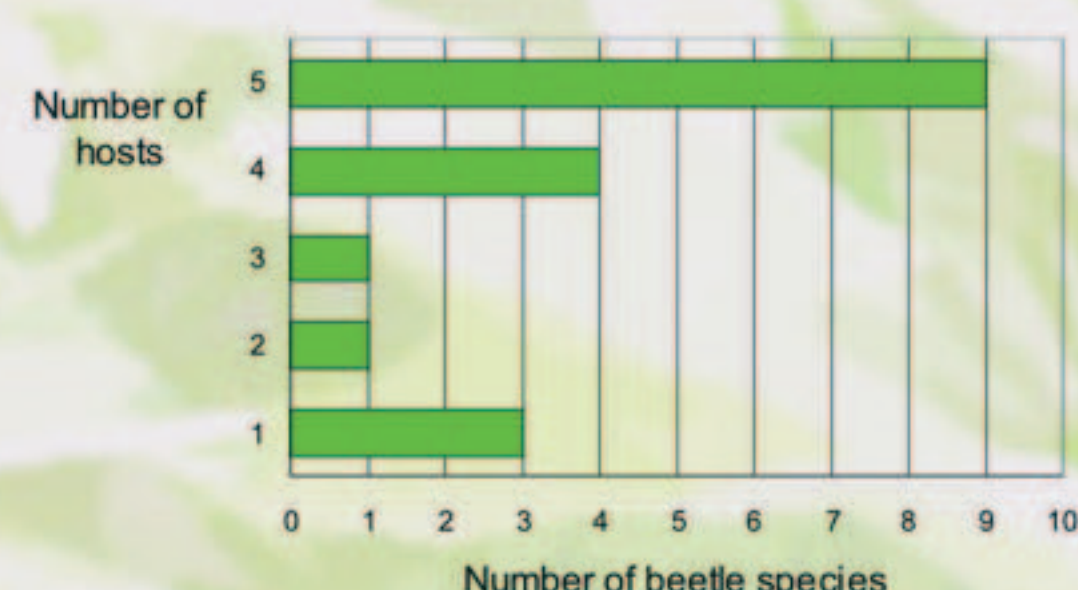


Fig. 4: Host specialisation: proportions of *Cerambycidae* species feeding on certain number of hosts.

Who is the Parataxonomist?

The prefix "para" in this context modifies the meaning of the word "taxonomist" to nonprofessional scientific assistant, with rather limited access to standard expert facilities, but yet largely independent and able to solve complex scientific tasks. In the Parataxonomist Training Center, we are trained to use scientific tools, to perform various research activities and to understand broad context of scientific work.



Fig. 5: Parataxonomist John Auga mounting the *Cerambycidae* beetles.

Fruit-flies project

The host specificity and species richness of fruit flies was studied in a lowland tropical rainforest around Madang, Papua New Guinea. We have reared fruit flies from almost 8,000 fruit flies from 53 plant species, moreover we collected 21,000 fruit flies using the Steiner traps baited by cuelure and methyl eugenol. Overall we obtained 72 identified species of fruit flies.



Fig.6: Steiner trap



Fig. 7: Micah Damag is processing the fruit samples.

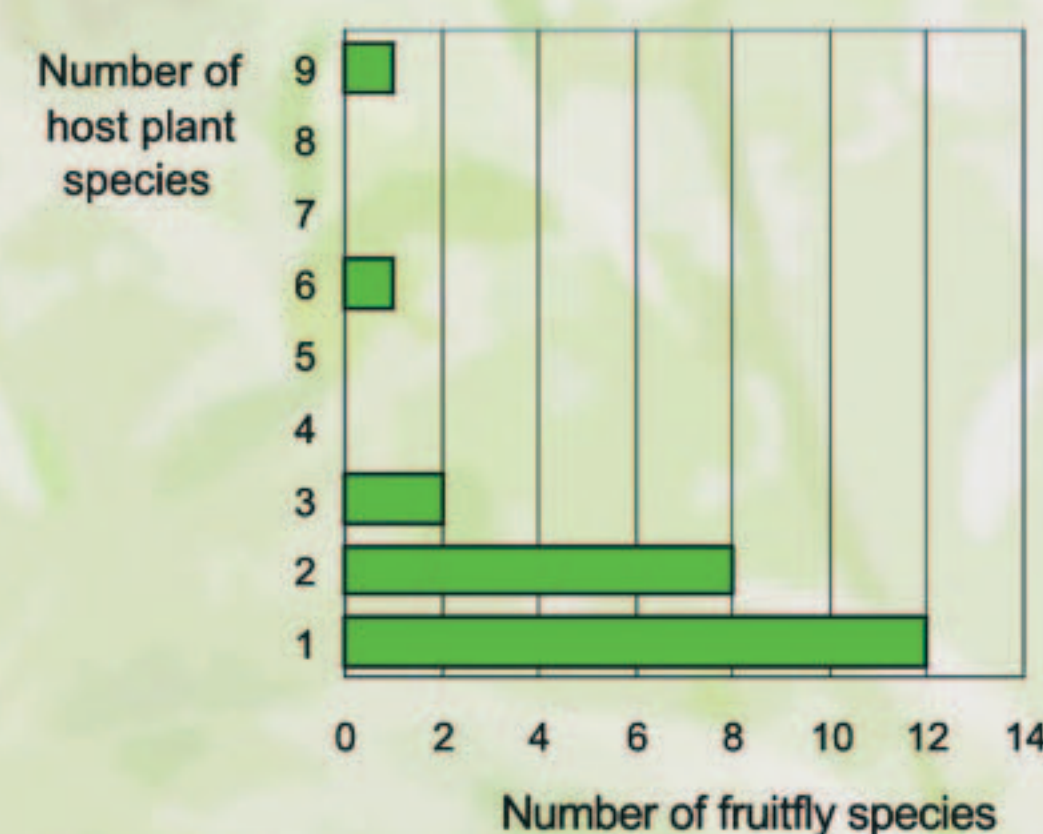


Fig.8: Fruit fly host specificity. Majority of fruit flies exploit only one or two host species.

Host specificity of fruit flies

Fruit flies were highly host specific, as they were mostly specialised to a single plant family (83% of species) and within each family to a single genus (88% species). Only 30 from the 53 plant species were colonised by fruit flies. Plant species hosted 0- 3 fruit fly species at densities characterised by the median of 1 (0 - 12) fruit flies per kg of fruits and 1 (0 - 17) fruit flies per 100 fruits. Steiner traps were highly efficient in sampling the lure-responsive fruit fly species as they re-collected 84% of all species trapped in the same rainforest area five years ago. From the results above we estimated the local species pool of fruit flies at 152.

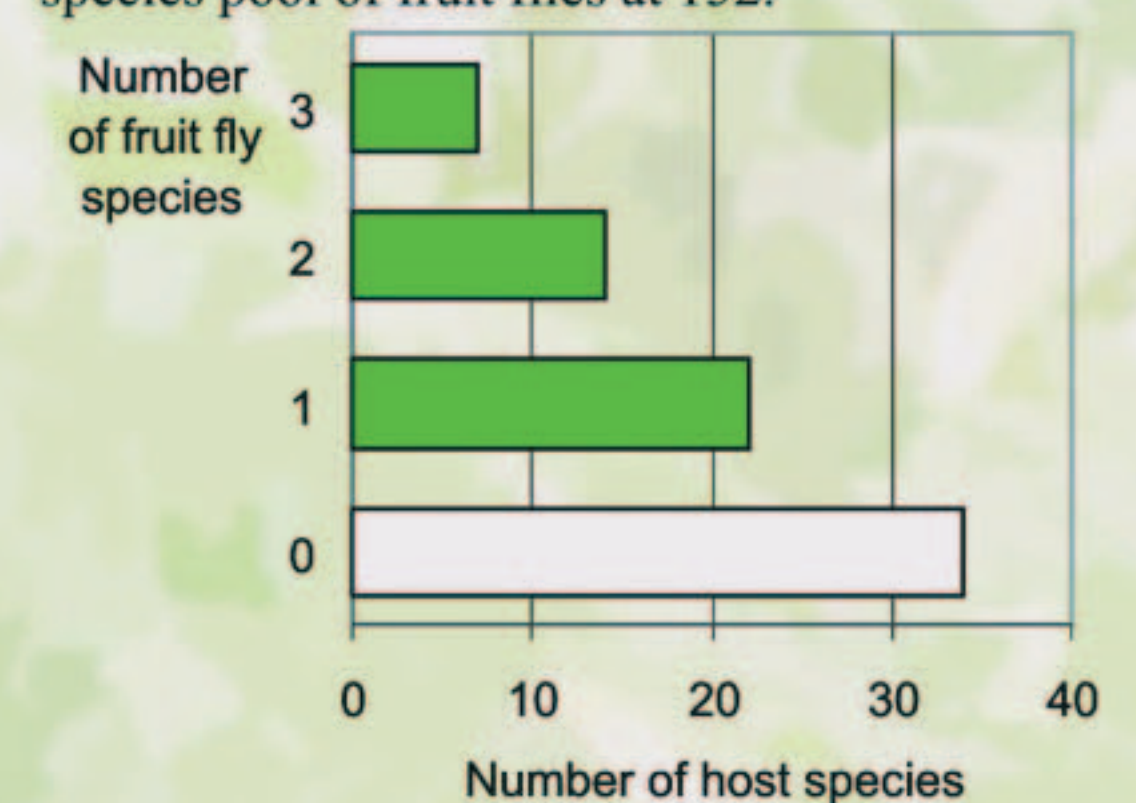


Fig.9: Fruit fly species richness. Only 0-3 fruit fly species per host species.

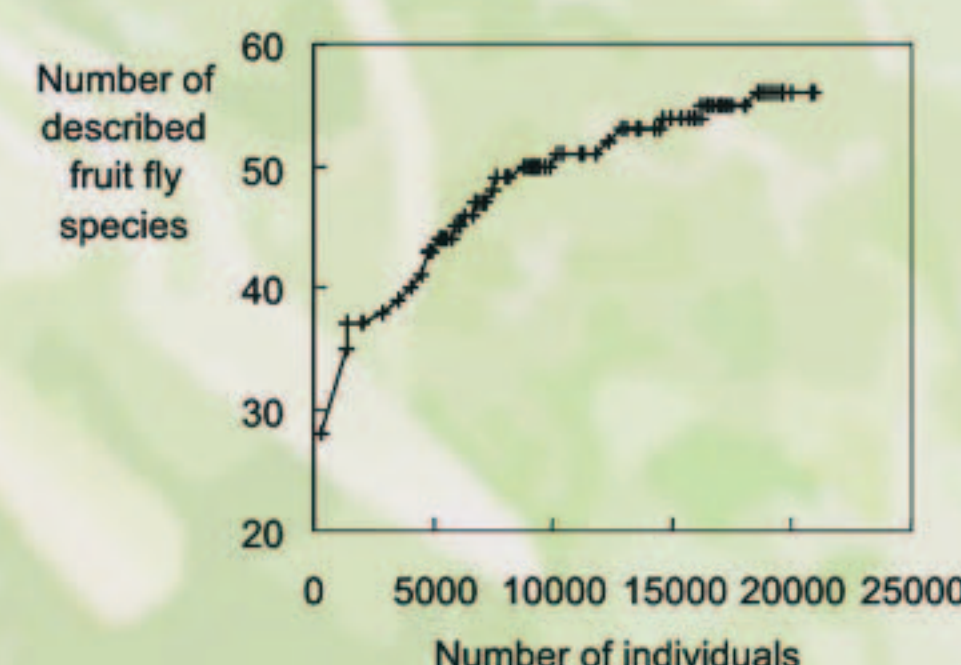


Fig. 10: Local pool of of fruit fly species. Almost completely sampled local diversity of described species

The Parataxonomy concept

To understand complex ecosystems with numbers of species and relationships, such as the insect community of tropical rainforest, demands thorough quantitative analysis. Such analysis could be reliable only when long-time and large-scale approach is employed. To achieve this, the Parataxonomist Training Center in Madang, Papua New Guinea, has adopted the concept of parataxonomists - talented people from local villages trained to carry out various scientific tasks. The Ohu Bush Laboratory is led by senior parataxonomist and local landowner Brus Isua.

