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The information layout and style in this version is the same as in the original microfiche version. The searchable PDFs were made by Trevor Crosby, May 2009, with the original computer files supplied to the printer in 1993 to produce the microfiches.

UNDP/FAO-SPEC Survey of Agricultural Pests and Diseases in the South Pacific

Technical Report Volume 3

Pests and other Fauna
associated with Plants,
with Botanical Accounts of Plants

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Food and Agriculture Organization of the United Nations

Manaaki Whenua – Landcare Research N.Z. Ltd

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Contents of volume 3

In this section, an indication is given of the information available in this volume, and the scope of the information.

Printed report

This report is in sections, separated by unnumbered blue pages, as follow.

- Background to information contained in volume 3, and future developments.
- Plant families index for the Plant – Animal microfiches.
- Botanical index for the Plant – Animal and Botany microfiches.
- Insect index for the Insect Records microfiche.
- References in numerical sequence (information sources are referred to in the Plant – Animal microfiches by number).
- References in alphabetical order of authors' names; this section may be regarded as a bibliography of plant–animal associations for the Pacific.

Microfiche folder

The microfiche folder contains the following parts.

- A copy of the introductory pages, as in the printed report.

- A Botanical Index microfiche (clear stripe) containing an index to all the plants referred to in the Plant – Animal and Botany microfiches. It contains the same information as the 94-page Botanical Index section of the printed report.
 - Thirteen Plant – Animal microfiches (yellow stripe) containing detailed information about animals associated with about 3600 plants. The plants are arranged alphabetically by family, and within each family alphabetically by genus and then species. For each plant, the animal information is presented in the order Insecta, other Arthropoda, other Invertebrata, and Chordata; within each of these categories orders, families, genera, and species are arranged alphabetically, with unidentified or undescribed taxa placed after known taxa.
 - Three Botany information microfiches (green stripe) containing detailed information for about 490 plants. For each plant a botanical description is given, followed by notes on distribution, synonyms, common names, varieties and cultivars, agronomy, and uses.
 - An Insect Records microfiche (pink stripe) containing detailed specimen data for about 400 species of insects from the Pacific for some families of the orders Blattodea, Coleoptera, and Lepidoptera, plus specimens from the University of the South Pacific Collection.
 - Two References microfiches (white stripe), with the references arranged in numerical order. The numbers cross-reference to the reference field entries in the Plant – Animal microfiches. This section is the same as the 223-page References, in numerical sequence, of the printed report.
-

How to find out about a plant and its animal associates

1. Consult the Botanical Index (printed report or microfiche) using the common or scientific name of the plant you want to check. This will provide you with a plant code number, and a number between 01 and 13 in **bold** for the Plant – Animal microfiche.
4. The animal associates found with the plant are listed sequentially. For the principal groups the order is as follows: Blattodea (cockroaches), Coleoptera (beetles), Dermaptera (earwigs), Diptera (flies), Heteroptera (true bugs), Homoptera (aphids, scale insects, planthoppers), Isoptera (termites), Lepidoptera (butterflies and moths), Orthoptera (crickets and grasshoppers), Phasmida (stick insects), Psocoptera (barklice and booklice), Thysanoptera (thrips); then Acari (mites), Araneae (spiders), Pseudoscorpiones (false scorpions), Chilopoda (centipedes), Diplopoda (millipedes), Crustacea (crabs, woodlice, etc.); then Platyhelminthes (flatworms, etc.), Annelida (earthworms, etc.), Mollusca (slugs and snails); and finally Chordata – Osteichthyes (bony fishes), Amphibia (frogs, salamanders, etc.), Reptilia (lizards, snakes, turtles, etc.), Aves (birds), Mammalia (mammals).

For example, taro or dalo, *Colocasia esculenta* (Linnaeus) Schott has been indexed under the following four entries in the index:

- *Colocasia esculenta* (Linnaeus) Schott;
- dalo;
- *esculenta* (Linnaeus) Schott, *Colocasia*; and
- taro.

From the index you find that taro has been assigned the plant code AG0069, and has the bold number **01** indicating it is on microfiche number 1 of the Plant – Animal set. On the microfiche, the number is in the top left-hand corner as **001**.

Plants for which there is information in the Botany microfiche set are indicated in the index with an asterisk (*) before the plant code. The lack of an asterisk for taro indicates there is no botanical information in the Botany microfiche set.

2. Check the appropriate microfiche. The microfiches of the Plant – Animal and Botany sets have plant codes in the top right-hand corner to indicate the range of plant codes for each microfiche. For microfiche 1 of the Plant – Animal set containing information for taro, AG0069, the plant code range is AA0001 to AG0124.

3. Locate the plant entry on the microfiche. On a microfiche the plant codes are arranged in alphanumeric order. Therefore taro is between plant codes AG0068 and AG0070.

The plant codes are on the left-hand side of a page, followed by a set of '=' signs across the page. For example, the entry for taro is:

```
AG0069 =====
          COLOCASIA ESCULENTA (Linnaeus) Schott
          TARO or DALO
```

6. Check out the information for an animal associate. For example, the scarab beetle *Papuana armicollis* Fabricius (Coleoptera: Scarabaeidae) has the entry:

```
>>*Papuana armicollis Fabricius - "Taro Beetle"
      Adults bore in tubers                Melanesia
      (#1011,#4269)
```

Line 1 gives the scientific and common names of the animal. The symbols preceding the scientific name '>>*' indicate that this species is an important pest in the Pacific, and is a major pest of the plant or crop under consideration. A full list of symbols follows at the end of this example.

Line 2 gives a statement of the damage caused, and the general distribution of the animal.

Line 3 gives the numbers to check in the References (numerical sequence) section of the printed report or on the References microfiches for details. #1011 refers to a technical paper by Johnston, A. (1963) on fungi recorded from the South East Asia and Pacific region, and #4269 refers to a book on taro edited by Wang, J.-K. (1983).

Symbols used before scientific names of animals

- > The taxon (e.g., species, subspecies, genus) is found in the *Pacific Region*.
- >> The taxon is found in the *Pacific Region* and is a *major pest* of the plant or crop under consideration.
- * The taxon is an *important pest* of one or more crops. This symbol is also used in instances where the pest causes minor damage to a wide range of crops – occasionally these pests can cause serious damage to plants growing under stressed conditions.
- + The pest *causes serious damage* to the crop, but as yet *has not been found in the Pacific Region*.
- V The pest is known to be a *vector* of virus or virus-like diseases.
- The following symbols indicate that an occurrence is not of economic importance to the plant:
- [..] Square brackets around an entry indicate that the record is *not considered to be economically important*.
- C The record is considered to be no more than a *casual occurrence* on this particular host (i.e., the animal probably has no association with the host, but was found resting on the leaves, flowers, etc.).
- E *Experiments on feeding* on this host have been conducted. The animal has not been recorded feeding on this host in natural conditions although it has done so under laboratory conditions.
- I The occurrence of the animal on the host under consideration has been *inferred* from the reference(s) cited, but no definite records have been seen. For example, one reference gives a list of pests of coconut and oil palm; when there is no other reference to confirm the occurrence of the pests on both coconut and oil plant, they have been included as inferred records on the non-verified host.
- L Animals recovered from the *leaf litter* associated with the plant. Note, however, that this fauna includes saprophages and sometimes larval, pupal, or adult stages of pests attacking the plant.
- P *Predators* and *parasitoids*.
- Q The occurrence of a given animal on a plant or plant product is represented only by *quarantine interception records*. These quarantine records are not regarded as evidence of occurrence in a given country. However, they are an indication of possible occurrences requiring confirmation.
- R The insect has been *reared in the laboratory* on the plant in question. Such records may indicate food plants which would not be eaten in the wild.
- S *Saprophages* – animals feeding on dead or dying (rotting) tissues.
- X The reference(s) cited indicate that the plant under consideration is *not a host* for the pest.

Background to information contained in volume 3

Maddison (1989) gave an account of the background to the entomological survey of the crop pests for the seven SPEC countries (Maddison, P.A. 1989. General introduction and account of the entomological survey. UNDP/FAO-SPEC Survey of Agricultural Pests and Diseases in the South Pacific. Technical Report. Volume 1, pages 17-19.)

This report is based on a literature search of over 9500 reference sources, as well as information provided from specimens (approximately 500,000) collected in the entomological survey and which are held in trust for the Pacific nations in the New Zealand Arthropod Collection, Manaaki Whenua – Landcare Research, Mt Albert Research Centre, Auckland.

Information on entomology in the Pacific is scattered through many journals, books, and unpublished records. The Project countries had requested, for quarantine purposes, to be aware of threats from elsewhere in the Pacific basin as well as of major crop pests throughout the world. The cut-off point for the literature search was the end of 1984; only a few important references published after this time have been included.

The procedure followed in assembling the data on pest/crop associations was to scan a wide range of 'literature' and assemble the information in electronic text files on a VAX computer using the EDT editor.

The literature was thoroughly searched, so later users can be confident that, where a reference is included, all useful host records have been extracted. This procedure has resulted in a small percentage of spurious records being included.

It was decided early in the Survey that it was important to include information on parasites and predators and on 'casual' occurrences on plants, particularly since the latter are frequently included in batches of specimens sent for identification. Some literature on vertebrates (including domestic animals) is cited since these can on occasion cause more 'damage' than many insect species.

Early in 1993 Dr Maddison ceased employment with Landcare Research N.Z. Ltd. In August 1993 Dr

Trevor K. Crosby was asked to bring the Volume 3 report to completion using Dr Maddison's VAX-based computer files. This report contains all the computer text files which were sufficiently completed by Dr Maddison to be included.

Dr Maddison originally intended to have 3 sets of microfiches, as outlined in his prototype microfiche user guide in 1987.

1. **Botany list:** for each plant a botanical description, notes on distribution, synonyms, common names, varieties and cultivars, agronomy, and uses.
2. **Plant—Animal list:** for each plant the insects and other animals associated with it.
3. **Animal:** for each animal information on its common names and scientific name, synonyms, distribution, host plant or other associates, significance in biological control, and economic importance, together with key references about it.

In addition, botanical and animal indexes were to be provided so that information could be located on the microfiches.

Dr Maddison's progress with the report at the time it was taken up for completion by Dr Crosby in August 1993 was as follows.

1. **Botany list.** There were 33 text files last modified between 1983 and mid 1985. The files contained approximately 490 detailed descriptions for plant species covered in the plant—animal files. In total there were about 1150 pages of information. Plant codes needed to be added to allow the plant names to be indexed.
2. **Plant—Animal list.** There were 58 text files last modified between 1987 and early 1993. The 5200 pages of information provided details for approximately 3600 species from 42 families of plants. The text files for the plant families had been alphabetically sequenced, and had reached as far as the genus *Spartina* in the family Poaceae (see Family Index, page 9 for the families available). Dr Maddison has handwritten notes in a 'shorthand' form for the

remaining families. Solanaceae is the only major family of concern to the Pacific region which needs to be put into electronic form. Plant codes needed to be added to about a quarter of the names so that they could be indexed.

3. **Animal list.** Only 6 small files were available; this information was too incomplete to produce microfiches. However, there were 16 files with specimen information for about 400 species of insects from the Pacific (some families of the orders Blattodea, Coleoptera, and Lepidoptera; plus specimens from the University of the South Pacific Collection), amounting to about 90 pages of information. Insect codes were added, for indexing the Insect Records microfiche.
4. **References.** There were 2 text files containing all 9566 references cited in the Plant – Animal files. These references covered the period up to the end of 1984 (with a few later additions). The references were arranged in numerical sequence, to allow them to be cross-referred to the entries used in the Plant – Animal files.

The references were reordered alphabetically to enable users to check if a particular reference had been included in the report. This list is effectively an entomological bibliography of the Pacific.

All the original text files were copied from the VAX computer to a LAN-based PC so that the files could be further processed for microfiche production using WordPerfect 5.1.

A Botanical Index file was lacking, there being only a test file of about 100 names. Therefore, the 3649 plant names were electronically copied from the Plant—Animal files, edited, and placed into a dBase IV database file. Names were then retrieved from the database, combined and sorted, and formatted as a Botanical Index for the microfiches using WordPerfect 5.1 on a PC.

Once files were ready for microfiching, they were output as ASCII text files from WordPerfect 5.1. The text files were compressed using the program PKZIP, and copied to 3½" diskettes. The microfiching firm, Hermes Precisa New Zealand, of Grey Lynn, Auckland, expanded the compressed files from the diskettes with the program PKUNZIP, and output them onto microfiche as ASCII text.

Future developments

Maddison (1989, see above) stated that the microfiche format was recognised as not being ideal for users in the Pacific Region, and discussed various options for making the information more readily available. The main option was to provide the information in electronic form, and to convert the text files into a searchable database.

Searchable database option. This would provide the most opportunities for use of the information on the microfiches, and would allow the incorporation of data into other databases concerned with plant protection.

However, instead of making all the text files searchable in this way, it would probably be more effective to restrict the effort to the Plant – Animal files, and to certain groups of plants (for example, those of prime economic importance in the Pacific, or the palm family, or some other such grouping).

Other electronic forms. It is worth investigating providing the data as electronic text files which users can browse through, rather like a book. 'Guide Reader' is an example of a program which allows a user to browse through files looking at headings, and displaying the information kept 'hidden' at a lower level only when requested. As with the searchable database option, it would be best to restrict the effort to the Plant – Animal files and to certain groups of plants.

A further option is to provide the text files to users so they can be searched by a word-processing program such as WordPerfect 5.1. The Plant – Animal files occupy about 12 megabytes of disk space, and these could be easily held on the hard disk of most recent computers.