

Fig News



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Fig News



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More observant readers of *Fig News* 5 will have noticed that it is a full year since issue 4 hit the streets. This was the result of the break-up of the Rhodes group, with myself moving back to Yorkshire, and then Tony Ware moving to the Northern Transvaal. He is now putting his knowledge of fig wasp host-finding to good use, looking at the parasitoids of citrus pests. As an assistant editor I have drafted in David Blakeley at Leeds, whose main interest is butterflies, but who does at least claim to have seen a wild fig tree on a field trip to Belize.

The last year or so has certainly seen some rapid advances for fig biology in general. On the taxonomic front, the publication of *African fig trees and fig wasps* by Kees Berg and Koos Wiebes, and the identification keys to New World fig wasps by Zdenek Boucek, coming some years after his 1988 *Guide to Australasian Chalcidoidea*, mean that fig wasps from all the southern continents can now be identified, at least to genus level. Equally significant has been the publication of Judy Bronstein's 'Seed Predators as Mutualists', which promises to become the standard review of fig ecology for the next few years.

Looking ahead, there is the get together of fig biologists in Bergen (Norway) in May. It promises to be a genuinely valuable conference, and I can vouch for the quality of the local scenery (if not the price of Norwegian Beer).

Steve Compton February 1994

THESIS ABSTRACT A.B. Ware.

Interactions between figs (*Ficus* spp., Moraceae) and fig wasps (Chalcidoidea, Agaonidae)
PhD. 1992. Rhodes University, Grahamstown, South Africa

Fig trees (*Ficus* spp., Moraceae) and fig wasps (Chalcidoidea, Agaonidae) are uniquely associated. In one fig wasp group, the pollinators (Agaoninae), each species is generally host species-specific. The relationship is one of obligate mutualism where the wasps provide pollination services and in return utilise some of the ovules for larval development. Non-pollinating fig wasps (generally belonging to subfamilies other than the Agaoninae) may be gallers or parasitoids, and can also be host species-specific. In the accompanying studies we examined the factors governing the interactions between fig wasps and their host trees.

Surveys of fig trees and their associated pollinating fig wasps conducted in southern Africa, Madagascar and The Comores generally confirmed their specific relationships. An examination of *F. sycomorus* in Madagascar resulted in the reclassification of *F. sakalavarum* as a distinct species with its own specific pollinator species.

Biological and chemical evidence is presented demonstrating that the pollinators are able to distinguish their hosts through volatiles which emanate from the figs when they were ready to be pollinated. Environmental factors were found to influence wasp behaviour. Ambient temperature governed the timing of wasp emergence from their natal figs. When dispersing from their natal figs, the fig wasps flew upwards and then were blown downwind. Once nearing trees bearing figs ready to be pollinated, the wasps lost height and flew upwind towards the trees. *E. bajinathi* females apparently avoided figs which already contained a conspecific foundress. Scanning electron microscope studies of pollinating female fig wasp antennae showed that while all the species possessed multiporous plate sensilla, in only a few species were these sensilla elongated. Multiporous plate sensilla elongation is rare or absent among other female chalcids and may have

evolved within the Agaoninae in order to facilitate their location of receptive host figs.

Pollinator choice specificity appears to break down in a number of cases. In the first case examined, two pollinator species were recorded from the figs of African *F. sycomorus*. One, *C. arabicus*, pollinates the figs while the other, *C. galili*, acts as a 'cuckoo' by utilising some of ovules for oviposition without providing pollen. In the second case three pollinating fig wasp species were recorded from the figs of *F. lutea*. Two were found to be incidental visitors and were not specifically attracted to the tree. The hybrid seeds from these crosses were successfully germinated but the seedlings did not grow passed the cotyledon stage of their development. In the concluding study the consequences of *Ficus* phenology and the structure of the fig's unusual inflorescence on the non-pollinating fig wasp community were examined. Various factors affecting the population levels and species richness were also examined. Future possible research directions were discussed.

FORTHCOMING MEETINGS

Details are enclosed of the forthcoming *Fig Trees and Associated Animals* meeting in Bergen, Norway, in May this year. If you require further information please contact either C. C. Berg, ARBOHA, Mildevegen 240, 5067 Store Milde, Norway, (FAX 47-55991546) or S. G. Compton, Dept of Pure and Applied Biology, University of Leeds LS2 9JT, England (FAX 0532 332882).

On the 10-13th of November this year there is a symposium on *Forest Canopies: Ecology, Biodiversity and Conservation* which is to be held at the Marie Selby Botanical Gardens, Sarasota, Florida, USA. Details and information are available from Dr. M. Lowman, Director of Research, Botanical Gardens, 811 S. Palm Avenue, Sarasota, FL34236, Tel. 813 366 5730 (FAX 813 366 9807).

BOOK REVIEW

Judith L. Bronstein. *Seed Predators as Mutualists: Ecology and Evolution of the Fig/Pollinator Interaction*. In *Insect-Plant Interactions IV* (Ed. E. Bernays): 1-44 (CRC Press. Boca Baton/Ann Arbor/London/Tokyo. 1992).

Reviewing Bronstein's paper causes me some excitement: where do her, and Berg's and my surveys overlap, and what have we, or has she, missed? Well, the two are largely complementary, which is a nice way to say that Kees and I missed most of the ecological and evolutionary modelling in our chapter on the biology of figs and wasps, and Judith the morphological details and the taxonomic comparison. Most of her examples are taken from the American monoecious figs and their wasps, which she knows so well from her own research.

After reviewing the natural history of the fig-pollinator interaction, the ecological and evolutionary conflicts between figs and their pollinators, and the population- and community- level consequences are discussed, much as these, shorter and more concise, were earlier treated by Addicott et al., (1). Bronstein's review is primarily focused on monoecious figs, because their natural history is much better known than that of the (gyno-) dioecious figs.

The association between figs and fig-wasps is far from altruistic and cooperative; Bronstein uses Janzen's term "reciprocal parasitism", and considers the disruption of the balance of the conflicting interests. Variation in the (unimodal) style-length distribution *per se* is not sufficient to maintain the fig-pollinator mutualism, but it might be disadvantageous for a wasp to elongate its ovipositor: this could allow the fig to develop (some flowers with) longer styles and so counter overexploitation by the wasps. Yet, in a small unpublished study of *Ficus aurea* and *Pegoscapus assuetus*, on which Bronstein reports, no evidence was found for a disadvantage of longer ovipositors. After Galil & Eisikowitch (5) published their graph showing the ovipositor-length-classes compared with the style-length-classes for *Ceratosolen arabicus*, *Sycophaga sycomori*, and *Ficus sycomorus*, much discussion, but little actual research, was devoted to the subject - to begin with

the way to measure an ovipositor (not its valves). I remember the first serious research on this subject that I saw, being done by Sylvie Michaloud, who measured actual ovipositor-lengths of *Blastophaga psenes*, when we had our meeting in Montpellier (1984)! It may be of interest here to recall a general observation, first made by William Ramirez (8), that pollinators of monoecious figs have long ovipositors compared to those of dioecious figs. I add that even within the pollinators of a group of related species of fig, there is a difference in the length of the ovipositor (-valves): in *Ceratosolen armipes* from dioecious *Ficus itoana*, the ovipositor is one-third of the length of the gaster; in *C. marshalli* from monoecious *F. pritchardii* it is a bit longer than the gaster. Alternative to the hypothesis that fig-wasp ovipositors are kept short enough to guarantee seed-production in the longest styled flowers, is Murray's (7) hypothesis that overexploited syconia are aborted, but this is also not supported by Bronstein's (previously unpublished) data on *Ficus aurea* and *F. citrifolia*.

Then, from her own data on *Ficus pertusa* and Compton & Nefdt's (3) on *F. burtt-davyi*, Bronstein concludes that ovary-access (length of the ovipositor relative to that of the styles) is an inadequate predictor of seed-to-wasp production. There also is as yet no evidence that a fig able to restrict overexploitation by fig wasps would produce more seeds. At this point, Bronstein returns to what she calls "basic natural history" with the question: which proximate factors determine whether or not a fig tree will be pollinated?

A fig tree that successfully attracts pollinators, the offspring of which later successfully delivers pollen to another tree, is fertile in both its male and female phases. If the pollinator's of spring does not find another tree (in the right stage), the effect is that the original tree is fertile in its female phase, but sterile as a pollen donor. A tree, of course, may be sterile in both phases. It follows that asynchrony in flowering between the trees of a population is essential; moreover, it must extend year-round. A simulation model was based on that data accumulated by Georges Michaloud (5); a seven-year record of flowering phenology in a large population of *Ficus natalensis*

in Gabon. In the average reproductive cycle, 55% of the trees within the simulated population were fertile in both the male and female reproductive phases, 10% were female-fertile only and the rest were sterile.

The stimulation also showed that, for fig pollinators to persist within a fig population, a minimum number of crops had to be perceptible to pollinators each week: this number depended directly on a relation between population size, the duration of, and the interval between, the flowering episodes. The conclusion is that certain fig flowering traits influence both individual reproductive success and the likelihood that a population of pollinators can persist locally. Actual observations show that the phenological traits greatly vary, which suggests that life-histories may differ among monoecious fig species.

In the last section of her review, Bronstein discusses the community-level consequences of the fig-pollinator evolution. Most interesting among the species that interact with the mutualists are the "interlopers", parasites of the symbiosis, and especially the agaonid "cheaters" that utilize developing fig-ovaries without pollinating. It is only recently that Compton & van Noort (4) published food-webs of the fig wasps associated with a species of fig, indicating the trophic relationships, and Bronstein could not have known this paper. She expects interlopers requiring the aid of agaonid males to escape from the syconium, to be more specific than those who can chew and dig their own exit-holes themselves. Sympatric fig species, the syconia of which open naturally, or have similar developmental cycles, most likely share interlopers. These predictions can and should be tested!

Next to the items mentioned above, because they interested me most, Bronstein discusses many other interesting points. Her review is very authoritative: generalizations are being made and the right questions asked. We are blessed with the simultaneous publication of several generalizations, some of which I include in the list below. Together they form an excellent

preamble to our discussions during the figs-wasps-meeting of 1994 in Bergen!

- (1) Addicott, J.F., J. Bronstein & F. Kjellberg - Evolution of Mutualistic Life-Cycles: Yucca Moths and Fig Wasps. In Genetics, Evolution, and Coordination of Insect Life Cycles (Ed. G. Gilbert): 143-165 (Springer-Verlag, London, 1990).
- (2) Berg, C.C. & J.T. Wiebes - African fig trees and fig wasps. Verh. Kon. Ned. Akad. Wet. Afd. Natuurk. Tweede Reeks, deel 89: 1-298 (1992).
- (3) Compton, S.G. & R.J.C. Nefdt - The figs and fig wasps of *Ficus burtt-davyi*. Mitt. Inst. Alg. Bot. Hamburg 23a: 441-450 (1990).
- (4) Compton, S.G. & S. van Noort - Southern African fig wasps (Hymenoptera: Chalcidoidea): resource utilization and host relationships. Proc. Kon. Ned. Akad. Wet. 95: 423-435 (1992).
- (5) Galil, J. & D. Eisikowitch - On the pollination ecology of *Ficus sycomorus* in East Africa. Ecology 49: 259-269 (1968).
- (6) Michaloud, G. Aspects de la reproduction des figuiers monoïques en forêt équatoriale africaine. XII + 256 pp. Thesis, Univ. Languedoc, Montpellier, France.
- (7) Murray, M.G. Figs (*Ficus* spp.) and fig wasps (Chalcidoidea, Agaonidae): hypothesis for an ancient symbiosis. Biol. J. Linn. Soc. 26: 68-81 (1985).
- (8) Ramirez B.W. Coevolution of *Ficus* and Agaonidae. Ann. Missouri Bot. Gdn. 61: 770-780 (1974).

J.T. Wiebes

LETTER

A. Menezes Jr: Universidade Estadual de Londrina, Dept. de Agronomia, Cx. Postal 6001, CEP 86051, Londrina PR, BRAZIL, writes:

I have been interested in insects associated with figs since working on chalcids for my Masters degree, and have collected material from several localities and many fig tree species in the south of Brazil. However it is only since last year that a more detailed study of this material was possible. At the moment our group is composed of myself, three students and Prof. Efraim Rodrigues, who helps with the tree phenology. Our project consists of three lines of research: Phenological monitoring of the fig trees on the university campus, taxonomic study of the insects associated with each fig species, and the biology and role of the main species of fig insects. So far, we have identified about 18 species, including pollinators (Agaonidae), and their associated species (Torymidae, Pteromalidae, and Eurytomidae). We are interested in establishing contacts with other fig researchers, to discuss methods, receive suggestions and possible collaboration.

ABSTRACTS

ZOOLOGICAL SOCIETY OF LONDON SYMPOSIUM "RECENT ADVANCES IN BAT BIOLOGY". 26-28TH NOVEMBER 1993. LONDON

RUTH C.B. UTZURRUM, Department of Biology, Boston University, Boston, MA02215, USA

Feeding ecology of Philippine fruit bats: patterns of resource use and seed dispersal

To date, data on the feeding ecology of pteropodid bats in the Philippines consist almost entirely of enumeration of food resources from studies conducted in secondary growth and cultivated areas. Little is known on species which forage primarily in forest and of the relationship between these frugivorous species and the plant communities with which they interact. Information on diet composition of, feeding patterns in, and seed dispersal by pteropodids was gathered in a primary tropical rain forest area on southern Negros Island, Philippines. Seeds and marked remains of food plants were collected (1) in 1 m x 1 m seed traps laid out in four 25-m transects along four cardinal directions around select fruiting figs and (2) randomly from the forest floor within a 100 m x 100 m area surrounding the same fruiting figs. Identity of consumers was determined directly through direct visual observation and from netting around sampling trees, or indirectly through analysis of palatal imprints on ejecta. Seed dispersal patterns were examined from seed shadows generated around the fruiting figs. Seed germination tests were conducted on a few fig species to determine potential effects of consumption on seed viability.

Evidence for the following patterns was found and will be described:

1. Differential patterns of fruit consumption among the various species of bats along lines of fruit bat size classes on the one hand, and fruit colour on the other. It is hypothesized that these patterns reflect differences in the nutritional quality of the fruits and of varying energy requirements

among bats.

2. Differential patterns of seed dispersal between large-sized bats which consume fruits directly on the source tree and the smaller-sized species which use temporary feeding roosts away from the source trees. It is suggested that these differences are ecologically important in determining local patterns of plant growth, including generation of mixed species clumps of plants.

3. Differential ingestion of ('intact' vs 'damaged') seeds, which could have direct consequences for success of seed dispersal and seed germinating and may be of importance in effecting long-range dispersal of viable seeds.

A BELIEF ABOUT THE FIG FLOWERS AMONG THE CHORTI INDIANS OF THE JOHOTAN REGION OF CHIQUIMULA GUATEMALA

The flower of the fig tree is a talisman and guarantees its owner of lifelong happiness, good health, success in love and money-making, and safety from the harm of sorcerers and evil spirits. He will also possess bravery and boldness, will be invulnerable to all harm, and will be able to dominate all the animals, even poisonous snakes. It is said that the fig tree lacks visible flowers and is reproduced by spores, but the curers insist that it produces a single flower each year. The flower becomes visible on a Friday at midnight, at which time an evil spirit, usually the devil, suddenly appears and seizes it for himself. The tree from which the flower is taken must be deep in the forest, far from any dwelling, and can be obtained only when it falls on the ground. There are stories about many men who have tried to get one of these flowers but who failed when they were stricken with terror upon seeing the evil spirit. They immediately sickened from terror and some are believed to have died.

Standley, P.C. and J.A. Steyermark. 1946. In p. 32 Flora de Guatemala. Fieldiana: Botany Natural History Museum, 24, part IV. 493 pp.

Translated by William Ramirez B.

ABSTRACTS

JOINT MEETING OF THE ASSOCIATION FOR TROPICAL BIOLOGY AND THE ORGANIZATION FOR TROPICAL STUDIES UNIVERSITY OF PUERTO RICO JUNE 1993

LAMAN, TIMOTHY G. The Biological Laboratories, Harvard University, 16 Divinity Ave. Cambridge, MA, 02138, USA.

Sympatric strangler figs show differences in host tree selectivity in Bornean rain forest

Over twenty species of hemiepiphytic *Ficus* trees in the subgenus *Urostigma* are sympatric in the mosaic of lowland and swamp forest of Gunung Palung National Park in Indonesian Borneo. All occur at densities considerably less than one tree per ha. Trees were surveyed in over 20 km of 30 m wide strip transects. Three of the most common species which had very similar growth habits and dispersal assemblages were selected for comparison of host tree and habitat selectivity; *F. consociata* (n=29), *F. stupenda* (n=58), and *F. xylophylla* (n=28). Each species occupied all forest types in the study area, but showed differences in density by habitat. In all three species, the point of initial germination of the host tree is readily discernable in the adult fig. Height of germination point and canopy layer occupied by fig host tree taxon, dbh, epiphyte load, and other factors were measured. All three species showed highly significant differences in both germination height and host tree dbh. Although partially accounted for by variation in forest structure by habitat, controlling for habitat type still showed significant differences. *F. stupenda* occupies the upper canopy, colonizing primarily dipterocarps, *F. xylophylla* colonizes smaller trees in the midstory, and *F. consociata* occupies all canopy levels. Although a high degree of overlap is likely for all twenty species, some specialization appears to occur.

NEWSTROM, LINDA E. Department of Entomology, University of California, Berkeley, CA 94720, USA

A reinterpretation of fig phenology using a new classification for plant phenology.

Figs have some of the most complicated phenological patterns in plants because they must coordinate with activities of their fig-wasp obligate mutualist pollinators. Using a new classification for plant phenology that explicitly separates levels of analysis (e.g. branch, individual, population) the differences in fig phenology patterns at various levels are clearly shown. According to this classification, in favourable climates such as in the seasonal tropics, sub-annual individual and continual population flowering patterns appear to be selected in figs. In seasonal climates, as the number of flowering phases per tree and flowering trees per population decrease, the fig-wasp system becomes more precarious. In temperate climates, annual flowering at both the individual and population levels prevail. In extreme cold climates, where only a few crops per year are possible, precise temporal coordination among crops is required to achieve simultaneous female and male flowering. The gap of no flowering in the winter requires specialized syconia for overwintering wasps. Four functional types of syconia are defined: trifunctional, bifunctional, seed, and wasp syconia. The temporal distribution of these specialized types of syconia may reflect seasonal stresses in both monoecious and dioecious fig species.

VERKERKE, W. Hugo de Vries Laboratorium, Kruislaan 318, 1098 SM Amsterdam, The Netherlands; present address: PTG, PO Box 8, 2670 AA Naaldwijk, The Netherlands.

Dioecy in *Ficus*

Ficus asperifolia (subgenus *Sycidium*) is a gynodioecious shrub or small liana of the West African tropical rain forest, and consists of female and hermaphroditic plants. The figs of female plants (seed figs) contain female flowers that develop seeds (seed flowers); the figs of hermaphroditic

plants (gall figs) contain both female flowers in which fig wasps oviposit (gall flowers) and male flowers. The seed figs take care of the plant's reproduction, whilst the gall figs maintain the population of the pollinating fig wasps. In seed figs a synstigma allows pollen tubes to reach neighbouring stigmata and so renders the chance for pollination the same for all flowers. In gall figs, a synstigma is lacking, but in both fig types double fertilization takes place. Why seeds never develop in gall figs is not completely understood.

POTTED FIG RIOTS

Thirty pot plants infected with a tiny insect just a millimetre long have caused serious disruption to life around Aalsmeer, a town at the heart of Holland's horticultural industry. Trouble began when inspectors from the Plant Diseases Service (PDS) discovered one of South America's worst pests, *Thrips palmikary*, on fig plants imported from Guatemala.

Random checks on the 1.3 million imported *Ficus* plants failed to spot the insects, but follow-up inspections of greenhouses found thrips on 30 plant belonging to three separate growers. Thrips are extremely damaging to commercial crops, including tomatoes, peppers and cucumber, and it is highly resistant to insecticides. Any outbreaks must be reported to the European Commission. Under pressure from the Commission, the PDS decided to order the destruction of all 1.3 million plants. The growers were incensed. They would not only have lost their plants but also have to pay the cost of destroying them - around £1 million. So they set up road blocks to prevent the inspectors reaching the glasshouses to carry out their task. After a week of negotiations, the horticultural industry association agreed to compensate the growers, and the destruction of the plants can now go ahead.

From *New Scientist* 2 January 1993 p11.

THESIS ABSTRACT S.J. Ross.

The phytophagous insect community on the veld fig, *Ficus burtt-davyi* Hutch. MSc. 1994. Rhodes University, Grahamstown, South Africa

The phytophagous insect community on the African fig tree *Ficus burtt-davyi* Hutch. was studied in an attempt to gain some insight into the factors which influence the composition of insect herbivore communities at a very local level, on individual plants of the host species at a single location. The tree's phenological patterns were determined, due to their relevance to herbivores, particularly those which are host-specific feeders. The trees exhibited inter-tree asynchrony and intra-tree synchrony in fruit crop initiation, whereas leaf production was synchronous both within and between trees.

Sixteen frequently occurring phytophagous insect species fed on the 123 *F. burtt-davyi* trees in the study area over a period of one year. Factors with the potential to influence the composition of this community were investigated at levels of the whole community (species richness), the guild, and the individual species. At each 'level' the effects of the measured factors on fluctuations in the community composition were investigated, both over time (i.e. temporally) and spatially from tree to tree.

During the year the phytophage community was influenced largely by temperature, although rainfall and tree phenological changes did exert varying influences on the abundances of guilds and individual species. Tree to tree variation in species richness (and thus commensurately, in the frequencies of occurrence of guilds and individual species) was influenced primarily by tree architectural complexity. Architecturally more complex trees hosted a greater number of species, a relationship largely attributable to effects of passive sampling and within-tree microhabitat heterogeneity and/or the availability of living space. The distributions of the leaf and stem piercing species were strongly associated with the presence of ants and this relationship manifested itself

within the community as a whole. The degree of isolation of trees had consequences for individual species and for overall species richness, with the numbers of species present decreasing as trees became more isolated.

A detailed analysis of guild distributional patterns revealed that the most important influential factors were those also evident at the level of the whole community and that species within guilds were, on the whole, no more similar to one another with respect to their habitat preferences than species from different guilds. The grouping of species into functional units therefore threw no additional light on the way in which the community is organised.

An analysis of possible interspecific interactions between all of the phytophagous species in the community revealed only positive associations, both between species within guilds and between those in different guilds. These were doubtless attributable to autocorrelation as a result of similar habitat preferences. Competition was therefore rejected as an organising force within the community.

LIGHT RELIEF- Fig Jam

For those of you who prefer to eat your figs rather than work on them, here's a recipe to make your mouth water. An ideal way to utilise your excess figs after sampling. Requirements: 1.5 Kg of ripe figs, 250 ml water, 60 ml lemon juice, 750 g sugar.

Peel the figs and either leave them whole or cut in half as you prefer, then place in a large saucepan with the water. Cover and simmer until tender (about five minutes) then remove from the heat. Add the lemon juice and sugar, stirring gently until the sugar has dissolved. Return to the heat and boil until the setting point is reached (when a little syrup sets on a cold plate) about 30 minutes. Scoop off the surface scum, spoon the jam into sterile jars and seal immediately and store in a cool place.

ANCIENT BANYANS, MANY KINDS OF FIG-WASP! E.J.H. Corner

This thesis, put forward by Dennis Hill in 'shorts' (Fig News 4, Nov. 1992, p.3), opens a new vista. In my botanical understanding all the banyans, stranglers and tree-splitters are variously ancient derivatives of the early pachycaul stage in the evolution of *Ficus* (Corner, Allertonia 4, 1985, 139-153). Some of these are very widely distributed from India eastwards to the Pacific, suggestive of their early evolution; others have variously limited distributions which are either those of innovations or remnants of a former wider extension. Thus, there are some 15 'wides' and many more 'narrows', as given in my check-list (Corner, Gardens' Bulletin, Singapore, XXI, 1965, 6-28). Here is ample opportunity to test the thesis in subgen *Urostigma* and I would add the strangler *Ficus tinctoria* with its ally *F. subulata*, of much smaller habit, in *Palaeomorpha* as well as the large buttressed tree *F. albipila* in *Pharmacosycea* (Corner, Allertonia 4, 1985, 126-138. But one must hurry lest deforestation exterminates most. It seems that there is no need to wait for accurate identification of the fig-wasps for it is the number of their variety which counts. The largest specific variety that came my way consisted of some eight kinds of fig-wasp and a strange large fly all of which came out of a few large figs of the strangler *F. stupenda* on Mt Kinabalu in Borneo, and it is one of the less advanced species of *Urostigma* of relict distribution. That was not half the numbers recorded for *F. benghalensis* and *F. microcarpa* by Hill. I note, however, that Hill emphasizes the need to collect the insects from many figs off as many different plants as possible to gain a true measure of variety and this will apply to 'wides' in all the lands where they grow naturally.

As for the gin in which Hill preserved his insects, it supplies an old means used, if I recall rightly, by Raffles to preserve the giant flowers of the Sumatran *Rafflesia* and it was used by C.E. Carr, the orchidologist, when he lived his isolated life in Pahang. It may be more expensive than ethanol, but it is usually more available. Thus I see a novel and simple check on *Ficus* antiquity.

RECENT PUBLICATIONS

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