Dear Peter,

August 5, 2006

I came across this clipping from the Arizona Daily Sun but unfortunately there is no date on it and it is not the entire article. However, it is a record of what I believe to be the first cooperative research at the Arboretum (The Arboretum, NAU, and CSIRO). There may be a reprint of the paper resulting from Alan's work in the Arboretum files, I am certain there once was or even Francis may have one among her treasures. This may be the reference: Kirk, A. A. 1975. Siricid woodwasps and their associated parasitoids in the southwestern United States (Hymenoptera: Siricidae). Pan-Pacific Entomologist 51: 57-61.

Alan needed a field site to contain wood chunks (logs) gathered from the southwest and contacted me. Of course at that time we had no facilities to build such a facility (24, 6 foot by 6 foot screened cages, each with a separate entrance door). I did not want to miss the opportunity to cooperate with an international scientist since it was the early years of our expanding graduate program and I contacted Francis to see if they could be built on her property. I hired student labor and we built the cages to Alan's specs. The site was maintained for two parasite emergence seasons and again I had students make the collections three times a week and air ship the cartons of live parasites to Australia where they were released. It was a very demanding undertaking for the Biology Department from a logistic, oversight, and financial perspective. We were of course reimbursed for expenses and for labor. He told me later that the Flagstaff "experiment" was the most successful of insect control by parasite introduction of any of their work to that date.

I send this to you in hopes you may want to archive it at the Arboretum in a way that it will not be lost. I think it is an important milepost in the history of the research effort at the Arboretum. I think you and Tom are perhaps the only ones to see the story's value. I suspect that you may personally know Alan Kirk and may find this web site interesting.

http://www.cnr.berkeley.edu/biocon/PDF%202006%20w1185/Goolsby.pdf

We are doing OK here in Sun City which I call "cartoon town" because nothing is real; it is all contrived environment. We miss the mountains and the forests and in summer of course the cool days and the moisture. We are near our two daughters here and they promise to look after us as we have need. We are still active physically exercising, I cycle, and doing all our own care and maintenance. I have not been able to do long walks because of my arthritic back that is impinging nerves into my right leg. I am now pondering surgery to release the pressure on a nerve root at the 5th lumbar vertebra. Best regards to Maureen and to all at the Arboretum.

Sincerely,

Jim Wick

jwick4@cox.net

half suffused with brown, color not sharply delineated; vein R_{4+5} curved upward at apex to meet costa at nearly a right angle; petiole of first posterior cell as long as r-m crossvein; upper intercalary vein short; r-m crossvein a little beyond middle of discal cell; axillary cell at base much wider than anal cell; alula well developed. Abdominal dorsum pale yellowish to whitish pubescent, long black hair across posterior margin of all segments except the first; tomentum consists of short, recumbent, somewhat curly hair. Venter white pilose, a few black hairs present at apex. Genitalia small, (Fig. 4), epiphallus curved upward apically, lower portion of tip of epiphallus somewhat lobed; aedeagus short extending about half length of epiphallus; dististylus not strongly hooked apically, posterior margin nearly straight; basistylus narrow, curved below.

Female. Eyes separated by two and a half times width of ocellar tubercle. Front entirely yellow pilose, a few black hairs present on each side at vertex, bare stripe present down front from ocellar tubercle to antennae. Side of abdomen fulvous at base, last three or four segments entirely fulvous. Wing coloring lighter than in male. Body pile and tomentum more yellowish, tomentum more dense. Otherwise as described for male.

Holotype, *allotype* and seven paratypes from San Felipe, Baja California, Mexico, III-27-63 (C. I. Stage). Types in California Academy of Sciences.

Literature Cited

Coquillett, D. W. 1902. New Diptera from North America. Proc. U.S. Nat. Mus., (1903) 25: 83–126.

Cresson, E. T. 1919. Dipterological Notes and Descriptions. Proc. Acad. Nat. Sci. Philadelphia, 71: 171–194.

Edwards, F. M. 1936. Bombyliidae from Chile and Western Argentine. Rev. Chilena Hist. Nat., 40: 31–41.

Hull, F. M. 1973. Beeflies of the World. The Genera of the Family Bombyliidae. U.S. Nat. Mus. Bull., 286, 687 pp.

Painter, R. H. 1930. A review of the Bombyliid Genus *Heterostylum* (Diptera). Jour. Kansas Entomol. Soc., 3(1): 1–7.

Painter, R. H. 1940. Notes on Type Specimens and Descriptions of New North American Bombyliidae. Trans. Kansas Acad. Sci., 42: 267–301 (1939).

Painter, R. H. and E. M. Painter. 1965. Family Bombyliidae in Stone et al.: A Catalog of the Diptera of America North of Mexico. Agric. Res. Serv., U.S. Dept. Agric. Handbk., 276: 407–446.

Paramonov, S. J. 1947. Zur Kenntnis der Amerikanischen Bombyliiden-Gattung *Triploechus* Edw. (Diptera). Rev. de Entomol., 18(1–2); 183–192.

Siricid Woodwasps and Their Associated Parasitoids in the Southwestern United States

(Hymenoptera: Siricidae)

A. A. Kirk

CSIRO Division of Entomology, P.O. Box 1700, Canberra City, A.C.T., Australia[1]

Since 1962 the Division of Entomology, CSIRO, has been involved in the biological control of *Sirex noctilio* F which was accidentally introduced into and has become established in plantations of *Pinus radiata* D. Don in southeastern Australia. Insect parasitoids and parasitic nematodes of siricids have been collected in the northern hemisphere and consigned to Tasmania for culturing and subsequent release in infested areas of Tasmania and Victoria. Earlier collecting in North America has been confined to California and Nevada and eastern Canada (Taylor 1967; Lloyd 1968, 1970). Ten species of siricids and six species of hymenopterous parasitoids were known to be present in Arizona, Colorado, and New Mexico (Cameron 1965), the three states I surveyed in 1971.

During April to August 1971 dead or dying coniferous trees and associated branches, logs and stumps were examined for signs of siricid larvae or galleries. Infested material was cut into one metre lengths and transported to outdoor cages at Flagstaff, Arizona. The logs were separated into groups according to locality and tree species. With limited time available the main emphasis of the work was placed on obtaining exact identifications of trees and the insects emerging from them. Precise daily records were made of insect emergence and from these their flight periods were determined. Insects were reared from 11 localities in northern Arizona, 2 localities in New Mexico, and from the San Juan Mountains in Colorado.

Results

The siricids *Sirex cyaneus* F., *S. juvencus californicus* (Ashmead), *S. longicauda* Middlekauff, *Urocerus californicus* Norton, *U. gigas* L., *Xeris morrisoni morrisoni* Cresson and *X. spectrum* L. were reared from *Abies concolor* (Gord. & Glend) Lindl, *A. lasiocarpa* (Hook) Nutt, *Picea engelmanni* Parry and *Pinus ponderosa* Laws. (Table 1).

[1] Present address: CSIRO Biological Control Unit, 335 Ave Abbé Paul Parguel, 34000—Montpellier, France.

The Pan-Pacific Entomologist 51: 57–61. January 1975

TABLE 1. Insect emergence from stored material.

Host Tree	No. of Logs	Mean Diam. (cm.)	Sir.c	S.j.c.	S.l	U.c.	U.g	X.m	X.s	R.h	R.p	M.n	Sch.c	I.l.e	I.m	I.rc	I.rp	P.m
P. ponderosa	54	9.3	—	—	—	—	—	—	x	x	—	—	x	—	—	—	—	—
Pa. engelmanni	8	28.0	—	—	—	—	—	—	x	—	x	—	—	—	—	—	—	x[a]
A. lasiocarpa *A. concolor*	14	41.0	x[a]	—	—	—	—	—	x	—	x[a]	—	—	—	—	—	x[b]	x
P. ponderosa	19	9.1	—	—	—	—	—	—	x	—	x	—	—	—	—	—	—	—
P. ponderosa	23	9.5	—	—	—	—	—	—	x	x	x	x	x	—	—	—	—	—
A. concolor	13	28.1	x[b]	—	x	x[a]	—	x[a]	—	—	x[b]	x	x	—	—	—	x[b]	—
P. ponderosa	76	12.4	—	x[a]	—	—	—	—	x[a]	x	x[b]	x[a]	x[a]	—	—	x	x[b]	—
Pa. engelmanni	17	27.4	x[a]	—	—	—	—	—	x[a]	—	x[b]	x	—	x	—	—	—	—
A. concolor	6	15.3	—	—	—	x	—	x[a]	—	—	x	x	—	—	—	—	—	x
A. concolor	4	27.4	x[a]	—	—	—	x[a]	—	x	—	x[a]	—	—	—	—	—	x[b]	—
P. ponderosa	4	9.3	—	x[a]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
P. ponderosa	23	7.4	—	—	—	—	—	—	x	x	—	—	x	—	—	—	—	—
A. concolor	14	16.7	—	—	x	x	—	x	—	—	x[a]	—	x	—	x[a]	—	—	—
A. concolor	48	26.0	x[a]	—	—	—	—	—	x[a]	—	x[a]	x[b]	—	—	—	—	x[b]	—
EMERGED 1971			347	186	106	41	11	113	150	161	111	64	358	10	43	210	—	10
EMERGED 1972			106	51	—	2	2	10	148	—	198	79	41	—	4	—	115	10

[a] Part emerged 1972.
[b] All emerged 1972.

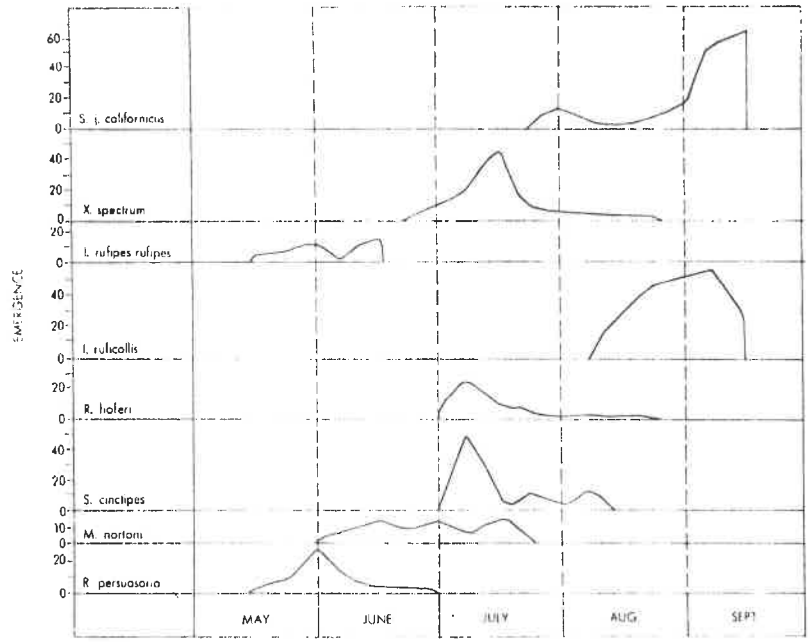

FIG. 1. Seasonal emergence of siricids and associated parasitoids from logs collected at Happy Jack, Arizona.

Nine species which are known to be parasitoids also emerged. These were the ichneumonids *Rhyssa alaskensis* Ashmead, *R. hoferi* Rohwer, *R. persuasoria* L. and *Megarhyssa nortoni nortoni* Cresson; the ibaliids *Ibalia leucospoides ensiger* Norton, *I. montana* Cresson, *I. ruficollis* Cameron and *I. rufipes rufipes* Cresson; and the stephanid *Schletterius cinctipes* (Cresson) (Table 1). The cleptoparasite *Pseudorhyssa maculicoxis* (Kreich) was found associated with *R. persuasoria* at three localities in Arizona (Table 1). The timber was stored over the winter of 1971/72 and another 766 insects emerged during 1972 (Table 1). More than 50% of the insects which emerged were parasitoids, but this cannot be taken as a true figure for parasitism because insect emergence had already taken place from some of the material collected.

DISCUSSION

Rather homeostatic conditions prevail in many of the undisturbed western United States coniferous forests (Hagen *et al.*, 1971), and epidemic outbreaks of insects are relatively rare (Balch, 1960). No evidence was found of current siricid epidemic outbreaks during the

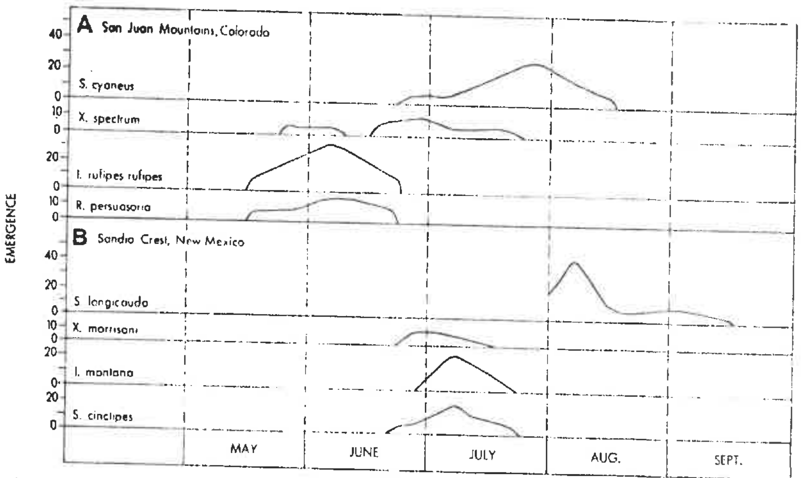

FIG. 2. Seasonal emergence of siricids and associated parasitoids from logs collected at A. San Juan Mountains, Colorado; B. Sandia Crest, New Mexico.

survey. The coniferous forests of the southwestern United States appear to be very diverse and stable communities, therefore it seems likely that host specific associations between insects and trees would have evolved. Evidence that seems to substantiate this is that *S. juvencus californicus* was associated only with *Pinus* spp. and *S. longicauda*, *U. californicus* and *X. morrisoni* were associated only with *Abies* spp. (Table 1). Less specialized relationships were found with *S. cyaneus*, which emerged from both *Abies* and *Picea*, and *X. spectrum*, which emerged from these as well as *Pinus* (Table 1). In addition Spradbery and Kirk (unpublished data), after eight years of extensive survey work and intensive collecting of siricid infested material and subsequent meticulous rearing, have evidence that there are distinct siricid coniferous tree associations in Europe and neighbouring areas. While the apparent siricid host tree associations in the southwestern United States described above cannot be regarded as conclusive without further data, there are good reasons for thinking that they are firm associations.

R. hoferi and *I. ruficollis* only emerged from *Pinus* (Table 1) and may be associated with *S. juvencus californicus*. *R. persuasoria*, *M. nortoni nortoni* and *S. cinctipes* attacked a wider range of siricid species from different host tree species (Table 1).

Relationships between siricids and parasitoids are clearly seen when the ht periods of the three ibaliid species are examined. *I. rufipes*

rufipes and *I. montana* have early summer flight periods and could only attack overwintered siricid larvae (Figs. 1, 2). The closely related *I. rufipes drewseni* Borries in Europe (Kerrich, 1973) behaves in the same way (Spradbery, 1970). *I. ruficollis* has an early autumn flight period and was observed to attack *S. juvencus californicus* larvae late in September. The closely related *I. leucospoides leucospoides* (Hochenwarth), (Kerrich, 1973), from Europe and neighbouring areas also attacks siricids in autumn, active females being noted in Tunisia as late as November (Spradbery and Kirk, unpublished data).

Much further work needs to be done to clarify the role of parasitoids in the suppression of siricid populations in the southwestern United States, but present evidence indicates considerable importance.

ACKNOWLEDGEMENTS

I wish to thank the Director of the U.S. Forestry Service for permission to collect infested timber, Forestry Service personnel for technical assistance, Dr. J. R. Wick, Chairman, Department of Biological Sciences, Northern Arizona University, Flagstaff, for providing laboratory facilities, Dr. C. D. Johnson for help with the manuscript, Mrs. Frances B. McAlister for permission to site cages on her land and Mr. T. D. Center for invaluable assistance during the survey. Funds for the project were provided by the National Sirex Fund, Australia.

*
*

REFERENCES

CAMERON, E. A. 1965. The Siricidae (Hymenoptera: Siricidae) and their parasites. C.I.B.C. Tech. Bull., 5, 31 pp.

BALCH, R. E. 1960. The approach to biological control in forest entomology. Can. Entomol., 92: 291–310.

HAGEN, K. S., R. VAN DEN BOSCH, D. L. DAHLSTEN. 1971. The importance of naturally-occurring biological control in the western United States. Chapt. 11 in Biological Control, C. B. Huffaker (ed.). Plenum Publ. Corp., N.Y. 511 pp.

KERRICH, G. J. 1973. On the taxonomy of some forms of *Ibalia* Latreille (Hymenoptera: Cynipoidea) associated with conifers. Zool. J. Linn. Soc., 53: 65–79.

LLOYD, D. C. 1968. Report on the collection and shipment of parasites of Siricidae in eastern Canada in 1967/68. C.I.B.C. Report. 7 pp.

LLOYD, D. C. 1970. Collection and shipment of parasites of Siricidae in the western United States in 1970. C.I.B.C. Report. 6 pp.

SPRADBERY, J. P. 1970. The biology of *Ibalia drewseni* Borries (Hymenoptera: Ibaliidae), a parasite of siricid woodwasps. Proc. R. Entomol. Soc. Lond. (A), 45: 104–113.

TAYLOR, K. L. 1967. The introduction, culture, liberation and recovery of parasites of *Sirex noctilio* in Tasmania. 1962 67. CSIRO D Entomol., Tech. Paper, 8.

ARIZONA DAILY SUN date: ~1971?

War on Wood Wasps

ENGLISH entomologist Alan Kirk, center, shows specimens of destructive wood wasps to Mrs. Frances McAllister of Flagstaff and Northern Arizona University's Biological Sciences chairman Dr. James R. Wick. Both Mrs. McAllister and the NAU Biology department cooperated with Kirk this summer in the collection of parasites of the wasp in the Flagstaff area. The parasites are being used in a long-term biological pest control project in Australia where the wood wasp has destroyed millions of dollars worth of pine timber since its accidental introduction there in 1948.

Flagstaff 'Foe' Battles

Flagstaff Foe Battles Australia Wood Wasps

An English entomologist said this week that parasites of the wood wasp collected in northern Arizona are helping to control an infestation of the tree-boring insect that has destroyed millions of dollars worth of timber in southeast Australia and Tasmania.

Alan Kirk of the Commonwealth Scientific and Industrial Research Organization, described the 10-year-old biological pest control battle Tuesday at a seminar in the Northern Arizona University Biological Sciences Center for more than 50 biology students and faculty members.

The British scientist spent this past summer in the vast Ponderosa pine forests around Flagstaff, searching for wood wasps and their parasties, using NAU's Biology department as his headquarters, and Mrs. John V. McAllister's ranch near Woody Mountain southwest of Flagstaff as his field base.

His work here has been part of a long-range, international effort, begun in 1962, to control the wood wasp infestation of Australia's coniferous forests biologically "by the action of its natural enemies."

Such controls, he pointed out at the seminar, require more time, but are more economical than chemical methods of control, for biological agents are self-perpetuating and thus "costs are restricted to research and establishment."

In contrast to the "billions" spent on chemical pest control, he added, only about $5 million is currently being expended in the world today on research and development of biological controls.

Kirk noted that while the chemical approach has predominated for the past 50 years, some 220 biological pest control projects, involving 110 species of insects in 60 countries, have been carried out successfully since 1889 when the first such project was undertaken in California to protect its citrus crop from insect incursions.

"In recent years, something like 200 species of insects are known to have reacted to chemical pesticides by producing resistant strains," he declared. "If this keeps up, the number of pests could be colessal, and the reconstruction of natural controls extremely difficult."

The wood wasps currently plaguing Australia's coniferous forests, he explained, are similar to those found in many parts of the world. In Europe, the Mediterranean area and in North America, he and his colleagues have found, they are apparently controlled naturally by a number of parasites and predators, at least to the extent that they are not an economic problem.

In 1948 however, he noted, wood wasps were accidentally introduced from Tasmania into southeast Australia where the insect has no natural enemies. The result, he said, was that by 1960, more than $90 million worth of coniferous forest was destroyed.

With wood wasps, the female of the species is the dangerous sex, Kirk said. They begin their destruction by depositing their eggs in a living tree, literally sawing a

(Continued on page 12)

Flagstaff Pair Arrested

an umbrella organization under which all of the programs dealing with the problem can operate more efficiently.

The basic objectives of the Coconino Council on Alcoholism are three-fold. First is the treatment of those affected by the disease of alcoholism, making available the services already existing (such as Alco- alcoholics who are affected by the problem.

Third is to develop a program of community education and information concerning alcoholism, the disease listed by the Surgeon General as the fourth leading health problem in the United States.

Elected as trustees of the Coconino Council on Alcoholism are ... Health Department; Dr. Geo Hazelhurst, local physician; rold Becker, psychologist, Co nino Guidance Clinic and D Lehmberg, County Health partment, who will serve as Council's public information ficer.

General public meetings the Coconino Council on Al holism will be held each fi and third Tuesday evening the auditorium of the Cocon County Health Department, 2 N. Fort Valley Road.