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Californian Station
Fontana , California, U.S.A.

REPORT

1963 FIELD WORK FOR THE COLLECTION OF SIRICID PARASITES
CALIFORNIA, U.S.A.

by

E. A. CAMERON



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Commonwealth Institute of Biological Control.

Introduction

During 1962 a general survey of numerous parts of Canada and the United States was conducted with a view to ascertaining which of the natural enemies of Siricids might be collected for export to Australia and New Zealand. (See: Cameron, E.A.: North American Survey for Natural Enemies of the Siricidae, May - October, 1962. C.I.B.C. Mimeo.) This is a part of a world-wide search, financed by the Division of Entomology, Commonwealth Scientific and Industrial Research Organization, in which the Pakistan and Indian Stations, and the Japanese sub-station of the Commonwealth Institute of Biological Control are also co-operating.

During the Period June 15 to October 19, 1963, some 6500 miles in the State of California were covered by car. This included a brief tour of the field areas and subsequent travel to San Francisco with Dr. John L. Madden of the C.S.I.R.O. Tasmanian Regional Laboratory, Hobart, Tasmania.

This season, nine shipments have been made to K. L. Taylor, Tasmanian Regional Laboratory, comprising the following adults:-

116 Ibalia ensiger
3 Ibalia sp.
1 prob. Schletterarius cinctipes
5 Rhyssa sp(p).

All of these insects are reported to have arrived alive and in good condition in Tasmania.

Also, three shipments have been made to Mr. Rudy Zondag, Forest Research Institute, Rotorua, New Zealand, comprising the following adults :-

43 Ibalia ensiger
9 Megarhyssa nortoni nortoni

I. ensiger are reported to have arrived in good condition, whilst only 2 females and 1 male of the 4 females and 5 males of M. nortoni nortoni were alive on arrival. All of the insects despatched have been used in the laboratory propagation attempts.

Recent encouraging advice from Mr. Zondag indicates that progeny of one female M. n. nortoni received by him in 1962, at latest report seven males and three females, are ovipositing vigorously in the laboratory.

The Ibalia ensiger were much later this year than anticipated (shipments in October and early November) and Mr. Taylor was hoping for a time that, using cool store for several weeks in Tasmania, it might be possible to field release some of those sent directly from California. However, a spell of cool weather intervened and all adults were eventually used for laboratory propagation.

In addition to the above-mentioned shipments of parasites overseas, three shipments comprising 15 females of Sirex areolatus (7 of these dead) and 2 females of Urocerus californicus (both dead) were sent to M. A. Stillwell, Forest Entomology and Pathology Laboratory, Fredericton, New Brunswick (Canada) for isolation of associated fungus from the intersegmental sacs. Very recent information indicates that cultures have been obtained from the 5 specimens of S. areolatus alive on arrival (3 were dead). All results were negative with the dead insects. It will be some time, however, before the identification of the associated fungus is known.

General

Essentially two periods were spent in the field - June 15 to September 19, and October 8 to October 19. The first period was interrupted briefly in August for return to Fontana for reasons unrelated to the project. Approximately 60% of the time was spent at Sagehen Creek, a Department of Zoology, University of California, Berkeley, field station located right on the fringe of the 1960 Donner Burn, about 12 miles north of the town of Truckee. 20% of the time was spent in the Foresthill area, and, of the remaining time, some at the Blodgett Forest (near Georgetown), another University of California field station, at the University in Berkeley to make use of library facilities, and at the Forest Insect Field Base, Hat Creek, which is a field station of the Pacific Southwestern Forest and Range Experiment Station, Berkeley.

In July, a seminar on biological control in general and these Siricid investigations in particular was presented to the Botany and Zoology students and staff who were at the Sagehen Station for University of California Summer School courses.

Methods

At the outset of the field season, it had been hoped that cages could be erected in the field at various locations, loaded with infested logs, the emerging parasites collected, and periodically shipped. Such a simple operation did not work.

Early in the season three screen cages were built. Each cage was composed of a number of panels which were drilled and then bolted together with carriage bolts and wing nuts. This means of construction permitted relatively easy assembly and disassembly by one man, and of course contributed to ease of movement of cages from location to location as might be necessary.

Each panel was merely a braced frame of 2" x 2" douglas-fir, covered with wire screen (16 mesh). Two sizes of cage were constructed. Two cages had outside measurements approximately 80" x 38" x 78" high, the third 80" x 38" x 40" high.

The larger cage comprised 7 panels - 6 with outside dimensions of 76" x 38", 1 being 80" x 38" for the top. Two of the panels were bolted together to form each side, and one was then bolted butted to each end. A hinged door, lifting up and being held by a hook-and-eye, or held closed by three thumb-screws, was built into the lower half of one of the end panels to allow for entry into the cage. (A modification to provide for a full-length door would be incorporated into any future cages built.) The seventh, top, panel was butted on the top edges of the other six and bolted down.

Initially the screening was stapled to the frame. However it became necessary in some instances as the cages were exposed to the weather, etc., to nail wood lath along the edge of the screen to seal places where insects might escape. Also, beaded weather-stripping (bead to the inside) was tacked around all of the wood-to-wood joints, again to plug gaps caused by warping, etc.

The smaller cage consisted of five panels - two 76" x 38" laid on their side, one 80" x 38" (top), and two 38" x 38" (ends). One of these smallest was fitted with a full-sized door.

One person could carry, with some effort, three of the larger panels at a time. Although weight was a factor, the biggest drawback to their transport was their awkwardness. A large cage could be assembled by one man in approximately one hour. Because of their knock-down-nature, the cages could be loaded onto a car-top carrier for transport between field locations.

The cages were set up at selected field sites and loaded

with what appeared to be infested logs. These had been bucked up to length with a chain saw, newly purchased for the project this spring. They were then checked periodically, at least once daily if practical, for emergence. But for the one in the Foresthill area, it was possible to choose locations off the beaten path for cages, and thus preclude the possibility of curious individuals interfering with the programme. The Foresthill cage was set in the most reasonable place available, but even so it was tampered with, and handles on the door - inside and out - were removed. It was made a point to have removed the cages from the field prior to the start of the hunting season (September 21) as nothing would have been safe after that time.

In mid-September and again in mid-October quantities of infested logs were brought back to Fontana for holding inside the laboratory. For this, a U-Haul trailer ("One Way Anywhere") was rented, and proved to be very satisfactory.

Remarks:

(See also 1962 Report for additional details).

A. The Donner Burn

This season work was concentrated in the Sagehen area, although the other two areas of 1962 concentration, Prosser Creek and Alder Creek were also visited at various times. (All of these locations are in Nevada County, California.) These latter, however, were not productive of parasites. The Prosser Slope had been almost completely cleared for replanting, and much of the brush had already been burned. Some of the lower portions of the slope had been replanted this spring. To reach the 1962 Alder Creek investigation area, it is necessary to travel about 2 1/2 miles each way by foot, as the logging road used initially had been cut off to vehicular traffic at the conclusion of salvage operations. But fortunately, current insect activity did not appear to warrant extensive work at this particular site. Unless otherwise specified, remarks under this section apply to the immediate vicinity of the Sagehen Creek Station.

1. Location - The great majority of the work was concentrated on one slope which was about 1/2 mile south-east of the Station. Apart from being the most convenient location, this was the same area from which most of the Megarhyssa and Rhyssa had been taken in 1962.

To reach this slope by road, bear left (west) on Forest Road 19N07, 6.9 miles north, on Highway 89, of the Highway 89 overpass over Interstate Highway 80. Bear left at forks on this road onto a unnumbered forest access road, which parallels the south side of Sagehen Creek, continuing a total distance of 2.7 miles. This is a point to the

south-east of Sagehen Station, and across the creek from it. The slope is to the left (south) of this position. Cage #1 (see below) was located in R16E., T18N., Section 8, at approximately 6550 feet, and Cage #3 almost due north of it near the southern edge of Section 5 of the same township, at approximately 6400 feet.

Cage # 2 was located near the northern edge of Section 5 of the above township, elevation approximately 6500 feet, and almost on the border-line between Sierra and Nevada Counties. This location is reached by following the (signed) road to Sagehen Station from the Highway, Forest Road 18N11, approximately 1/5 mile to its junction with Forest Road 19N08, north (right) on this for 1/4 mile, and then approximately 1/10 mile on an access road to the left.

2. General Features. - The area of Cages # 1 and # 3 was a slope of approximately 25-35%, facing generally to the north-west. Most of the trees near the ridge (area of Cage #1) had been killed during the 1960 fire, while many of those lower on the slope (Cage #3), although stem-charred, are recovering and thus form a much less open type of forest. Not too much salvage-logging had been carried out on this slope (although a fair amount of timber had been removed from the ridge area) apparently as either many of the trees were not of merchantable size or many of the larger trees were not damaged to the point where it appeared that they would not recover.

The area of Cage #2 was a much flatter and more open type, having been heavily salvage-logged. Few living trees remain here.

3. Host Tree Species. - In my 1962 report the trees were identified as Pinus ponderosa, Abies concolor, and A. magnifica. Closer study this year, in the company of a trained botanist, revealed that in fact many of the Pinus trees are P. jeffreyi (P. ponderosa var. jeffreyi of some authors) or hybrid swarms of ponderosa-jeffreyi. Positive identification of burned or charred stems of these closely related species is very difficult if not impossible. (The most facile separation of these two species is accomplished through cone characteristics.) However it was the Abies spp., mainly concolor, which proved to be much more heavily attacked than the Pinus spp.

4. Climate. - Some climatic data were given for Truckee in the 1962 report. This year, records of daily minimum and maximum temperatures, and precipitation, were made available at the Sagehen station. With the exception of two days during the Donner Burn (August 21-22, 1960) and a maximum reading for August 25, 1961, continuous and complete records are available since April 26, 1960. (Sagehen is a co-operating United States Weather Bureau station, submitting their records once a month to the Weather Bureau.)

This past season has been regarded by all people with whom I have come in contact as a most unusual one. There was a much later and much wetter spring than usual, followed by a comparative cool summer.

When temperature-rainfall data are examined, this fact becomes very apparent. In 1963 from April to August inclusive, the mean monthly temperature (i.e. $\frac{\text{daily maximum plus daily minimum}}{2}$)

2

n

where "n" represents the number of days in the month) was in each month except May, lower than it has been for the corresponding months since 1960. (September figures are only partially complete in my records, since I last visited Sagehen the middle of that month.)

Rainfall charts provide an even more startling picture. For the three successive September-to-August periods, the rainfall totals are :

1960-61	-	23.14 inches
1961-62	-	33.56 inches
1962-63	-	47.82 inches

This year, rainfall continued comparatively heavy through even May and June (over 3 inches in each month) whereas it usually is considerable under 1 1/2 or 2 inches per month after March. Indeed, precipitation as snow was recorded at Sagehen on June 28 of this year.

It might be noted that February 1963, was an unusually warm month, with temperatures rising as high as 62°F. on two occasions. 15°F. was the lowest recorded. The mean for the month (see above) was 38.29°F, as compared with 26.34°F. in February 1962. However, both March and April cooled off considerably, the respective monthly means being 30.27°F and 31.85°F. During these months the temperature did not climb above 60°F until it reached 61°F April 28-30 inclusive. The lowest temperature, -7°F, was recorded April 17, with a -3°F as late as April 22.

When this situation became known after analysis of weather data after my return to Fontana, it raised the question as to whether the unusual February weather might have been warm enough to stimulate the insects in the wood to recommence their development, only to be killed by the much colder temperatures of March and April. The February mean (38.29°F) compares favourably with a normal April mean (37.37°F in 1961, 42.02°F in 1962). Unfortunately, large quantities of infested logs from Sagehen were not brought back to the laboratory, and those few which were, had been discarded because of a total lack of production.

Unusually large numbers of dead insects within the logs in

the field were not noted, although there was no conscious assessment of this point. As in 1962, dead insects which had not emerged were recovered from time to time.

B. The Foresthill (Volcano) Burn

More extensive scouting was carried out in this area than during 1962. However, as noted in the earlier report, larger areas of this burn appear to have been salvaged, and more rapidly, than in the Donner Burn. In only two places was Siricid or parasite activity observed this season.

1. Location. - All of the Ibalia ensiger shipped came from very near the site of the old Mountain Chief mine, R. 11E., T.15N., border of Sections 28 and 33. On October 17 and 18, while burning of small brush piles and litter was in progress, many Siricids and one I. ensiger female were taken in the adjacent Section 29. These locations, approximately seven miles in a line to the northeast of the town of Foresthill, are reached by a combination of the Foresthill Divide Road and Forest Roads, especially 15N20 and 15N21. It might be added that heavy rains, as encountered October 11-12, make these unpaved roads very slick and often impassable for ordinary 2-wheel drive vehicles.

2. General Features and Host Trees. - Elevation of the more productive area is approaching 4000 feet. Two dying incense-cedar trees, Libocedrus decurrens each about 60-70 feet in height, were felled, and nine sections, each about 32 inches in length, were taken from each butt and placed in a field cage. The trees were located in a more or less open and isolated position near the top of a very steep slope, in the canyon at the base of which flows Mountain Chief Creek. Each tree had a number of old Siricid and presumably also parasite emergence holes, and appeared to be carrying a good current infestation.

This particular area had been salvage-logged, but there were some very large Pinus and Abies, as well as Libocedrus, which had not been immediately killed (although some were severely charred and now dying) in the 1960 Burn. Tenders for clearing in preparation for replanting of this site had been called.

That area in Section 29 was of somewhat younger trees. One-half to two-thirds were L. decurrens, while P. ponderosa and a few A. concolor were also present. During this past summer, prison labour had been employed to hand rather than machine clear the dead conifers, manzanitta, and other brush, and place this in small piles for burning. Such burning was being carried out on October 17 and 18.

3. Climate. - Weather Data for Foresthill of the completeness of that of Truckee was not available. However, some temperature and

rainfall records were obtained from the Foresthill Ranger Station (U.S. Forest Service), and temperature records from the Foresthill California Division of Forestry Station. Since this latter agency especially does not have a year-round operation or continuous secretarial help, their records are rather spotty at such times as crews may be out on fires, etc.

The Ranger Station takes daily readings of present temperature at 1450 hours Pacific Standard Time between roughly mid-April and early November. Records for May 1963, were unavailable. This year the mean temperature at 1450 hours PST for the months June, July, and August was lower for each month than it has been for the same months since 1960. The mean for September was the second lowest September mean for the same period. June and July in particular were much colder than in previous years - June was 8.4°F cooler than the three-year (1960-1962) average, and July 7.5°F cooler than the average for 1960 and 1961 (July, 1962 records unavailable.)

As at Sagehen, startling differences in rainfall for the three successive September-August periods were also evident. (Rainfall records are taken the year round by the Ranger Station). For the three years, the totals are :

1960-61	-	34.62 inches
1961-62	-	43.85 inches
1962-63	-	65.28 inches

C. The Siricids

Note: All identifications are tentative and by the writer.

1. Sirex areolatus - Only one male was recovered from the Donner Burn, and that one emerged on September 23 from one of a few sticks of Abies concolor brought back to Fontana for holding in the lab. (It is, incidentally, the only insect to have emerged from this fir material). No other insect of this species, or genus for that matter, were observed at any time in 1963 in the Donner Burn.

From L. decurrens brought back to Fontana from Foresthill in mid-September, 135 males (70.3%) and 57 females (29.7%) emerged between September 30 and November 4. (These incense-cedar logs had been caged in the field since July 17.) Emergence of this species until November 4 from L. decurrens logs brought back to Fontana in mid-October amounted to 27 males (64.3%) and 15 females (35.7%), for an overall lab. emergence of 162 males (69.2%) and 72 females (30.8%). It is to be noted that the emergence of males preceded that of females by 5 days in the laboratory, and it is presumed that a similar situation occurs in the field. Thus the first percentages quoted (70.3:29.7) probably give a more accurate indication of the natural sex ratio

than do the figures obtained from emergence from the second lot of host material since field emergence had already begun by this time.

On October 17 and 18, in the area of burning brush, 14 more female adults of this species were collected, every one either in flight or at rest on L. decurrens. No males were observed. Literature sources, e.g. Middlekauff, W.W., 1960. The Siricid Wood Wasps of California (Hymenoptera : Symphyta). Bull. Calif. Ins. Surv. 6(4): 59-77, suggest that adult males gather about the crown of the trees, rather than frequenting the lower bole. There seemed to be no preference shown for shady vs. sunlit side of the trunk, although it was noted that there was a very definite preference for charred bark vs. non-charred bark for resting. Insects were concentrated between two and five feet above ground level, although they were taken between three inches and about ten feet, and observed on occasion at higher positions. They did not frequent the younger trees, say less than 7 inches DEH. None were seen on smouldering or burning logs.

In the late afternoon, about an hour before sunset, another visit was paid to this area of burning. Whereas Siricids had been very common in the earlier part of the day, they were now quite scarce. Quite intensive searching yielded at that time only one Urocerus californicus, and that was taken in flight near the ground. It is all but certain that the insects do not crawl into cracks and crevices of the bark for the night. Where they do go is not known.

2. Urocerus californicus - On August 4, one adult was captured in flight in the Sagehen area, and on October 17 a further six adults, most in flight, were captured about the burning brush in the Foresthill area. All of these were females. No other details are available for this species.

3. Xeris spectrum - This species was recovered only from the Donner Burn. From Cage #1, between July 8 and 18, 27 males and 1 female emerged from Abies concolor and Pinus ? jeffreyi x ponderosa. On August 4 three more males emerged from A. concolor in Cage #3, for a total of 30 males (96.8%) and 1 female (3.2%).

4. Xeris prob. macgillivrayi - (Identified in 1962 as X. morrisoni) This was by far the most common species recovered at Sagehen, a total of 105 males (72.9%) and 39 females (27.1%) being taken from all cages between July 8 and August 28. Males of this species were seen on June 24, the first day in the field at Sagehen, but the first females were not seen until July 2. Emergence from the field cages was concentrated between July 8 and 21, with another lower peak during early August. However, the cages were not checked nearly as regularly in the latter month as, during much of this period, I was elsewhere in the

field. Thus a complete picture of emergence is not available. It would appear, though, that it did significantly taper off during August.

Of Siricid emergences from Libocedrus brought to the lab. from Foresthill, X. prob. maegillivrayi comprised only 27.6% of the adults. This was composed of 61 males (68.5%) and 28 females (31.5%).

On October 17 and 18, a further 30 females of this species were field collected. The same observations as reported above for S. areolatus apply also to this species.

D. The Parasites.

1. Megarhyssa nortoni nortoni - As noted earlier, only nine (4 females, 5 males) adults of this species were shipped in 1963. Seven males and 2 females were captured in flight on June 24-25, raising hopes of early shipment possibilities, but 18 days passed before two more males were captured. Eight days later, July 21-23, 4 females and 18 males were taken, and from these were the nine adults despatched to New Zealand. Of these, 2 females and 1 male arrived alive. Zondag reports that one of the females was not once observed to have oviposited, while the second was observed ovipositing in old exit holes of Sirex noctilio.

As noted above, M. nortoni nortoni males were observed in flight, and some captured, on June 24, the first day in the field at Sagehen. Both sexes were observed and captured the next day. Although the latest capture of the season was recorded on August 5, 1 male and 1 female were observed in flight September 2. Females were very infrequently seen after about July 25, while few males were seen, and none captured, after August 5. Altogether, 50 males (89.3%) and 6 females (10.7%) were taken during the season. None were recovered from caged logs.

It should be noted that perhaps this is not a true indication of the sex ratio, as a concerted effort was made to capture every female seen, whereas, because of their comparative abundance, the same diligence was not exercised in chasing males. It is also interesting to note the sharp difference in sex ratios between the 1963 season, and two days' collecting in 1962. (1962 Report, page 9.) At that time, 16 females and 6 males were taken with a net. Such high numbers were never observed in 1963. On July 21, 13 males were captured, but usually the daily capture was much lower. It was an exceedingly rare day when even 4 or 5 females would be seen in the field, let alone captured.

Males seem to fly at almost any height up to 12 or 15 feet, and have been observed above these heights, but not as commonly. They seem to have no particular preference for sunlit locations as opposed

One male was recovered from the field cage near Foresthill on August 6, and 2 more males on September 9. These were the only field cage recoveries of parasites all summer. On September 26, seven days after the logs had been placed in a cage in the laboratory (at a constant temperature of 76 - 80°F), 2 females and 2 males emerged. Daily emergence followed thereafter, with males predominant for the first 10 days. The last female emerged October 29, with one male following on each of October 31 and November 4.

From additional material picked up in the field in mid-October and placed in the laboratory on October 21, 11 males and 4 females emerged. (In this same period, 4 males and 9 females emerged from the logs brought back earlier.)

During the period in the Foresthill area in mid-October, I captured 4 males and 1 female in the field. The female was taken on the second day of burning in Section 29, and was the only parasite seen in all the time spent there while burning was being carried out. (Contrast this with the number of Siricids collected during the same time.)

Both Taylor and Zondag have indicated that I. ensiger appears almost identical with I. leucospoides from Europe. Zondag, in a letter of November 4, says in part, "... I cannot distinguish between the species introduced from Gt. Britain and the ones from California. Mr. Eady of the Commonwealth Institute of Entomology confirmed this. In living specimens the "ensiger" has a more reddish gaster than the leucospoides, but old mounted specimens do not show this. I may try at a later stage if mating and crossbreeding between the species occurs". Taylor, in a letter of the same date, has said, "...I do not feel that I could separate field-collected material"

I have seen only a very few pinned specimens of I. leucospoides. At first glance, the two species do appear exceedingly similar. However, I. leucospoides would seem to have a darker overall appearance, and a somewhat clearer wing than I. ensiger. There is considerable variation in I. ensiger (both in colour and in size), and I have pinned one male which is darker than any of the I. leucospoides seen, being almost a jet black.

While working with the insects, it has been observed that the female seems to have a rather darker spot on each side near the dorsum about 2/3 of the way back to the abdomen. This is a convenient and quite reliable characteristic for the rapid sexing of living individuals.

A few limited observations have been made on the mating behaviour of this species. Copulation seems to be preceded by a period of variable duration, usually 30 seconds to 1 minute, when the male mounts the female and alternately strokes each antenna of the female

with his, during a part of which time his wings are fanning rapidly. During the act of copulation, lasting about 1 minute, both insects are motionless, the antennae of the female extended forward and together. Following this, the male will move off and resume activity, while the female remains motionless, ovipositor sheath still open and antennae forward, for a period timed variously up to 1 3/4 minutes.

On one occasion a female was observed to have copulated with 4 different males within little over 10 minutes. A fifth male approached just after a mating, and stroked the antennae of the female for almost a minute. Having no response, he then left the female. Thus there would appear to be a period (probably of rather short duration) immediately following mating when the female is not receptive to another male.

It is now known whether or not one male will mate with more than one female.

4. Schletterarius cinctipes - (Field identification by the writer) Four individuals, 3 females and 1 male, of this species were taken, one each on July 29, 30, August 2, and September 2 (the male on July 30). Mating was obtained on August 2, and the mated female sent to Tasmania August 3.

Literature indicated that the Stephanidae are parasitic on larvae of wood-boring insects, or of wood-boring Coleoptera. They are practically unknown biologically. Unfortunately, recent advice from overseas indicates that oviposition of the mated female was not observed in the Tasmanian laboratory.

E. The Predators (All observations in the Sagehen area.)

1. Birds - Bird predation is certainly a significant factor in the Siricid populations in Northern California. Quite commonly, especially in the early parts of the summer, females of Xeris spp. were observed with the ovipositor embedded in a tree, attached to only the last 5 or 6 abdominal segments, and usually with the ovipositor sheaths remaining attached. It was obvious that the fore part of the insect had been ripped away.

Carl Dock, a senior student at the University of California, Berkeley, as a special project for his Zoology 146 course, made studies of the birds using selected burned areas of the Donner Burn. Grateful acknowledgement is extended to him for the following information. Birds observed to be utilizing Siricids (Xeris spp.) as food, and especially as food for their young in nests, include the following:-

FAMILY FRINGILLIDAE

Oregon Junco,
Chipping Sparrow

Junco oregonus
Spizella passerina arizonae

FAMILY SITTIDAE

White-Breasted Nuthatch

Sitta carolinensis

FAMILY PICIDAE

Hairy Woodpecker
Black-Backed Three-Toed
Woodpecker

Dryobates villosus
Picoides arcticus

FAMILY TRYANNIDAE

Dusky Flycatcher

FAMILY TURDIDAE

Robin
Mountain Bluebird

Turdus migratorius
Sialia currucoides

FAMILY THRAUPIDAE

Western Tanager

Piranga ludoriciana

FAMILY PARIDAE

Mountain Chickadee

Penthestes gambeli

(Note: Scientific names were obtained by the writer from Peterson, R.T., 1941. A Field Guide to Western Birds. Houghton Mifflin Company, Boston.)

It should be pointed out, however, that the Siricids, although in some cases they comprised a major portion of the diet, were not necessarily the only food source for any of these birds.

From my own observations, I might add that, although it is common to see remains of the Siricids, I have never observed remains of a parasite which appeared to have been preyed upon by a bird.

2. Hemiptera - On one occasion a Hemipteran adult was taken preying upon a male adult of Xeris prob. macgillivrayi. Adults of what appear to be this same species were taken at rest on Abies concolor on two other occasions.

3. Formicidae - On one occasion, an ant was observed firmly holding on to the wing of an adult male X. prob. macgillivrayi. The Siricid was dragging the ant over the trunk of the tree, but the latter refused to let go. It is not known whether or not this was an isolated example, or whether in fact ant predation is not unusual.

4. Coleoptera (? Ostomatidae (Ostomidae of some authors)) - On one occasion an adult beetle was seen actively preying on a female adult of Xeris prob. macgillivrayi.

5. Asilidae - On one occasion, an Asilid was observed preying on a male adult of Xeris prob. macgillivrayi. Asilids were common throughout most of the summer, but only the one incidence of predation was observed.

F. Suggestions for 1964

Areas where large numbers of Siricid parasites might be readily collected in 1964 are not known to the writer. Populations in both the Donner and Foresthill (Volcano) Burns were at a much lower level this season than in 1962, and it is anticipated that there will be even more decrease in 1964.

In October of 1962, a severe storm hit a large area of the Western United States (see 1962 report.) Part of the damage it caused is referred to as the "Columbus Day Blowdown" (since major damage occurred on Columbus Day, October 12). In Northern California, it has been estimated that about 430 million board feet of timber were felled or damaged (Forest Pest Conditions in California, 1962. Official Report of the California Forest Pest Control Action Council, Feb. 1963). Much of this has been salvaged already, but in Lassen Volcanic National Park especially, large areas of this blowdown will be left undisturbed. Mr. Eoyd Wickman of the Pacific Southwest Forest and Range Experiment Station, Berkeley, and stationed at Hat Creek (Shasta County) for the field season, has been investigating the insect problems associated with the blowdown. As has been mentioned earlier, this has been a cool and wet season, and insects have been much later than usual. However, by mid-October, Wickman had recovered in "sticky-foot" traps both Ibalia and Rhyssa. Thus this area might well be watched in 1964.

Through the courtesy of Dr. David Fellin of the Inter-Mountain Forest and Range Experiment Station, Missoula, Montana, I have received a number of reports from foresters in Idaho and Montana. These often indicate the presence of Siricids (Urocerus is suspected by the writer in at least two cases) around recent burns. None of the burns has approached the size of either of the burns to which attention has been

given this year, but these might still be a source of parasites (Rhyssa spp. and Megarhyssa especially.) These foresters are not trained entomologists, thus they are not familiar with the Siricid parasites, but the volume of reports of the hosts is certainly significant.

The Sagehen (Megarhyssa and Rhyssa) and Foresthill (Ibalia) areas might also be checked again if desired.

In the East, as was suggested in the 1962 report, and using Fredericton, N.B., as a major base, those parasites most likely to be recovered would include Rhyssa persuasoria, R. lineolata and R. crevieri. Others might include an eastern strain (if indeed such a difference exists) of Ibalia ensiger, Megarhyssa nortoni quebecensis, and Pseudorhyssa ruficoxis.

It is suggested that a plan of operation might include the first half of the season, say mid-May to the end of July, in Eastern Canada (and possibly the North-Eastern United States), followed by the remainder of the season in various areas of the Western United States (Idaho, Montana, then northern California especially for Ibalia) It is felt that more satisfactory arrangements could be made in the East for subsequent handling of material than might be made in the West, thus the order of preference.

Acknowledgements

Through Dr. David L. Wood of the Department of Entomology and Parasitology of the University of California, Berkeley, accommodations were made available for several days at the Blodgett Experimental Forest. Dr. Robert L. Eutler, in charge of the Sagehen Station, very kindly made the facilities of the Station available for extended periods during the field season. Through the courtesy of Mr. Boyd E. Wickman, accommodations were provided for several days at the Hat Creek Station. Mr. Vernon Hawthorne, Laboratory Technician, was primarily responsible for the excellent and complete weather records obtained from the Sagehen Station. These persons, and others who throughout the course of the project have provided valuable information and suggestions, I gratefully acknowledge.

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A supplementary report will be issued after identifications of material have been received from taxonomists.

E R R A T A

Page 5. 9th line from bottom:
"attached" should read "attacked"

Page 6. Formula should read:

$$\sum \left[\frac{(\text{daily maximum} + \text{daily minimum})}{2} \right]$$

n

Page 8. 13th line from bottom:
"were" should read "was"

Page 11. 15th line from bottom:
"include" should read "induce"

Page 12. 6th line from bottom:
"to" should read "on"

Page 14. 10th line from top:
"TRYANNIDAE" should read "TYRANNIDAE"

Page 14. 16th line from top:
"ludoriciana" should read "ludoviciana"

Page 15. 8th line from top:
"and" should read "an"

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