OBSERVATIONS ON ALASKAN SNIPE-FLY PESTS (*Symphoromyia:* Rhagionidae)

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INTRODUCTION

Two common Alaskan species of *Symphoromyia,* viz. *atripes* Bigot and *kincaidi* Aldrich, are the biters *par excellence* of the only North American biting genus of rhagionids, or snipe flies. There exist local pest problems attributable to *atripes* in subarctic Central Alaska and to *atripes* plus *kincaidi* in temperate Southeastern Alaska. Travis (1949), and Sailer (1951) reported *S. atripes,* and Frohne & Williams (1951) added *kincaidi* and sketched distribution, habitats, and the biting habits of both species. This notorious Alaskan pair of blood-suckers belongs to an otherwise virtually innocuous and therefore neglected genus of not less than 22 species in the United States and Canada. The Alaskan species, at least, being the bad actors, require investigation: the secretive immatures remain entirely conjectural; the conspicuous females will not be ignored; the mysterious males invite attention. For heuristic reasons, then, to interest entomologists visiting Alaska, my son and I offer our summer snipe-fly notes, a by-product of a major interest in mosquitoes.

Data supporting this paper were secured more from opportunity than by plan. Adults were collected intermittently in an extensive habitat of both species, June 19–August 12, 1958, covering most of the local biting season. Landing rates, biting habits, and habitat characteristics were determined as time allowed. The findings relate chiefly to four matters of long-standing uncertainty:

(1) The taxonomic status of a golden-haired *Symphoromyia* collected over forty years ago in the identical area of this study, Sheep Creek, Thane, near Juneau;

(2) Correct species association of males and females;

(3) Habits of females, especially comparative landing rates, influence of weather on activity, and biting habits;

(4) The habitat, particularly its characteristic vegetation.

GOLDEN-HAIRED *Symphoromyia.* When Aldrich (1915) described *S. kincaidi* he studied several Alaskan specimens acquired from Prof. Melander who had taken a very odd one at Sheep Creek where the present observations were made. Dr. Aldrich tentatively assigned this exceptional fly to his new species with the reservation that it differed by having "entirely yellow pile all over" and that it "may be a different species." Leonard (1930) did not comment. Frohne & Williams (1951) confirmed occurrence of typical *kincaidi* in Alaska on the basis of four biting females from Salmon Creek, which is about fifteen miles northwest of Sheep Creek, stating their specimens have the black hair on front and thorax normal to *kincaidi.* In such cases of uncertainty the best evidence is a series of specimens from the original collection site of the specimen in question. Accordingly my son Dick and I collected 140 *kincaidi* females along Sheep Creek in nine lots over a period of eight weeks. (Two hundred twenty-six *atripes* were taken and pinned at the same time.) We also hand-collected from ourselves other samples of both species and swept by net non-biting rhagionids at five other creeks of the Juneau region. Unfortunately, however, we failed to discover a single *kincaidi* with completely yellow pile. So the interpretation of Aldrich's questionable specimen is still uncertain. Is it a faded changeling, a rare variant of *kincaidi,* or a new species?

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Color characters only are known to separate females of the two species, and the easiest one to use under a lens is pigmentation of halteres, yellow in *kincaidi*, but tan, dark-brown or black in *atripes*. For tentative field identification grey females are *atripes;* brown ones, *kincaidi*. In selecting specimens to pin, which we usually did while counting landing rates, we noticed size and color deviations. Size varies in both species, and we took, e.g., two dwarf females of *atripes* decidedly less than half usual size. Variations in color and pollinosity of the body and infuscation and color, especially in the anal angle of the wings, conspire to make an occasional *kincaidi* almost indistinguishable in the field from *atripes*. On the other hand, even under the microscope I found several flies pre-sorted in the field to *kincaidi* which possess brown halteres. In these questionable specimens the overall color is brownish rather than grey, and the anal angle of the wing is orange. Such specimens will key to *atripes* but should be assigned to *kincaidi*. Abnormalities in wing venation are commonplace in both species. The "open anal cell," a key character of the genus, is closed in about a third of these specimens, though rarely on both wings and there is never much "stalk" distal to such closed anal cells. Color of the pile in *Symphoromyia* is an indefinite, quantitative character tricky to observe properly. Definitely, however, the pile on front and thorax is dark, usually nearly jet-black, in all *kincaidi* we collected at Sheep Creek in 1958.

Association of Males and Females

The proper association by name of the sexes has long been problematical for most North American species of *Symphoromyia*. Aldrich (1915) attempted designation of both sexes for eleven of the twenty-two species. Leonard (1930) completed an additional pair by describing the male of *S. plumbea* Ald. Unfortunately, the chief criterion for applying the same name to male and female forms is but little more than their occurrence in the same area at the same time—collection together. This rule of thumb provides an uncertain basis for *Symphoromyia* because of pronounced sexual dimorphism, intraspecific variation, paucity of diagnostic characters, scarcity of males in collections, and absence of pairs taken *in coitu*. It is usual, unfortunately, in western *Symphoromyia* habitats for more than one species of female to occur on the wing at the same time.

However, we have virtually confirmed Aldrich's association of the sexes of *S. kincaidi*. My son Dick and I swept thirty jet-black non-vittate male *Symphoromyia* at Sheep Creek in 1952. They fitted Dr. Aldrich's description of Washington and British Columbia males he had designated *kincaidi*. Female *kincaidi*, however, were much less common there at the time than *atripes*, and we doubted our new evidence fully confirmed Dr. Aldrich's proper association of male and female *kincaidi*. In 1955, nevertheless, we took nine larger, grey, vittate males resembling female *atripes*. This evidence obtained in the Upper Cook Inlet seems adequate and conclusive proof that the jet male belongs to *kincaidi*, the grey one to *atripes*. Now, Aldrich had based his description of the *atripes* male quite lamely on a single, incomplete specimen collected by Osten Sacken in California in 1876. The Alaskan specimens do not agree well with his designated type, but they seem to have a more legitimate claim to conspecificity with the female everyone calls *atripes* than has Aldrich's male type. For an unknown reason *atripes* males are extremely rare in collections. We have collected most of them (ten) ourselves in Alaska by sweeping. Alexander Hubert, while searching American museums for male *Symphoromyias*, uncovered another specimen matching the Osten Sacken-Aldrich type male *atripes*. In Frohne (1957) these different males are compared. Quite possibly the agreement in swollen first antennal joints of Alaskan males with the Osten Sacken-Aldrich male should outweigh color differences so that both the grey (Alaskan) and darker (Stateside) forms with similarly very swollen first

antennal joints can be considered true *atripes* males. While the *kincaidi* male seems confirmed beyond reasonable doubt there are, nevertheless, two reasons for further collection of *kincaidi* males in Alaska. In the Upper Cook Inlet two jet-black *kincaidi* males were swept along with nine grey, vittate *atripes* males. This is an extraordinary find because no female *kincaidi* whatsoever has yet been collected north of Southeastern Alaska. These two northern *kincaidi* are identical with male *kincaidi,* except one, from Sheep Creek, Southeastern Alaska. The exceptional Sheep Creek male constitutes the other reason for further collecting. This puzzling *Symphoromyia* was swept the same afternoon in 1958 with three normal *kincaidi* males. It resembles *atripes* in some respects, *kincaidi* in others, being brown rather than jet-black, non-vittate, and smaller than most *atripes* males. It is probably *kincaidi* since the first antennal segment is relatively less swollen and carries longer hair than *atripes,* but its wings are completely clear like no other *kincaidi* male of 33 we have taken there. This puzzling specimen quite spoils my assertion (Frohne, 1957) that "*kincaidi* males may invariably be distinguished with the unaided eye from *atripes.*"

HABITS OF FEMALES

Statements in the literature on snipe-fly biting, pest importance, influence of weather and light on activity, etc. are few and subjective. The blood-sucking habit of *atripes* was firmly established by Aldrich (1915), who was also rightly "under the impression that *kincaidi* is an almost equally bad biter." Frohne & Williams (1951) reported *kincaidi* biting severely in Alaska. In the main, knowledge even of the biting habit has not advanced appreciatively since 1877 when Count Osten Sacken reported an unknown *Symphoromyia* female "stings quite painfully and draws blood like a *Tabanus.*"

The present field notes on biting at Sheep Creek in 1958 relate to fourteen different dates and doubtless give a representative, nearly complete sketch of the seasonal history of the flight period there. The landing rates were determined by averaging counts of flies alighting on the front of the trousers as described by Blanton *et al.* (1950) for mosquitoes. They provide a rough means of comparison with pest problems of mosquitoes and other biting flies.

Snipe flies have been taken biting in the Juneau area from mid-June to mid-September, but the period when they are numerous and active enough to cause a nuisance is much shorter. In 1958 it included all calm, sunny days from June 24 to August 20. These 58 days actually included only about 38 days of bad biting, i.e., with landing rates of five or higher. It is evident that, as for horse flies, people fuss over several snipe flies more than for a score of mosquitoes. The following observations were, to be sure, made in an area of high densities. Yet rates seldom reach five in the Evergreen Bowl, Juneau city park on Gold Creek where public demand requires adulticiding every summer. Hikers to upper Gold and Granite creeks and also to Eagle River encounter higher densities. Salmon Creek, home of Ralph Williams, a keen observer of snipe flies for more than a decade, has equally high densities. Other creeks near Juneau, e.g., Lemon Creek, may be entirely free of *Symphoromyia* although this more likely reflects low densities and inadequate search. We lived on another of these "negative" streams, Eagle Creek, Douglas Island, in 1958 and actually collected a few snipe flies there on three occasions in July.

The first adult *Symphoromyia* of 1958 seen at Sheep Creek were three *kincaidi* on June 19. A half-day search did not show any present June 14. The afternoon of June 24 was sunny, not at all windy, and temperatures on the upper basin level reached 71° F. Both species were present, the combined landing rate varied 2–12, and the sample collection contained 55 *kincaidi* with 38 *atripes.* June 26 was cooler (60° F.) and cloudy, though calm. No landing rate counts were made but it was

noted that a range similar to June 24 characterized the biting activity. However, there was a marked difference in species composition, for few *atripes* were seen. June 30 was a warm, partly sunny day. Landing rates and a sample were taken when a marked increase in *atripes* was noted. The landing rate was 10–20, and the sample was composed of 39 *atripes* and 34 *kincaidi*. July 5 was hot (71° F.), sunny and calm, and snipe flies were very annoying. A cloud of about fifty followed my wife at head height and settled on her whenever she stooped to botanize, the following swarm of the insects much suggesting the behavior of certain *Aedes*. Maximum landing rates were 30, the lowest 10. The following day, July 6, all conditions were similar, and the sample collection shows a pronounced *atripes* preponderance of 60 to 30 *kincaidi*. Several males were swept, and this date was probably near the peak for density of both species, both sexes. July 7 was cool (55°–60° F.) and landing rates were off to about half the previous day's. Similarly, July 9 was cool (55° F.) and flies were still fewer. The sample collection of that day reversed the species proportion, for 22 *kincaidi* to only 13 *atripes* were taken. July 13 was mostly cloudy, but intermittent sunshine raised the midafternoon temperature to 63° F. The landing rates became high late in the afternoon, reaching 25–30. It was especially interesting that *atripes*, evidently more of a fair-weather fly than *kincaidi*, again predominated, 50 in the sample to only 11 *kincaidi*. July 15 was mostly sunny and the temperature climbed to 70° F. Late afternoon landing rates ranged 25–30. None was made earlier but we had the impression of as few as 5 flies. The sample collection contained 52 *atripes*, 11 *kincaidi*. (Cold, windy, rainy weather intervened until July 28.) July 29 cleared, but the upper basin was exceedingly wet. Landing rates were 2–5 in the canyon and 5–10 on the plateau. The *kincaidi* were decidedly scarce and the sample, 23 *atripes* and 5 *kincaidi*, reflected bias from our effort to include the scarcer species. Actually the ratio was probably over 90 percent *atripes*. (Another week of stormy weather interrupted observations.) August 1, the first day of intermittent sunshine, a careful search of the upper basin yielded only a single *atripes* female. It was not possible to return to Sheep Creek in 1958, but we worked at Granite and Gold creeks about two and a half miles to the northwest which have similar upper basins. At Granite Creek landing rates of August 9 and 11, partly sunny days, were 5, and we collected 28 *atripes* to 1 *kincaidi*, and 25 *atripes* to 1 *kincaidi*, respectively. Thus the flies were troublesome on calm, warm days from late June to mid-August, and there was a greater tendency in *atripes* to reduce activity in cool, windy, wet periods, though, in fact, neither species was active in very bad weather.

S. atripes and *kincaidi* bite similarly. However, it appears that *kincaidi* begins biting earlier in June and continues to bite relatively more than *atripes* in rainy, cold, or windy weather. The following notes apply to both species.

Adults are strictly diurnal. Bright sunshine appears to provide optimal light for biting, and activity promptly decreases when clouds obscure the sun. Attack seems to occur in greatest force and most avidly under the open sky. Certainly fewer flies attacked us at Sheep Creek in the coniferous forest, a result, probably, also of increased distance from breeding areas. The first flies are noticed as early as 7 a.m. (AST) on a fair day. Their numbers generally increase gradually, which is to say biting activity increases during the morning. There is a peak about noon on cloudless days, which may be delayed to mid-afternoon on cloudy ones. Lulls with no apparent meteorological cause occurred as in the activities of mosquitoes and other flies. In the study area no sooner does the sun pass below the mountain rim so that most of the basin is shaded all at once than the flies abruptly disappear for the day. In June and July this happens between 7 and 8 p.m. It took place, for example, on June 30, 1958

precisely at 7:45. Within five minutes the last straggler had gone. Not another *Symphoromyia* was seen that day though we worked for an hour longer in the bright light reflected from the blue sky and then hiked another hour on the trail.

Both species are purposeful biters. They alight without preliminary buzzing, that annoying habit of blackflies, and settle chiefly on feet, legs, lower trunk, or arms, less frequently on neck or head. Again differing from blackflies, they are not attracted to eyes and ears, nor drawn like mosquitoes by the breath and warm skin. Selection of host and point of attack is certainly partly visual, for dark-colored clothing, especially olive-drab, is preferred to light-colored and even to the bare skin. Sometimes cloth of woolly (rough) texture was preferred over smoother. However, dark-brown, slightly shiny, smooth leather boots (being worn) were by far the most favored of all. Preference for the posterior half of the human body was still evident when we lay prone or sat under a cliff. About as many flies would land on boots whether one stood or brought the head between the knees and put the arms around the ankles. They occasionally landed on discarded clothing and musette bags but less often, I believe, than on the same articles in use. Even a sweaty white nylon shirt hanging on a bush though of least favored color and texture was not altogether exempted. *Symphoromyias* were not observed to land near a host on ground, rocks or vegetation except once when one crawled on a stone into the spray of the creek. It was collected and dissected, showing no evidence of having fed and no egg development. In fact, except coming to bite or in flight after engorging they were simply not seen in Nature at all. This is not a claim without basis for many hours were spent carefully examining flowers, etc., while miscellaneous Diptera were collected. Visual stimuli are not so important in finding the host as for tabanids which often mobbed our red-brown station wagon, behavior not seen for the more abundant snipe flies.

A reputation for bad biting mentioned by Aldrich and other authors interested us and we made some effort to account for it. Unmolested snipe flies bite repeatedly without taking flight. An *atripes* was allowed to bite my knuckle at the base of the index finger. When about half-engorged it withdrew the stylet, moved about a quarter of an inch and bit again. This was repeated five times until the fly was fully engorged when it flew away. From two to seven minutes per bite or a total of seventeen minutes for the series of six bites elapsed. Four of the bites oozed a little blood and three were momentarily quite painful. In fact I have rarely experienced as sharp pain to provide a full blood meal for a mosquito. The bites were circled in ink and two were rubbed and lightly scratched (although they did not itch), but there was no immediate or delayed reaction, viz. color or swelling, and two hours later nothing but the ink circlets marked the bites.

HABITATS

I have described two Central Alaskan snipe-fly habitats in a previous paper (Frohne, 1957). They are limited foci of five to ten acres each, located at about 3200 feet, well above timber line in the headwaters of Fishhook Creek, Upper Cook Inlet. The terrain is a helter-skelter hotchpotch of wet rocks lushly overgrown along the numerous dashing watercourses by alder, scrubby willows and very tall weeds. On the less rugged lateral slopes and ridges, however, the coarse growth thins out and gradually changes to delicate carpets of alpine herbs and mosses. My wife has furnished a list of characteristic plants. The collection of both species of males in the Fishhook Creek foci and the emergence of two female *atripes* in Dove traps vouch for breeding microhabitat.

The Southeastern Alaskan snipe-fly collecting area at Sheep Creek is on a grander scale, covering nearly all the watershed or not quite a square mile. Highest densities of the females, males, and by inference the larval breeding sources are all found

on a plateau 750 feet above sea level. The females, presumably, disperse a mile or so from the plateau, for they occur at usually progressively lower densities downstream. The upward limits of adult and larval habitats remain conjectural. Perhaps the best surmise as to larval habitat is the inaccessible, wet, alpine cliffs and grassy rock-ledges between 800 and 1600 feet elevation which enclose the plateau-like palisades, but the only evidence to support this conjecture is the negative one of unsuccessful search for larvae on the plateau. I shall describe our collecting area of predilection one mile along Sheep Creek below Portal Camp on the plateau to orient visiting entomologists seeking male *Symphoromyias*. The local name for the plateau is "upper basin."

Sheep Creek courses 3½ miles from primary sources below Middle Peak in three large, nameless cirques flowing along the so-called upper basin, a U-valley left by the current retreat of the local glacier. Where the glacier presented a sheer face to the sea about 5,000 years ago at elevation 600 feet the creek now plunges off the rim of the basin. It becomes a succession of chutes, cascades and falls for the next mile while it loses over 500 feet of elevation but then almost meanders for a quarter mile across tidal flats near the ghost gold-mining town of Thane to empty into Gastineau Channel. Sheep Creek and valley are thus sharply divided into three parts: a higher, relatively horizontal reach called the upper basin; a middle, vertical jumble of falling white water in a canyon; and a short, rather level, partly tidal coastal section. This physical partition of the watershed is emphasized by corresponding differences in vegetation. The coastal stretch is mostly open, bare or grassy flats; the canyon is densely timbered with big conifers, chiefly Western hemlock, Sitka spruce, and Douglas fir; and the flora of the upper basin and alpine highlands differs utterly from the plants of both lower levels.

Large trees leave off abruptly at the rim of the upper basin—a sudden transition to subarctic vegetation. Only a few spruces grow in the upper basin, but there is a jungle of small willows, alder, salmonberry thickets, and tall weeds, particularly nettle, wild celery, and hellebore, which form a lush subarctic, intermediate floral step to the comparatively insignificant arctic alpine plants of meadows, and the rock, snow and ice fields above. (However, several small "islands" of gigantic cottonwoods thrive near Portal Camp at the confluences of intermittent tributaries with Sheep Creek.) Alpine and arctic influences inevitably mark the upper basin, cooled by vast glaciers. The arctic charr is the characteristic fish, the water ouzel, a typical bird. The mute and shy, though hardy, boreal forms contrast with the spectacular, gross humpy salmon which spawn in the coastal stretch below, their eyes pecked out by the raucous gulls!

The general aspect of the upper basin vegetation strikingly simulates Fishhook Creek plants. The cause is a relatively few rank, abundant, showy species in common. The two widely separated habitats actually share relatively few plants; the two lists have less than ten species in common. The largest and most abundant plants precede in the following list prepared by my wife, Gertrude Frohne. Species she listed (Frohne, 1957) for Fishhook Creek are designated with an asterisk. Characteristic plants of the upper basin, Sheep Creek are:

Alnus sp. (alder), *Salix* spp. (willows), *Rubus spectabilis* (salmonberry), *Populus* sp. (prob. *tricocarpa*), (cottonwood), **Heracleum lanatum* (wild celery), **Epilobium angustifolium* (giant fireweed), *Picea sitchensis* (Sitka spruce), **Veratrum eschscholtzii* (hellebore), *Urtica lyallii* (nettle), **Geranium erianthum* (northern geranium), *Achillea borealis* (northern yarrow), *Aruncus vulgaris* (goatsbeard), *Sambucus racemosa pubens* (elder), *Viburnum edule* (high-bush cranberry), **Aconitum delphinifolium* (monkshood), **Epilobium latifolium* (dwarf fireweed), *Sanguisorba sitchensis* (burnet), *Oplopanax horridus* (devilsclub), *Ribes lacustre* (gooseberry), **Aquilegia formosa*

(columbine), *Rubus stellatus* (nagoonberry), *Aster modestus* (great northern aster), *Rumex arcticus* (dock), *Streptopus amplexifolius,* and *roseus* (twisted stalks), *Actaea arguta* (baneberry), *Impatiens noli-tangere* (touch-me-not), *Heuchera glabra* (alpine heuchera), *Tiarella trifoliata* (foam flower), *Claytonia flagellaris* and *siberica* (springbeauty), *Saxifraga punctata* and *tricuspidata* (saxifrages), *Galium triflorum* (bedstraw), *Mimulus guttatus* (monkeyflower), *Campanula rotundifolia* (harebell), *Ranunculus occidentalis* (buttercup), *Cerastium fischerianum* (chickweed), *Geum macrophyllum* (avens), *Circaea alpina* (enchanter's nightshade), *Solidago multiradiata* (northern goldenrod), *Epilobium adenocaulon* (fireweed), *Tellima grandiflora* (fringe-cup), *Prenanthes alata* (rattlesnake root), *Gentiana acuta* (northern gentian), *Veronica tenella* (veronica), *Trifolium hibridum* (alsike clover), *Plantago major* (plantain), *Equisetum arvense* and *hiemale* (horsetail), *Polypodium vulgare occidentalis* (licoricefern), *Cryptogramma acrostichoides* (parsleyfern), *Athyrium ? felix-femina* (ladyfern), *Polystichum ? braunii* (shieldfern).

SUMMARY

The biting rhagionids, *Symphoromyia atripes* and *kincaidi,* were observed and a long series of specimens collected in a mountainous habitat near Juneau, Alaska in an unsuccessful attempt to secure additional specimens of an aberrant form of *kincaidi* of uncertain systematic status known only from this area. The blood-sucking habits and the habitat are described, and the proper assignment of the little known males to species is indicated.

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Host for the 16th annual meeting of the AMCA, to be held at the Somerset Hotel in Boston, Massachusetts on March 27, 28, 29 and 30, 1960.