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INSECTS FROM HIGH-ALTITUDE SUMMER SNOW IN AUSTRIA, 1981

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From 20.8. to 9.9.1981, the authors took a mountaineering holiday in Austria. We had no plans for serious collecting because of the late date of our visit, but once in the mountains we were fascinated by the diversity and occasional abundance of the insects seen dead or crawling over snow patches and Firn.

Little data has been published on the phenomenon of insects in such seemingly inhospitable areas. MASUTTI (1978) has characterised the insect fauna of late winter and spring snow in the Carnic and Julian Alps (N. Italy). His studies revealed that certain insects, e. g. Isotoma hiemalis (Collembola), Boreus ssp. (Mecoptera), Trichoptera ssp., Trichocera hiemalis (Diptera), are typically active during winter on alpine snow. Other groups of insects, particularly Coleoptera Carabidae, have been indicated as characteristic of "new ground" at receding snow patch edges (JANETSCHEK, 1949).

In summer, however, by far the greatest number of insect species and individuals found on snow are not resident to areas of permanent snow at all, but are either members of summer subalpine-alpine communities or are of more distant lowland origin. It is probably true, as has often been stated in the past, that most organisms found inactive on high-altitude snow have merely been blown or carried up into the mountains by wind or convection currents. This is almost always the right explanation for biological debris on snow in non-alpine areas, e. g. the Scottish Mountains (BRUCE in THORNLEY, 1896). But for certain types of summer, alpine insects assemblages we think that large scale migrations of lowland species, rather than **passive**/accidental transport by wind, play an important role in introducing insects to the snowfields in some areas. Our data from the Alps of Kärnten (Glockner-Gruppe) seem to support this interpretation.

Below are listed, in two sections, the insects which we collected in

1) Hochstubai, Nordtirol.

2) Glockner-Gruppe, Kärnten.

For each species a few voucher specimens were preserved and written notes taken on numbers of individuals and their state of preservation, i.e. living, torpid, dead (and undamaged: therefore probably recent arrivals on the snow), dead and badly preserved (probably earlier arrivals). Authorities are named where identifications were made by entomologists other than the authors.

I. Hochstubai, Nordtirol, 23.8. -26.8.1981

A: Firn snow on Wilder Freiger. Some insects found on very summit of this mountain. 23.8.

2 Plutella xylostella (L.)(Lepidoptera, Plutellidae). 3500m.
Alive, 1 other seen. Det. S.WHITEBREAD.

3 Zeiraphera diniana (Gn.)(Lepidoptera, Tortricidae). 1 at 3000m, 2 at 3500m. All alive, no others seen. Det. S.WHITEBREAD.

2 Episyrphus balteatus (Deg.)(Diptera, Syrphidae). 3300m and 3500 m.
Dead (undamaged), no others. Det. K.WATT.

B: Firn snow and lower snow patches on walk from Nürnberger Htt. - Ost. Feuerstein - Bremer Htt. 25.8.

5 Zeiraphera diniana (Gn.). 3100m. All alive, no others. Det. S.WHITEBREAD.

1 Oscinella frit (L.)(Diptera, Chloropidae). Below Ost. Feuerstein (Simmingferner).2800-3000m. Alive and dead, a few flying over snow. Countless numbers.

C: Single large snow patch above Bremer Htt. at 2500m, 25.8.

1 Leuctra sp. (Plecoptera). Alive, no others.

1 Aphid sp. (Aphidoidea). Alive, no others.

2 Episyrphus balteatus (Deg.). Dead, no others.

1 Bibio pomonae (F.)(Diptera, Bibionidae). Dead and badly preserved, no others.

2 Muscidae sp. (Diptera). Dead (undamaged), no others.

2 Myrmica ruginodis Nyland (Hymenoptera, Formicoidea). Winged sexuals. Dead (undamaged-badly damaged), 4 or 5 others seen. Det. B.BOLTON.

1 Apis mellifera L. (Hymenoptera, Apoidea). Worker. Dead (very badly preserved), no others. Being fed on by Aphodius sp. A & below).

1 Aphodius sp. A (Coleoptera, Scarabaeidae). Alive, feeding on body of Apis mellifera (above), no others.

1 Aphodius sp. B. Alive, crawling on snow, no others.

1 Chrysomelidae sp. (Coleoptera). Dead (undamaged), no others.

D: Snow patches on Habicht, above Innsbrucker Htt. 2500m. 26.8.

- 1 *Trichoceridae* sp. (Diptera). Alive, no others.

II. Glockner-Gruppe, Kärnten, 2.9.81.

Fresh snow lying on Firn.

- 1 *Autographa gamma* (L.) (Lepidoptera, Noctuidae). Johannisberg (3100m). Torpid and dead, 3 others seen, all with very rubbed wings.
- 2 *Scotia ipsilon* HUFN. (Lepidoptera, Noctuidae). Above Oberwalder Htt. (3100m). Torpid, 11 others seen, good condition.
- 1 *Sympetrum sanguineum* MUELLER (Odonata). Johannisberg (3100m). Dead, badly broken, no others. Det. I. BALDWIN.
- 1 *Chrysopa carnea* L. (Neuroptera). Johannisberg (3000m). Dead, 3 others.
- 1 Aphid sp. Very large black species. Johannisberg (3000m). Dead, no others.
- 1 *Eristalis tenax* (L.) (Diptera, Syrphidae). Johannisberg (3100m). Torpid, one other seen. Det. K. WATT.
- 4 *Episyrphus balteatus* (Deg.). Johannisberg (2900-3200m). All dead, some apparently fresh. Very many: probably hundreds.
- 1 *Scaeva pyrastris* (L.) (Diptera, Syrphidae). Oberwalder Htt. to 3200m on Johannisberg. All dead, badly damaged. About 50 others seen.
- 2 *Coccinella septempunctata* L. (Coleoptera, Coccinellidae). Johannisberg (3100m). Dead, 2 others seen.

Discussion

Nearly all of the species from the peaks of the Stubai were obviously lowland or subalpine in origin and had probably been blown up to the snowfields during the day that we observed them. The weather was poor, with low cloud, high winds, occasional falls of snow and freezing temperatures. It is unthinkable that any of the species found near the summits of the Wilder Freiger or Ost. - Feuerstein had arrived more than half an hour before they were observed. Any earlier arrivals would have been buried in the fresh powder snow after they succumbed to the cold. In terms of numbers (apart from *Oscinella frit*), we saw far fewer insects in the Stubai than we did in the Glockner area. This was probably partly due to the differences in weather conditions (Figs. 1-4). The only abundant insect in the Stubai was *O. frit*, which gave the snow a dirty appearance on parts of the Simmingferner.

The *Plutella xylostella* found on the Wilder Freiger may have been on migration, but could equally well have been transported by wind from a local population. The moth is cosmopolitan and a well-known migrant. Its larva has been noted at 2800m in the Alps.

S. WHITEBREAD and E. de BROS have both told me of finding hundreds of *Zeiraphera diniana* on permanent snow at 3400m on the Mettelhorn, near Zermatt, 31.7.1981. E. de BROS also reports having 200 dead *diniana* in his Heath trap during a single night at Zermatt. According to S. WHITEBREAD, the specimens on the Mettelhorn were concentrated in one place only: on a col immediately above an almost sheer drop to the larch forest below. Our Austrian specimens were found 2 1/2 km the nearest area of *Larix*,

in the Langental. Loss of adults to high altitudes and subsequent death may be an important control acting on this defoliator in alpine areas.

The species from the relatively low snow patch above the Bremer Hütte are likewise predominantly from lower altitudes. Aphodius sp. A, however, appeared to be making use of the insect debris as a food source. Only the Trichoceridae sp. may be a real representative of the permanent snow community.

Of the insects from the Glockner-Gruppe, at least the two Noctuidae are well documented migrants (REZBANYAI, 1979, 1980), particularly in the Alps, where they are amongst the commonest moths taking part in mass migrations. The vast numbers of Episyrphus balteatus may also indicate that migrations of this hoverfly passed through the area. It is interesting to note that on the late afternoon of 2.9.81 we observed several Vanessa atalanta flying steadily northwards over the snowfield below the Johannisberg.

Other species such as Chrysopa carnea and Sympetrum sanguineum may have been individual "wanderers" which had unsuccessful post-emergence dispersal flights. Dispersal flights of this type are well documented in C. carnea (DUELLI, 1980).

The differences in composition of insect assemblages on snow between the Hochstubai and the Glockner-Gruppe may partly be due to the fact that the Johannisberg (Glockner) lies at the head of a major alpine valley and its surrounding snowfields are the highest point on what is otherwise probably a useful migration route between south-eastern and more central Europe. Conversely, there are several easier routes round the Hochstubai rather than over these mountains.

Finally, the main difference between the late summer insect assemblages described here and the spring ones found by MASUTTI is the absence of Hymenoptera Symphyta from the summer ones. This was only to be expected: the only adult sawflies that we encountered during the whole visit were Athalia rosae (L.), Tenthredo aegra ENSLIN and T. velox (F.) (all on the Franz-Josef-Höhe, Kärnten, 2100m, 1.9.81). Even these were very scarce.

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Summary

Insects were recorded from high altitude snow in the Hochstubai and in Kärnten, Austria, during August and September 1981. Some of these summer assemblages contained remarkable numbers of migrant species (e.g. Scotia ipsilon and Autographa gamma). An Aphodius species was found scavenging on dead insect remains in the Stubai. Sawflies, typically common in spring snow assemblages, were absent.



- Fig. 1: West Feuerstein Ridge from the Wilder Freiger, Stubai, 23.8.81
Fig. 2: On the Aperer Feuerstein, Stubai, 25.8.81
Fig. 3: The Oberwalder Hütte, Kärnten, 2.9.81.
Fig. 4: The Grossglockner Ridge from the snowfields below the Johannis-
 berg, Kärnten, 2.9.81.

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