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AERONAUTIC SPIDERS IN THE ARCTIC

BY

JENS BRÆNDEGAARD

WITH 3 FIGURES IN THE TEXT

KØBENHAVN
C. A. REITZELS FORLAG
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Aeronautic spiders is the name given to the small spiders which are carried through the air by means of the air-currents drawing the long floating threads produced by themselves. Only vertical air-currents can make the animals rise vertically, but as a rule the ascent takes place in a slanting direction, because vertical as well as horizontal air-currents are in action simultaneously. The small spiders occurring in the capacity of gliders may be the young of larger species or adult Micro-Araneina.

In Danish the phenomenon is called "Flyvende Sommer" (ɔ: flying summer), in German "Altweibersommer" (ɔ: old wives' summer) or "Mariefaden" (ɔ: Our Lady's threads). These names clearly testify to their being of popular origin, and there is no doubt that the phenomenon has been known by the people, long before scientific biology began to take account of it.

John Blackwall was most probably the first to subject this phenomenon to scientific treatment (1827). On the strength of his observations he gave i. a. a full and correct description of the manner in which the spiders embark on their aerial voyage. He describes this start as taking place backwards, and curiously enough a hundred years were to elapse, before it was established that a forwards start is also made (Brændegaard, 1937$_2$). Blackwall designates the phenomenon as "aerial excursions", whereas English arachnologists of a later period have made use of the term of "ballooning excursions"; but already in 1834 Blackwall speaks of "aeronautic spiders", which must be said to be the most appropriate name.

In the days of Blackwall no thought was given to the fact that aeronautic spiders might be of importance for the dispersal of the species. The first scientist to conceive this idea was Mc Cook, and in several important publications (1877, 1878 and 1889—93) he demonstrated the possibility that these flights might be a factor of dispersal of great importance from a zoogeographical point of view. This hypothesis was naturally received with scepticism, or no attention was paid to it as merely concerning spiders. Only, when E. P. Felt (1928) published his comprehensive and ingenious work on "Dispersal of Insects by Air-Currents", in which he demonstrated, by means of numerous examples

that many small and light insects are also dispersed by the agency of the wind, naturalists began to pay attention to the hypothesis of the wind as a factor of dispersal. FELT maintains that there are great quantities of floating arthropodes in the air, and that the spreading over longer distances must especially take place in the higher air-strata, where the velocity of the wind is much greater than at the surface. It was, however, B. R. COAD (1931) who by using aeroplanes for the collection of material established the existence of these floating land-arthropodes, the animal air-plankton in the higher air-strata.

In August 1921 the English arachnologist W. S. BRISTOWE spent some time in Jan Mayen (71° lat. N., 8°30′ long. W.) and when writing

Fig. 1. An aeronautic spider makes a forward start from the tip of a finger, the arrow indicating the direction of the wind. When the drawing of the air-current becomes sufficient, the thread snaps near the hold, and the spider floats away through the air, provided the vertical movement is strong enough to carry it.

about the land-arthropode fauna in this island, he called attention to the fact that "spiders in the Arctic do not appear to resort to ballooning excursions as they do in warmer climates, or, no doubt, they would be caught up similarly". He therefore thought that the spiders, on the contrary, had come to Jan Mayen with driftwood from Siberia, or in other words across the Arctic Ocean. When I wrote about the spiders of the Faroes (1928), I tried to demonstrate the untenability of this hypothesis, and CARL LINDROTH made the following statement regarding this matter (1931, p. 530): "Ich stimme völlig Brændegaard (pp. 23—25) bei, der eingehend und effektiv dieser Ansicht widersprochen hat." As far as I know, there is no later mention of this hypothesis. Still, it must be admitted in defence of BRISTOWE's hypothesis that as long as the presence of aeronautic spiders has not been demonstrated in arctic regions, one is not compelled to consider it an established fact. Besides, everything points towards the more frequent occurrence of aeronautic spiders in warm as compared with cold climates, and it is consequently natural to doubt their occurrence in arctic regions.

Among the animal air-plankton the spiders further occupy an exceptional position by the manner in which they keep floating. In this respect the plankton may be divided into 3 groups.

I. Small animals, the weight of which in proportion to their surface is so insignificant that, like particles of dust, they are able to keep

floating. Among the arthropodes this group more particularly seems to consist of individuals belonging to the two orders: *Acarina* and *Collembola* (Coad 1931, Berland 1935).

II. Light winged insects belonging to several different orders of insects.

III. Spiders. In proportion to the extent of their surface these are too heavy to keep floating and must, therefore, themselves actively produce floating threads. The urge to do this may no doubt be of a different nature, and even though in some cases it has been possible to give a plausible explanation, this aspect of the case is still far from being fully elucidated.

As to the whole question of aeronautic spiders there is still so much uncertainty that even those who believe in their occurrence in arctic regions would wish that it were possible to establish decisive proofs of it. Bristowe (1929, 1931) has himself given valuable contributions towards showing the importance of aeronautic spiders for the dispersal of the species in temperate and tropical regions. He has also called upon the members of English expeditions to arctic regions to direct their attention to the possible occurrence of aeronautic spiders, but this has as yet been without any positive result.

From C. S. Elton (1925) we are aware that the dispersal of insects has taken place in arctic regions. This is proved by the fact that an English expedition to Spitsbergen on the inland ice of Nordost Island found great quantities of living *Dilachnus picea* Pz. and a few other insects, which through the agency of the wind must have traversed a distance of more than 1500 km. The arctic atmosphere may thus at times be abundant in animal air-plankton. The question arises: does it contain any spiders?

The greater part of the arctic spiders belong to the *Linyphiidae* family, and this applies both to the number of the species and that of the individuals. Thus 34 species are on record from East Greenland. 19 of these belong to this family, and of the 296 individuals, collected between Cape Farvel and Scoresby Sound, 160 belonged to the same family (Brændegaard, 1935, 1937₁). In temperate zones the species of this family are proportionally less numerous, but on the other hand the most active aeronauts of the temperate zones are individuals belonging to this family (Bristowe 1929). This points very much in the direction that one must also expect to meet aeronautic spiders in arctic regions, as it is difficult to imagine any reason why the numbers of the *Linyphiidae* family should entirely abandon their aerial flights in those parts.

In Eskimo myths, legends and tales one often comes across accounts of spiders descending from the sky (Rasmussen 1929, 1932), and it

stands to reason that these can only be aeronautic spiders. There are, perhaps, many people who are apt to reject Eskimo accounts dealing with observations of Nature; but anyone familiar with the Eskimos knows that their sense of observation regarding animals is much finer than ours, unless we are especially trained in natural-scientific investigation.

As regards the problem of the occurrence or non-occurrence of

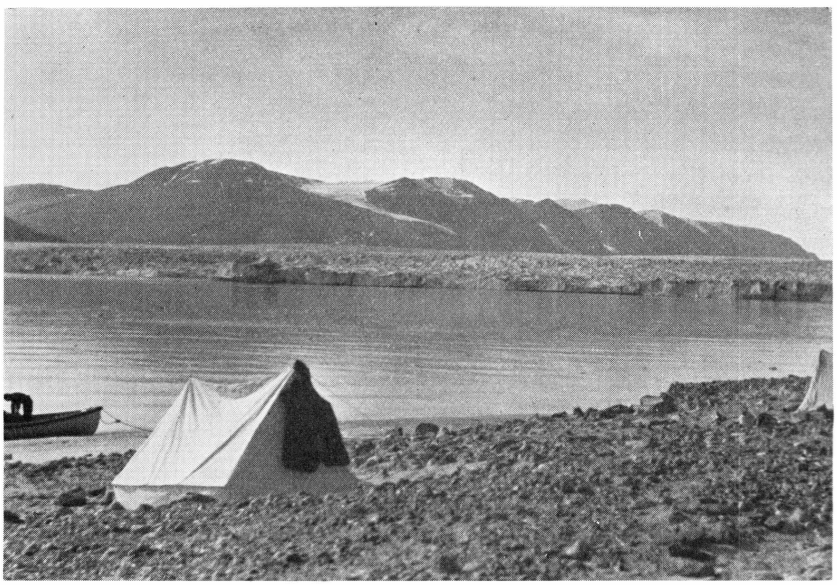

Fig. 2. The edge of the alluvial cone at Nordfjord. In the background the Walterhausen Glacier and the Strindberg Peninsula.

aeronautic spiders in arctic regions, I have long felt persuaded that it was only a question of time and opportunity to produce decisive proofs. In the summer of 1932, when I was a member of the Three-Year Expedition to Christian X Land (East Greenland), this was one of the tasks which I had hoped to solve. Unfortunately the time at my disposal proved too short. The vessel ("Godthaab") lay long in the drift ice and only reached the shore on July 25th. The summer was then fleeting, and the warm and quiet summer-days when I might hope to catch aeronautic spiders were few. Besides, there was a good deal of other work to do.

On July 29th, however, I had the opportunity of making an observation as regards aeronautic spiders. I spent that day on an alluvial cone (fig. 2), which owed its existence to a glacier river. This river came steeply down from the elevated plateau, which forms the western shore of Hudson Land in the direction of Nordfjord (about 73°50′ lat. N. in Franz Joseph Fjord), and in the course of the dry season it had dwindled

to an insignificant brook. The dry, sandy alluvial cone was strewn with larger stones, and sheltered between them grew a quantity of the fine large-flowered *Epilobium latifolium* (fig. 3). On these plants there was an abundant fauna which was, however, poor in species and almost exclusively consisted of the small arctic spider (*Dictyna borealis* CAMBRIDGE and one bug (*Geocores*).

The weather was warm and sunny with a faint southern breeze.

Fig. 3. *Epilobium latifolium* in bloom, sheltering among the stones.

I brought together a comparatively numerous selection of this fauna, and as there were still spiders (*D. borealis*) in abundance I tried, by way of experiment, to make them act as aeronautic spiders. Among the specimens used for these experiments there were both adult and young individuals. The young animals in particular were ready to float away, when I lifted them up with my hand, so that they felt the air-current, but they all made a forwards start (fig. 1). Still, in spite of the sun and the heat it proved that the vertical movement in the air was too faint to carry the spiders, and they all landed on the ground three or four metres from where I stood. They all acted in the same manner, not one of them trying to start backwards. This seems to suggest that the manner of starting is the same for individuals of the same species.

This experiment, of course, was not a decisive proof of the occurrence of aeronautic spiders in the arctic. At that period it was upon the whole unknown whether the species belonging to the *Dictynidae* family occur as aeronautic spiders. This question was not entirely

cleared up, until S. C. BISHOP and C. R. CROSBY published a list of spiders caught by means of an aeroplane in U.S.A. (1936). Among these spiders there were also two species of the *Dictyna* genus.

In 1933—34 the zoologist F. SØGAARD-ANDERSEN joined the Three-Year-Expedition to Christian X Land, and before his departure I called his attention to this problem. He was going to winter in Ella Island (72°50′ lat. N. in Franz Joseph Fjord) and would thus be able to carry on observations throughout the summer. In this manner he would have the most favourable opportunity possible to procure a material, which would furnish the decisive proof of the occurrence of aeronautic spiders in the arctic, and I was consequently very much disappointed when, as he himself thought, he returned without any positive results as to this problem.

Fortunately, however, it turned out to be an oversight on his part. For when I had nearly finished determining the whole of the material of spiders collected in the course of this expedition, I came across a find the label of which read as follows: Station 646 Ella Island, July 15th, 1934, "flying summer", see the journal. The journal of SØGAARD-ANDERSEN contained the following data relating to Station 646: At about 12,20 a.m. he was sailing about in the small lake called Rundsø, and here he saw the spider light on the boat. The height of the barometer was 767 mm; the sky slightly overcast; almost quite calm.

The meteorological data are very significant. The high air-pressure suggests a descending movement in the air, and it is an established fact that, when the sky was further slightly overcast, the midnight sun could not produce local ascending air-currents. Under these circumstances there could only, as proved by the observations, be a question of an aeronautic spider alighting after an aerial flight.

The determination of the species caused no trouble. It was a young female, belonging to the *Dictyna borealis* CB. species, or in other words an individual of the same kind, with which I had myself experimented on the shore of Nordfjord, about 100 km farther north. *Dictyna borealis* CB. is up to the present only known in arctic regions and, furthermore, seems to be a pronouncedly higharctic species. Its most southerly occurrence in East Greenland thus seems to be Miki's Fjord (about 68°10′ lat. N. — BRÆNDEGAARD 1935). These two observations form an excellent supplement to one another, and it must now be regarded as indisputably proved that aeronautic spiders occur in arctic regions, and that arctic spiders occur in the capacity of gliders. In the future it will consequently be absolutely necessary to pay due attention to the importance of the wind as a factor of dispersal when trying to realize the conditions of distribution of the spiders in arctic regions from a zoogeographical point of view.

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