

**Report on an Investigation of the Local
Distribution of the Components of the Community
Chaetostricha pulchra (Hym. Chalc.),
Tettigoniella viridis (Hem. Hom.)
and *Juncus effusus* and *conglomeratus*.**

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In a preliminary note (Ent. Medd. 22 1940 p. 15—16) information is given about the commencement of this investigation, which will comprise a list of the localities investigated within an area between Copenhagen and Roskilde for the purpose of fixing, as far as possible, the limits of the distribution of *Chaetostricha pulchra* and the character of this distribution within the area, as also its possible ways of immigration. As the western part of the area has proved to contain more localities — the small pools on the fields — than could be expected at the outset, and the investigation therefore will extend over some more years, this preliminary survey of the localities appears, treated from a zoogeographical point of view.

On the accompanying map the occurrence of a species of rush, *Juncus effusus*, in a locality is marked by a horizontal line, and that of the related species *J. conglomeratus* by a vertical line; the leaf-hopper *Tettigoniella viridis*, the eggs of which hibernate in the stems of the two species of *Juncus*, is indicated by a semi-circle; and *Chaetostricha pulchra*, which is parasitic in the eggs, is indicated by a circle; besides, various com-

binations of these signs are used, and the parts of the area not fully investigated are indicated by oblique lines.

As will be seen from the map, *Chaetostricha* has hardly spread to the district of Copenhagen and is absent from the islands Amager and Saltholm (situated three miles east of Amager). At the shore north of Copenhagen its limit is formed by the former bay of the sea, which in the earlier Stone Age extended inland south of the Jægersborg Dyrehave; only near the Ermelunden is *Chaetostricha* found in the present meadowland. Here in Ermelunden a *Chaetostricha*-locality is found in a recent plantation of spruce, probably introduced with the plants; from this locality *Chaetostricha* and the other components of the community have most likely migrated along a brooklet down the slope.

Only *Juncus* and *Tettigoniella* have succeeded in immigrating into Ordrup Krat south of the Jægersborg Dyrehave. Of particular interest is the former oak forest, Charlottenlund, where I have not found the two species of *Juncus*. Here *Juncus effusus* was found in 1922 by Knud Wiinstedt (Bot. Tidsskr. 38, 1925), no doubt, however, it was only sparsely represented, since at that time the plants of the bogs were decreasing in number, and the species is not mentioned in Kylling's list of 1684, nor has it been found in the intermediate period. *Juncus conglomeratus*, however, is mentioned in Kylling's list but was not refound in 1922 or in the intermediate time, and moreover it is emphasised by Wiinstedt that the species, being a bog plant, has most likely been found by Kylling outside the forest itself. As in no place along the shore south of the Dyrehave *Chaetostricha* has contrived to get a firm foothold, we must conclude that its immigration has been obstructed in some way or other; if this immigration took place prior to the Littorina period, the bay of the sea possibly formed this obstacle.

Farther eastward *Chaetostricha* has spread as far as the bog of Utterslev, where it is present in a small locality, having migrated from the north via Mørkhøj by way of meadows and ditches. The next localities, by Islev, have no doubt connection with the rivulet Kagsaa, which from the north empties into Harrestrup Aa through a lock-gate in the former fortress ditch; it is noteworthy that the localities along the Harrestrup Aa inside the ditch only contain *Juncus*, whereas *Tettigoniella* and *Chaetostricha* have stopped outside the ditch.

Toward the south, *Juncus* is found in Kongelunden on the island of Amager and *Tettigoniella* is present here in one locality. They have probably been introduced with the vegetation, for Kongelunden is a young forest planted one hundred years ago on a former sea bottom, which, like the Saltholm and the bay at the Dyrehave, has been uplifted after the Littorina period.

Towards the southwest, along the Køge bay, a number of localities, in some cases fairly large ones, with *Chaetostricha* are found between the rivulet Store Vejleaa and the bog of Karlslunde. These localities are situated behind the raised beach which was formed by the uplift in the Stone Age. Behind the raised beach a moist moorland has formed where the brooks run partly along the shore, their outlets having been blocked up with sand, and new ones having formed. Accordingly this series of localities must be of a fairly recent date, having arisen after the rise in the Stone Age. The country just behind has not been sufficiently investigated.

North of Karlslunde a continuous area of the territory has been investigated. The distribution of *Chaetostricha* here is exclusively due to the presence of small pools in the fields. If, for example, we choose the territory between the roads Karlslunde-Tune-Hedehusene-Taastrup, we find here about 550 pools in an area of 53 sq. km.; the number of *Juncus*-localities in this region

is 113, of which 24 have been reached by *Tettigoniella*, and of these again 11 have been occupied by *Chaetostricha*. However, the pools are not evenly distributed with an average number of about 10 pools per sq. km.; the greater number occur in the southern part of the territory, about 21 per sq. km., while in the northern part of the territory there occur about 8 per sq. km.; and correspondingly *Chaetostricha* has not spread to the northern part of the territory. It would seem that a density of about 10 pools per sq. km. is required to ensure a fairly gradual immigration of *Chaetostricha*. The few natural bogs and meadows found in the territory have no great coverings of *Juncus*, nor do the water courses or ditches seem to contribute to its immigration, which seems to be based exclusively upon the artificial bodies of water and marl pits associated with the agriculture; since moreover the localities are rather small, the immigration must be of a rather recent date, having taken place after the introduction of agriculture, when the water-bodies had reached a sufficient density, which at present seems to be in return. Moreover we are here confronted by a new feature in the ecology of the *Chaetostricha*, since formerly the species was only known from moist meadows, especially in forests; this considerably increases its possibilities of dispersion.

A somewhat deviating type of distribution is met with in the region north of Ballerup. In this territory — a subglacial valley (tunnel valley) from the glacial period — an abundance of pools and meadows are found which are covered by *Juncus* with *Tettigoniella* and *Chaetostricha*. Even if only a few localities have been investigated it is reasonable to assume that this territory is the oldest of those investigated, as here the distribution has taken place on the basis of the oldest pools and the localities are more abundant. However, the immigration can only be dated with a wide margin, viz. between

the time of the immigration of *Juncus* into Denmark from the south, probably in the late glacial period, and the time of the afore-mentioned other two types of distribution, after the rise in the Stone Age and after the introduction of agriculture in the Stone Age.

As regards the routes of immigration, it would seem that the territory is too small to permit any decisive conclusions; thus no route of migration from early southern localities toward the oldest part of the territory north of Ballerup has been demonstrated. The Jægersborg Dyrehave seems to be an old locality, as its plant covering is very dense, and the immigration may have taken place from the area north of Ballerup. The difference in age between the two younger territories, that north of Karlslunde and that along the Køge bay, is difficult to make out, but it applies to both that the *Juncus*-coverings are more vigorous in the south; this may be indicative of an immigration from the south, which has continued along the shore to the bog of Vallensbæk, where the watersheds stopped the immigration towards Copenhagen. Finally the Kongelund on Amager was reached only by *Juncus* and *Tettigoniella* a hundred years ago, whereas the Saltholm, which is most nearly a shore meadow, was not reached by either of them.

The materiel is too sparse to justify further conclusions as regards the spreading of the species along water-courses. On the whole two ways of dispersion have appeared to be predominant in the area investigated: either the spreading has taken place step by step in foliferous woods and meadows, as may be seen in the Dyrehave and in the bog of Vallensbæk, or by leaps of a few hundred meters, as mentioned for the regions north of Karlslunde and around Ballerup.

Dansk Oversigt.

Denne Meddelelse fra en igangværende Undersøgelse behandler Snyltehvepsen *Chaetostricha pulchra*'s Udbredelse mellem København og Roskilde set paa Baggrund af dens Vært, Cikaden *Tettigoniella viridis*' Udbredelse, og, da denne igen paa Grund af sine overvintrende Æg har de 2 Sivarter *Juncus effusus* og *Juncus conglomeratus* som Basis, med disse to som det egentlige Grundlag for *Chaetostricha pulchra*'s Udbredelsesomraade, der kan deles i flere Afsnit:

1. Det ældste Omraade, Tunneldalomraadet, Nord for Ballerup med talrige naturlige Smaaavande som Basis.
 2. Et yngre Omraade Nord for Karlslunde med Vandinger og Mergelgrave knyttet til Agerbruget som Basis, formentlig Indvandring fra Syd efter Agerbrugets Indførelse i Stenalderen.
 3. Et Bælte bag de tilgroede Strandvolde fra Karlslunde Mose til Vallensbæk Mose, formentlig Indvandring fra Syd efter Stenalderhævningen.
 4. Kongelundsomraadet paa hævet Havbund, formentlig stammende fra Skovens Plantning for 100 Aar siden og kun naaet af *Juncus* og *Tettigoniella*.
 5. Dyrehaven, et ret gammelt Omraade, men dog af ubestemt Alder, begrænset mod Syd af den tidligere Havbugt fra Litorinatid.
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