

The distribution of Orthoptera in Denmark, Scania and Schleswig-Holstein.

By
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This paper is based on the collections kept in the Zoological Museum, Copenhagen (ZM), the Natural History Museum, Århus (NM) and the Zoological Institute, Lund (ZI). The literature on the area has also been examined, and collections were made during the years 1964—67 by Mr. Peter Esbjerg and the author.

The Orthoptera of the region (Fig. 1) have previously been studied by a number of authors, particularly P. Esben-Petersen in Denmark, Kjell Ander in Sweden and Carl Lunau and Herbert Weidner in Schleswig-Holstein.

Our knowledge of the distribution of the Orthoptera was formerly rather inadequate. Only a few districts had been studied thoroughly, these being Bornholm, North Zealand N. of Copenhagen, the environs of Århus, west from here to Silkeborg and North to Mols, and finally some districts of S. Jutland. This gave an unsatisfactory picture of the distribution of the Orthoptera in Denmark. For example, *Tettigonia viridissima*, very common in Denmark (Fig. 5), was found in only two localities in Funen. Excursions were therefore arranged to other parts of the country, in 1964—66 to S. Zealand, Lolland, Falster, Funen, W. Jutland and other regions of S. Jutland by the author, and in 1965 to W. Jutland by Peter Esbjerg.

In Scania the finds are scattered, apart from the most northerly regions.

In Schleswig-Holstein, collections were made particularly in the southern and eastern parts of Holstein, where the author also made excursions in 1966—67.

During the author's excursion in Denmark and Holstein, the song of the grasshoppers was used to a large extent as an aid in

tracing the animals. It was also recorded on tape in most cases. and oscillograms and sonograms were prepared from this.

Fig. 2 shows the localities in which *Chorthippus brunneus* was found, the most common grasshopper in the region. The figure gives an impression of the density of the collecting sites; in general it may be stated that the region has been evenly investigated.

List of Species

Leptophyes punctatissima (Bosc, 1792). Fig. 3

Scania: Magnarp, 4 ♀, 18.viii.1938 and 1 ♂, ix.1939, Arton (ZI); Båstad, 1 ♂, Thomson (ZI); Brunnby, Mölle and Kullen, several finds (ZI; coll. Tjeder).

Bornholm: Rønne, in gardens (Schjødte, 1842—43). — Zealand: Springforbi, in gardens (Schjødte, 1842—43); Surroundings of Copenhagen, 1 ♀, viii.1873, Meinert (ZM); Copenhagen, 1 ♀, 18.ix.1872, Løvendal (ZM). — Møn: Møns Klint, 1 nymph, 23.v.1943, Wolff (ZM); St. Damme, in a garden, 3 ♂, 6 ♀, 15—21.ix.1944, Bork-Andersen (ZM). — Falster: 2 ♂, 1 ♀, 18—20.viii.1900, Esben-Petersen (ZM); Næsgaard, 4 ♀, 2 nymphs, 18.viii.1900 and 8.—20.viii.1907, Esben-Petersen (ZM). — Lolland: Maribo (Meinert, 1887—88); Halsted, 2 nymphs, 23.v.1934, Larsson (ZM); Keldskov, 3 nymphs, 1.viii.1913, Esben-Petersen (ZM); Vindeholme Skov, 1 nymph, 10.vii.1958, Bøggild (ZM). — Funen: Pilehuse near Eskebjerg, 1 nymph, 29.vii.1930, Larsson (ZM); Stavrby Skov, on *Pteridium aquilinum*, 18 ♂, 6 ♀, 14 nymphs, 6.viii.1936 and 3.viii.1937 (NM), (Findal, 1937). — Æbelø: 1 ♂, 1 ♀, 6 nymphs, 4—15.viii.1946 and 2 nymphs 25.vi.—9.vii.1943,

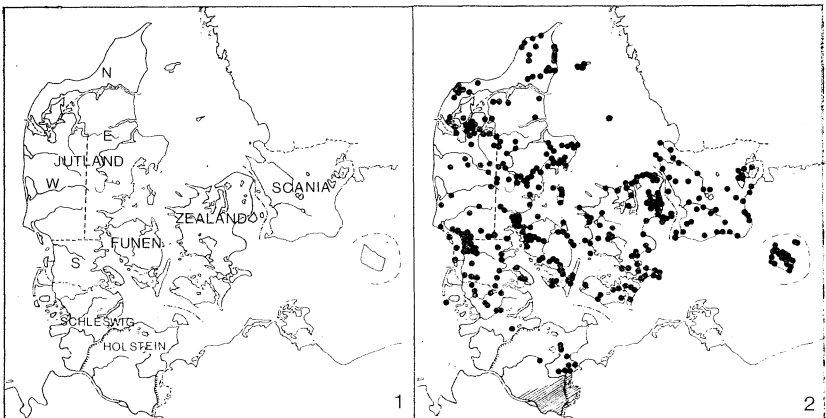


Fig. 1. Denmark, Scania (Sweden) and Schleswig-Holstein (Germany). Fig. 2. *Chorthippus brunneus*. Hatching means: very common in S. Holstein (after Weidner, 1938).

Worm-Hansen (ZM). — Tåsinge: on a seaside meadow, 1 nymph, 25.vii.1930, Larsson (ZM). — Langeland: Tranekær, 1 ♂, viii.1896, Schlick (ZM); Fårevejle Skov, 1 nymph, 21.vii.1930, Larsson (ZM). — E. Jutland: (Ranum by Løgstør, viii. (Christiansen, 1912)). This record cannot be accepted); Hald, 1 ♀, 12.viii.1911, Esben-Petersen (ZM); near Hald Sø, on leaves of *Fagus silvatica* near the ground, 1 ♀, 8.ix.1966, Holst; Århus, 1 ♂, 1 ♀, 13 nymphs, 28.vii.1887?, Klein (ZM). — S. Jutland: Sønderborg, 1 ♂, 2 ♀, 1 nymph, 15.viii.1886 and ix.1890, 1892 and 1902, Wüstnei (ZM); Skelde, Broagerland, 1 nymph, 30.viii.1891, Wüstnei (ZM); Madeskov, 2 nymphs, 8.viii.1891, Wüstnei (ZM); Kollund, 1 nymph, 29.vii.1940, Leth, and 2 nymphs, 17.vii.1940, Gerhard Nielsen (ZM); Tornskov near Løgumkloster, 3 ♂, 5 ♀, 9.viii.1937, Esben-Petersen (ZM); Povlsskov near Tinglev, 1 ♂, 5.ix.1935, Esben-Petersen (ZM); Rinkenæs, 1 nymph, 15.vii.1938, Esben-Petersen (ZM); Åbenrå, in a hedge with *Rubus fruticosus* and *Humulus lupulus*, 1 ♀, 1 nymph, 6.viii.1935 (NM), (Findal, 1937). — Als: Lysabild, 2 nymphs, vii.1934 and 30.vii.1935, Hoffmeyer (NM); Tandslet, 1 nymph, 31.vii.1940, Leth (ZM).

Holstein: Warringholz, Krs. Rendsburg (Lunau, 1963). — Hamburg: Winterhude, in a garden (Zacher, 1917).

This species appears to occur particularly in the southern and eastern parts of the region.

Meconema thalassina (De Geer, 1771)

It is recorded in the whole area apart from W. and N. Jutland. It is very common in N. Zealand N. of Copenhagen, perhaps because this is one of the most wooded landscapes in Denmark with many groves and clumps of trees. However, it is also one of the best investigated areas in Denmark.

Conocephalus dorsalis (Latreille, 1804). Fig. 4.

Scania: Valje (Wallengren, 1866), Åhus, seaside meadow, 1 ♂, 4.viii.1930, Gaunitz (ZI), (Ander, 1931); Ravlunda, Klammersbäck (coll. Tjeder); Mälarhusen, in dunes, 2 nymphs, 8.viii.1952, Ardö and Persson (ZI); Löderup, 1 ♂, 1 ♀, 1 nymph, 19.viii.1930, Gaunitz (ZI); Fyleån near Ystad, 1 ♀, 27.vii.1914, Dahl (ZI); Ystads Saltsjöbad, 1 ♀, 7.viii.1952, Ardö and Persson (ZI); Falsterbo, sand beach, 1 ♂, 1 ♀, 11. and 16.ix.1930, Ander (ZI); Skanör, 1 ♀, 16.ix.1930, Ljungbeck, and on a seaside meadow, 3 ♂, 1 ♀, 2.ix.1956, Anderson (ZI); Theisland Dynan near Klagshamn, on *Scirpus maritimus* and *Aster tripolium*, 2 ♂, 3 ♀, 18.ix.1965, Douwes (ZI); Lomma, 1 ♂, Nyholm, and 1 ♂, 29.viii.1933, Ander (ZM); Bjärred, several finds (ZI); Barsebäckshamn, 1 ♂, 28.viii.1936, Ander, and 1 ♀, ix.1938, Hanström (ZI); Hälsingborg, 1 ♀, 3.viii.1914, Ringdahl (ZI); Lerberget, 1 nymph, Klefbeck (ZI); Ängelholm, 1 ♀, 10.ix.1916, Ringdahl (ZI) and 1 ♂, 1 nymph, on dunes, 24. and 30.vii.1943 (ZI); Höör, 1 nymph, Dahl (ZI).

Bornholm: Between Rønne and Blykobbå, in *Elymus* dunes (Schjødt, 1842—43); Tejn, in a seaside meadow mainly covered with *Scirpus maritimus*, *S. palustris* and *Festuca arundinacea*, 5 ♂, 2 ♀, 3.viii.1930, Lohmander (Ander, 1931a); Dammegård near Povlsker, on *Ammophila* dunes, 1 ♂, 19.x.1930, Lohmander (Ander, 1931a); Dueodde, in a meadow, 1 ♀, 1 nymph, 14—15.vii.1930, Bro Larsen (ZM); Dueodde, 2 nymphs, 28.vii.1938, Leth (ZM). — Anholt: 2 nymphs, 10. and 17.vii.1953, Meurling (ZI). — Zealand: Esbønderup, 1 ♂, 31.vii.1911, Larsen (NM); Nivå Strand, 1 ♀, 16.viii.1966, (coll. Esbjerg); Strandmøllen, viii. (Meinert, 1887—88); Charlottenlund, on the beach, viii. (Meinert, 1887—88); Amager, very common in seaside meadows, several finds (ZM); Karlslunde, 1 ♀, 1 nymph, 31.vii.1941, (ZM); 4 km N of Køge, in grass, 1 ♂, 3.viii.1964, Holst (ZM); Køge Strand, 2 ♂, 8 ♀, 1 nymph, 24.viii.1933 (NM); Jungshoved Voldgrav, 1 ♂, 1 nymph, 12.vii.1964, Sejr Jensen (ZM); Kalvehave, in grass near the sea, 1 nymph, 15.vii.1965, Holst (ZM); Langebæk Skov, seaside meadow, 2 nymphs, 13.vii.1930, Larsson (ZM); Knudshoved Odde, on *Scirpus maritimus*, 3 ♂, 2 ♀, 18.viii.1966 and 24.vii.1967 (coll. Esbjerg); Dybsø Fjord, 3 ♀, 29.vii.1905, Esben-Petersen (ZM); Holsteinborg, Glæno Dæmningen and Glæno Østerfed, seaside meadows, in great numbers, 25.ix.1966 (coll. Esbjerg); Skelskør, 3 ♂, 3 ♀, 28.vii.—11.viii.1927; Hoffmeyer (ZM); Korsør, 1 ♂, 1 ♀, 1. and 13.ix.1926, Hoffmeyer (ZM); Korsør Strand, 1 nymph, 3.viii.1952, Bøggild (ZM); Bjerger Klint S. of Kalundborg, 4 specimens observed in *Phragmites*, 1 in *Elymus*, 16.vii.1964, Holst; Bjerger Strand, in vegetation of *Galium verum*, *Trifolium arvense*, *Dianthus deltooides* and different kinds of grasses, 2 nymphs, 15.vii.1964, Holst; The canal from Halleby Å near Bjerger, in *Scirpus*, 15.vii.1964, in great numbers, Holst (ZM); Halleby Å near Osen, in meadows, 1 ♂, 1 ♀, 4 nymphs, 17.vii.1964 (coll. Holst); Bjerger Enge, 3 km from the coast in meadows, 2 ♂, 1 ♀, 17.vii.1964 (coll. Holst);

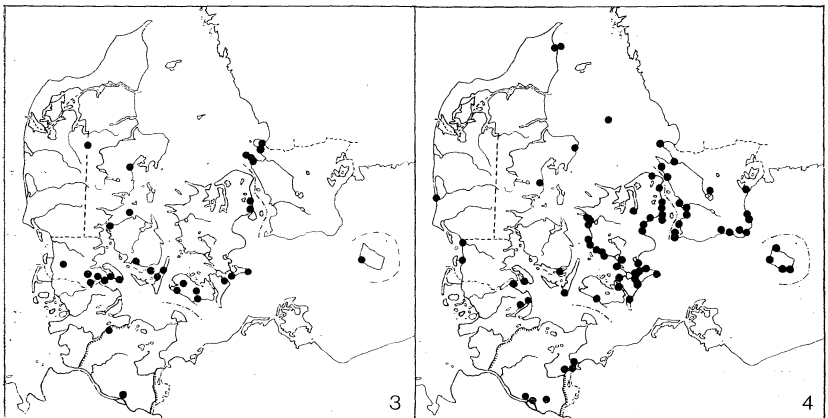


Fig. 3. *Leptophyes punctatissima*. Fig. 4. *Conocephalus dorsalis*.

Bognæs, in seaside meadows with *Scirpus*, in great numbers, 19.ix. and 3.x.1964, Esbjerg (ZM; coll. Esbjerg). — B o g ø : 5 ♂, 6 ♀, 8.viii.1952, Esben-Petersen (ZM). — M ø n : Ulfshale, 2 ♂, 3 ♀, 30.viii. — 5.ix.1944, Worm-Hansen (ZM); Hegneden, Ulfshale, (Hoffmeyer, 1915); Klintholm Havn, seaside meadow, 1 ♂, 28.viii.1966 (coll. Esbjerg). — F a l s t e r : Resle Strand, 1 ♀, 17.viii.1965, Møller-Andersen (coll. Esbjerg); Næsgård, in numbers, 3.viii.1905 and 8.—20.viii.1907, Esben-Petersen (ZM; NM); Marienlyst Strand, 1 ♂, 15.vii.1967, Møller-Andersen (coll. Esbjerg). — L o l l a n d : Noret near Majbølle, seaside meadow, 1 ♀, 19.vii.1964, Møller-Andersen (coll. Esbjerg); Rødbyhavn, in *Ammophila-Elymus*, 1 ♂, 5.viii.1964, Holst (ZM). — T å s i n g e : In a seaside meadow, 1 ♀, 25.vii.1930, Larsson (ZM), and 1 ♂, 2 ♀, 3 nymphs, 20.vii.1936, Nielsen (NM). — L a n g e l a n d : Bagenkop, 2 ♂, 1 ♀, 8 nymphs, 22.viii.1964, Martin (ZM; coll. Esbjerg). — N. J u t l a n d : Frederikshavn, on the beach (Schjødte, 1942—43); Rønnerne near Frederikshavn, 6 ♂, 8 ♀, 25.viii.1965, Esbjerg (ZM). — H i r s h o l m e n e : Hirsholm, 1 ♂, 20.vii.1966, (coll. Esbjerg). — W. J u t l a n d : Nyminde Strøm, 2 nymphs, 31.vii.1949, Carlo F. Jensen (ZM); Gammelgab, in numbers, 4.viii.1968, Bro Larsen (ZM). — E. J u t l a n d : Katholm S. of Grenå, on *Phragmites*, 1 ♀, 28.vii.1967 (coll. Esbjerg); Norsminde, in numbers, 1964, Overgaard Nielsen (NM). — S. J u t l a n d : Kammersluse near Ribe, 2 nymphs, 6.viii.1930, Larsson (ZM); Rømødæmningen near Skærbæk, 9 ♂, 12 ♀, 26.vii.1940, Leth (ZM); Skelde, 1 ♂, 31.vii.1893, Wüstnei (ZM). — A l s : Hørup, 5 ♂, 3 ♀, ix. 1893, Wüstnei (ZM).

S c h l e s w i g : Süderbrarup near Schlei, 1 ♀, 7.ix.1959, Torp Petersen (ZM); Falshöft (Lunau, 1963). — H o l s t e i n : Rothenhaus (Zacher, 1917); Dummersdorfer Ufer on *Carex* and *Juncus*; Travemünde and Bad Schwartau (Weidner, 1938). — H a m b u r g : Several finds (Zacher, 1917; Weidner, 1938).

Conocephalus dorsalis is a typical coast animal. As the region has a long coast-line, it is found in several places, and on the coast of Scania, Bornholm, Zealand, Møn, Falster and Lolland it is particularly common, and is probably also common in N.E. Holstein. During the excursions it was sought in S. Funen, near Ringkøbing Fjord in W. Jutland and near the Limfjord, but without success.

It is also found mainly in coast-regions in Norway, in the remainder of Sweden, and in England and Wales.

As will appear from the list, *C. dorsalis* occurs both in moist and dry localities. It can be very common in sea-meadows with *Scirpus*, but it also occurs on other swamp plants and in grass (see the list). It is remarkable that *C. dorsalis*, apparently a typical hygrophil grasshopper, also occurs in littoral dunes with *Psamma-Elymus* and in mature dunes. But where it occurs in both mea-

dows and dunes, as I observed at Bjerger near Halleby Å, W. Zealand, it is more common in the meadows than in the dunes, and the development of the animal to imago seems to take place more rapidly in the meadows. I therefore think *C. dorsalis* belongs more to the meadows than to the dunes. *C. dorsalis* was very common where Halleby Å debouches at Bjerger. Here I found it in Bjerger Enge 1½ km from the coast, but it did not continue from here up the river, even though the swamp vegetation continued.

The microclimate by the coast must be important for the occurrence of *C. dorsalis* in N. Europe. It cannot be salinity near the coast, because it occurs both in salt marshes and in fresh-water swamps, and it cannot be special vegetation, because it occurs in such different kinds of vegetation even though it deposits its eggs in the plant stems. It is not difficult to keep *C. dorsalis* in captivity, even a long way from the coast. It sings and is very lively, so perhaps the microclimate is important for the development of this grasshopper.

***Tettigonia viridissima* L., 1758. Fig. 5**

The map shows that *T. viridissima* has been recorded from many places in Scania and the Danish Islands. The series of dots on North and South Zealand and on Funen are a result of the excursions in 1964—67. The distances were covered by car, and the song of this species was heard overall. In Schleswig and Holstein, *T. viridissima* is probably common in many places.

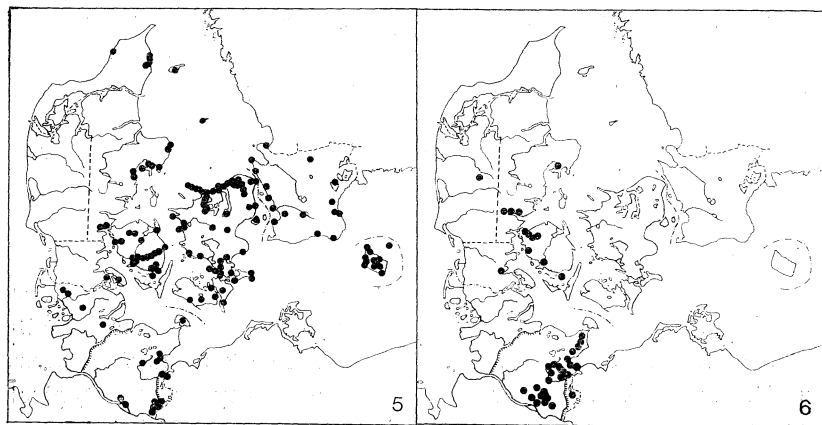


Fig. 5. *Tettigonia viridissima*. Fig. 6. *Tettigonia cantans*.

In Jutland this species has a remarkable distribution. It is only localized in some places near the east coast with the exception of the find at Lønstrup in N. Jutland (1 ♂, 19.viii.1965, Esbjerg (ZM)). It probably also occurs in other places, but this must be very local. This species has never been found or heard in Thy near Thisted and in the environs of Silkeborg, both places having been thoroughly investigated. During the excursion it was never heard in W. Jutland or the western part of S. Jutland.

The reason this species does not occur in a great part of Jutland is probably because it is associated with more dry areas than e.g. *T. cantans*. The east coast of Jutland, the Danish Islands and Scania are in the rain shadow of Jutland, which the west wind must pass over. One must also remember that this species lives in trees often several meters above the ground.

***Tettigonia cantans* (Fuessly, 1775). Fig. 6**

F u n e n : Brenderup, 10 ♂, 1 ♀, 6.viii.1936, Findal (NM); Brendepup, Skovs Højrup, Harndrup and Skovsgårde, 6 ♂, 15.viii.1964, Holst (ZM; coll. Holst); Svanninge Bakker, 4.ix.1938 (Petersen, 1939); Gammelndam, 1 ♂, 2.viii.1937, Findal (NM). — **T å s i n g e :** Bregninge Kirke, 4.ix.1938 (Petersen, 1939). — **E. J u t l a n d :** Knebel, 1 ♀, 5.viii.1936, Leth (ZM); Grejsdalen, observed since 1939, very common, (Petersen, 1943); Vejle, a few km N. of the town, 3 ♂, 5.viii.1940, Leth (ZM); Grobegårde E. of Vejle, 1 ♂, 12.viii.1943, Leth (ZM). — **W. J u t l a n d :** Knudmose near Herning, 1 ♂, 13.viii.1939, Leth (ZM). — **S. J u t l a n d :** Åbenrå, several finds, observed for the first time in 1936, Thau (Findal, 1936).

H o l s t e i n : Holstein (Schiodte, 1842—43); Oldenburg, Lensahn, Nienrade, 10 km N of Neustadt and Timmendorferstrand, in great numbers, 4.ix.1966 (ZM; coll. Holst); Mönkhagen V. of Lübeck, 5.ix.1966 (coll. Holst); Lübeck, Lütjenburg, Scharbeutz near Pönitzer See, Segeberg, Wader, Wesin, Pronsdorf, Eilsdorf, Kashagen, Dissau and between Segeberg and Oldesloe (Lunau, 1963 and 1966); Bad Schwartau, Schwarzenbeck, Travemünde, Sachsenwald, Salem Krögers Moor and Oldesloe (Weidner, 1938). — **H a m b u r g :** Several finds (Zacher, 1917; Weidner, 1938).

This species is not recorded from Sweden and Norway.

Fischer (1950), Roeber (1951), Kühnelt (1959—60) and Lunau (1966) found that *T. cantans* and *T. viridissima* do not occur together. Over large areas, *T. viridissima* may be common and *T. cantans* absent, and in other areas the opposite may be the case. Only where two areas border on one other can the two species occur together. The same seems to hold in Denmark and Holstein.

From his investigations in Schwaben, S. Germany, Fischer thinks that *T. cantans* is found mainly in humid-cold areas with small temperature-fluctuations and high precipitation, and *T. viridissima* is found in dry, warm areas with great temperature-fluctuations and small precipitation. Something similar seems also to hold in Westphalen (Roeber). Lunau, from investigations in Holstein, thinks that the distribution of these two species depends on the soil in which the eggs are deposited. *T. viridissima* is found in soils which are easily permeable to water and *T. cantans* on soils with a greater water saturation.

In Denmark *T. viridissima* is found mainly in young moraine landscapes with preponderantly clayey soil in E. Denmark and not in the fluvial plains formed by melt-water rivers in the glacial period in W. Jutland. *T. cantans* is common in and near some of the tunnel valleys in E. Jutland. In Funen this species is also common in the north-western and low-lying parts of the island, and towards the east, in the higher-lying parts of Funen, it is replaced by *T. viridissima*, on places where the precipitation is also greater. The greatest part of Funen consists of moraine landscape. I think that the ecology of these two species is more complicated than has been considered till now. Roeber thinks likewise.

It must be pointed out that the oldest find of *T. cantans* in Denmark goes back to 1936. However, it is considered to have been heard in Åbenrå since 1920. Still, it is a rather late observation for a species of this size and with such a strong song. *T. cantans* is probably a new immigrant in Denmark, and possibly with time it will spread to great areas in Jutland, where *T. viridissima* is missing.

Decticus verrucivorus (L., 1758)

This species is found generally throughout the area.

Platyleis denticulata denticulata (Panzer, 1796). Fig. 7

Scania: Mölle, 1 ♀, 29.viii.1931, Ringdahl (ZI); Kullen, 1 ♀, 26.viii.1936, Brinck (ZI); Brunnby, Kullen, 3 ♀, 9.ix.1932, Ossiannilsson/Kemner, and 1 nymph, 29.vii.1961, Ossiannilsson (ZI); Löderup, 1 nymph, 24.vii.1934, Kemner (ZI); Ivetofta (Wallengren, 1866).

Bornholm: Ronne, 3 ♀, 25.vii.1908, Esben-Petersen (ZM); Løvendal, 1 ♀, ix.1900 (ZM); Dueodde, 1 ♀, 31.viii.1927, Hoffmeyer, and 1 ♀, 11.x.1930, Löppenthin (ZM), and common (Bro Larsen, 1931); Svaneke, by light, 4 ♀, 5.vii.1938, Leth (ZM); Pedersker, 2 ♀, 1 ♂, 21.ix.1933, Jensen (ZM); Boderne, 2 ♂, 6 ♀, 29.vii.1938, Leth (ZM); Sose, 1 ♀, 25.ix.1965 (coll. Esbjerg); Ypnested, 1 ♂, vii.1935, Henriksen

(ZM); Galgeløkken near Rønne, 1 ♂, 13.vii.1933, Jensen (ZM); Arnager, 2 ♀, 29.viii.1925, Larsson, 1 ♂, 1 ♀, 1 nymph, 11.vii.1930, Bro Larsen (ZM), and 1 ♀, beneath the cliff on xerophil vegetation (among others: *Elymus*), 11.ix.1930, Lohmander (Ander, 1931a). — Christian sø: 1 nymph, 6.viii.1929, Tuxen, and 1 ♂, 3 ♀, 1.viii.1936, Leth (ZM). — Zealand: Tisvilde Hegn and Asserbo Plantage, 1843 (Meinert, 1887—88). Since that time it has been found regularly during the years. It occurs in the sandy belt in the coniferous forest, in sunny places and in the dunes; Bavnebjerg, Refnæs, 1 ♀, 7.ix.1940, Simonsen (ZM); Kongens Enghave, 2 ♀, 10.xi.1916, Larsen (NM). — Anholt: 1 ♀, Tauber (ZM), and 1 nymph, 18.vi.1949 (Klefbeck, 1951, det. Ander).

Holstein: Besenhorst near Geesthacht, 2 ♀, 13.ix.1937, Titschack (Weidner, 1938); Langenlehstener Heide S. of Gudow near Mölln, common in several places, Götting S. of Mölln, and Salemer Heide SE. of Ratzeburg (Lunau, 1950).

Ander (1949b) has shown that this species forms different races in Scandinavia. Ander considers that it has immigrated during the Boreal Period when the climate was drier than to day, and the original population was thereafter isolated in specially warm and dry places. It is difficult to explain the distribution of this Orthopteron without accepting it as a relic from the Boreal Period. An examination of the titillator of the animals from Bornholm and Tisvilde shows that it belongs to the subspecies *denticulata*.

Metrioptera bicolor (Philippi, 1830). Fig. 8

Scania: Vomb, Klostersågen and Nygård, several finds between 1930 and 1936, Kemner and Ander (ZI; Ander, 1933).

Holstein: Between Segrahn, Rosengarten and Langenlehstener

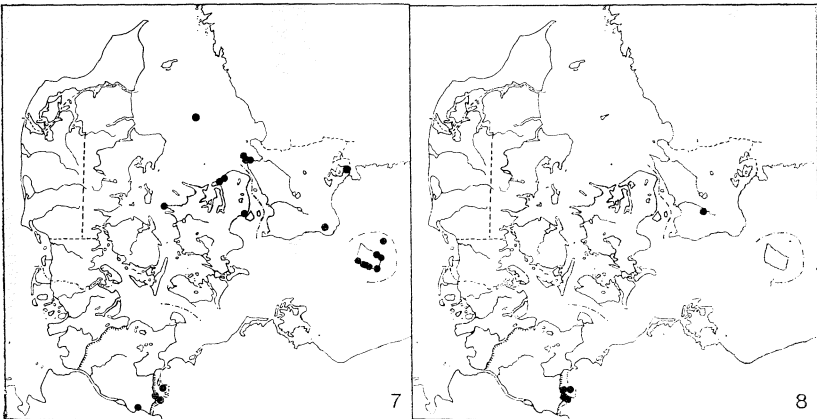


Fig. 7. *Platycleis denticulata*. Fig. 8. *Metrioptera bicolor*.

Heide, S. of Mölln in several places, Auf der Heide near Mölln, and Sterley S. of the town (Lunau, 1950); Götting, on the old highway, 3 ♂, 2 ♀, 25.vii.1967, (ZM; coll. Holst).

The presence of the isolated population in Scania is difficult to explain. Perhaps it is a relic from the Boreal Period, but it can also have migrated at a later period from N. Germany.

Metrioptera roeseli (Hagenbach, 1822). Fig. 9

Z e a l a n d : (Bøllemosen, x., Schlick (Meinert, 1887—88). This find cannot be accepted). — **F a l s t e r** : Bøtø on both sides of the embankment in dunes, grass and meadows, observed for the first time 15.viii.1947, Kryger (ZM), and very common, (ZM; coll. Esbjerg). — **L o l l a n d** : Meadows in forest, Schiødte (Meinert, 1887—88). In ZM, the label of a male bears Schiødte's writing. This specimen is possibly caught on Lolland. — **W. J u t l a n d** : Knudmose near Herning, 1 ♂, 13.viii.1939, Leth (ZM).

H o l s t e i n : Bliesdorf, Fredeburg, Schmilau, Salemer Heide, Mustin, Dutzow and from around Mölln to Gudow and Götting, Langenlehstener Tannen and Fortkrug (Lunau, 1950); Ratzeburg (Weidner, 1938). — **H a m b u r g** : Boberg, Duvenstedter Brook, Sande and Lohbrügge (Zacher, 1917; Weidner, 1938).

M. roeseli is possibly a relic from the Boreal Period, but it can also have migrated from the population of N. Germany at a later period.

Metrioptera brachyptera (L., 1761). Fig. 10

This species is almost always associated with heathlands or moors. The vegetation is normally *Calluna* and *Erica* with some

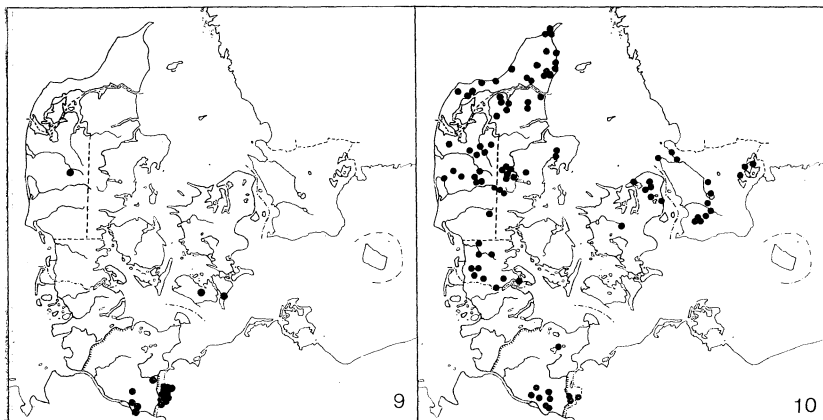


Fig. 9. *Metrioptera roeseli*. Fig. 10. *Metrioptera brachyptera*.

Sphagnum. It can also occur in open parts in the woods, in damp places (e.g. N. Zealand). This species often occurs with *Omocestus viridulus*.

This species is more common in Jutland than in the other parts of Denmark. The reason is that heathland is common in Jutland. In older times, a hundred years ago, the heath dominated in W. Jutland. The map shows roughly where in Denmark the soil is preponderantly sandy or clayey. This species is missing on arable land and hardwood forest on clayey soil such as dominates in the Danish Islands, the eastern part of E. and S. Jutland and around the western part of Limfjorden (Schou, 1949).

Pholidoptera griseoptera (De Geer, 1773). Fig. 11

This species lives almost always in hedges, bushes, edges of woods and open parts of woods. The map shows roughly that it occurs in that part of Denmark where *Metrioptera brachyptera* is not found.

Tachycines asynamorus Adelung, 1902

It is found in many places in the area in glass-houses.

Gryllus campestris L., 1758. Fig. 12

Bornholm: Galløkken Tryde near Rønne, 1 ♀, 1897 (ZM); it seems to have occurred commonly in the southern part of Bornholm in the years 1943—57, according to Arne Larsen; 3 km N. of Rønne, in dunes, 1 ♂, 13.v.1943, Juul Nielsen (ZM; Larsen, 1944); Raghammer Odde E. of Rønne, 1 ♂, 8.vi.1947, Arne Larsen (ZM); Stampen, 4 specimens, 1947, according to Larsen; from the airport near Stampen to

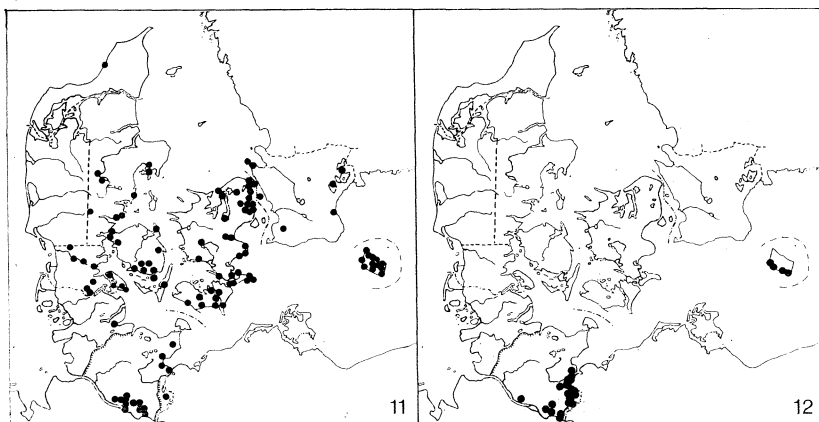


Fig. 11. *Pholidoptera griseoptera*. Fig. 12. *Gryllus campestris*.

Dueodde, very common on sandy soil, 1947, from information by Larsen; Dueodde, 1 ♂, 5.vii.1949?, Ryberg (ZM); the airport, very common, v.1952, Holst.

Holstein and Hamburg: In several localities (Beuthin, 1875; Zacher, 1917; Lunau, 1934, 1936 and 1963; Heydemann, 1936; Weidner, 1938).

The occurrence of this species on Bornholm has been discussed by Spärck and Larsen (1944). Spärck thinks that it is a relic of the Boreal Period. In the years 1947—57 the small population increased because the weather was very warm in this period. Larsen thinks that it was introduced from time to time to Rønne. Several of the finds were made near this town. The last introduction may be by the Russian troops in 1945. I consider that Larsen's theory is the most likely.

Acheta domestica (L., 1758)

This species is found in many places indoors and outdoors on rubbish dumps.

Gryllotalpa gryllotalpa (L., 1758). Fig. 13

Scania: Farhult, 1 ♀, (ZI); Vånga, 1 ♂, 6.vi.1925, Ammitzböll (ZI); Nosaby, 1 ♀, viii.1909, Rosén (ZI); Vram, 2 ♀, 8.vi.1903, Bengtson (ZI); Ljunghed, 1 ♀, 24.v.1937, Ander (ZI); Sibbarp, 1 ♀, vi.1956, Franzén (ZI); Råby, Ivetofta and Näsrum (Wallengren, 1866).

Bornholm: Arnager, 1 ♀, viii.1937, Arne Larsen (ZM). — Zealand: Østerbro, Copenhagen, in gardens at the beginning of the 19th century (Meinert, 1887—88); Christiansholm, Enrum and Fredensborg (Bergsøe, 1915); Grib Skov and Jægerspris (Meinert, 1887—88); Rosenvænget in Copenhagen, 4 ♂, 2 ♀, great numbers of nymphs, 16.vii.1878, Conradsen (ZM); Måløv, 1 ♀, 1876 (NM); Vemmetofte, adult and eggs, vii.1885, (Meinert, 1887—88); Bramsnæsvej, 5.vi.1895, Meinert (information in ZM); Hvalsø, 1 ♀ (ZM); Arresødal, 1 ♀, Esben-Petersen (ZM); Langemosegård, Gladsaxe, 1 ♀, 16.viii.1918, Højsgaard (ZM); Frederiksdal, 2 ♀, 3 nymphs, 22.—31.vii.1922, Esben-Petersen (ZM); Bagsværd, in a garden, a great number of eggs and nymphs, 26.vii.1924, Højsgaard (ZM); Kalundborg, 1 ♀, about 1.vi.1934, Kryger (ZM); Helsingør, 1 nymph, 25.v.1937, Nielsen (ZM); Lillerød, 1 ♀, v. 1939, Möhl Hansen (ZM); Allerød, 1 ♂, great number of nymphs, eggs, 27.vii.—22.ix.1940, 30.v.1941, 17.vii.1941 and viii.1941, Kryger (ZM); Lekkende NE. of Vordingborg, 1 ♀, Löppenthin (ZM); Hesselbjerg near Græsted, 1 ♂, 25.vii.1942 (ZM); Kattehale Mose, 1 nymph, 30.vi.1952, Kristiansen (ZM); Hellerup, 1 ♀, 7.vii.1952, Kröhn (ZM); Klampenborg, 1 nymph, 10.viii.1954, Andersen (ZM); Strødam, 1 ♀, 1962 (NM). — Neksælø: 2 ♀, 1 nymph, 6.vii.1939, Jensen-Storch (ZM). — Møn: Hunosøgaard, 2 ♂, 15 nymphs, 23.vii.1942, Stephens (ZM). — Falster: Gedser, 2 ♀, 24.vi.1952, Leth (ZM); Torkilstrup, 1 ♀, 16.vii.1936, Kristiansen

(ZM). — L o l l a n d : Maribo, 3 ♀, ix.1874 and vi.1876, Schlick (ZM); Hildesvig Skov, Guldborgland, Koch (Meinert, 1887—88). — F u n e n : Fåborg, in gardens, and Brahetrolleborg, Strøm-Schiøtz (Meinert, 1887—88). — Æ b e l ø : 1 ♀, 15.vi.1904, Thorsen (ZM). — E. J u t l a n d : Balskovgård, Rosenholm N. of Kalvø Vig, Rosenkrantz, and Silkeborg, Lotze-Schiøtz (Meinert, 1887—88).

S c h l e s w i g : Försterei Mörel near Eckernförde (Jessen, 1915); Kappeln (Zacher, 1917). — H o l s t e i n : Brockenlande near Neumünster; Lägerdorf near Itzehoe; Anstalt Hörnheim near Kiel; Preetz, Hitzhusen; Bad Bramstedt; Waldhusen and Haffkrug (Lunau, 1963; Zacher, 1917; Weidner, 1938). — H a m b u r g : Ahrensburg, Eggerstedter Feldmark near Pindeberg, 1915, Poppenbüttel, Beimoor, Bergedorf, Farmsen Ziegeleiteich, 1928, Grossensee, 1892 and Trittau, 1937 (Beuthin, 1875; Zacher, 1917; Weidner, 1938).

It appears to occur in particular in the southern and eastern parts of the region.

Tetrix subulata (L., 1761)

This species is recorded in many places throughout the area.

Tetrix undulata (Sowerby, 1806)

(*T. vittata* Zetterstedt, *T. kiefferi* (Saulcy))

This species is very common throughout the area.

Tetrix nutans (Hagenbach, 1822). Fig. 14

(*T. tenuicornis* Sahlberg)

H o l s t e i n : Alt Mölln (Lunau, 1950).

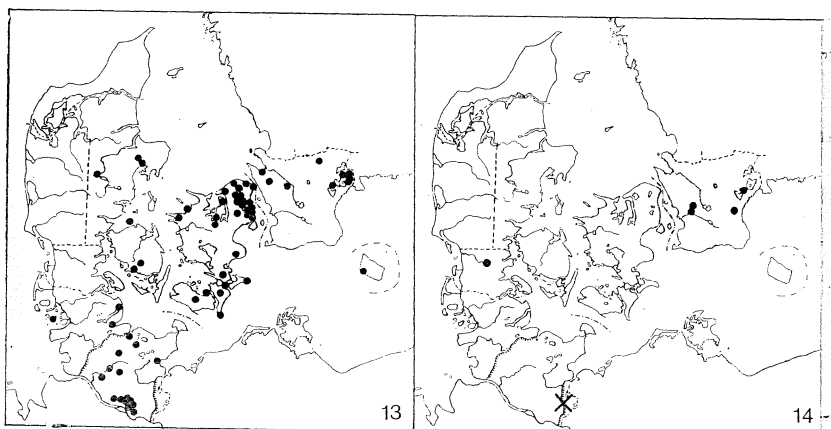


Fig. 13. *Gryllotalpa gryllotalpa*. Fig. 14. *Tetrix bipunctata*. X *Tetrix nutans*.

Tetrix bipunctata (L., 1758). Fig. 14*(T. kraussi* Sauley)

Scania: Nosaby, 1 ♀, vi.1905, Rosén (ZI); Reslöv, 1 ♀, Rosén (ZI); Farstorp, 1 ♀, vii.1898, Rosén (ZI); Degeberga, 1 ♀, 5.v.1938, Ehnbon (ZI).

Bornholm: Almindingen, 1 ♂, 4.viii.1940, Johnsen (ZM). — S. Jutland: Hjartbro, 1 ♀, 8.ix.(?)1934, Findal (NM).

This species is recorded in Sweden from Scania in the South to Lapland in the North. In Europe to day it has a boreo-alpine distribution. Ander (1949a) thinks that this species migrated to Scandinavia in the late Yoldia Period or early Ancylus Period. Ragge (1963) thinks that it managed to survive the glaciation in the British Isles. The isolated find in S. Jutland seems to be the last trace of an animal which migrated early on.

Podisma pedestris (L., 1758)

This species has been recorded in Sweden from Scania in the South to Lapland in the North (Ander, 1945, 1953).

Psophus stridulus (L., 1858). Fig. 15

Scania: Glades in forest in NE. Scania (Wallengren, 1866); Vånga, 3 ♂, Rosén (ZI); Farstorp, 1 ♂, 1894, Rosén, and 1 ♂, 1916, Rydén (ZI); Munka-Ljungby, 2 ♂, 1915, Ringdahl (ZI); Yngsjö Havsbad, 2 ♂, 20.ix.1949, Lohmander, and 1 ♂, 2 ♀, 23.ix.1951, Sjösted (ZI).

Zealand: N. Zealand (Müller, 1766 and 1776).

In Sweden this species extends to mid-Sweden (Ander, 1945).

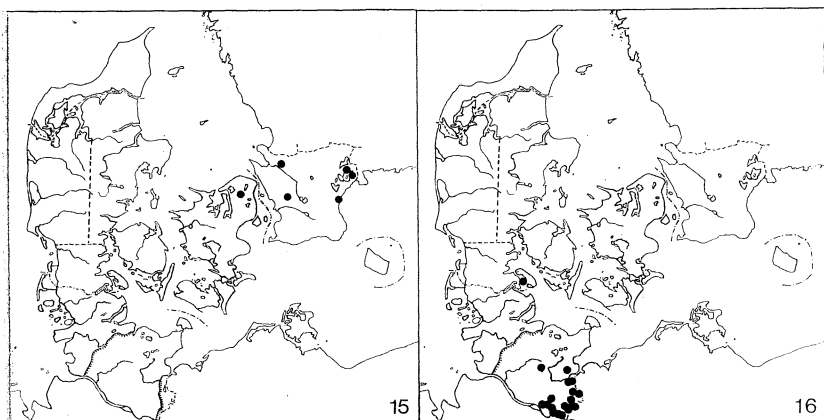


Fig. 15. *Psophus stridulus*. Fig. 16. *Oedipoda caerulescens*.

Locusta migratoria L., 1758

This species has from time to time migrated to the area, both in ph. *solitaria* and ph. *gregaria*.

Schistocerca gregaria (Forskål, 1775)

In the Zoological Museum in Copenhagen there is a specimen labelled "Samsø" with an old label. This may be wrong, but this species from time to time migrates to the southern part of the British Isles, so perhaps it also can find its way to Denmark.

Oedipoda caerulescens (L., 1758). Fig. 16

S. J u t l a n d : Sønderborg, 3 specimens in Altonaer Museum, Wüstnei (Weidner, 1938).

H a m b u r g a n d H o l s t e i n : Several finds (Zacher, 1917; Weidner, 1938; Lunau, 1950).

This species is recorded from Särö, Halland, Sweden, two specimens (Ander 1945).

Sphingonotus coeruleans (L., 1767)

H o l s t e i n : Rothenhaus near Trittau, 2.ix.1888 (Weidner, 1938); Grambek S. of Mölln, 1946 and 1947 (Lunau, 1950).

This species is recorded from many places in S. Sweden (Ander, 1945).

Bryodema tuberculata tuberculata (Fabricius, 1793). Fig. 17

J u t l a n d : in sandy regions (Fabricius, 1793); Mors, common on moors (Schade, 1811); Vind Sande near Holstebro, in numbers, 1870 and 1871; Hjelm Hede S. of Skive, 1870, between Vrove and Vristed near Viborg, in numbers, 1871 and 3 ♂, 2 ♀, 27.vii.1872 (ZM), Herning, Vendsyssel, in numbers and Nibe (all Meinert, 1887—88); Høllund SW. of Vejle, 1 ♂ (ZM); Lille Vildmose, 11 ♂, 3 ♀, vii.—viii.1891, Jensen (ZM); Henne near Varde, in numbers, about 1896 (Knudsen, 1911; ZM); Hammer Bakker, 1 ♀, 1899, Nordstrand (NM); Hjarbæk, 1 ♂, 1901 (ZM); Gatten Hede SE. of Løgstør, 6 specimens, 1900—01 (Hald, 1902), and 3 ♂, viii.1904, Thygesen (ZM); Ashøje E. of Thisted, 1 specimen, 1901 (Hald, 1902); Rakkenborg Hede at Ulbjerg near Viborg, 21.ix.1904, Binderup and Sjøstrup Heder near Ars, Rom Hede, 3 specimens, 1902, and 1 ♀, 28.vii.1904 (all Esben-Petersen, 1902; ZM); Bejstrup near Fjerritslev, 1 ♂, ix.1912, Søndergård (ZM); Ansager near Varde, 1 ♂, 1 ♀, ix.1911, (ZM; Marcussen, 1914); W. of Skersø near Æbeltoft, 2 specimens, 18.viii.1908 (Thygesen, 1911); Glyngøre, Salling, about 1908 and Torsted and Grimstrup Hede near Herning (Thamdrup, 1938); Als Odde near Mariager Fjord, in a plantation, 3 specimens, 10.viii.1916, (Pedersen, 1917); Vrads Sande, in numbers, 5.viii.1940 (NM); Vestre Skole, Silkeborg, 1 ♀, 23.viii.1941, Esben-Petersen (ZM); Tandrup Hede

in Himmerland near Urhøje, in numbers, 10.ix.1939, 17.ix.1939, 3.viii.1940, 30.vi.1941 (Nørgaard, 1942; ZM; NM); Gunderup Gd. near Tandrup Hede in Himmerland, 1 ♂, Sørensen (ZM); Ovtrup Hede, 4 specimens, 28.viii.1937, 3.viii.1938, (Nørgaard, 1942; ZM); Løgstør, 1 ♀, 19.ix.1939 (Nørgaard, 1942); Abild Hede, in numbers, 3.viii.1949 (NM).

Schleswig: 2 specimens, Wüstnei (Weidner, 1938). — Hamburg: Winterhude, 1873—74 (Beuthin, 1875; Weidner, 1938).

This species has not been found in Jutland since 1949. Some of the known localities in Jutland were investigated during the excursions in 1964—67, without results. The animal may have been lost from Jutland, Schleswig and Holstein. The reason for the disappearance of this species is the development of heath cultivation.

Bryodema tuberculata is a typical continental animal, with its main distribution in Central Asia. It has or had its most north-westerly distribution in Jutland. The nearest occurrences are on Lüneburg Heide in N. Germany and Öland in the Baltic Sea (Sweden). From his investigation on Öland, Ander (1949a) thinks that it is a relic from the Boreal Period, but this cannot be the case with the former population in Jutland, as the heathland is a product of cultivation, which developed with the introduction of agriculture, and which was maintained by sheep farming, cutting heath peat and burning-off the heath. The natural vegetation of Jutland is forest. The connection south and east over the heaths in Germany and Poland gives the possible route for the immigration of this species.

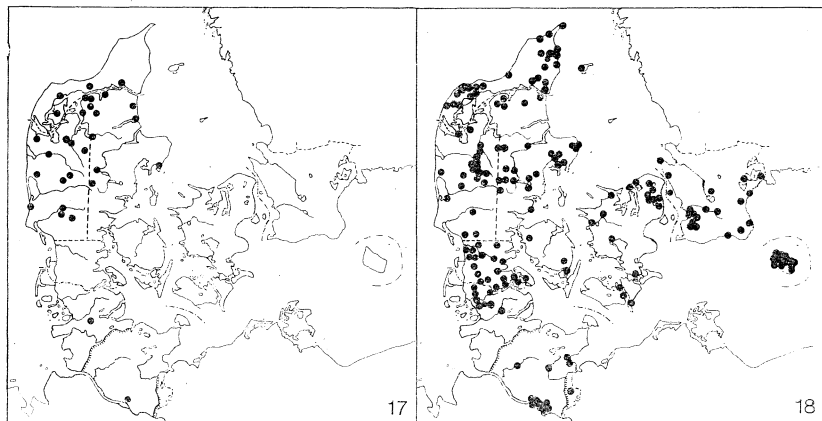


Fig. 17. *Bryodema tuberculata*. Fig. 18. *Omocestus viridulus*.

Mecostethus grossus (L., 1758)

It is found in damp places throughout the area. It is particular common along the great water-courses in Jutland.

Chrysochraon dispar (Germar, 1835)

Holstein: From Herrenfähre to Schellbruch near Trave NE. of Lübeck and Genin 4 km SW. of Lübeck (Lunau, 1950).

This species has been recorded in Sweden from Öland, Gotland, Västmanland and Närke or Uppland.

Stenobothrus stigmaticus (Rambur, 1839)

This species has been found in a few localities in SE. Holstein (Weidner, 1939; Lunau, 1950). It is not recorded from Sweden or Norway.

Stenobothrus lineatus (Panzer, 1796)

Holstein: Sachsenwald and Rothenhaus E. of Hamburg.

This species has been recorded from several localities in SE. Holstein and near Hamburg (Weidner 1939, Lunau 1950). It is not recorded from Sweden or Norway.

Omocestus viridulus (L., 1758). Fig. 18

This species often occurs together with *M. brachyptera* on heathland and moor, but it can also occur in both damper and dryer localities. By comparing Fig. 10 and Fig. 18 it will also be seen that *O. viridulus* has a greater distribution. Like *M. brachyptera* it is more common in Jutland than on the Danish Islands. It is worth noticing that it is very common on Bornholm, where *M. brachyptera* has not yet been found.

Omocestus ventralis (Zetterstedt, 1821) Fig. 19

Scania: In NE. Scania (Wallengren, 1866); Esperöd, Björnstorp and Kabusa (Haij, 1888); Finjasjön, Fjellfotasjön, Yddingesjön, Räften near Lund and Ringsjön (Haij, 1888); Oppmanna, Arkelstorp, 1 ♂, 2 ♀, Rosén (ZI); Fjälkestad, 2 ♂, 1 ♀, Rosén (ZI); Grönhult, Vånga, 1 ♀, Ammitzböll (ZI); Degeberga, 1 ♂, 9.viii.1930, Draning (ZI); Höör, 1 ♂, Rosén, and 1 ♀, viii.1949, Dahl (ZI); Munkarp, 2 ♂, 1 ♀, viii. 1949, Dahl (ZI); St. Olof, 1 ♀, 14.viii.1930, Draning (ZI); Ystad, 1 ♀, Ammitzböll (ZI); Käseberga, 1 ♀, 29.viii.1931, Kemner (ZI); Hyby, Bökeberg, several finds, Ander, Kauri (ZI); Skabersjö, 2 ♂, 8.viii.1931, Ljungtved (ZI); Skabersjö (coll. Tjeder); Torup, 1 ♂, 1 ♀, 31.vii.1931, Ljungbeck (ZI); Väderön, 1 ♂, 24.viii.1949, Ringdahl (ZI).

In the area investigated this species was only found in Scania.

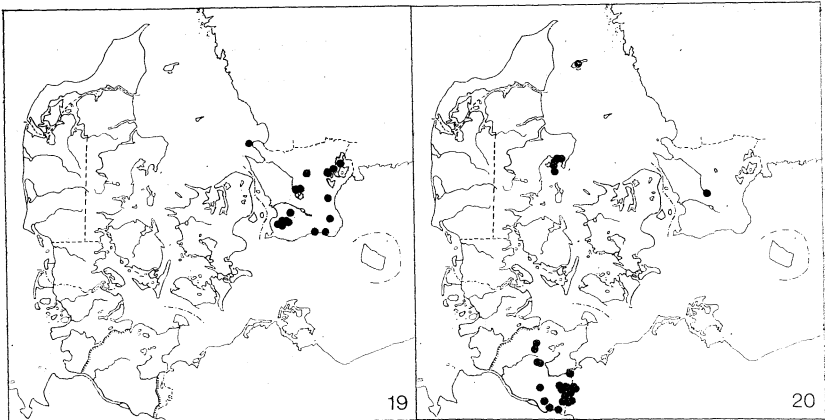


Fig. 19. *Omocestus ventralis*. Fig. 20. *Omocestus haemorrhoidalis*.

Meinert (1887—88) mentions it as being found in Nykøbing Lyng, Odsherred, and Esben-Petersen (1916 and 1917) near Viborg. This find cannot be accepted as I have not been able to trace the specimen. In Sweden it is recorded from Scania in the South to Upland, Vestmanland and Vermland in Middle Sweden. In N. Germany it is very scattered.

***Omocestus haemorrhoidalis haemorrhoidalis* (Charpentier, 1825). Fig. 20**

Scania: Bosjökloster, 1 ♀, vii.1949, Dahl (ZI).

Læsø: 1 ♀, 25.vii.1933, Findal (NM).

E. Jutland: Strandkær near Femmøller, several finds near "Mølslaboriet", mainly on sandy moraine with *Calluna* and scanty growth of grass (ZM; NM; coll. Gärdefors; coll. Esbjerg; coll. Holst); Femmøller, 1 ♂, 1.ix.1932 (NM); Handrup Bakker, 1 ♂, 28.viii.1933, Bro Larsen (ZM); Viderup, 1 ♂, 2 ♀, 1964, Gärdefors (ZM); N. of Bogens, 1 ♀, 1964, Gärdefors (ZM); Ellemandsbjerg, 1 ♂, 1 ♀, 25.vii.1962, Johnsen (NM) and 1964, Gärdefors (coll. Gärdefors).

Holstein and Hamburg: Several finds (Zacher, 1917; Weidner, 1938; Lunau, 1950); Forst Neumünster, 1 ♂, 1 ♀, 5.ix.1966 (coll. Holst).

In other parts of Sweden it is recorded from Öland, Gotland and Västergötland (Ander, 1945, 1949a and 1953). Ander thinks that it is a relic from the Boreal Period. It is difficult to explain the distribution without accepting it as a relic.

***Chorthippus brunneus brunneus* (Thunberg, 1815). Fig. 2**

This species is very common throughout the area (see the map).

The costal field of ♂ tegmina is very variable in its width, and it can sometimes resemble that of *Chorthippus biguttulus*, but the number of stridulatory pegs on the inner surface of the hind femur shows that it belongs to this species. There was no relation between the numbers of pegs and the width of the costal field of ♂ tegmina. 22 males were examined. The number of pegs on the hind femur ranges from 52 to 78, but the width of the costal field shows no regular variation from animals with a low number to those with a high number of pegs. There is no transition between *Ch. brunneus* and *Ch. biguttulus* in Denmark.

The number of pegs was counted on the hind femur of 189 males and dotted in on a map, but there was no regularity in the distribution.

Chorthippus mollis mollis (Charpentier, 1825), Fig. 21

S. Jutland : Søgård near Bjergskov, 1 ♂, 5.viii.1935 (Findal, 1937; NM); Ribe, 2 ♂, 1 ♀, 25.vii.1940, Leth (ZM).

Schleswig : Enge near Leck and Süderlügumer Dünen (Lunau 1950). — Holstein : Besenhorst near Geesthacht, Büchen, Escheburg and Rothenhaus (Weidner, 1938); Götting, on the old highway, 2 ♂, 25.viii.1967, Holst (ZM); Forst Neumünster, 2 ♂, 5.ix.1966, Holst (ZM). — Hamburg : Boberg, Borsteler Moor and Holm Dünen (Weidner, 1938).

This species is not found in Sweden. Ander (1933) mentions it as being found in Åhus, Scania, but he later cancelled this record (Ander, 1945). It is found under more dry conditions than *Ch. brunneus*.

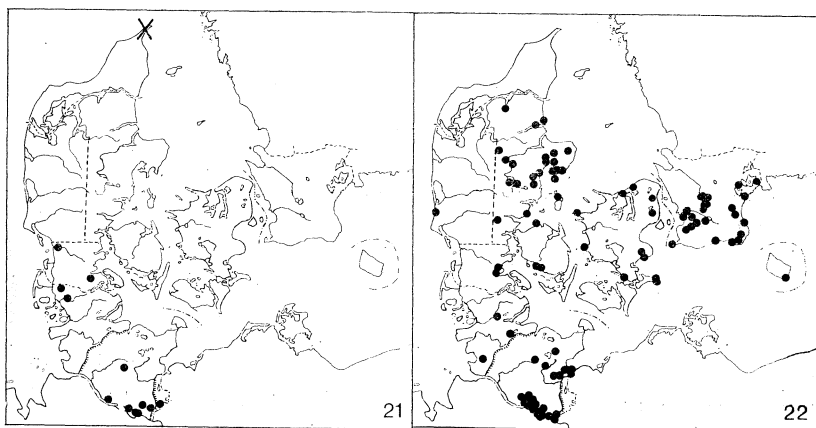


Fig. 21. *Chorthippus mollis*. x = *Chorthippus vagans* (many finds).
Fig. 22. *Chorthippus biguttulus*.

Chorthippus biguttulus biguttulus (L., 1758). Fig. 22

This species has a scattered distribution in the area. It seems, however, to be more common in some parts of Scania and E. Jutland and in the southern part of Holstein and Hamburg. It is a little more xerophil than *Ch. brunneus*.

Ander (1949a) thinks that this species is a fairly late immigrant, but as its distribution in the area is now better known, I cannot agree with this view.

Chorthippus vagans (Eversman, 1848). Fig. 21

N. J u t l a n d : Ålbæk Klitplantage, in the sandy belt in the plantation, 3 ♀, 24.viii.1965, Esbjerg (ZM); Skagen Klitplantage, 1 ♂, 1 ♀, 19.ix.1965, Bræstrup (ZM); Kirkeklit near Skagen, 1 ♂, 4 ♀, 6.viii.1966, Holst (ZM; coll. Holst); 3 km N. of Skagen, in a heath, 1 ♂, 2 ♀, 6.viii.1966, Holst (ZM); on the dune of Grenen, 1 ♂, 1 ♀, 6.viii.1966, Holst (ZM); Råbjerg Mile, 1 ♂, 1 ♀, 7.viii.1966, Holst (ZM) and in numbers, 21.vii.1966 (coll. Esbjerg); Bunken Klitplantage, 3 ♂, 1 ♀, 7.viii.1966, Holst (ZM; coll. Holst).

The occurrence of this species in Denmark is very surprising. It seems to occur only at Skagen N. of Ålbæk and Råbjerg. Esbjerg and the author looked for it during the excursions in the dunes and in the sandy belts in the coniferous forest near the west coast more south in Tværsted Plantage, Ugerby Klitplantage, Lökken and Blokhus, without any results. The northern part of Denmark, where this species occurs, has a greater number of hours of sunshine than the remainder of Jutland, and this may be the reason for its occurrence here.

Myrmeleotettix maculatus was also found to be very common together with *Ch. vagans*, and also *Ch. albomaginatus* near the coast. *Ch. brunneus* has not been recorded at all near Skagen.

This species is not recorded in Sweden. The nearest finds were in Germany and Poland, where it is very sparse and rare. It was found by Haake S. of Hamburg (Zacher, 1917) and in Hartz, Mark, the debouchment of the Wista and Mierzeja Wislana (Harz, 1957).

It can be difficult to understand how this species reached Skagen, so far to the north of its main distribution area. Perhaps it was introduced from Middle Europe by car. Skagen is a very popular holiday place, and many Germans spend their holidays here. Grasshoppers and remains of grasshoppers are often seen on the car radiator, and it could be brought to Skagen in this way. More probably, it is a relic from the Boreal Period.

Chorthippus apricarius apricarius (L., 1758). Fig. 23

Scania: In NE. Scania (Wallengren, 1866); Nosaby, 4 ♂, 6 ♀, vii.1905, Rosén (ZI); Oppmanna, Arkelstorp, 1 ♂, 3 ♀, viii. 1905, Rosén (ZI); Horna, Åhus, 1 ♂, 3.viii.1930, Gaunitz (ZI); Maglehem, 15 ♂, 14 ♀, 11.—17.viii.1930, Gaunitz (ZI); Degeberga, 1 ♀, 9.viii.1930, Gaunitz (ZI); Forsakar, Degeberga, 1 ♀, vii.1949, Dahl (ZI); Brösarp, 1 ♀, 14.ix.1931, Kemner (ZI); Skäralid, 1 ♀, 13.vii.1941, Heinze (ZI); Åstorp, Söderåsen, 1 ♀, 28.vii.1941, Heinze (ZI); Brandstad, 1 ♂, 16.viii.1933, Ander (ZI); Höör, 3 ♂, 1 ♀, 1949, Dahl (ZI); Bosjökloster, 1 ♂, vii. 1949, Dahl (ZI); Rövarekulan, 1 ♂, 1 ♀, vii.1949, Dahl (ZI); Jonstorp, 1 ♂, 3.vii.1933, Ehnbohm (ZI); Ystad, 6 ♂, 8 ♀, 1906—09, Ammitzbøll (ZI); Kabusa near Ystad, 2 ♀, 19.vii.1931, Lauerbeck (ZI); Lund, several finds, Ander and Heinze (ZI); Flädie, 1 ♂, 1 ♀, 5.viii.1931, Ander (ZI); Torup, 1 ♂, 12.vii.1937, Ljungbeck (ZI); Torna Hällestad, 1 ♀, 6.ix.1932, Ander (ZI); Sandby, several finds, Ander (ZI); Lomma, 1 ♂, 21.vi.1948, Berden (ZI); Råå, 1 ♂, 1 ♀, 20.vi.1936, Brinck (ZI). — **Ven**: 3 ♂, 4 ♀, 13.—20.vii.1949, Princis (ZI).

Zealand: Masnedsund, 6 ♂, 6 ♀, 29.vii.1905, Esben-Petersen (ZM); Knudskov, Knudshovedodde, 2 ♂, 4.viii.1964, Holst (ZM). — **Bogø**: 3 ♂, 1 ♀, 8.viii.1922, Esben-Petersen (ZM). — **Falster**: Stangerup, 2 ♂, 2 ♀, 4.viii.1905, Esben-Petersen (ZM). — **Lolland**: Sundby and Strandby near Nykøbing, 3 ♂, 2 ♀, 10.viii.1905 and 1.viii. 1913, Esben-Petersen (ZM); Keldskov, 2 ♂, 1 ♀, 1.viii.1913, Esben-Petersen (ZM); Toreby, 1 ♀, 12.viii.1945, Worm-Hansen (ZM); Stor-skoven near Guldborg, 1 ♂, 1 ♀, 16.vii.1930, Larsson (ZM); Søholt and Skørtinge near Maribo, 3 ♂, 6 ♀, 5.viii.1964, Holst (ZM). — **W. of Saks-købing**, 1 ♂, 1 ♀, 6.viii.1964, Holst (ZM); Berritsgård, 5 ♂, 2 ♀, 15.ix. 1967, Holst (ZM; coll. Holst). — **Langeland**: Henninge, Klæsø Gård and Spodsbjerg, very common, 6.ix.1964, Holst (ZM); Spodsbjerg, 2 ♂, 2 ♀, 18.vii.1965, Holst (ZM). — **Tåsinge**: vii. and viii. 1910 (Poulsen, 1911); Bregninge Kirke, 2 ♀, 3 nymphs, 19.vii.1965, Holst (ZM). — **Funen**: Ørbækklunde, Rallebæk, Vr. Åby and N. of Hedeskov, very common, 4.—5.ix.1964, Holst (ZM; coll. Holst); Stejlebjerg near Assens, Sandager, Tanderup, Favrskov and Galgehøj near Gelsted, very common, 19.—20.vii.1965, Holst (ZM; coll. Holst); Brenderup, 1 ♂, 6.viii.1938, Findal (ZM); Årup, 8 ♂, 7 ♀, 19.vii.1935 (NM). — **E. Jutland**: Femmøller and Strandkær, found very commonly during the years since 1932, Esben-Petersen, Findal, Holst (ZM; NM); Knebel, 1 ♂, 1 ♀, 1937, Leth (ZM); Vornæs near Kalvø Vig, 1 ♀, 24.vi. 1939, Esben-Petersen (ZM); Æbeltoft, 1 ♂, 1 ♀, 8.vii.1934, Larsson (ZM); **W. of Grenå**, 3 ♂, 2 ♀, 2 nymphs, 4.viii.1966, Holst (ZM); Skanderborg, found very commonly during the years since 1904, Esben-Petersen, Findal (ZM; NM). — **S. Jutland**: Near Åbenrå, several finds (Findal, 1937).

Schleswig: Eckernförde (Weidner, 1938); **N. of Rendsburg**, 2 ♂, 1 ♀, 5.ix.1966, Holst (ZM; coll. Holst). — **Holstein**: Malentegremsmühlen and Bad Schwartau (Weidner, 1938); Oldenburg, Nienrade, Tiimmendorfer Strand, Bad Segeberg and **N. of Nortorf**, in great

numbers, 4—5.ix.1966, Holst (ZM; coll. Holst). — H a m b u r g : Gross-Borstel, Lokstedt and Rodenbeck (Weidner, 1938).

This species is often found in the edge of ditches where the grass is cut, or in dryer spots with half-wilted grass.

Its distribution in the area is very extraordinary. In Scania it is recorded almost overall, but it does not seem to have reached Bornholm. More extraordinary is the fact that it has not been recorded in N. Zealand. It has a general distribution in Southern Zealand, Falster, Lolland, Langeland, Funen, S. Jutland, Schleswig and Holstein, here probably because of the southern position of the area.

Ander (1949a) thinks that this species is a fairly late immigrant, but now that its extraordinary distribution in the area is better known, I cannot agree with this view.

Chorthippus albomarginatus albomarginatus (De Geer, 1773).

Fig.24

This species occurs practically overall near the coast in mature dunes, sometimes in the dunes with *Psamma-Elymus* and in the grass. It is found together with *Conocephalus dorsalis*, but its distribution in the area differs from that of *C. dorsalis*, and it is not so typical a coast animal as *C. dorsalis*. It occurs inland in western Jutland, Holstein, Bornholm and some parts of Scania. In other part of the range of distribution it occurs both near the coast and inland.

The microclimate near the coast must be of importance for *Ch.*

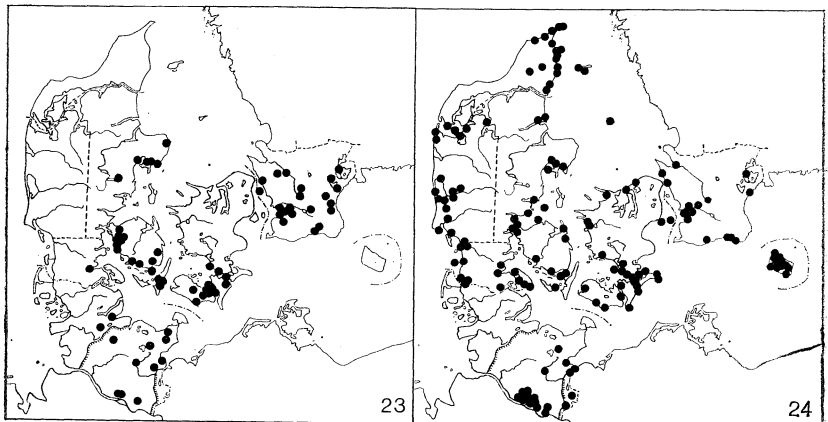


Fig. 23. *Chorthippus apricarius*. Fig. 24. *Chorthippus albomarginatus*.

albomarginatus. Contrary to *Conocephalus dorsalis* it is not so lively in captivity, and compared with other Acrididae it is very difficult to make it sing. An investigation of the ecology of this species would be of great interest.

Chorthippus dorsatus dorsatus (Zetterstedt, 1921). Fig. 25

Scania: NE. Scania (Wallengren, 1866); Fjälkestad, 1 ♂, 1 ♀, Rosén; Rövarekulan, 1 ♂, vii.1949, Dahl (ZI); Drakamölla, Maglehem, 4 ♂, 11.viii.1930, Gaunitz (ZI); Höör, 5 ♂, 2 ♀, viii.1949, Dahl (ZI); Lund, several finds, Ander (ZI); Torup, 1 ♀, 31.vii.1931, Ljungbeck (ZI).

Bornholm: (Meinert, 1887—88); Åremyre, 1 ♀, 5.viii.1929 (Ander, 1931a). — Zealand: Grønnehave near Elsinore, 4 ♂, 3 ♀, 16.viii.1872, Budde-Lund (ZM); Gribskov, 2 ♂, 1 ♀, 23.vi.1964, Holst (ZM); Asserbo, 1 ♀, 7.viii.1932, Worm-Hansen and 3 ♂, 18.ix.1965, Edelmann (ZM); Ellemosen near Tisvilde, 1 ♂, 8.viii.1961, (coll. Esbjerg); Stængehus in Tisvilde Hegn, several finds, Esbjerg and Holst (ZM; coll. Esbjerg); Lynæs, 1 ♀, 8.iv.1964, Holst (ZM); N. of Nykøbing (Meinert, 1887—88); Hillerød, 1 ♂, 29.vii.1907, Esben-Petersen (ZM); Ørholm, 2 ♂, 2 ♀, 5.ix.1941, Larsson (ZM); Dyrehaven, 1 ♀, 1.ix.1872 (ZM); Frederiksdal, 1 ♂, 4.ix.1872 (ZM); Farum Mose, in numbers, vii.1963 (coll. Esbjerg); Bognæs, 1 ♂, 17.ix.1964 (coll. Esbjerg); Holbæk, 1 ♂, 17.ix.1905, Larsen (NM); Gevninge, 1 ♂, 8.viii.1872 (ZM); Køge Ås (Findal, 1937); Tystrup, 1 ♂, 1 ♀, 28.viii.1941, Johnsen (ZM); Suserup, 1 ♀, 27.viii.1941, Johnsen (ZM). — Falster: Storskoven, in numbers, 5.viii.1905, Esben-Petersen (ZM; NM); Næsgård, 1 ♂, 5.viii.1905, Esben-Petersen (ZM); — Lolland: Strandby, 1 ♀, 1.viii.1905, Esben-Petersen (ZM); Toreby, 1 ♀, 12.viii.1945, Worm-Hansen (ZM). — Funen: Mindedal, in numbers (Findal, 1937). — E. Jutland: Near Århus (Meinert, 1887—88); Funder, 2 ♂, 2 ♀, 26.viii.1906, Savværket near

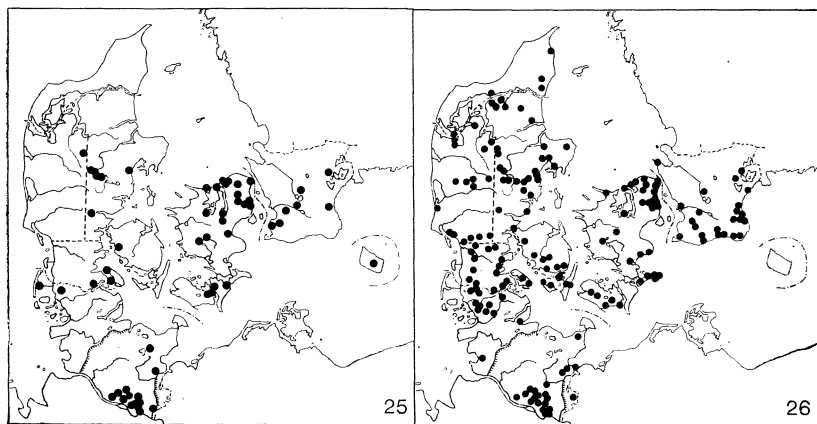


Fig. 25. *Chorthippus dorsatus*. Fig. 26. *Chorthippus longicornis*.

Silkeborg, 1 ♀, 2.ix.1906, Silkeborg Østerskov, 4 ♀, 19.ix.1905, Funder K., 1 ♂, 12.viii.1936, and Jenskær near Silkeborg, 2 ♂, 27.viii.1934, all Esben-Petersen (ZM); Vingsted near Vejle, 8 ♂, 8 ♀, 22.vii.1940, Leth (ZM). — S. J u t l a n d : Rinkeæs, 2 ♂, 1 ♀, 15.vii.1933, Esben-Petersen (ZM). — A l s : Sønderborg, 1 ♂, 2 ♀, viii.1891, Wüstnei (ZM); Nordborg, 5.ix.1935 (Findal, 1937).

S c h l e s w i g : Archsum on Sylt (Zacher, 1917); Emmesböll, 1 ♀, vii.1891, Wüstnei (ZM). — H o l s t e i n : Malente-Gremsmühlen, Bad Schwartau, Büchen, Friedrichsruh, Geesthacht, Reinbek, Rothenhaus near Trittau, Sachsenwald, and Schönberg (Beuthin, 1875; Zacher, 1917; Weidner, 1938). — H a m b u r g : Boberg, Borsteler Moor, Duvenstedter Brook, Fuhlsbüttel, Holm, Mühlenkamp and Zollenspieker (Zacher, 1917; Weidner, 1938).

In the remainder of Sweden it occurs very sparsely in the southern part.

Chorthippus longicornis longicornis (Latreille, 1804). Fig. 26

Ander (1949a) considers that this species, which is not recorded from Öland and Gotland, must be a late immigrant. Ragge (1963) thinks the same is the case in Britain because it is not recorded on the Isle of Man, Scilly, Ireland, Lundy and the Outer Hebrides. I consider the same applies to Denmark. It will be seen from the map that it is not recorded from Anholt and Læsø, which however do not offer a good habitat for this species, nor from Bornholm. Samsø and several other islands where collections were made. It is also rare in N. Jutland, which it seems to have difficulty in reaching across Limfjorden.

This species is common in moist grass. I have examined several localities in Thy without any results, but south of Oddesund, I find it very common in several places.

Chorthippus montanus (Charpentier, 1825).

This species is recorded in Sweden from the north to the south, including Scania (Ander, 1945, 1953). In Holstein and Hamburg it is observed in several localities (Weidner, 1938; Lunau, 1963).

Gomphocerippus rufus (L., 1758).

S c a n i a : NE. Scania (Wallengren, 1866); Skrärelid, Söderåsen, 1 ♀, 13.ix.1947, Ander (ZI); Löderup, 1 ♀, 30. vii.1929, Gaunitz (ZI); Kulla Gunnarstorp, 1 ♂, 1944, Heinze (ZI); Skabersjö (coll. Tjeder).

This species is recorded in the other parts of Sweden from the South to the North, except from Lapland. From NW. Germany it is only found near Hamburg, but Weidner (1938) thinks that this find is doubtful.

Myrmeleotettix maculatus (Thunberg, 1815).

This species is common overall in the area, on sandy soil.

Zoogeographical Remarks

The number of species found in the area is restricted to 40, which is a small number compared with Central or South Europe. The reason is the north-westerly position of the area in Europe, with mainly temperate maritime climate. The great majority of Orthoptera are thermophilous and xerophilous, and a number of the species are in fact found more frequently in the southern (warmer) and eastern (more continental) part of the area. Examples of these are the species: *Leptophyes punctatissima* (Fig. 3), *Tettigonia viridissima* (Fig. 5) and *Chorthippus apricarius* (Fig. 23).

Several species have their northern limit in this part of Europe (W. Germany, Denmark, The Scandinavian Peninsula). The following reach to Holstein: *Stenobothrus stigmaticus*, *Stenobothrus lineatus*, *Tetrix nutans* (Fig. 14), if we leave out the find on Gotland (Ander, 1945), and *Gryllus campestris*, if it is considered to be introduced from time to time into Bornholm.

Some Orthoptera are restricted to several places in Holstein, and also a few places north of here: *Metrioptera bicolor* (Fig. 8), which also is recorded in Scania, *Metrioptera roeseli*, on Falster, Lolland and W. Jutland, and *Oedipoda caerulescens* (Fig. 16) from Sønderborg and Särö, Halland, Sweden.

Otherwise, the eastern part of Holstein between Lübeck and Lauenberg is one of the richest in species in the region, with several xerophil species. This can only be a result of the southerly position of the area and of the presence of a number of mild tunnel valleys and melt-water valleys.

The following reach to S. Jutland: *Chorthippus mollis* (Fig. 21), and to Funen and the middle of Jutland: *Tettigonia cantans* (Fig. 6).

Chorthippus vagans (Fig. 21) must be mentioned in particular, with its most northerly occurrence on Skagen.

Several species are found in especially warm localities and have a sporadic spread to South Scandinavia and Schleswig-Holstein; in particular: *Platycleis denticulata* (Fig. 7), *Metrioptera bicolor* (Fig. 8), *Metrioptera roeseli* (Fig. 9), *Sphingonotus coeruleans*,

Oedipoda caerulescens (Fig. 16), *Chrysochraon dispar*, *Omocestus haemorroidalis* (Fig. 20) and *Chorthippus vagans* (Fig. 21).

Some of these species, perhaps all of them, may be relics from the warm and dry Boreal Period. At this time Denmark formed a land-bridge between North Germany and the Scandinavian Peninsula, and many animals and plants immigrated during this period. In the last part of the Boreal Period the climate was warmer and dryer than to day, and probably more of the above mentioned species have been common in the area. With the later, moist climate of the Atlantic Period or more probably during the Subatlantic Period, the original number has been divided into a series of isolated populations. Ander (1949a, 1949b) thinks the same is the case for *Platycleis denticulata*, *Omocestus haemorrhoidalis*, *Sphingonotus coeruleus* and *Metrioptera bicolor*. It is difficult to explain the appearance of the above mentioned Orthoptera in the area, without assuming them to be relics from the Boreal Period. For some species which are only recorded in a few places, it can be a question of immigration at a later time (e.g. *Metrioptera* from N. Germany), or they may have been introduced (*Chorthippus vagans* to Skagen from Central Europe), though it is less likely.

Some species have an eastern distribution in the area. These are: *Podisma pedestris*, *Omocestus ventralis* and *Gomphocerippus rufus* from Scania, *Tetrix bipunctata* (Fig. 14) from Scania and a single record from S. Jutland, and *Psophus stridulus* (Fig. 15) from Scania and perhaps N. Zealand.

Of these species, the following reach to N. Sweden: *T. bipunctata*, *P. pedestris*, and *G. rufus*. For this group a northern immigration to the Scandinavian Peninsula might be possible, although the finding of *T. bipunctata* in S. Jutland does not indicate this. It is more probable that they are early immigrants from the south in the Allerød Period or perhaps in the early part of the Boreal Period, when the climate was more continental than today. In Europe and Asia today they have a more continental distribution. The following extend to Middle Sweden: *P. stridulus* and *O. ventralis*. These species can only reach S. Scandinavia over Denmark, and probably with the above-mentioned group. These two species have also a continental spread.

As examples of Orthoptera which have been late immigrants might be mentioned *Chorthippus longicornis* (Fig. 26) and perhaps *Tettigonia cantans* (Fig. 6).

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