

**PLATYCNEMIS PENNIPES (PALLAS)
ON EUROPEAN ISLANDS
(ZYGOPTERA: PLATYCNEMIDIDAE)**

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In its northern and western range the sp. is known only from a few islands. It occurs in S England and E Wales, the Isle of Wight and the Polish island Wolin. Records prior to 1913 are available from Sjælland and Vendsyssel. From 5 further islands only single and doubtful records are known which, apart from Bornholm, are all more than a century old; viz. Corsica, Sardinia, Sicily, and Crete. The sp. has not been recorded from any other island in the Baltic, the North Sea, the English Channel, the Atlantic Ocean, or in the western Mediterranean. In SE Europe it inhabits numerous islands in the Ionian and Aegean Seas. – Four different hypotheses for the absence of *P. pennipes* on the islands in its northern and western range are discussed.

INTRODUCTION

The distribution of *Platycnemis pennipes* (Pallas) in Europe seems well known (Fig. 1). Its northern limit extends through southeastern Norway, southern Sweden and central Finland (SØMME, 1937; VALLE, 1952b), its western limit is in southern England and Wales (HAMMOND, 1983). The Pyrenees and southern Italy (HEYMER, 1968) form its southern limit. Few localities are known in northeastern Spain (HEYMER, 1960, 1964). In southeastern Europe the species occurs in different forms, one of which is considered a subspecies, *P. pennipes nitidula* (Brullé) (DUMONT, 1977b).

When attempting to analyze distribution data of *P. pennipes*, one finds an inconsistency. In many national surveys it is stated as very common, but referring to the literature on the fauna of islands, the species is rarely cited. For this reason, the presence or absence of *P. pennipes* on islands was looked at more closely.

All the available literature on records from the islands of the Baltic, North Sea,

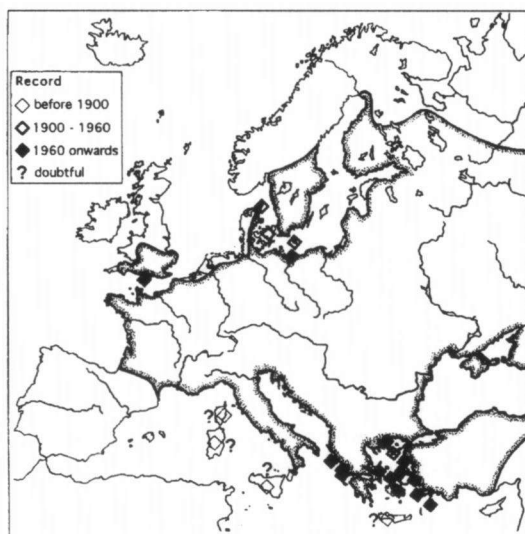


Fig. 1. The European range of *Platycnemis pennipes*. The occurrence on islands is marked with a diamond.

English Channel, the French Atlantic coast, and the Mediterranean from Corsica to Cyprus were evaluated. I was struck by a number of ambiguities: errors were often passed on, and some published information tends to remain unconsidered in regional reviews. All to me known references pertaining to the potential range of *P. pennipes* are listed (Tabs I-III), save for publications on the Wadden Sea and the Frisian Islands listed by KIAUTA (1968). However, this review still lays no claim to being complete.

ISLAND RECORDS OF *PLATYCNEMIS PENNIPES*

In the Baltic the first record of *P. pennipes* originates from Sjælland. At the river Susaa, Herlufsholm near Næstved, F.J.A. Larsen observed large numbers (ESBEN-PETERSEN, 1905, 1910, 1913b; ANONYMOUS, 1908). KRÜGER (1975) listed this record twice, under Herlufsholm (ANONYMOUS, 1908) and from Susaa (ESBEN-PETERSEN, 1910) and also, erroneously, a record of WESENBERG-LUND (1913) from Frederiksborg. Contrary to Krüger's statement, Wesenberg-Lund emphasized that *P. pennipes* was missing in his Frederiksborg study area (= Hillerød). The population of the Susaa seems to be extinct. On 30-VI and 1-VII-1995, I could not find any specimen either at Herlufsholm, or at 8 other localities on the river.

In Denmark, the northernmost known record is on Vendsyssel, from the stream Voers Aa, northeast of Ålborg (ESBEN-PETERSEN, 1910, 1913b; THOMSEN, 1911). The stream flows into the Kattegat. The vicinity is characterized nowadays by intensive agriculture. On 4 and 5-VII-1995, I could not confirm this record.

The species also occurs on Bornholm (ESBEN-PETERSEN, 1934b, 1936a, 1936b). According to a communication by J.C. Jensen, a specimen, collected by the late A. Hjorth, was deposited in the Museum of Bornholm, Rønne (ESBEN-PETERSEN, 1934b). More detailed information and further records are needed, but lacking (cf. SØMME, 1937). In her survey of dragonfly distribution in Denmark, KRÜGER (1975) does not cite this record.

MUSIAŁ (1988) reported several *P. pennipes* colonies on Wolin (1970-1976),

Table I
Evaluated references on the presence of Odonata on islands of the Baltic Sea

Islands	References
Åland archipelago	VALLE (1952b), VALTONEN (1980)
Islands in the Gulf of Finland	VALLE (1952b)
Hiiu-maa, Vormsi, Muhu	KAURI (1949b)
Saaremaa	MIERZEJEWSKI (1913), KAURI (1949b)
Gotland	ANDER (1929, 1944), KAURI (1949a), SAHLÉN (1985), SAHLÉN & MEDQUIST (1987)
Öland	ANDER (1929, 1944), SAHLÉN (1985)
Bornholm	ROSENBOHM (1922), ANDER (1931, 1935), ESBEN-PETERSEN (1933, 1934a, 1934b, 1936a, 1936b), KRÜGER (1975)
Wolin	MUSIAŁ (1975, 1979, 1988)
Usedom	MUSIAŁ (1988), MAUERSBERGER (1989), BROCKHAUS (1993)
Rügen	LE ROI (1913), MAUERSBERGER (1989), ADOMSSANT (1992), BROCKHAUS (1993), MUTH (1995)
Hiddensee	EMMRICH (1970), MAUERSBERGER (1989), BROCKHAUS (1993)
Poel	LE ROI (1913), MAUERSBERGER (1989), BROCKHAUS (1993)
Fehmarn	LOHMANN (1965), SCHMIDT (1975a, 1975b)
Sjælland	ESBEN-PETERSEN (1905, 1910, 1913b), Anonymous (1908), WESENBERG-LUND (1913), KRÜGER (1975)
Anholt	KRÜGER (1975)
Læsø	KRING (1973), KRÜGER (1975)
Vendsyssel-Thy	ESBEN-PETERSEN (1910, 1913), THOMSEN (1911), KRÜGER (1975)

some of them very large, located on 3 lakes and on 2 interconnecting canals in the eastern part of the island. From lake Czajczym he recorded a larva and freshly emerged adults, suggesting the species is indigenous on Wolin.

No records exist from the North Sea islands, but Great Britain has numerous populations of *P. pennipes*. They are limited to the southern half of England and eastern Wales (LONGFIELD, 1949; HAMMOND, 1983). Longfield described it as "Entirely a running-water species in the British Isles".

From the Isle of Wight both early and recent records are known (KILLINGTON, 1926; CHEVERTON, 1988). The 10 recent localities also include lentic waters.

From Corsica a single record from the past century exists. SELYS (1864) specifies: "Un exemplaire très foncé, pris par M. Mannerheim, a été examiné par M. le docteur Hagen". Because the presence of *P. pennipes* on Corsica was already listed in SELYS & HAGEN (1850), this record is to be dated before 1850. However, no subsequent sightings are known, although the species figures in all Corsica checklists. Since 1985 the exploration of this island has been intensified significantly (ROCHE, 1990); but not a single additional record of this species became known.

P. pennipes from Sardinia was recorded by RAMBUR (1842), under *P. platypoda*:

Table II

Evaluated references on the presence/occurrence of Odonata on islands of the North Sea, the English Channel, and the Atlantic Ocean. – [Publications on the Wadden Sea Islands in the North Sea already cited by KIAUTA (1968) are not listed additionally]

Islands	References
North Frisian Islands	HEYMER (1958), SCHMIDT (1974), RUDOLPH (1984)
Helgoland	DALLA TORRE (1889), KEILHACK (1911), LE ROI (1913), BEIER (1928), ROSENBOHM (1928), CASPERS (1942), SCHMIDT (1974, 1980), KORN (1988)
Scharhörn, Neuwerk	MLODY (1986, 1988), GLITZ et al. (1989)
Großer Knechtsand	SCHUMANN (1970, 1972)
Mellum	ALTMÜLLER et al. (1981), LEMPert & MILEWSKI (1980), HAESLER (1987), BRÖRING et al. (1993), J. Lempert (pers. comm.)
East Frisian Islands	LE ROI (1913), HEYMER (1958), BRÖRING & NIEDRINGHAUS (1981), RUDOLPH (1984), ALTMÜLLER et al. (1981), ZIEBELL & BENKEN (1982), BRÖRING et al. (1993), RETTIG (1995), FINCH & NIEDRINGHAUS (1996), J. Lempert (pers. comm.)
Dutch Wadden Islands	LEMS (1952), KIAUTA (1968), GEIJSKES (1969), GEIJSKES & VAN TOL (1983), WASSCHER et al. (1995)
Province of Zeeland	KIAUTA (1965), GEIJSKES & VAN TOL (1983), BELLE (1986), GEENE (1987), KREBS (1990)
Great Britain	LONGFIELD (1949, 1960), HAMMOND (1977, 1983)
Isle of Wight	KILLINGTON (1926), LONGFIELD (1949), CHEVERTON (1988)
Isles of Scilly	MOORE (1954), HAMMOND (1983)
Jersey	LEQUESNE (1946), HAMMOND (1977, 1983), BELLE (1978), LONGFIELD (1979), SILSBY & SILSBY (1988)
Guernsey, Aldemey, Herm, Sark	BELLE (1980, 1981)
Ile de Noirmoutier	MACHET (1990)
Ile de Yeu	PAULIAN (1945)
Ile de Ré	ORIEUX (1994)

“Très-commune le long des eaux courantes pendant l’été dans une grande partie de l’Europe. M. Gén   me l’a communiqu  e de Sardaigne.” This seems to be the only known record. All references by the subsequent authors, viz. SELYS & HAGEN (1850), BENTIVOGLIO (1908), NIELSEN (1940) and CONCI & NIELSEN (1956), are based on this information. BUCCIARELLI et al. (1983) clearly point out that for *P. pennipes*, there is only a single primary record from Sardinia. The determination is not in doubt, but doubts were raised as to the correct labeling of the specimens.

In Sicily, *P. pennipes* was reported from “Palermo” (MINA-PALUMBO, 1871; cf. CARFI & TERZANI, 1993). Since this is the only known record and it was made more than a century ago, and although CONCI & NIELSEN (1956) consider the presence of the species on Sicily as established, CARFI & TERZANI (1993) hesitated to put it on the island checklist.

Table III
Evaluated papers on the presence of Odonata on islands in the Mediterranean Sea

Islands	References
Corsica	SELYS & HAGEN (1850), SELYS (1864), MORTON (1907, 1934), BENTIVOGLIO (1908), ESBEN-PETERSEN (1913a), DOMMANGET (1987, 1994), DOMMANGET & MARTINEZ (1984), MICHIELS (1988), ROCHE (1990), REINHARDT (1992)
Sardinia	RAMBUR (1842), SELYS & HAGEN (1850), BENTIVOGLIO (1905, 1908, 1920), NIELSEN (1940), CASTELLANI (1950, 1951), CONCI & NIELSEN (1956), SCHUMANN (1964), BUCCIARELLI (1977), BUCCIARELLI et al. (1983), BURMEISTER (1989)
Circumsardian islets	UTZERI & COBOLLI (1993)
Tuscan Archipelago	GESTRO (1924), CONSIGLIO (1958), CAPRA (1976), TERZANI (1983), UTZERI (1988)
Capri	CAPRA (1937)
Ustica	RIGGIO (1885, 1889), BENTIVOGLIO (1908), CARFI & TERZANI (1993)
Sicily	BENTIVOGLIO (1908), CAPRA (1934), SCHMIDT (1952), CONCI & NIELSEN (1956), BUCCIARELLI (1971, 1977), CARFI et al. (1980), CARFI & TERZANI (1993)
Pantelleria	BENTIVOGLIO (1908), LOHMANN (1989), CARFI & TERZANI (1993)
Malta	McLACHLAN (1899), COWLEY (1940), VALLETTA (1949, 1957)
Dalmatian Islands	WERNER (1920), ST. QUENTIN (1944), ADAMOVIĆ (1967)
Ionian Islands	SELYS (1887), BENTIVOGLIO (1929), COWLEY (1940), SCHMIDT (1950), DUMONT (1977b), HÄMÄLÄINEN (1983), VAN TOL & VERDONK (1988), BATTIN (1992), LOPAU & WENDLER (1995)
Aegean Islands	HAGEN (1863), STEIN (1863), SELYS (1887), DE JOANNIS (1916), BENTIVOGLIO (1929), WERNER (1938), COWLEY (1940, 1944), BUCHHOLZ (1954), ST. QUENTIN (1964), THEISCHINGER & KOUTSAFTIKIS (1974), DUMONT (1977a), MALICKY (1977), GALETTI & PAVESI (1983), VAN TOL & VERDONK (1988), BATTIN (1990, 1992), OTTOLENGHI (1991), LOPAU (1991, 1993, 1994), LOHMANN (1992), DELL'ANNA (1994), LOPAU & WENDLER (1995)
Crete	SELYS & HAGEN (1850), LUCAS (1854), HAGEN (1863), STEIN (1863), CECCONI (1895), PONGRÁCZ (1911), BENTIVOGLIO (1929), MALICKY (1977), GALLETTI & PAVESI (1983), BATTIN (1989), BRÄNDLE & RÖDEL (1994), LOPAU & WENDLER (1995)
Cyprus	HAGEN (1863), MARTIN (1894), VALLE (1952a), KIAUTA (1963), DUMONT (1977a)

Table IV

Records of *Platynemís pennípes* on Greek Islands. – [Only primary references are listed]

Islands	References
Corfu	SELYS (1887), SCHMIDT (1950), DUMONT (1977b), HÄMÄLÄINEN (1983), BATTIN (1992)
Lefkas	BATTIN (1992)
Kefallinia	VAN TOL & VERDONK (1988)
Thasos	BATTIN (1992)
Euboea	VAN TOL & VERDONK (1988)
Andros	WERNER (1938), BATTIN (1992), LOHMAN (1992)
Tinos	WERNER (1938)
Siros	SELYS (1887)
Naxos	BUCHHOLZ (1954), BATTIN (1992)
Limnos	WERNER (1938)
Lesbos	DE JOANNIS (1916), LOPAU (1991, 1994), BATTIN (1992)
Chios	LOPAU (1995)
Samos	DUMONT (1977a), BATTIN (1992), LOPAU (1993)
Kos	DELL'ANNA (1994)
Rhodes	BENTIVOGLIO (1929), ST. QUENTIN (1964), LOPAU (1995)
Crete	SELYS & HAGEN (1850)

The checklists of Corsica, Sardinia, and Sicily are often compared with one another (e.g. BENTIVOGLIO, 1908; NIELSEN, 1940; CONCI & NIELSEN, 1956; BUCCIARELLI et al., 1983; DOMMANGET & MARTINEZ, 1984; CARCHINI et al., 1985). *P. pennipes* is always cited from all three islands, but critical considerations are usually not provided. Whether the species has ever been indigenous on Corsica, Sardinia or Sicily, and if so, why and when it became extinct, can not be traced.

At this point one should mention a record from Mallorca. NAVÁS (1910, 1914) twice published the same record of *P. latipes* Rambur, from the vicinity of Pollensa in the northern part of the island, dated on 16 July 1909 and COMPTE SART (1963) questioned the validity of this record and was unable to trace the specimens, whether in the Barcelona museum, or in the Colegio del Salvador in Zaragoza, therefore he chose to disregard the record. Even so, the same author considered the local occurrence of *P. pennipes* as more likely, because this species also colonizes the Spanish province of Gerona and the islands of Corsica, Sardinia and Sicily. OCHARAN LARRONDO (1987), on the other hand, holds an opposite view: *P. pennipes* has only been confirmed in the extreme northeast of Gerona (HEYMER, 1964). The occurrence of *P. latipes* on Mallorca would not be unexpected, since the species is common and abundant on the Spanish Mediterranean coast, while *P. pennipes* is rather rare there.

BATTIN (1989) reviewed the dragonfly fauna of Crete. He emphasized that since SELYS & HAGEN (1850), based on Frivaldszky, no further records of *P. pennipes* were published. BRÄNDLE & RÖDEL (1994) confirmed the presence of a few

species, not reported on Crete for many years, but *P. pennipes* was not among them. Here too, the question of the reliability of the early reference is raised. The information is contradictory. Selys (in SELYS & HAGEN, 1850) specified [E.] Frivaldszky as the collector, while Hagen is said to have examined the material (p. 284). But HAGEN (1863) himself writes: "Die Fauna Creta's enthält nach einer früheren Mittheilung von Frivaldszkys folgende Arten: ...". Whether Frivaldszky is the collector himself, or he merely checked the Budapest museum material, is another problem. A re-examination of this material is not possible, since Frivaldszky's collection was destroyed in the 1956 fire at the Hungarian National Museum (BATTIN, 1989).

The situation is different for the other Greek islands. Many records are available from the islands in the Aegean and Ionian Sea (Tab. IV, Fig.1).

DISCUSSION

Platycnemis pennipes is widespread on the East Mediterranean islands. In this region, the shape of the tibiae is particularly variable. According to BATTIN (1992), males from the Cyclades and the Ionian Islands show significant differences with specimens from the Greek mainland. Between the central Greek populations and their northern neighbours there is a fluid transition zone in this respect. He explains the variability of the species in this area in terms of complex local geomorphologic changes during the Tertiary. Battin also evaluated material, which DUMONT (1977b) and GALETTI & PAVESI (1983) considered referable to *P. p. nitidula* (Brullé), a form extending to Albania (DUMONT et al., 1993) and Montenegro (DUMONT, 1977b); but he refrained from a final conclusion.

BATTIN's (1992) studies on variation of the tibiae represent the first comprehensive attempt at a systematic analysis. Unfortunately, his assumption that "Analogous to the calopterygid male wing spot, tibiae of male *Platycnemis* can serve as genetic markers", representing "key elements in male courtship display, where mate recognition is mainly achieved by visual stimuli", is erroneous. There is no evidence to suggest the function of the dilated tibiae during courtship. The legs (the females have dilated tibiae, too) are exhibited in both sexes only during threat display. The threat display of a female in flight was figured by GORB (1992), but the role of the legs was not mentioned. The behaviour leading to pair formation was described in detail by ROBERT (1958) and BUCHHOLTZ (1956) for *P. pennipes*, and by HEYMER (1966) for *P. latipes* and *P. acutipennis*; tandem formation occurs when a male becomes aware of a female, usually in flight, quickly intercepts her and fastens his claspers on her prothorax (BUCHHOLTZ, 1956). The differences in leg shape are hardly of any significance in the process of the speciation. The differences are apparent only in populations, considered to be particularly isolated.

If one, nevertheless, goes along with Battin, the Aegean is the origin of *P. pennipes*.

The island populations in the eastern Mediterranean are very old and clearly isolated from one another. The forms from the northern Aegean initiated the postglacial recolonization of Europe.

At present, the species is widespread on the European mainland. For a number of reasons it is doubtful that from there the islands beyond the Aegean could be reached or permanently colonized. For the absence of *P. pennipes* on many islands in northern and western Europe, which is our main concern here, various hypotheses are put forward:

- (1) Compared to other zygoterans, *P. pennipes* is a bad flyer and very susceptible to strong wind currents.
- (2) In its northern range it is associated with larger streams or rivers, which are usually missing on the corresponding islands.
- (3) The species does not occur in exposed coastal regions of the Northwest, therefore one would hardly expect to find it on the islands that are even more exposed to the maritime weather.
- (4) The experiments in outdoor cages show the maturation period to be relatively long, and the mortality during long periods of bad weather is very high (LEHMANN, 1994). This could be of importance on the islands subjected to heavy rains and to the

Atlantic climate.

The species's poor flying ability would explain why, with one exception, there have been no records of a single specimen from small islands in northern or northwestern Europe. The crossing of large, windy expanses of sea seems unlikely. Inland, when *P. pennipes* occurs at stagnant waters, it usually involves a permanent body of water with a large surface area. On islands, sea breezes over large areas of water can have strong influence on adult activity, making colonization difficult.

The significance of the small number of island records of *P. pennipes* becomes clear when one compares it with the sightings of

Table V
Records of *Erythromma najas* from European islands

Islands	References
Åland	VALLE (1952b), VALTONEN (1980)
Suursaari	VALLE (1952b)
Saaremaa	KAURI (1949b)
Gotland	ANDER (1929), SAHLÉN (1985)
Öland	ANDER (1929), SAHLÉN (1985)
Bornholm	ANDER (1935), ESBEN-PETERSEN (1934a, 1936a, 1936b), KRÜGER (1975)
Wolin	MUSIAŁ (1975, 1988)
Usedom	MAUERSBERGER (1989)
Rügen	MAUERSBERGER (1989), ADOMSENT (1992), MUTH (1995)
Poel	MAUERSBERGER (1989)
Fehmarn	LOHMANN (1965)
Sjælland	WESENBERG-LUND (1913), KRÜGER (1975)
Amrum	SCHMIDT (1974)
Helgoland	SCHMIDT (1974, 1980)
Wangerooge	J. Lempert (pers. comm.)
Juist	ALFKEN (1891), KIAUTA (1968)
Walcheren	KIAUTA (1965)
Great Britain	LONGFIELD (1949, 1960), HAMMOND (1983)

Table VI
Records of *Calopteryx splendens* from European islands outside the Mediterranean region

Islands	References
Pieni Tytärsaari (Gulf of Finland)	VALLE (1952b)
Saaremaa	MIERZEJEWSKI (1913), KAURI (1949b)
Gotland	ANDER (1944), SAHLÉN (1985)
Öland	ANDER (1944), SAHLÉN (1985)
Wolin	MUSIAŁ (1988)
Poel	MAUERSBERGER (1989)
Sjælland	WESENBERG-LUND (1913), KRÜGER (1975)
Mellum	J. Lempert (pers. comm.)
Helgoland	CASPERS (1942), SCHMIDT (1974, 1980)
Scharhörn	MLODY (1986, 1988), GLITZ et al. (1989)
Wangerooge	KIAUTA (1968)
Memmert	KIAUTA (1968)
Terschelling	KIAUTA (1968), GEJSKES & VAN TOL (1983)
Great Britain	LONGFIELD (1949), HAMMOND (1983)
Ireland	LONGFIELD (1949), HAMMOND (1983)
Isle of Wight	LONGFIELD (1949), HAMMOND (1983), CHEVERTON (1988)
Jersey	LEQUESNE (1946)

Erythromma najas (Hans.) (Tab.V), which covers a similar range in northern and western Europe. Although *E. najas* tolerates brackish water to a certain degree (MIELEWCZYK, 1970), this cannot be the only reason for many recorded sightings.

In the N and NW of its range, *P. pennipes* is said to be bound to lotic habitats. In Norway the only recorded sightings are from running waters (SØMME, 1937; OLSVIK & DOLMEN, 1992). In Finland it mainly occurs at medium sized to large streams (VALLE, 1952b). In Great Britain and in the Netherlands *P. pennipes* is generally considered to be a running water species (LONGFIELD, 1949; GEJSKES & VAN TOL, 1983). As a rule, running waters are lacking on islands in the North Sea and Baltic, where the odonate habitats are mostly restricted to temporary pools, where normally the species cannot develop. However, the running water species, *Calopteryx splendens* (Harr.), has been recorded from numerous islands (Tab.VI), including single sightings from islands as Pieni Tytärsaari, Poel, Helgoland, Scharhörn, Mellum, Wangerooge, Memmert, Terschelling, and Jersey with no, or no suitable, running waters.

P. pennipes does not colonize North Sea coastal regions in the Netherlands, Germany or Denmark (KRÜGER, 1975; SCHMIDT, 1966; ALTMÜLLER et al., 1981; GEJSKES & VAN TOL, 1983; BREUER et al., 1991; RETTIG, 1995). Also, it is not found on many stretches of the southern and southwestern Baltic coast, for example on the coast of Mecklenburg-Vorpommern (BROCKHAUS, 1993), on the Hela peninsula (MIELEWCZYK, 1971) or on the coast of Estonia (KAURI, 1949b). Apart from the fact that records become less probable the further one is from the

species main distribution area, this could be a further indication of the susceptibility of adult *P. pennipes* to wind (hypothesis 1).

SØMME (1937) compared the northern limit of *P. pennipes* in Scandinavia with the 16°C- July-isotherm, and at the same time tried to establish a correlation between its range and the distribution of clay soils. SCHMIDT (1949), who concerned himself solely with the 16°C- July-isotherm, focused on the relatively good agreement with the northern limit of *P. pennipes* in England and described the situation in Germany briefly: "In Deutschland verläuft diese Isotherme über die ostfriesischen Inseln, dann nördlich und schließlich nordöstlich durch Schleswig". If it were possible to establish a clear correlation between the 16°C-July-isotherm and long lasting periods of bad weather in summer, a combination of the hypotheses (3) and (4) would provide the best explanation, suggesting that the northwestern limit of *P. pennipes* is determined by climatic factors which effect only the adult stage.

But before one attempts a definitive evaluation of the various hypotheses, one should make sure that our distribution record is fairly complete. It cannot be ruled out that some island observations may not have been published because their importance was not visualised.

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