

Bisexual populations of *Otiorhynchus rugifrons* (Coleoptera: Curculionidae)

Many species of short-nosed weevils are parthenogenetic. Especially within the genus *Otiorhynchus* there are many species in which males are unknown. Some species with parthenogenetic reproduction may have males in some parts of their distribution area. Although there were indications that bisexual populations of *Otiorhynchus rugifrons* existed, there are no published records of localities where these bisexual populations can be found. The authors found several male specimens of *O. rugifrons* in France as well as in Great Britain. They were collected mostly in coastal localities at the roots of herbaceous plants growing on sea cliffs or rocky coasts. A short description of the male is presented and both male and female genitalia are depicted. Information on distribution and ecology of the species is presented.

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Introduction

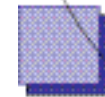
Many species of *Otiorhynchus* are parthenogenetic and in some species males are unknown. In other species with parthenogenetic reproduction males occur in some parts of their distribution area. Examples of such species with asexual as well as bisexual populations are *O. raucus* (Fabricius), *O. nodosus* (Müller) (syn. *O. dubius* (Ström)), *O. rugosostriatus* (Goeze), *O. scaber* (Linnaeus), *O. veterator* (Uyttenboogaart), *O. sulcatus* (Fabricius), *O. fullo* (Schrank), *O. ligustici* (Linnaeus) (Dieckmann 1980). Many parthenogenetic weevils have been investigated cytologically (Suomalainen 1969). The basic chromosome number in the bisexual *Otiorhynchinae* is 11, whereas the parthenogenetic weevils are polyploids. The majority of the species studied are triploid e.g. *O. singularis* (Linnaeus), *O. lepidopterus* (Fabricius) (syn. *O. salicis* (Ström)), *O. sulcatus* (Fabricius), *O. ligustici* (Linnaeus) and *O. rugifrons* (Gyllenhal). Some species, like for example *O. coecus* (Germar) (syn. *O. niger* (Fabricius)), *O. scaber* (Linnaeus), *O. subdentatus* Bach, have triploid as well as tetraploid populations (Suomalainen 1969).

Otiorhynchus rugifrons (Gyllenhal) is known to be a triploid parthenogenetic species. Only Hoffmann (1950) refers

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to the existence of males, but he does not indicate where bisexual populations can be found. Apparently Palm (1996) also found no males, since he does not depict the aedeagus of this species, even though he does for other species with males. Several authors (e.g. Dieckmann 1980, Morris 1997) point out that only Hoffmann (1950) recorded males but without writing where they occur. For his cytological studies, Suomalainen (1954) studied specimens from diploid bisexual populations and triploid parthenogenetic ones from Switzerland. He used two males and two females from a bisexual population from Pilatus, a mountain near the Vierwaldstätter



Figure 1. *Otiorhynchus rugifrons*, female, September 2004, Côte d'Armor, Brittany, France. Photo: T. Heijerman
Otiorhynchus rugifrons, vrouwtje, september 2004, Côte d'Armor, Bretagne, Frankrijk.



Figure 2. *Otorhynchus rugifrons*, male, September 2004, Côte d'Armor, Brittany, France. Photo: T. Heijerman.
Otorhynchus rugifrons, mannetje, september 2004, Côte d'Armor, Bretagne, Frankrijk.

See, as well as one parthenogenetic triploid female collected at Gurnigel, west of the Thuner See.

In this contribution we report on bisexual populations of *O. rugifrons* discovered in France and Great Britain. We will also give a short description of the male.

Bisexual populations in France and Great Britain

In late September 2004 several specimens of *O. rugifrons* (figures 1, 2) were collected by the first author in France (Côte d'Armor, Brittany) in several locations. A total of 35 specimens were taken, 23 of which were males, and 12 were females (table 1).

All specimens were collected along the coast and most of them on small rocky islands (figure 3). At high tide only a few square metres of the surface arise above sea level. One location (l'Armor, near Sillon de Talbert) was on a small island at a distance of several kilometres from the coast. The specimens were collected from under tussocks and cushion plants: sea pink (*Armeria maritima* Willd.), sea campion (*Silene maritima* With.) and spurrey (*Spergularia* spec.).



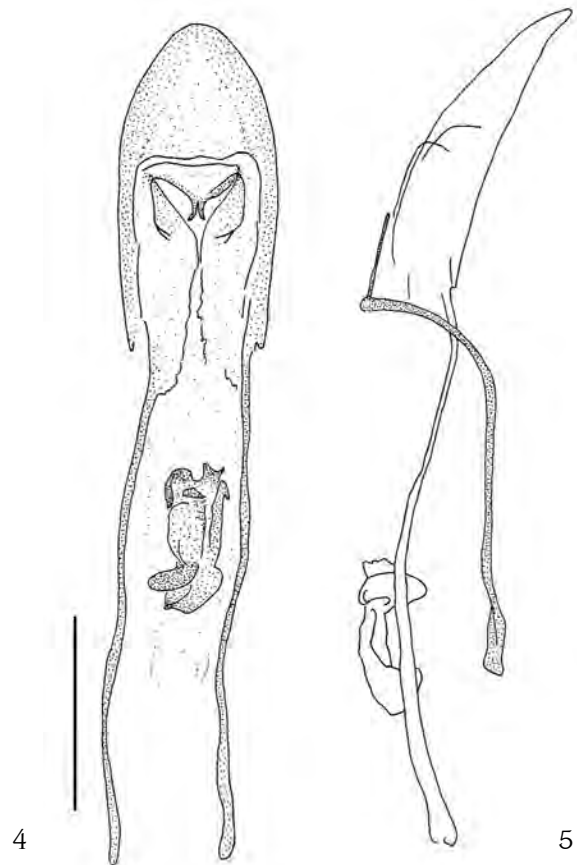
Figure 3. Typical location in France (Côte d'Armor, Brittany), where *O. rugifrons* has been collected in September 2004. Photo: T. Heijerman
Kenmerkende plek van voorkomen van O. rugifrons in Frankrijk (Côte d'Armor, Bretagne), waar de kever is verzameld in september 2004.

Table 1. List of localities where *Otorhynchus rugifrons* has been found by the first author in Côte d'Armor, Brittany, France.

Locaties waar de eerste auteur Otorhynchus rugifrons in Côte d'Armor, Bretagne, Frankrijk, heeft gevonden.

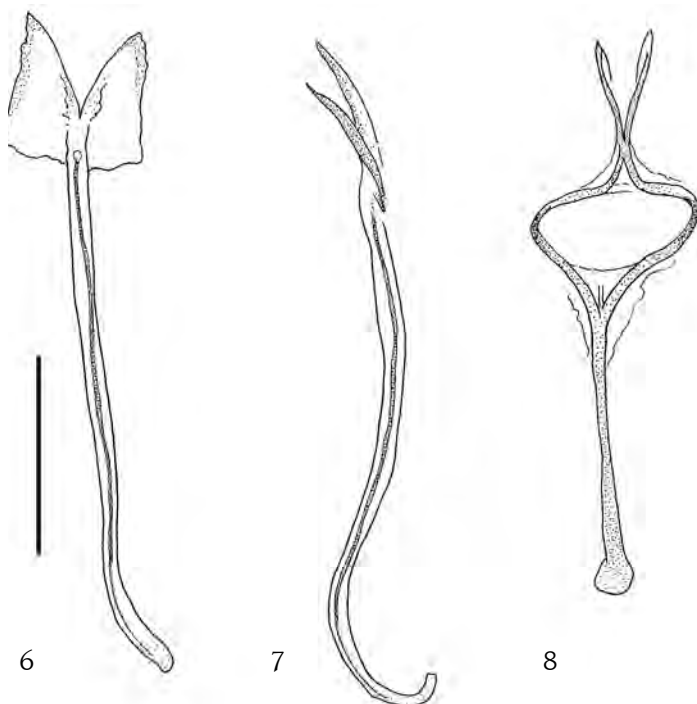
location	date	♂	♀
Pleubian, Kermagen	20/07/2004	0	2
Pleubian, Kerbors	22/07/2004	13	7
Plougrescant, Keravel	28/07/2004	1	0
L'Armor, Lanros	29/07/2004	7	2
L'Armor, near Sillon de Talbert	30/07/2004	2	1
total		23	12

In Great Britain *O. rugifrons* is recorded from many places in England, Wales and Scotland, mostly in coastal localities at the roots of herbaceous plants growing on sea cliffs, shingle beaches and other rough grassland habitats. Males were collected by the second author as follows: 1) England: on the south facing bank of Fort Gilkicker near Gosport, South Hampshire, 9 August 1995, 1 male; 2) Wales: cliff-top grassland south of Bryn-y-Graig, Caer Bwdy, Pembrokeshire, 11 June 2000, 1 male; 3) Wales: cliff-top grassland, Trelerw, Pembrokeshire, 12 June 2000, 1 male (table 2).



Figures 4-5. Aedeagus (median lobe) of *Otorhynchus rugifrons*, **4** in dorsal view, with sclerites of internal sac and **5** in lateral view, with sclerites and tegmen *in situ*. Scale line 0.5 mm.

Aedeagus van Otorhynchus rugifrons, 4 in dorsaal aanzicht, inclusief de sclerieten van de interne zak en 5 in lateraal aanzicht, met sclerieten en tegmen in situ. Schaallijn 0,5 mm.



Figures 6-8. Spiculum gastrale of male *Otiorynchus rugifrons*, **6** in dorsal view and **7** in lateral view and **8** tegmen in dorsal view. Scale line 0.5 mm.

Spiculum gastrale van mannetje Otiorynchus rugifrons, 6 in dorsaal en 7 in lateraal aanzicht en 8 tegmen in dorsaal aanzicht. Schaallijn 0,5 mm.

Table 2. List of localities where *Otiorynchus rugifrons* has been found by the second author in England and Wales, Great Britain. *Locaties waar de tweede auteur Otiorynchus rugifrons in Engeland en Wales, Groot-Brittannië, heeft gevonden.*

location	date	♂	♀	sex ?
Gosport, South Hampshire	09/09/1978			2
Chesil Beach, Dorset	28/05/1990			1
Chesil Beach, Dorset	30/05/1990			1
Gosport, South Hampshire	09/08/1995	1	0	
Caer Bwdy, Pembrokeshire	11/06/2000	1	0	
Caer Bwdy, Pembrokeshire	12/06/2000	0	1	
Trelerw, Pembrokeshire	12/06/2000	1	0	
total		3	1	4

Description of the male of *Otiorynchus rugifrons*

The male of *O. rugifrons* is very similar to the female. The most distinctive characteristic of the male is the impression on the metasternum. In the male the anal segment has a rather indistinct longitudinal impression, whereas in the female it is more or less convex. According to Hoffmann (1950) the male funiculus should be less robust than in the female, but we cannot confirm this. On average males are smaller than females, but there is considerable overlap in size (table 3). In the male the elytra are slightly more parallel than in the female. In many species the male elytra are also narrower than in the female, but this seems not the case in *O. rugifrons* (table 3; figures 11-12). The male aedeagus is illu-

strated in figures 4-8. For sake of completeness, figures 9-10 show the female spermatheca and spiculum gastrale.

Table 3. Total length and ratio of elytral length to width of *O. rugifrons*, measured in mm. Total length was measured from front margin of eyes to apex of elytra. Data taken from French specimens. *Totale lengte en verhouding dekschildlengte : dekschildbreedte van O. rugifrons, in mm. Totale lengte is gemeten van de voorkant van de oogrand tot de punt van de dekschilden. Alleen de Franse kevers zijn gemeten.*

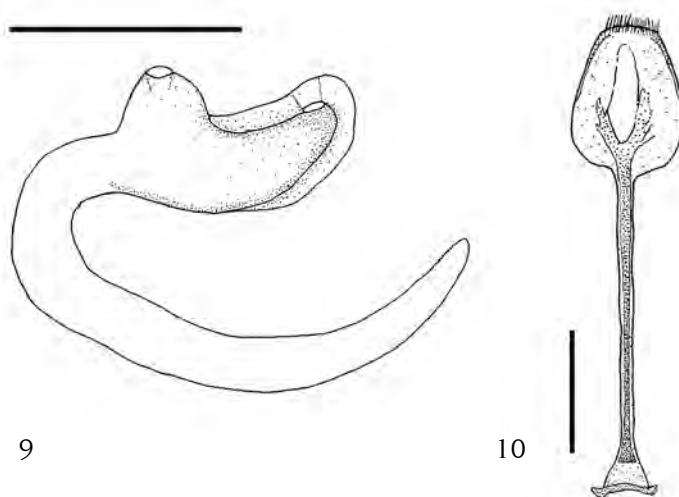
	♂ (n = 23)	♀ (n = 12)
mean total length	5.42	5.88
range	4.73 – 6.27	5.50 – 6.27
mean ratio width / length of elytra	0.238	0.242
range	0.22 – 0.25	0.23 – 0.25

Distribution

Otiorynchus rugifrons is widely distributed throughout Central, western and northern Europe: it is known from Iceland, Norway, Sweden, Finland, Karelia, Denmark, Ireland, Great Britain, Belgium, France, Germany, Poland, Czech Republic, Slovak Republic, Switzerland, Austria, Hungary and Italy. The species also occurs in North America, where it was accidentally introduced (Dieckmann 1980, Palm 1996). Strangely enough it is not recorded from The Netherlands. The species occurs in mountainous regions in Central Europe as well as along the coasts of western and northern Europe.

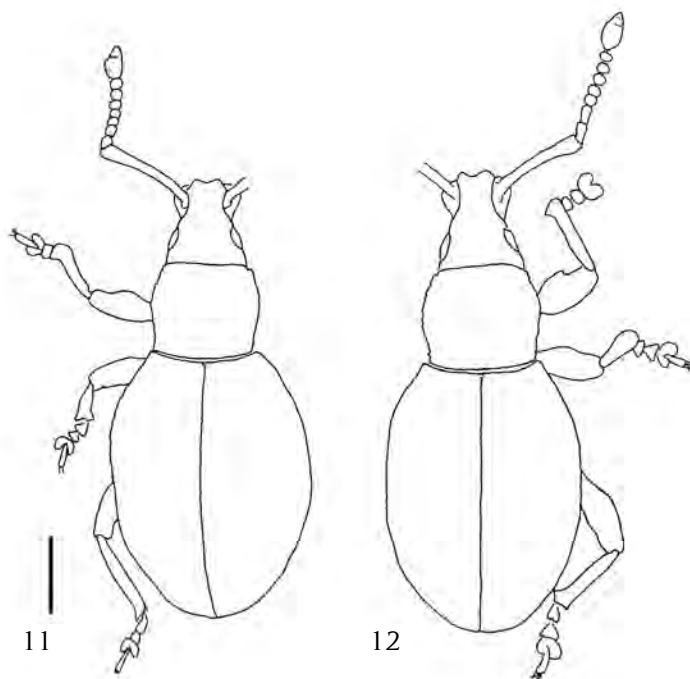
Ecology

Otiorynchus rugifrons is a ground-living species that can be found under stones and cushion plants. It is, like many species of the genus, nocturnal and apterous (Dieckmann 1980, Morris 1997). The species is polyphagous. In England it is



Figures 9-10. **9** Spermatheca (scale line 0.2 mm) and **10** spiculum gastrale (scale line 0.5 mm) of female *Otiorynchus rugifrons*.

9 *Spermatheca* (schaallijn 0,2 mm) en **10** *spiculum gastrale* (schaallijn 0,5 mm) van vrouwtje *Otiorynchus rugifrons*.



Figures 11-12. Habitus of **11** female and **12** male of *Otiorrhynchus rugifrons*. Scale line 1 mm.

Habitus van **11** vrouwtje en **12** mannetje van *Otiorrhynchus rugifrons*. Schaallijn 1 mm.

known as one of the 'strawberry root beetles', causing damage to garden plants and soft fruit (Morris 1997). It is also reported as a pest of several plants in rock gardens, like saxifrage (*Saxifraga* sp.) (Dieckmann 1980) and associated with cushions of wild thyme (*Thymus serpyllum* L.) (Lindroth 1931 cited by Larsson & Gígja 1959). Scherf (1964) mentions gooseberry (*Ribes uva-crispa* L.), raspberry (*Rubus idaeus* L.), wild strawberry (*Fragaria vesca* L.), *Saxifraga hostii* Tausch and grasses as substrate for the larvae.

The larva is described by Van Emden (1952), based on specimens from England (Surrey) found - or reared? - on *Saxifraga cotyledon* L. (collected by G. Fox Wilson). Fox Wilson (1925) reports *O. rugifrons* larvae found mining leaves of *Saxifraga hostii*. He carried out breeding experiments in his laboratory with descendants of these specimens and found that the young larvae mine the leaves for two or three days, after which they tunnel through the petioles and stem and go to the ground, where they then feed on the roots. Fox Wilson (*l.c.*) further writes that on hatching the larvae are curved and similar in form to those of *O. sulcatus*, but during their stay in the mines they become flattened. This is very unusual: in general larvae of broad-nosed weevils live ectophagously on the roots of their host plants. Also Van Emden (1952) mentions that larvae of *O. rugifrons* feed on the roots of their food plant. There are a number of weevils with leaf-mining larvae (e.g. *Rhynchaenus*, *Orthochaetes*), but none within the broad-nosed weevils. Chittenden (1925, in Larsson & Gígja 1959) reports that in North America the larvae cause damage on strawberry (*Fragaria*).

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Samenvatting

Bisexuele populaties van *Otiorrhynchus rugifrons* (Coleoptera: Curculionidae)

Vooral binnen het snuitkevergenus *Otiorrhynchus* komen veel soorten voor die zich parthenogenetisch voortplanten. Sommige van deze soorten hebben in een beperkt deel van het areaal toch mannetjes. Voorbeelden hiervan zijn *O. raucus*, *O. nodosus*, *O. rugosostriatus*, *O. scaber*, *O. veterator*, *O. sulcatus*, *O. fullo* en *O. ligustici*. Het is gebleken dat exemplaren van bisexuele soorten 11 chromosomen bezitten, terwijl parthenogenetische soorten polyploid zijn. De meeste parthenogenetische soorten zijn triploid, maar er zijn ook soorten met zowel diploïde als tetraploïde exemplaren.

Otiorrhynchus rugifrons staat in de literatuur bekend als een triploïde soort. Volgens de literatuur zouden er ook mannetjes bestaan, maar waar deze voorkomen is onbekend.

In deze bijdrage vermelden we het voorkomen van bisexuele populaties van *O. rugifrons* in Frankrijk (Bretagne) en Groot-Britannië (Engeland en Wales). We geven een korte beschrijving van het mannetje en presenteren afbeeldingen van zowel het mannelijke als het vrouwelijke genitaal. Daarnaast wordt de verspreiding in Europa en de ecologie van de soort besproken.