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Breeding of the Water Rail *Rallus aquaticus* in *Cladium mariscus* vegetation

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Abstract

We have studied breeding habitats of the Water Rail *Rallus aquaticus* in *Cladium mariscus* (Galingale) vegetation at Botshol (Abcoude, 51°52'N;5°04'E) in The Netherlands and on Öland in Sweden. Water Rails were localised by day by provoking vocal responses with a cassette recorder, using three typical call types that indicate breeding status of the rails. We found 21 territories and five nests in *Cladium mariscus* vegetation. In the territories and around the nests we measured the degree of plant cover, frequency of different plant species, height of vegetation, and water depth. No rails were heard in pure reed (*Phragmites australis*) vegetation. In all territories and around all nests *Cladium mariscus* was dominant. *Cladium mariscus* was also the most common nest material. The soil and the vegetation mat were inundated. The water depth was usually below 50 cm. This study seems to be the first one documenting Water Rails breeding in *Cladium mariscus* vegetation.

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Introduction

In The Netherlands Water Rails *Rallus aquaticus* mainly breed in fluvial reed-mires (SOVON 1987), in which *Carex riparia* is dominant (De Kroon 2000). In Spain rails also breed amongst *Juncus maritimus* and *Sparganium erectum*, vegetations which completely deviate from reed-mires (De Kroon in preparation). De Kroon (1982) and Svensson et al. (2000) incidentally mentioned *Cladium mariscus* (Galingale) as breeding habitat of rails, but without any descriptions of nest sites or nests. In the standard handbooks (Dementiev et al. 1969, Glutz von Blotzheim 1973, Cramp & Simmons 1980, Hagemeijer & Blair 1997), *Cladium mariscus* is not specifically listed as a breeding habitat for the Water Rail. These were the reasons why we wanted to study whether rails breed in *Cladium mariscus* vegetation. (Below *Cladium mariscus* will be called only *Cladium*, since there is only one species of this genus in our areas). We did not carry out any search of rails in pure reed beds or reed marshes (*Phragmites australis*).

We found Water Rails breeding in *Cladium* vegetation both at Botshol and on Öland, and the present study will describe their breeding habitats, the nests and nest sites, and the hydrological situation of the soil in the *Cladium* vegetation. This is, to our knowledge, the first detailed description of rails breeding in such vegetation.

Cladium has a virtually cosmopolitan distribution in moderately warm and warm regions and occurs locally in large parts of Europe (Hultén 1958, Anderberg 1997). It reaches its northern boundary in Sweden.

In The Netherlands *Cladium* is rather scarce (Mennema et al. 1985). In Sweden it is less scarce (Anderberg 1997). On Gotland it is common (S. Sundberg, Uppsala, pers. comm.). On Öland it is scattered (Sterner 1986) over small surfaces (16 m^2 – 0.5 ha) in the "Stora alvaret" and in larger areas (1 – 10 (?) ha) on the northern half of the island (E. G. Rosén, Uppsala, pers. comm.).

The *Cladium* vegetation belongs to the plant community Cladietum marisci and comprises two sub-communities occasionally including *Phragmites australis* or *Carex hudsonii*, *Dryopteris thelypteris*,

Figure 1. Water Rail habitats. Left photo: A wide expansion of *Cladium mariscus* at Köping Öj mosse, Öland. Right photo: A narrow zone of *Cladium* at Botshol, the Netherlands.
Biotoper för vattenrall. Vänstra bilden: Vidsträckt fält av ag på Köping Öj mosse, Öland. Högra bilden: Smal zon av ag vid Botshol, Nederländerna.

Mentha aquaticus, Peucedanum palustre, Menyanthes trifoliata, Utricularia- or *Chara-* species, *Solanum dulcamara* and *Myrica gale*. It is most characteristic of shallow, standing water in lowland topogenous mires fed by calcareous base-rich ground water. It occurs, often as narrow stands, in basin mires and along transitions between land and open water in larger hollows and flood plain mires (Rodwell 1995).

The Water Rail is a breeding bird both at Botshol and on Öland (Svensson et al. 2000).

Methods

Study areas

The field studies were carried out in the Botshol area (Abcoude, 51°52'N;5°04'E, The Netherlands) on 21 March, 25 April, 4 May and 13 June 2001, and in the northern part of Öland (Sweden) on 20, 23, 24, and 26–28 May 2001. Several potential sites were visited, and rails were found at five of them.

Botshol is a wetland landscape (originating from peat dredging till the beginning of the 20th century) with two ponds (Grote en Kleine Wije) and some very small islands. In this area *Cladium* grows in long narrow stands along open water, as margin overgrowth. This is in contrast with the *Cladium* vegetation on Öland, where the areas are much larger. Examples of Water Rail habitats are shown in Figure 1.

Localising the rails

For localising Water Rails by day we used a portable cassette recorder, and a sixty minutes tape with continuous recording of 33 seconds long sequences of the most common announcement call of an European Water Rail *R. a. aquaticus*. This call is like the squeal of a piglet. The call was copied from the gramophone-record (M 45) of Paul Feint, Hildesheim, Germany.

Along the borderline of the *Cladium* vegetation, either from the open water side (with a boat or wading) or from the land or forest side, we provoked the rails to betray their presence every 50 – 100 m with the broadcasting of the calls, followed by some minutes waiting for a reaction. If necessary we repeated the provocation. A second observer, 25 – 100 m behind the person with the cassette-recorder, was also listening for any possible calls of rails.

Call types

Vocal reactions of rails are important for finding out the status of the couple and the nest site. Important signals are three typical call types:

(1) A soft drum or purring (Turner 1909; Glutz von Blotzheim 1973; Cramp & Simmons 1980), meaning territorial behaviour and commotion in connection with a nest with eggs or young;

Table 1. Number of breeding territories and nests of *Rallus aquaticus* found in *Cladium mariscus* vegetation at Botshol and in the five areas on Öland (location of sites A–E given in the text).
Antal revir och bon av vattenrall funna i agvegetation vid Botshol och i fem områden på Öland (lokalerna A–E ges i texten).

	Botshol	Öland					
		A–E	A	B	C	D	E
Territories							
Revir	3	18	4	1	1	10	2
Nests Bon	4	1					1
Egg clutches							
Äggkullar	1						1
No. of eggs							
Antal ägg	6						9

Table 2. The average degree of cover per m^2 and frequency of plant species in breeding habitats of *Rallus aquaticus* in order of diminishing cover. M = mean degree of cover, N = number of plots, F = frequency in percent.
Genomsnittlig täckningsgrad per kvadratmeter och frekvensen av växtarter i häckningsbiotoperna för vattenrall i ordning efter minskande täckningsgrad. M = medeltäckning, N = antal lokaler, F = frekvens i procent.

	Botshol			Öland (A–E)		
Plant species	M	N	F	M	N	F
Cladium mariscus	5	4	100	5	14	100
Carex hudsonii				2	3	21
Phragmites australis	1	3	75	1	7	50
Menyanthes trifoliata				1	1	7
Solanum dulcamara				1	1	7
Typha angustifolia	1	1	25			

(2) A grumble or growl, meaning territorial behaviour in the nest habitat; and
(3) Alarm or family call, "phith!!", "(p)pheeth!"' or "(p)pheeh-eeht!" (Glutz von Blotzheim 1973), used in situations of alarm and excitement, like when rails are disturbed because they have got eggs or chickens. With this call it attracts the attention of a predator (human) and lure him/her away with itself. If there are chickens, it warns them too.

Habitat data

Where Water Rails were present as a couple we investigated plots of one square metre each (four plots at Botshol and 14 plots on Öland). We collected the following quantitative data: (1) *Degree of cover of plant species*. Five classes of cover degree were used: 1–5% = 1**,** 6–25% = 2**,** 26–50% = 3**,** 51–75% = 4 and 76–100% = 5. (2) *Frequency of plant species*. Frequency (over all plots) was calculated as number of plots with the species divided by the total number of plots (18). (3) *Height of vegetation*. This was measured from the soil surface or the vegetation mat suspended in the water up to and including the end of the stem. At least five measurements (minimum, maximum, and three most dominant lengths) were taken per m^2. (4) *Water depth*. This was measured from the soil surface or from the plant material suspended in the water, at least at five locations around the nest. (5) *Distance between nest site and open water*. (6) *Nest height* from the water surface to upper side of the nest. (7) *Nest size*. Outside diameter of the nest, maximum opening of nest bowl and depth of the nest bowl.

Results

Breeding vegetation

Twenty-one Water Rail territories were found in *Cladium* vegetation, three at Botshol and 18 at five different locations on Öland (Table 1). The locations

Table 3. Water depth in centimetres in the different *Cladium mariscus* vegetations where Water Rails were present.
Vattendjupet i centimeter i olika bestånd av Cladium mariscus *där det fanns vattenrall.*

Area *Område*	Water depth (cm) *Vattendjup (cm)*
Botshol	2–28 (30)
Öland	
A	1–30
B	10–50
C	1–25
D	2–50 (>100 = open water)
E	30–75
Average Öland	8–43 (N = 6)

on Öland were (the letters refer to Table 1): (A) north-east of Neptuni åkrar, (B) Knisa mosse south of Sandvik, (C) east of Föra, (D) Köping Öj mosse in the neighbourhood of Köpingsvik, and (E) along the road to Björkerum, between Åstad and Dyestad. All localised rails and the five nests we found were within *Cladium* vegetation that had not been mown or grazed. Striking was that we did not hear the rails in small reed (*Phragmites australis*) or *Carex hudsonii* clusters or zones inside *Cladium* vegetations. The different calls were typical for breeding birds (see Call types).

Apart from the locations where we found rails, we visited a number of other *Cladium* sites on Öland, where we did not hear any rails. They were near Norrböda, Hornsjön in the surroundings of Horn and Vedby, along road 36 before Högby, along the same road on the east side near the turn-off for Persnäs, along the road in the direction of Persnäs, and in the nature reserves Djurstad and Petgärde träsk near Djurstad.

The vegetation properties of the 18 one square metre sample plots are given in Table 2. *Cladium* was dominant in all of them with an average cover of 5 and a frequency of 100%. *Carex hudsonii* occurred only on Öland, where its cover score was 2 and frequency 21%. *Phragmites australis* had a cover of only 1, but was present in 10 of the 18 plots (56%).

In contrast with Öland, the nest habitats at Botshol were on small islands with narrow *Cladium* borders. These borders were 25–30 m long and 0.5–3 m. broad.

Table 4. Nest and nest site properties. Four nests at Botshol (found 25 April and 4 May) and one nest on Öland (site E, found 28 May). All nests in Cladietum marisci vegetation type. For vegetation degree of cover classes, see Methods. All measurements in centimetres. For the Botshol nests the figures are mean values. Figures within parenthesis give the number of measurements.
Beskrivning av boplatser och bon. Fyra bon i Botshol (funna 25 april–4 maj) och ett bo på Öland (lokal E, funnet 28 maj). Alla bon i vegetationstypen Cladietum marisci. För täckningsgrad, se Metoder. Alla mått i cm. För Botshol är talen medelvärden. Siffrorna inom parentes avser antalet mätningar.

	Botshol	Öland
Degree of cover *Täckningsgrad*		
Cladium mariscus	5	5
Carex hudsoni		1
Phragmites australis	1	1*
Typha angustifolia	1	
Vegetation height *höjd*	174 (8)	175 (3)
Water depth *vattendjup*	10 (8)	30 (3)
Distance to open water *Avstånd till öppet vatten*	144	50
Upper rim to water surface *Övre bokant till vattenytan*	21	10
Outside diameter *Ytterdiameter*	20	18
Inside bowl diameter *Balens innerdiameter*	13	15
Bowl depth *Balens djup*	10	9
Nest material, dry weight, g. *Bomaterial, torrvikt, g.*		
Cladium mariscus	118 (3)	–
Phragmites australis	7 (2)	–
Graminae species	5 (1)	–
Leaves *Blad*	2 (1)	–

* 25 dead shoots *25 döda skott*

Hydrological situation

In all breeding habitats (both Botshol and Öland), the surface water was fresh and eutrophic. The acidity (pH) was 6–7. The soil and the vegetation mat were inundated. Water depth varied depending on both the thickness of the vegetation mat and the position of the surface of the soil (Table 3).

The nest sites

Five nests were found, two of them with 6 and 9 incubated eggs. Properties of the nests and nest sites are given in Table 4. The nests were placed between leaves and stems. They sometimes rested on a pile of dead plant material (primarily leaves), emerging from the water. Above the top of the nest the vegetation was dense and not transparent and it rose to a height of more than one metre. *Cladium* was the dominant species at all nest sites, and it was also the most common nest material.

Structure of Cladium *vegetation*

Judged by the submerged and dense mat of fleshy roots, the stands could be considered to be pure

Cladium stands. The gregarious stout stems with the characteristically bent over long tough leaves in all directions formed a dense cover, which was often virtually impenetrable. However, just above the water surface the structure was somewhat open, permitting the rails to move about here. The total vegetation layer had a height of more than 1.50 m.

Discussion and conclusion

In conclusion, we can now state that *Cladium* vegetation belongs to the breeding habitats of the Water Rail. All examined breeding sites were species-poor, almost pure stands of *Cladium*. All localised rails and their nests were found in such vegetation. We are certain that also the rails, whose nests we did not find, were breeding birds in view of their typical call types and behaviour, characteristic of a breeding bird. On some locations on Öland we were too late to search for the nests because chicks were present. Their parents must have begun nest building in the second half of April. In pure *Phragmites* stands within the *Cladium* vegetation, no rails were heard.

The dense structure of the tall *Cladium* vegetation gives the rails the important cover from view that they need, both from above and from the sides. Cover seems to be more important than the floristic composition of the vegetation. Apparently it does not matter which plant species occur if the rails can behave inconspicuously and unobserved during the pairing, the nest building and breeding period. This may be the reason why *Cladium* has not previously been specifically reported and studied as a breeding habitat. Ornithologist may simply have assumed, when they have heard a rail from *Cladium* stands, that it is a known, normal breeding habitat, although this has not been documented until now.

The Water Rail's slender ("rail") body is adapted for life amongst densely structured vegetation, and the birds can lift their legs high when running (Sigmund 1959) through such vegetation structure.

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Sammanfattning

Häckning av vattenrall Rallus aquaticus *i ag Cladim mariscus*

Vi har undersökt om vattenrallen häckar i agvegetation i Botshol i Holland och på flera lokaler på Öland, och beskriver vegetationen, vattendjupet och bottenförhållandena i reviren och runt bona. Vi beskriver också bona. Vattenrallarna lokaliserades med hjälp av uppspelning av en kassett med de vanligaste revirlätena. Tre olika läten, som indikerar ett häckande par, användes som indikation på häckning när rallarna svarade.

Vi bestämde vegetationens täckningsgrad, frekvensen av olika växter, vegetationens höjd och vattendjupet i arton kvadratmeterstora provytor i reviren och nära bona (fyra ytor i Botshol och 18 ytor på Öland). Täckningsgraden indelades i fem klasser 1 = 1–5%, 2 = 6–25%, 3 = 26–50%, 4 = 51–75% och 5 = 76–100%. Vegetationens höjd mättes från botten eller rotmattan till stammarnas topp. Vattendjupet mättes från botten eller mattan av flytande vegetation. Vi mätte också avståndet från boet till öppet vatten, avståndet från vattenytan till boets överkant samt boets storlek (yttre diameter, bobalens största vidd och dess djup).

Vattenrallar hördes på 21 platser med agvegetation, tre i Botshol och 18 (på fem olika lokaler) på Öland. Ölandslokalerna (bokstäverna hänvisar till Tabell 1) var: (A) nordost om Neptuni åkrar, (B) Knisa mosse, (C) öster om Föra, (D) Köping Öj

mosse nära Köpingsvik, (E) längs vägen till Björkerum (mellan Åstad och Dyestad). Fem bon hittades och de låg också i ag. I samtliga fall rörde det sig om ren agvegetation. Intressant var att vi inte hörde några rallar i de små partier av *Phragmites*-vass eller *Carex hudsonii* som förekom på vissa ställen i agvegetationen. Vi är säkra på att även de rallar, vars bon vi inte hittade, också häckade eftersom deras läten var typiska för häckande rallar.

Förutom de lokaler där vi fann rallar, undersöktes också ett antal andra lokaler med agvegetation, där vi inte hörde några rallar: nära Norrböda, Hornsjön nära Horn och Vedby, längs väg 36 före Högby och öster om denna väg nära avtagsvägen till Persnäs, längs vägen till Persnäs samt i naturreservaten Djurstad och Petgärde träsk.

I alla arton provytorna var ag den helt dominerande växten. De olika växtarternas täckningsgrad och frekvens framgår av Tabell 2. På samtliga ställen stod vegetationsmattan och bottnen under vatten. Vattendjupet varierade men var i samtliga fall litet, vanligen grundare än 50 cm (Tabell 3).

Fem bon påträffades, två med ägg. Bona låg bland stammar och blad, vilande på uppstickande död vegetation. I bomaterialet dominerade ag. Bonas egenskaper beskrivs i Tabell 4.

Stammarna och de böjda bladen i agen bildade en tät, nästan ogenomtränglig vegetation med en höjd av upp till över 1,5 m. Den gav insynsskydd för rallarna både från ovan och från sidorna. Endast närmast vattenytan eller den flytande vegetationsmattan fanns öppnare förhållanden som gjorde att rallarna kunde röra sig där. Inget rallrevir låg i ag som hade slagits eller betats.

Denna studie är, så vitt vi vet, den första som dokumenterat häckning av vattenrall i agvegetation. Vi har granskat de större handböckerna, men inte funnit några beskrivningar av revir eller bon av rallar i ag. Biotopen har bara nämnts i förbigående i ett par arbeten. Det är möjligt att ornitologer som eventuellt hört rallar i ag helt enkelt antagit att ag är en känd häckningsbiotop för rall, trots att detta uppenbarligen inte dokumenterats tidigare.