

Fig. 1. The "hill" with the runs of the ruffs.
Skoggerpladsen med Brushanernes ståsteder.

A Study of the Display of the Ruff (*Philomachus pugnax* (L.)).

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(Med et dansk resume: En undersøgelse af Brushanens
(Philomachus pugnax (L.)) parringsspil.)

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Introduction and method.

This paper is the result of the observations made on one of the "hills" in the sanctuary Tipperne. It was not intended to give a detailed description of the display itself and its antics, as done by SELOUS and later authors in their works, but, on the contrary, to describe the composition of this particular community and the behaviour of the individual birds as part of it.

In the summer of 1950 five "hills" were in use in the sanctuary Tipperne. One was situated in the southern part of the sanctuary, the other four in the northwestern part. In the latter territory the grass is rarely mown, and therefore an ideal breeding place for ruffs is to be found here. Our observations were made from one of these four "hills". (The situation of the "hill"

is seen on the map drawn by ANDERSEN (1948, fig. 1, c.)). This "hill", which has been used since 1947, is an almost circular place with a diameter of 2 metres, overgrown with short, worn grass. The runs of the owners were distributed in this place as shown in fig. 1. The "hill" was situated on a slightly higher level than the surrounding land (about 10 cm).

The tent (fig. 2), from which we made our observations, was built of grey, waterproof paper-bags and had the following di-

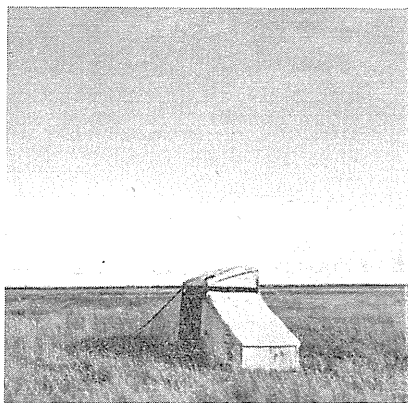


Fig. 2. The observation-tent.
Observationsteltet.

mensions: length 3 m., height 1 m. (maximum), breadth 0.7 m. It was pitched in such a way that one man could sleep at the back of the tent, while the observer was sitting in front, where the tentwall had a horizontal split of 5 cm level with his eyes. For the observations we used 10×50 field-glasses. In order to make the birds accustomed to the tent it was erected at some distance from the "hill" a week before and gradually advanced to a distance of 20 m. from the "hill". Neither the ruffs nor any of the other birds seem at any time to have been disturbed by our presence. The area between the "hill" and the tent was even one of the most used foraging territories, and Common Gulls (*Larus canus*) and Yellow Wagtails (*Motacilla flava*) often sat on the tent. We always arrived at the tent between midnight and one o'clock and completed between 23 o'clock and midnight so that the birds did not notice our arrival at

and departure from the tent. Primarily we made precise notes of the birds' arrival at and departure from the "hill", but in addition we noted the behaviour of the ruffs in detail.

Material.

In order to facilitate the understanding of the following it is necessary briefly to explain our classification of the males on or in connection to the "hill".

By *owners* we mean the males that have a decided run on the "hill".

By *whites* we mean the males with white ruffs.

By *guests* we mean the males which are not allowed to enter the "hill".

As mentioned above we recorded the presence and behaviour of the ruffs on the "hill". This was done throughout the period of the observation, but we give only the notes for 24 hours, *viz.* 26. V. (table I). The other observations were made on 3. VI. and 9. VI.

On the 26. V. '50 the weather was cold (10—13° C.) with a light wind, with a half to quite cloudy sky and no rain.

We arrived at the tent at 1 o'clock, and at that hour no ruffs were present on the "hill". The observations were, however, impeded by haze and darkness till 2,30. At 2,10, however, we observed 5 flying ruffs at the "hill", but not until 2,30 could it be stated that the 5 owners were present on the "hill".

The time was Central European Time, which is 27 minutes ahead of local time (long. 8° 13' E.).

Each vertical line in table I indicates the presence of one ruff or reeve on or at the border of the "hill". If a ruler is laid across the table, it shows the situation on the "hill" at any moment. For instance at 4,15 the following birds were present on the "hill": All the owners (no. 1, 2, 4, 5 and 6), no whites, 1 guest and 2 females. Within the same minute 2 guests and 1 female arrived.

Table I shows that the owners faithfully stayed on the "hill" from somewhat before daybreak until about 8 o'clock; between 8 and 12 they foraged. According to our observations this happens very near the "hill" so that the owners assemble on it on the slightest provocation. As is evident from the table,

there is no absolutely inactive period in the forenoon, although the activity has been very much reduced, at any rate for a few hours. Towards 12 o'clock the foraging period ends, and the owners will stay on the "hill" almost without intermission until 18,30. After 18,30 the owners will appear only sporadically on the "hill", and 21,51 the owners—no. 1. and no. 6.—end their last visits to the "hill". Notice no. 5.'s frequent visits to the "hill" within the last period. The behaviour of the owners on the "hill" may be divided into two periods of activity, interrupted by a period of foraging. Our examinations of the diurnal variation of the activity exactly agree with those of ANDERSEN (1948, p. 142, table 10 and 1951, sect. 3.) which are based on the number of captures by snares of ruffs on the "hill".

The owners.

In the previous literature on ruffs, SELOUS, MELLQUIST and others, it is often mentioned that some particular ones have their own places, a small run in the greensward, on the "hill". But in all statements the owners of such runs are identified by their plumage. Certainly it is very seldom to see two males with a completely uniform plumage, but in order to be quite sure that it was really the same males observed on the run every time, we marked them by colouring a small part of the left leg after having caught all of them by means of snares on the "hill". The marks on the legs were easily seen, and our observations showed that the owners have their decided runs to stand in every day. There were five owners on the observed "hill", which is very different from the "hills" observed by MELLQUIST (1943, p. 63), where at most two males with decided runs were seen on the "hill". Each of the owners were, as mentioned above, connected to their particular runs and defended it against penetrating guests, but in addition the whole "hill" was regarded as a common territory, to the effect that a guest entering the "hill" was displaced by the nearest standing owners jointly. Thus all the owners were equally anxious to defend the territory. Evidently the owners form a community, and we found it highly probable that a hierarchy existed here. Our observations, however, did not confirm this supposition. The individual owners behave highly different, which may be explained

by individual differences or hormonal variations, but it may also be due to the traditions connected to the particular runs.

In the following description the owners will be mentioned as no. 1, 2, 4, 5 and 6.

<i>Owner no.</i>	<i>ring no.</i>	<i>year of ringing</i>	<i>year of recapture</i>
1.	633610	1947	1948, 1949 and 1950
2.	633964	1948	1949 and 1950
4.	634001	1948	1950
5.	634491	1950	
6.	634489	1950	

All the ringing was done on the same "hill" (ANDERSEN 1948, fig. 1, c.). ANDERSEN (1951, sect. 5) gives a description of no. 1. (633610), no. 2. (633964) and no. 4. (634001).

Description of the individual owners.

No. 1. was an old acquaintance. It was caught on the "hill" four times in 1947, six times in 1948, once in 1949 and once in 1950. The question whether no. 1. had been an owner on the "hill" in the previous years, cannot be definitely answered, but the great number of recaptures tends to show that this was the case. In its behaviour it may be characterized as being rather inactive. Only once was it seen in copulation on the "hill". The reeves were not interested in it. Thus we did not a single time observe that a reeve placed itself at its run. Most frequently no. 1. took part in the dances, but once we saw that it was standing uninterestedly on its run arranging its feathers while the other owners were sexually excited on account of the visiting reeves. No. 1. was eagerly displacing the guests from the "hill".

No. 5. was acting as an owner only on 26. V. Its run was in the centre of the "hill", and it was the largest and deepest of it. On the whole, it seemed to take up an important place of the community. Thus no. 5. was preferred by the reeves, and copulated four times during the first 24 hours, which makes half of all the copulations this day. During the time between 26. V. and 3. VI. we were catching ruffs by snares on the "hill". No. 5. was caught, and probably it had been hurt, as we did not see it fly afterwards. On 3. VI. at 11,57 it was walking towards the "hill" and acted as a guest. No. 2. had entered upon its run. No. 5. did not try to enter the "hill", but stayed at the border of it. It tried to allure reeves from the "hill" out to it, and it was successful in two cases, whereupon it disappeared with the reeve. No. 5. was last seen at 17,38 at which time it disappeared with a reeve. On 9. VI. no. 5. did not appear.

No. 2. was caught by snares, 8 times in 1948 and recaptured once in 1949 and once in 1950.

Its run was not so well defined as those of the other owners, as it had no depression. The grass, however, was worn in spots on the run. Very seldom did it stay on its run for a long time, but foraged on the "hill" and in the neighbourhood of it. If visitors happened to enter the "hill", it would run or fly back at once and danced just as eagerly as the others. No. 2. displaced guests from the "hill", but apparently was more interested in foraging. This was a characteristic feature in the behaviour of no. 2. during the 26. V. On 3. VI. its behaviour was quite changed. This alteration was possibly correlated with the fact that it had entered upon the run of no. 5., which was the largest and deepest run of the "hill". Now no. 2. was by far not so eager to forage and was the owner that most seldom left the "hill". The reeves had become interested in no. 2. They often settled near its run, and two copulations were observed. (It did not copulate on 26. V.). That especially no. 2. entered upon the run of no. 5. may be due to the fact that no. 2. was the owner which was most loosely connected to its run, — as mentioned above it was not so well defined and without any depression, and no. 2. would often leave it in order to forage. What further seems to emphasize the insignificance of the run is the fact that the run was not taken possession of by others, when no. 2. had left it.

No. 4. and 6. were almost like each other in their behaviour, their runs were situated in the outskirts of the "hill" (fig. 1), the depressions were almost equally large, and behind each of them there was a little hillock, 10—15 cm. high. We often saw no. 4. and 6. — especially no. 6. — flapping up upon the hillock, from which they were attentively looking about. Suddenly they would lift their wings up to a vertical position so that their bright undersides became visible. This seemed to be the signal to the other owners, since shortly afterwards all the owners were flapping their wings together with contingently present whites. On such occasions flying ruffs were to be found without fail in the neighbourhood. No. 4. and no. 6. evidently had the special job to call the attention of the ruffs passing by the "hill". On the first day no. 4. differed from the other owners, when — like the white — it flew after the leaving reeves and returned shortly after, often together with a reeve (table 1). On 3. VI. it was just as stationary as the other owners. Apart from no. 5. the 26. V. and no. 2. the 3. VI. no. 4. and no. 6. were preferred by the reeves, each of them having undertaken $\frac{1}{3}$ of all copulations observed on the "hill".

No. 8. Another ruff deserves a special mention (in our diaries mentioned as no. 8.). No. 8. was seen on the "hill" only the 3. VI. It was standing at the run of no. 2. — the previous run of no. 5. In its behaviour it differed somewhat from the owners. It did not appear on the "hill" until 5,19, and apart from the afternoon it appeared only now and then on the "hill". Apparently, it was uninterested in what happened on the "hill". Thus it might leave the "hill", even when reeves were present, and sometimes it went preening while the other ruffs were sexually excited.

The guests.

It is evident from our observations that the "hill" belonged to the owners. They did not tolerate that the other ruffs, the guests that visited the "hill" during the day, entered into their common territory, the "hill". They were displaced at once and were only allowed to stay outside the downtrodden territory.

In this connection it should be mentioned that the guests very seldom tried to enter the "hill", but always placed themselves outside it on the arrival and remained staying at the border of the "hill". On 26. V. at 16,35 a guest placed itself on the run of no. 5. This is the only observation of a guest having placed itself on a run of an owner. This guest was immediately turned away.

The whites.

Three ruffs (in our diaries they are mentioned as no. 3. 7. and 9., but in the article they are mentioned jointly) differed from the others. They were all characterized by a white ruff, fair ear-tufts and on the whole light feathers. These ruffs were allowed to enter the "hill". They differed from the owners by not being bound to a decided run on the "hill" — thus there were no depressions — and on the whole by sticking to the "hill". They would often arrive together with reeves and guests and fly after reeves that left the "hill", or they would arrive at the "hill" now and then, but if nothing was happening, they soon left again. They did not seem to regard the "hill" as their own territory, since they did not take part in the attacks of the owners against offensive guests, but as distinct from the guests they had free access to the "hill" and seemed even to be regarded as very welcome by the owners. Therefore, this group assumed a very interesting position in the community. The fact that no males with white ruffs were to be seen among the guests, tends to show that this group holds a particular position. In this connection it would be important to have observations from other "hills" of the sanctuary in order to find out, for instance by ringing, whether the same males with white ruffs take up a similar special position on the other "hills".

One of the white — no. 3. — deserves special mention, since on 26. V. it reminded somewhat of the owners by its frequent

appearance on the "hill". Even during periods when no reeves were on the place, no. 3. — as distinct from the other whites — stayed on the "hill" together with the owners. Most frequently it placed itself between no. 1. and no. 4., but had no particular limited run and did not partake in turning away the guests from the territory. The latter features of its behaviour make it remind of the other white. On 3. VI. and 9. VI. no. 3. did not differ from the other white.

The reeves.

Our observations of the behaviour of the reeves do not differ from those made by E. SELOUS. When reeves arrive at the "hill" — in periods of activity often several reeves at a time, in the forenoon and towards evening only singly — they place themselves on the very "hill". On arrival they are often accompanied by whites and guests, but this is not the rule. The courtship of the reeve towards an owner was as follows: It would approach the owner it had chosen for copulation, placed itself at its run or down in the depression taking up the attitude for copulation, whereupon copulation took place. Still it would often happen that the ruff did not respond to the appeal of the reeve, but stayed in its spasmodic attitude. We cannot, however, give any final concept of the course of the "display", since this differed very much from time to time. On some occasions the reeves do not seem to be interested in the ruffs at all, thus they might leave the "hill" without having approached the run of an owner. At other times the reeves would begin to court the ruffs immediately on the arrival, whereupon several copulations might take place. Thus the copulations observed would take place on the very "hill" — most frequently on the runs — which is not in agreement with MELLQUIST's observations, as the copulations observed by him very seldom took place on the "hill", but at some distance from it (MELLQUIST, 1943, p. 58).

E. SELOUS has observed attempts at copulation both between two ruffs and between two reeves. Also MELLQUIST has seen copulation between two ruffs (1943, p. 48). According to our observations this does not seem to happen very often, since we have only one such observation. Our journal of 9. VI.:

7,35: On the "hill" are present: All the owners on their runs (no. 1, 2, 4. and 6.), 1 white (no. 3.), 3 guests (at the border of the "hill") and 4 reeves.

The reeves gather round no. 6. The white tries to copulate with no. 1. A reeve tries to copulate with another reeve.

7,40: No. 6. copulates with a reeve.

7,41: A guest and a reeve leave the "hill" in order to forage. A reeve tries to copulate with another reeve.

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DANSK RESUMÉ

En undersøgelse af Brushanens (*Philomachus pugnax* (L.)) parringsspil.

Denne artikel bygger på tre døgn's kontinuerlige iagttagelser af en af reservatet Tippeternes skoggerpladser i sommeren 1950 (d. 26. 5., 3. 6. og d. 9. 6.). Observationerne blev foretaget fra et telt (fig. 2), der var anbragt 20 meter fra skoggerpladsen (fig. 1). Nærmere oplysninger om reservatet Tippeternes skoggerpladser findes hos ANDERSEN (1948, pp. 126—32). Den af os iagttagne skoggerplads er identisk med "c", fig. 1 i samme afhandling.

Der blev for hvert døgn ført bog over Brushønsenes ankomst til og afgang fra skoggerpladsen samt over de enkelte Brushøns' opførsel.

Brushanerne inddeles i tre grupper:

Ved *ejerne* forstår vi de brushaner, der har et bestemt ståsted på skoggerpladsen.

Ved de *hvide* forstår vi de hvidkravede Brushaner.

Ved *gæsterne* forstaar vi de Brushaner, som ikke har adgang til skoggerpladsen.

Dagbogsoptegnelserne for det første døgn, d. 26. 5., er opført i skemaet tavle I, de lodrette linier i de forskellige kolonner angiver tilstedeværelse på skoggerpladsen — for gæsternes vedkommende i kanten af denne — og hver af linierne angiver et individ. Man kan således ved at lægge en linial tværs over skemaet aflæse situationen på skoggerpladsen til forskellige tidspunkter (f. eks. kl. 4,15: tilstede på pladsen er alle ejere (nr. 1, 2, 4, 5 og 6), ingen hvide, een gæst og to hunner. Inden for samme minut ankom to gæster og een hun). Et "x" på en linie angiver stedfunden parring.

Ved hjælp af ringmærkning og farvning fastsloges, at fem hanner — ejerne — havde deres bestemte ståsteder på skoggerpladsen fra dag til dag. De enkelte ejere forsvarede deres ståsteder mod indtrængende gæster, men samtidig opfattedes hele skoggerpladsen som et fælles territorium, der forsvaredes af ejerne i fællesskab. Nogen hakkeorden mellem ejerne iagttoges ikke. Ejerne opholdt sig trofast på skoggerpladsen bortset fra en fourageringsperiode om formiddagen. De enkelte ejere viste indbyrdes store forskelligheder i opførsel.

Gæsterne havde ikke adgang til skoggerpladsen, men opholdt sig uden for det nedtrampede område, i kanten af skoggerpladsen.

De hvide havde adgang til skoggerpladsen, men adskilte sig fra ejerne ved:

- 1) ikke at have ståsteder på skoggerpladsen.
- 2) ikke at deltage i forsvaret af skoggerpladsen.
- 3) sjældent at opholde sig på skoggerpladsen i længere tid ad gangen.

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