

Preliminary data on the diet of migrating Ruffs *Philomachus pugnax* in northern Italy

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Gizzards from 18 Ruff *Philomachus pugnax* casualties obtained during five ringing seasons were examined. Three birds found dead (possibly lead poisoned) not far from the netting sites were also analysed. The results stress the importance of aquatic food, apart from a very few cases of specialised agricultural grain feeders, no earthworms were found. It is possible that Italian grasslands are not wet enough for being exploited by migrating waders.

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Было проанализировано содержание желудков 18 погибших турухтанов *Philomachus pugnax*, полученных во время пяти сезонов кольцевания. Были обследованы и три птицы, найденные мертвыми (возможно, отравленные свинцом) недалеко от мест ловли птиц паутиными сетями. В результатах отмечается значение водного корма, за исключением небольшого числа птиц, специализированных в питании зерна на сельскохозяйственных угодьях, дождевые черви не встречены. Травянистые угодья в Италии, возможно, недостаточно мокры для мигрирующих куликов.

Introduction

During spring migration Ruffs *Philomachus pugnax* are known to forage in a variety of habitats such as salt-pans, marshlands, lagoons and wet grasslands. Most studies based on stomach analysis have investigated the diet of different wader species in one habitat (Recher 1966; Treca 1975, 1984; Lifjeld 1983) and have analysed prey selection in relation to body size (Lifjeld 1984). The aim of the present paper is to provide preliminary information about the use of different feeding habitats rather than to investigate food preferences. Unlike other studies, this work uses netting casualties of birds caught at roost and not birds shot while feeding.

Study Area and Methods

The study was conducted at four different Italian wetlands (Figure 1): Zavelea marsh (44°40'N, 12°06'E, Cervia salt-pans (44°15'N 12°20'E', San Rossore coastal marshland (43°43'N 10°19'E and Burano Lagoon (42°24'N 11°23'E). The first two localities are on the east coast of Italy, whereas the

others are on the west coast. Zavelea is a dammed marsh of 70 ha, bordering Comacchio Lagoon and huge cereal crop areas. Cervia is an operational saline of 828 ha, in which the water depth and salinity vary seasonally, and is surrounded by cultivated land. The coastal marshland of San Rossore, characterised by the presence of the Arno river estuary, has water depths which usually do not exceed 30 cm and has a few cultivated fields nearby. The Burano Lagoon is situated to the south of the Orbetello Lagoon (south Tuscany) and is separated from the sea by a narrow beach-dune system. Its water depth varies from 40 to 100 cm depending upon the opening or closure of its connecting channel with the sea. The lagoon is bordered landward by cultivated fields. For further details regarding these sites see Grimmett & Jones (1989).

During the springs of 1988-1992, a total of about 1,000 Ruffs were captured with mist-nets, ringed and measured (Baccetti *et al.* 1998). From all these captures, 18 stomachs taken from all casualties (*i.e.* healthy birds that died during catching) were



Figure 1. Study area.

analysed. Additionally, the stomach contents of two injured Ruffs caught by hand in the Cervia salt-pans, where they definitely had fed, are included, together with those of three birds found dead at the same site. At San Rossore the food spontaneously vomited by a single bird was also analysed. Oesophagus contents were not examined.

Results

All except one of the 18 stomachs of the casualties analysed were completely full, the exception being a bird from Zavelea (Table 1). Therefore all the birds had presumably fed for most of the day before capture.

All of the Zavelea stomachs contained green plant material and wild plant seeds, making up most of the stomach contents. At the other sites, these food categories seemed more infrequent and less important. The wild seeds mainly belonged to aquatic taxa (e.g. *Juncus* sp.), but the leaves have not so far been identified.

Agricultural grains were identified as maize *Zea mais* and rice *Oryza sativa*. In all of the three Burano

casualties the maize, a very large hybrid type of grain, was the main item found. These birds probably belonged to the same flock and had all fed together. Rice grains were found in two Zavelea birds besides the abundant green leaf material.

Of all the invertebrates found in the stomach contents, two taxa, Diptera and Coleoptera, were the most important. The Diptera found were mainly Chironomid larvae and were the main items present in the Cervia and San Rossore stomachs, although a bird from Zavelea had quite a large number of uncountable larvae. This indicates that the birds had been feeding in aquatic habitats. Adult Diptera occurred as well. Coleoptera are less easily digested and longer lasting prey. Items identified principally belonged to the aquatic taxa e.g. Dytiscid larvae, Hydraenidae. A riparian Staphilinidae and a few large-sized Araneae were also found.

Grit is known to be found regularly in waders' stomachs. Mineral particles were found in varying amounts in all of the samples examined. Sand particles and fragments of bivalve shells made up of most of the grit.

The stomach analysis of two birds with broken

Rossoire ITEM	CASUALTIES													INJURED		FOUND DEAD			VOMIT					
	Zavelea													Ce	Ro	Burano			Cervia		Cervia			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Green plant material			++	++	++	++	++	++	++	++	++	++	++	+	++	++	++	++	+	-	+	+	+	-
Juncus seeds										+	+													
Gramin. seeds								2																
Corn grains																++	++	++						
Rice grains			10									26												
Hirudinea																				2				
Ostracoda																				1				
Araneae														1	1		1	1	1					
Odonata larvae																2								
Lepidoptera										1														
Diptera																								
Tipulidae																++								
Culicidae																+								
Chironomidae																	+							
Chiron. larvae										++		50			++									
Chiron. pupae														+										
Diptera undet.										+					2									
Coleoptera																								
Ditiscidae larvae														1	4									
Hydraenidae larvae										2				1										
Staphylinidae										1														
Dryopidae										1				2										
Brentidae																3								
Curculionidae															1	1								
Coleoptera undet.									1	++				++					1					
Grit	-	-	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+			-		+	-	-
Lead shot																			4	2	6			

Table 1. Stomach contents of 23 examined Ruffs and one sample of spontaneous vomit. Numbers refer to individuals or items taken; (++) = items amounting to more than 50% of a full stomach; (+) = items amounting to less than 50% of a full stomach; (-) = items observed in traces (for grit less than ten particles); no symbol = absence of items.

wings - shot by hunters and afterwards found in the Cervia salt-pans - provided information on prey items that must have been taken within the salt-pans. This site is normally used as a feeding area both by birds commuting from the Zavelea roost (Serra *et al.* 1990) and by local birds. As in the case of the one healthy bird examined from this site, the animal components of the stomachs of the two injured birds were mainly Chironomid larvae and adult Diptera. Plant material was only found in one bird.

The three birds which were found dead at our ringing sites all came from Cervia and were collected in two different years. Each of these birds had very little or no organic material in their stomachs, just some natural grit and between two to six lead shot.

Only once did a Ruff spontaneously vomit during handling. The totally undigested material was immediately collected and fixed in alcohol. This spontaneous reaction allowed better identification of the Chironomid larvae present which were found to belong to the sub-family Ortocladinae (31 specimens with body lengths of up to 26 mm). A

single prey item from the Erpobdellidae family (Hirudinea) was also identified.

Discussion

Analysis of the contents of these 23 stomachs showed that the proportion of different food items taken depends on the particular site. Zavelea is the only locality where green plant material always occurs and where wild and agricultural seeds are most frequently found. The presence of rice grains together with plant material in the stomach indicates that these Ruffs had fed in rice fields, probably on spilled grain because usually rice is sown later in the season. This fact is also confirmed by re-sightings of birds, colour-marked at Zavelea, feeding in rice fields (Serra *et al.* 1990). The maize was probably also spilled grain, unless it was food supplied to feral animals. These grains were not found with particularly abundant plant material. Rice and other larger-sized grains, up to the size of peanuts, make up an important part of the species diet in winter quarters (*e.g.* Morel & Roux 1966; Treca 1975; Hötter *et al.* 1990).

It is interesting to note that only two out of a total of

the 13 Zavelea birds' stomachs had this kind of prey. Likewise, only one of the three Burano birds' stomachs contained invertebrate prey. It should also be noted that neither Oligochaeta (Lumbricidae) nor Hirudinea were ever found in the stomach contents. The former (at least in the case of small-sized species) are completely digested within one minute of reaching the stomach (Lifjeld 1983). In our case, we suspect that if large earthworms were important in the diet of our birds, there should be some traces of them in the stomach. This problem will require further investigation, especially because oesophagi were not analysed. Lumbricidae would actually be the best indicators of feeding in wet grasslands (if wet grasslands exist in Italy during Ruff spring migration), a habit which would assume some importance from a management point of view.

The three birds found dead had practically empty stomachs due to the fact that, even if not particularly emaciated, these birds were apparently suffering from acute lead poisoning. Lead shot had probably been ingested on small hunting pools scattered around the Cervia salt-pans immediately after the birds had arrived from Africa. Similar problems were found elsewhere in several wader species, including Ruff in the Camargue (Locke & Friend 1991; Pain 1990).

These preliminary results support the hypothesis that Ruffs do not have a specialised diet, at least at spring staging areas, but their food depends on the particular habitat where staging takes place.

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