

AUTUMN MIGRATION OF PALAEARCTIC WATERBIRDS ACROSS THE ALGERIAN SAHARA

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ABSTRACT. During a study of bird migration across the Western Central Sahara from August 27 to October 16, a further 27 species of Palaearctic waterbirds were recorded. These records are summarized and discussed in relation to the extent of cross-desert movements of Palaearctic water birds wintering south of the Sahara. The observations suggest that many species cross the Western Central Sahara during their southward autumn migration.

KEY WORDS: migration/ water birds/ Sahara/ body weights.

As Guichard (1947) and later Moreau (1967) have already pointed out, the occurrence of Palaearctic water birds in certain parts of Northern tropical Africa suggests that they may have crossed the Sahara. But in his review Moreau (1967) found only little evidence for a regular crossing of the Sahara by such species and he mentioned that although the birds in autumn passage are nearly twice as numerous as those in spring passage, the fall-out of water birds over the Sahara in autumn passage is "amazingly small". Dowsett (1980) has recently reviewed the inland occurrence of Palaearctic coastal waders in sub-Saharan countries suggesting that many species observed inland in tropical Africa must have crossed the Sahara and that the extent of trans-Saharan migration of waders is greater than supposed. Altogether these reviews demonstrate a major gap in our knowledge about the migration of Palaearctic water birds across the Sahara. The status of the many species presumed to cross the Sahara is incompletely documented and therefore "in need of further investigations" (Dowsett 1980). Generally, gathering further information on the occurrence of birds in Saharan oases should be the first step in analyzing the cross-desert movement of Palaearctic birds. This paper summarizes records of Palaearctic waterbirds, obtained during a seven-week study of bird migration in central Algeria in autumn 1983.

STUDY SITES

After a preliminary study of autumn bird migration at various points in the central Sahara in 1981 (Bairlein et al. 1983, 1984) a more detailed study was possible with two teams at two sites in autumn 1983. Passerine birds were trapped using mist nets at the following points with suitable vegetation in the Algerian Sahara (Fig. 1).

Hassi Marroket (30.2°N, 2.8°E): a small vegetation "island" of about 17 ha at an artesian spring, 40 km south of El Golca, with a dense marsh and tamarisk vegetation and some small

and shallow water pools. Here we trapped and recorded migrants from August 27 to September 22, September 27 - 28 and October 2-16.

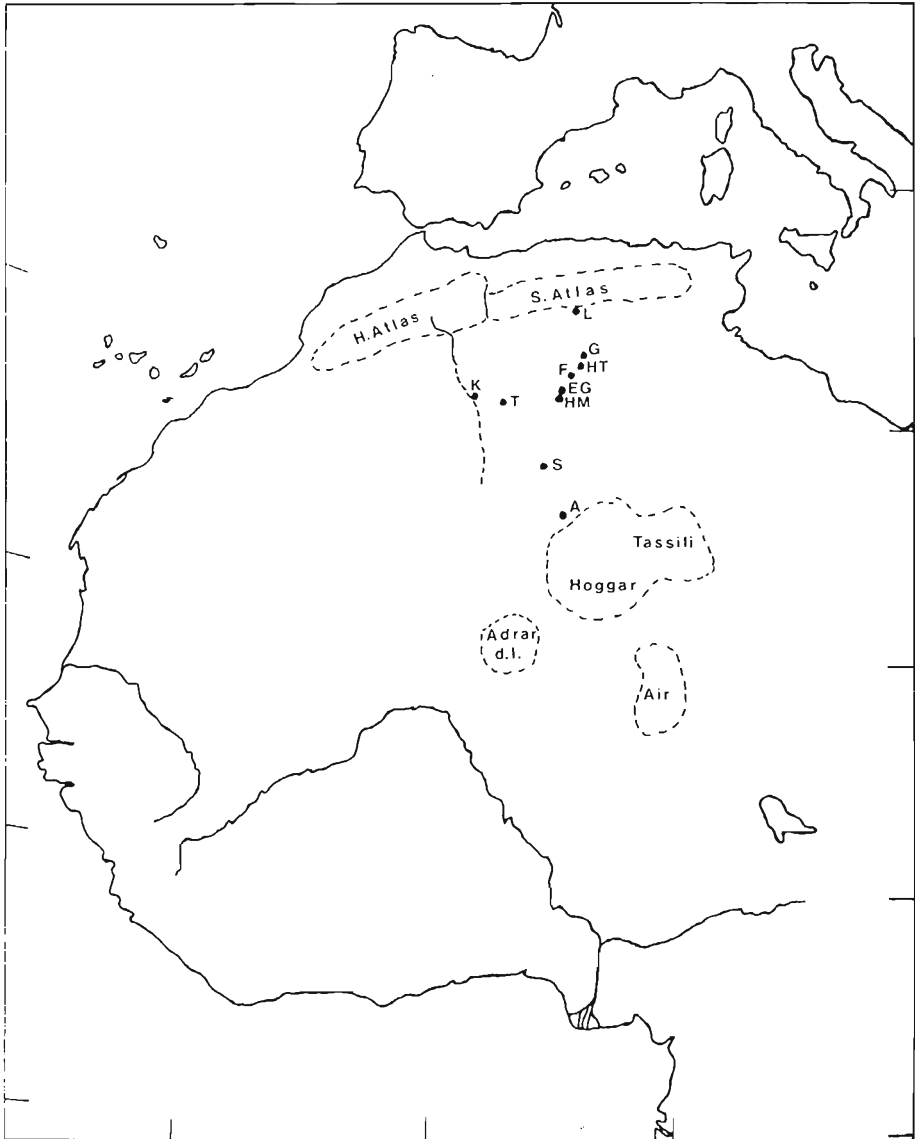


FIGURE 1. The different localities at which palaeartic waterbirds were observed or trapped in autumn 1983. HM: Hassi Marroket, A: Arak, L: Laghouat, G: Ghardaia, HT: Hassi Touiel, F: Hassi Fahl, EG: El Golea, S: In Salah, T: Timimoun, K: Kerzaz.

Arak (25.3 °N, 3.7 °E): a vegetation strip along a temporarily flooded river bed on the north-westerly border of the Ahaggar mountains, consisting mainly of acacia trees, with some open water pools used as cattle watering-places. At Arak we trapped and recorded birds from September 10 - 29.

Besides trapping, we counted all the water birds at the pools at least twice a day (early morning and late afternoon). All other observations were recorded as well. Whilst netting passerines, we also caught some waders at the pools. Their species, sex, age, moult stage, fat score, wing length and body weight were recorded too.

SYSTEMATIC LIST

The records of species regularly observed at Hassi Marroket are listed in Tab. I. The following systematic list gives some additional records mainly from Arak and from some other points in the Algerian Sahara (Fig. 1). The body weights of the trapped birds are shown in Tab. II.

Grey Heron *Ardea cinerea*. Regularly on migration at Hassi Marroket (Tab. I) with only very few stop-overs. Further records: 27 VIII 1 bird at Hassi Fahl, 9 IX 1 Arak, 29 IX 7 Timimoun.

Purple Heron *Ardea purpurea*. Although Moreau (1967) states that Purple Herons are more numerous in the Sahara than Grey Herons we only recorded one at Hassi Marroket on 9 IX.

Little Egret *Egretta garzetta*. According to Ledant et al. (1981) some Little Egrets winter in the Sahara. Our records show: 6 IX 5 at El Golea, 7 IX and 15 IX one and 18 IX two at Hassi Marroket.

Cattle Egret *Bulbucus ibis*. The "lack of oasis records and the absence of winter influx to Sahel regions suggest Sahara seldom, if ever, crossed" (Cramp & Simmons 1977). According to Ledant et al. (1981) occasionally observed in the Sahara. We observed one bird in the palmery of Timimoun on 29 IX.

Night Heron *Nycticorax nycticorax*. Some observations of the species in passage at Hassi Marroket (Tab. I). Only one further record: 9 IX two birds at Arak.

White Stork *Ciconia ciconia*. At our arrival at Hassi Marroket on 27 VIII we found 6 White Storks resting. They departed on 28 VIII at about 10.00 hours. Furthermore, an older carcass of a White Stork was found at Hassi Marroket.

Glossy Ibis *Plegadis falcinellus*. On 26 VIII one heading south at Hassi Touiel. In the evening of 27 VIII 28 birds arrived at Hassi Marroket where they rested until 29 VIII. On 29 VIII two birds were shot by an Algerian. One bird died, the other, unable to fly, rested until 8 IX, when it departed after recovering its flying capacity. Further records: 6 IX five birds in El Golea, 9 IX one at Arak and 29 IX one at Kerzaz (Saoura).

Pintail *Anas acuta*. According to Ledant et al. (1981) the Pintail winters regularly in Saharan oases. We observed it three times at Hassi Marroket: 21 IX 1♀, 28 IX 2♂, 2♀, 16 X 4 seen passing.

Garganey *Anas querquedula*. Only one record of two "♀" at Hassi Marroket. Up to now there are remarkably few records of Garganey in the Sahara especially

TABLE I. Daily counts of some palaeartic water birds at Hassi Marroket/Algeria, autumn 1983. Only the periods of observation are shown.

| | | <i>Ardea cinerea</i> | <i>N. nycticorax</i> | <i>Charadrius dubius</i> | <i>Tringa ochropus</i> | <i>Tringa glareola</i> | <i>Actitis hypoleuca</i> | <i>Calidris minuta</i> | <i>Calidris temminckii</i> | <i>Philomachus pugnax</i> |
|-----------|----|----------------------|----------------------|--------------------------|------------------------|------------------------|--------------------------|------------------------|----------------------------|---------------------------|
| August | 27 | | 1 | 7 | 2 | | | | 2 | 1 |
| | 28 | | | | | | | | | 4 |
| | 29 | | | 3 | 2 | 1 | | 2 | 7 | 6 |
| | 30 | | | 3 | 1 | 1 | 1 | 8 | 30 | 6 |
| | 31 | | | | | | | 7 | 4 | 1 |
| September | 1 | | | 11 | | 1 | 2 | 10 | | 3 |
| | 2 | | | 4 | | 1 | 1 | 5 | | 4 |
| | 3 | | 1 | 5 | | 1 | | 5 | | 2 |
| | 4 | | | 33 | 2 | 1 | | 4 | | 4 |
| | 5 | | | 21 | | 2 | | 3 | | 4 |
| | 6 | | | 1 | 1 | 3 | | 3 | | 3 |
| | 7 | | 1 | 5 | 3 | 1 | | 7 | | 2 |
| | 8 | | | 1 | 1 | | | 1 | | |
| | 9 | | | 5 | 1 | | 1 | 10 | 2 | 1 |
| | 10 | | 1 | 10 | 1 | | | 11 | | 1 |
| | 11 | 1 | 2 | 10 | | | | 9 | | |
| | 12 | 3 | | | 4 | | 2 | 3 | | |
| | 13 | | | | | | | 1 | | |
| | 14 | | | 1 | 1 | | | 2 | 1 | |
| | 15 | 1 | | 3 | | | | 2 | 2 | |
| | 16 | 1 | | 1 | | | | 2 | | |
| | 17 | | | 1 | | | | | | |
| | 18 | 1 | | 1 | 3 | | | | | |
| | 19 | | 1 | 2 | | | | | | |
| 20 | | | | 1 | | | | | | |
| 21 | 2 | | 1 | | | | 1 | | | |
| 22 | | | | | | | 1 | | | |
| 27 | | | | | | | 8 | 1 | | |
| 28 | 1 | | | | | | 2 | | | |
| October | 2 | | | 1 | | | | 5 | | |
| | 3 | 1 | | | | | | | | |
| | 4 | | | | | | | | | |
| | 5 | | | | | | | 4 | | |
| | 6 | | | | | | | | | |
| | 7 | | 1 | | | | | | | |
| | 8 | 1 | | | | 1 | | | | |
| | 9 | | | | | | | | | |
| | 10 | 1 | | | | | | | | |
| | 11 | | | | | | | 2 | | |
| | 12 | | | | | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 16 | | | 1 | | | | 1 | | | |

during the autumn, although large numbers winter in the northern tropics of West Africa (Cramp & Simmons 1977, Ledant et al. 1981, Roux & Jarry 1984).

TABLE II. Body weights of some waders trapped in Saharan oases in autumn 1983. *Where possible, range and standard deviation are given; if the sample size is less than four birds the individual weight values are shown. ** From Cramp & Simmons (1983) *** adults after crossing the Sahara in April: ♂ 98, 100, 110 g, ♀ 78 g (Dupuy 1970)

| Species | Locality | number of birds | body weight* | ranges of weights on migration** |
|----------------------------|----------------|-----------------|-----------------------------|----------------------------------|
| <i>Charadrius dubius</i> | Hassi Marroket | 2 | 26.8; 35.5 | 26-53 |
| | Arak | 4 | 30.9 ± 2.0 (29.4 - 33.8) | |
| <i>Tringa glareola</i> | Hassi Marroket | 1 | 48.6 | 42-98 |
| <i>Actitis hypoleuca</i> | Arak | 1 | 46.4 | 38-70 |
| <i>Calidris minuta</i> | Hassi Marroket | 5 | 18.8 ± 1.9 (15.9 - 20.6) | 16-43 |
| | Arak | 21 | 23.1 ± 3.9 (16.7 - 30.1) | |
| <i>Calidris ferruginea</i> | Arak | 1 | 38.2 | 35-103 |
| <i>Philomachus pugnax</i> | Hassi Marroket | 1 ♂ | 112.8 | 130-254*** |
| | | 3 ♀ | 63.4; 68.7; 71.4 | 72-170*** |

Shoveler *Anas clypeata*. On 14 IX two birds seen passing at Hassi Marroket; 27 IX - 16 X again two birds resting at Hassi Marroket. Ledant et al. (1981) mentioned no autumn record in the Algerian Sahara.

Water Rail *Rallus aquaticus*. The breeding population of North Africa seems to be resident (Glutz von Blotzheim et al. 1973, Ledant et al. 1981). Nevertheless there are a few records of Water Rails in the Sahara especially during the spring. During our study at Hassi Marroket we recorded one bird on 31 VIII.

Spotted Crake *Porzana porzana*. Although there are only few records from West Africa (Cramp & Simmons 1980) and only one autumn record from Algeria (Ledant et al. 1981), Moreau (1967) has already mentioned that the Spotted Crake "crosses at least the west central Sahara and winters in West Africa more commonly than been recognized". At Hassi Marroket I observed one bird on 10 IX.

Moorhen *Gallinula chloropus*. Nearly daily records of a calling bird and some observations of the bird at Hassi Marroket. According to Ledant et al. (1981) the Moorhen breeds in Saharan oases, and therefore probably at Hassi Marroket too.

Little-Ringed Plover *Charadrius dubius*. Regularly recorded at Hassi Marroket with up to 33 birds per flock (Tab. I). The main passage occurred in September whereas in October there were still only a few records at Hassi Marroket. The majority of the birds arrived in the early morning, rested a few hours only and left in the late afternoon. Sometimes, flocks of up to 21 birds were seen heading South in the late afternoon. A few passing birds were also observed at Arak with flocks of 1 - 2 birds from 15 - 29 IX. The body weights (Tab. II) and the visible fat deposits of the trapped Little-ringed Plovers were very low.

Common Snipe *Gallinago gallinago*. Three records of a single bird each at Hassi Marroket on 27 VIII, 7 X, 15 X, and one record of two birds at Arak on 27 IX.

Great Snipe *Gallinago media*. A single bird was observed seven times at Hassi Marroket from 4 - 16 X. According to Cramp & Simmons (1983) the Great Snipe winters mainly in tropical Africa, especially in the eastern half but also some in West Africa where it is, for example, common in Nigeria from August to November. But up to now there are no Saharan records for the autumn and only two for the spring (Ledant et al. 1981).

Greenshank *Tringa nebularia*. Although the majority of Greenshanks pass through coastal sites, there seems to be also some trans-Saharan crossing with peak migration in September (Cramp & Simmons 1983). At Hassi Marroket one bird was observed from 29 - 31 VIII, three birds were seen heading South on 19 IX 18.00 hours and another single bird was recorded on 5 X. One further record of a single bird at a small temporary pool north-west of Laghouat on 24 VIII.

Green Sandpiper *Tringa ochropus*. Regularly recorded at Hassi Marroket in groups of up to 4 birds (Tab. I). Since this species migrates over the Sahara, and over a broad front, Moreau (1967) and Ledant et al. (1981) mention records of it at various Saharan oases. The first Green Sandpipers arrive in the Sahel-zone at the end of August, the majority in September (Cramp & Simmons 1983).

Wood Sandpiper *Tringa glareola*. Wood Sandpiper also pass overland over a broad front and winter south of the Sahara. The first arrivals in tropical Africa were recorded in August/September with numbers increasing there in October (Cramp & Simmons 1983). At Hassi Marroket we recorded a single bird on 29 VIII and have trapped it on 30 VIII (Tab. II). This ringed bird was then observed regularly until 7 IX. Another Wood Sandpiper was seen on one occasion together with the ringed one on 5 IX, and on 6 IX three other Wood Sandpipers were seen heading South at 19.00 hours. Another bird was observed on 8 X. On 27 VIII two birds were recorded at Hassi Fahl.

Common Sandpiper *Actitis hypoleuca*. Six records of 1 - 2 birds at Hassi Marroket (Tab. I) and one record of two birds at Arak on 14 IX. Of those a juvenile was trapped on 15 IX (Tab. II). On 24 VIII two birds were observed at Laghouat. According to Ledant et al. (1981) Common Sandpipers winter occasionally in Saharan oases.

Little Stint *Calidris minuta*. The Little Stint was the commonest wader heading South at Hassi Marroket (Tab. I) and at Arak (regular records of up to 10 birds). Further records are: 27 VIII one at Hassi Touiel, 6 IX one at El Golea, 26 IX two at a small temporary pool near In Salah. According to the figure in Tab. I the peak migration of Little Stints in the central, Algerian Sahara in autumn 1983 was in September with still only a few records during the first half of October. The birds trapped at Hassi Marroket were significantly lighter than those trapped at Arak (Tab. II; $p < 0.001$). A Little Stint retrapped at Arak three days later at the same hour had gained weight from 16.7 to 18.7 g indicating sufficient feeding conditions.

Temminck's Stint *Calidris temminckii*. According to Ledant et al. (1981) Temminck's Stint is a rare migrant in northern Algeria. Although it is widely distributed

during winter in the Sahelian and Savanna zones of West and West central Africa Moreau (1967) gives only a few Saharan records. During our study, Temminck's Stints were regularly observed at Hassi Marroket, mainly at the end of August and in early September (Tab. I). On 24 VIII a further record of four birds at a small temporary pool northwest of Laghouat. According to these records, Temminck's Stints probably cross the west central Sahara more commonly than has been suggested.

Dunlin *Calidris alpina*. This coastal species winters abundantly on the West coast of Northwest Africa, especially in Morocco and Mauritania. But according to Lamarque (1980) small numbers occur inland in Mali too. Ledant et al. (1981) mentioned a small number wintering in the region from Toggourt to Ouargla and three records further south. During our study at Hassi Marroket one adult Dunlin showing partial breeding plumage stayed for one day on 10 IX.

Curlew Sandpiper *Calidris ferruginea*. Although there are no desert records of this chiefly coastal species — except for a bird at Ouargla on January 1965 (Moreau 1967, Ledant et al. 1981) — Cramp & Simmons (1983) suggested the possibility of some "making more direct passage across the desert". At Hassi Marroket one bird was recorded on 10 IX, and one bird was seen staging at Arak from 24 to 29 IX. This bird was very lean (Tab. II).

Ruff *Philomachus pugnax*. The Ruff winters in Africa especially in Sahel and the northern Savanna zones from Senegambia eastwards to the Sudan. For example, it is numerous in the Niger inundation zone in Mali and at Lake Chad. Many records all over the Sahara indicate a broad front Saharan crossing (Moreau 1967, Cramp & Simmons 1983). At Hassi Marroket we recorded Ruffs regularly in small numbers (Tab. I) and trapped four birds, all very lean (Tab. II) and without visible fat deposits. The most exhausted female (63.4 g) ringed on 31 VIII was found recently dead one week later. One further record of a single bird at a temporary pool near In Salah. According to our records the peak passage of Ruffs in Northwest Africa seems to be from late August to early September.

Avocet *Recurvirostra avosetta*. According to records of Avocets south of the Sahara especially in the Niger inundation zone in Mali and at Lake Chad, crossing of the Sahara is probable. We observed two Avocets at a tiny temporary pool northwest of Laghouat on 24 VIII.

Collared Pratincole *Glareola pratincola*. One bird was observed at Hassi Marroket on 27 and 28 VIII. According to Cramp & Simmons (1983) the low numbers of Collared Pratincole recorded in oases suggest unbroken crossing of the Sahara at high altitude.

DISCUSSION

These records of Palearctic waterbirds show that a general crossing of the western central Sahara, at least on a small scale, does take place during postbreeding southward migration. For some species, like the Little Stint, Little Ringed Plover and the Ruff, the regular direct desert crossing is now well documented, for other species our records give additional evidence. Furthermore, the records indicate possible

regular stop-overs at such suitable sites during autumn passage, even when the weather conditions are good. Up to now nothing was known about how long individual birds stay at stop-over sites. Our observations suggest that the individual birds stay for only a short time (often for only one daylight period) and that there is a high turnover of migrants at such localities. For example, on 4 IX, 33 Little Ringed Plovers arrived at Hassi Marroket at 7.00 hours and departed at 18.30 hours; on 5 IX, 7 Little Ringed Plovers were counted at 7.15 and at 13.00 hours but at 18.00 hours a new flock of 21 birds arrived and left Hassi Marroket heading South again at 19.00 hours.

Therefore, the data suggest that the extent of trans-Saharan migration by European water birds is greater than supposed. As Davidson (1984) has recently summarized, there is a close connection between fat reserves of migrating waders and migration phenology. But there is little reliable information about the body condition of waders during passage, especially across North Africa (e.g. Dick & Pienkowski 1979).

The majority of waders trapped at Hassi Marroket or at Arak in autumn 1983 were relatively lean, with a little visible fat. Some of them were nearly exhausted. Nevertheless they departed from Hassi Marroket and Arak again and have prolonged the southward migration. Very lean birds probably continue their length of stop-over until they have gained weight (fat) for further migration. The only Little Stint retrapped was lightest one and it had gained 2 g within three days, a rate of increase of 4% of lean body mass per day. The highest rates of gain in waders are 5 – 7% of lean mass per day (Davidson 1984).

Our weight data suggest that waders trapped in oases are able to depart from stop-over sites for further autumn migration with very small fat loads, perhaps owing to the fact that waders trapped there are relatively close to the end of their migration to the African winter quarters. Therefore, it may be tentatively suggested that, generally, the body conditions for timing of departure from stop-over sites and for further migration vary with the position of the stop-over sites relative to the end of the species-specific migration route, and perhaps according to the length of further flight range.

Acknowledgements. The hard work under desert conditions would not have been possible without the enthusiasm of all members of this expedition: therefore, best thanks to Christian Buresch, Andrea Gardiazabal, Dietrich Frank, Sylvia Klockau, Hartmut Kula, Bernd Raddatz and Doris Weichselbaum. Prof. Dr. D. Neumann gave comments on the manuscript, Mrs. Sharon Meyen-Southard improved the English text. The work supported by Deutsche Forschungsgemeinschaft.

RIASSUNTO

MIGRAZIONE AUTUNNALE DEGLI UCCELLI ACQUATICI PALEARTEICI ATTRAVERSO IL SAHARA.

-- Si descrive la presenza di 27 specie di uccelli acquatici in oasi del Sahara (Fig. 1), osservata

metodicamente nel periodo 27 agosto-16 ottobre 1983.

— La fenologia delle specie è presentata nella Tab. I, e i pesi di individui catturati nella Tab. II.

— I movimenti migratori attraverso il deserto da parte degli uccelli acquatici sono discussi, mostrando che la loro frequenza è maggiore di quanto apparisse dalle conoscenze precedenti.

FIG. 1. Oasi del Sahara (contrassegnate dalle iniziali dei nomi citati nel testo) ove sono state compiute osservazioni.

TAB. I. Numero di individui delle specie di uccelli acquatici contati nell'oasi di Hassi Marroket (Algeria) nell'autunno 1983.

TAB. II. Pesi di alcune specie. Per i gruppi di oltre 4 uccelli sono fornite la media e la deviazione standard, per meno di 4 uccelli sono dettati i singoli valori.

RESUME'

MIGRATION DES OISEAUX D'EAU PALEARCTIQUES A TRAVERS LE SAHARA PENDANT L'AUTOMNE.

— On décrit la présence de 27 espèces d'oiseaux d'eau dans quelques oasis du Sahara (Fig. 1), observée méthodiquement du 27 août au 16 octobre 1983.

— Le Tab. I montre la présence quantitative des espèces, et le Tab. II montre les poids des oiseaux capturés.

— Nous discutons les mouvements de migration des oiseaux d'eau à travers le désert; leur fréquence est plus haute qu'il n'apparaissait de la littérature précédente.

Fig. 1. Oasis du Sahara (indiqués par les initiales des noms cités dans le texte) où les observations ont été conduites.

TAB. I. Nombre d'oiseaux de chaque espèce observée dans l'oasis de Hassi Marroket (Algérie) pendant l'automne 1983.

TAB. II. Poids de quelques espèces. On donne la moyenne et la déviation pour les groupes de plus de 4 oiseaux, autrement on donne chaque poids.

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Ricevuto 12 luglio 1984