

# Diurnal time budget of wintering Teal *Anas crecca* at Lac des Oiseaux, northeast Algeria.

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*This paper investigates the spatial distribution and the diurnal time budget of wintering Teal *Anas crecca* over a period of four years at a shallow lake, Lac des Oiseaux, northeast Algeria. The lake is exploited by Teal as a diurnal roost for both resting and feeding. The spatial distribution of Teal within the lake may be affected by drought but appeared to vary little over the study period. However, wintering Teal displayed a strong seasonal shift in behaviour (sleeping, feeding, preening, swimming, flying), probably to meet changes in energy requirements. Lac des Oiseaux and neighbouring Mekhada marsh appear to act as a "functional unit" for wintering ducks. The results highlight, in part, the need to afford legal and effective protection to the whole Numidian wetland complex. Degradation of the Mekhada marshland, threatened by dam construction, may well make Lac des Oiseaux, a Ramsar site, an unfavourable habitat for wintering ducks.*

**Key Words:** Anatidae, wintering strategy, wetland conservation, Ramsar sites, North Africa.

It is widely believed that migration serves mainly to keep birds in good foraging areas at all times of the year and to even out environmental heterogeneity (Owen & Black 1990; Dingle 1996). It has long been known that waterbirds

aggregate at high density in their winter range while they disperse themselves within their breeding sites (Tamisier 1970). Although much uncertainties still surround many aspects of the behaviour of wintering ducks, it

emerged that a social organisation may be present and that ducks may exploit their wintering grounds as "functional units" (Tamisier 1974, 1985). There are many studies on the social requirements of ducks in winter (Tamisier 1974, 1985; Campredon 1982; Paulus 1983; Pirot *et al.* 1984; Allouche & Tamisier 1989; Tamisier & Dehorter 1997). These studies, combined with progress in behavioural ecology, provide a wealth of information about wintering strategies of several Anatidae. However, specific requirements vary considerably from species to species and populations from geographically distinct areas might have taken divergent courses of adaptation. The information has also been gathered mainly in Europe and North America while fewer data are available from southern parts of the wintering range.

Understanding the dynamics and wintering strategy of ducks requires the characterisation of their degree of behavioural variation to fulfil their needs in the face of a changing physical environment (Krapu *et al.* 1983). The aim was to record the abundance, spatial distribution and time budget of wintering ducks at Lac des Oiseaux and to focus on Teal *Anas crecca*, a common wintering species at the selected site.

## Study area

Lac des Oiseaux (36°46.800'N, 8°07.200'E) is a shallow lake of 70 ha which has an extensive area of open water (Figure 1). The climate is

Mediterranean and typically consists of two distinct periods: a wet season with warm winter and irregular rainfall (400-1200 mm year<sup>-1</sup> spread from October to May), and a dry and hot period of four months punctuated with Sirocco spells. This dessicating wind comes from the Sahara and has an overwhelming effect on the fauna and the flora. The vegetation is composed mainly of *Typha angustifolia*, *Scirpus lacustris*, *Scirpus maritimus* and scattered islets of *Nymphaea alba*. A belt of *Juncus acutus* surrounds the site which has recently acquired Ramsar status and is part of a large wetland complex spread over much of Numidia, northeast Algeria (Samraoui & Bélair 1997, 1998). Lac des Oiseaux is an important staging post and wintering quarter for a diversity of western Palearctic birds (Samraoui *et al.* 1992; Houhamdi 1998; Houhamdi & Samraoui in press).

## Methods

Systematic weekly observations amounting to 220 hours were made from October 1996 to October 2000 through a telescope 33x and a pair of binoculars 10x50. The spatial distribution was recorded on a map and time budget was monitored from 0700 to 0930 and noon to 1430, using focal sampling (Altman 1974). An individual duck was followed for 10 minutes and its behaviour recorded as one of five activity classes: feeding, swimming, preening, sleeping and flying. Additional observations were carried out at dawn and dusk to record ducks'

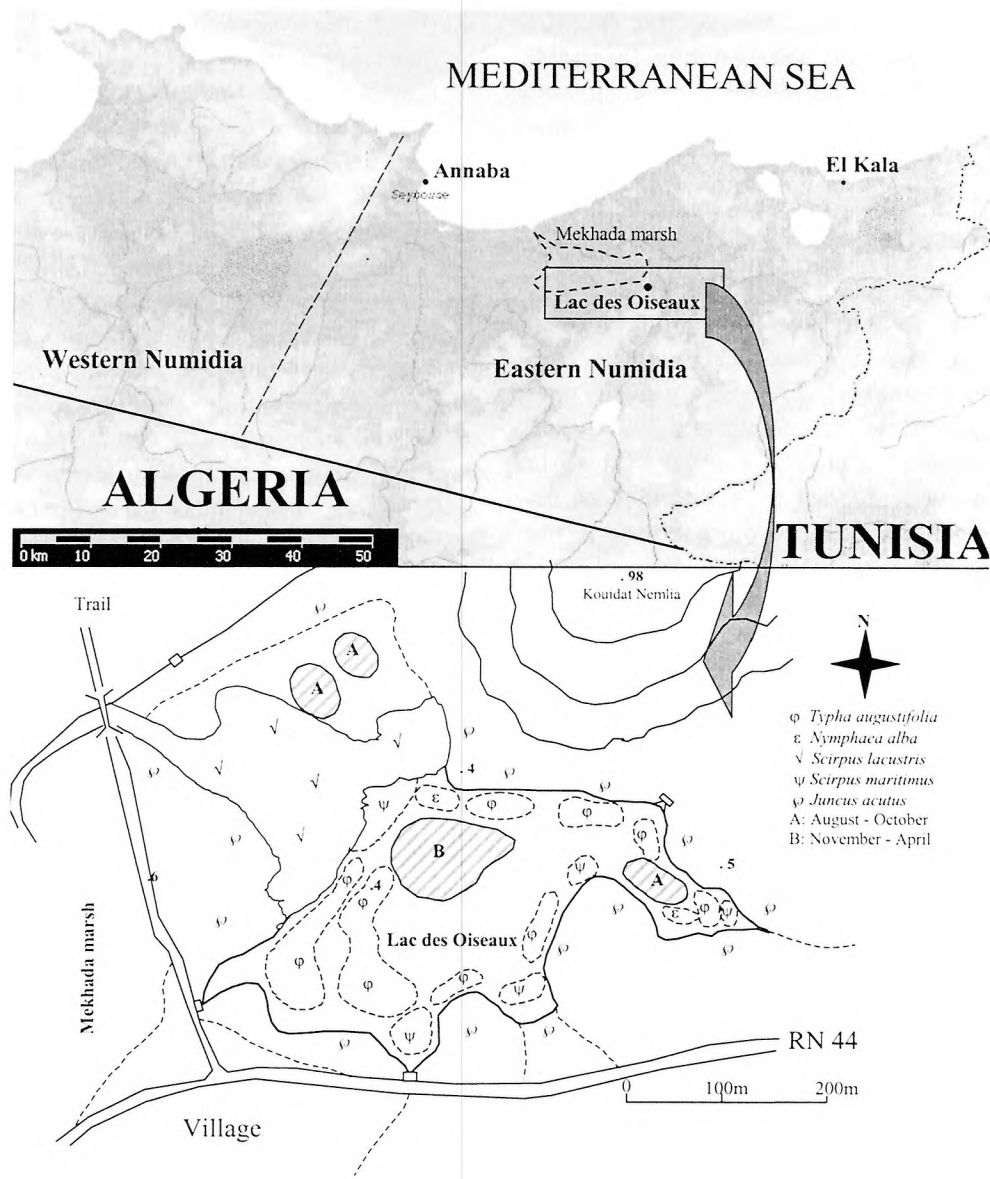


Figure 1. Maps of Lac des Oiseaux, northeast Algeria, showing the location of wintering Teal during 1996-2000.

movements between Lac des Oiseaux and other adjacent wetlands. Displayed percentage activity for the five classes of behaviour are averages across four years for each week.

## Results

Teal begin to arrive at Lac des Oiseaux at the end of August (**Figure 2**). Two major peaks occur in October-November (ca 1,300 ducks) and December-January (ca 2,300 birds). Early in January, numbers start to decline steadily to a relatively stable size until all birds leave the site at the end of April.

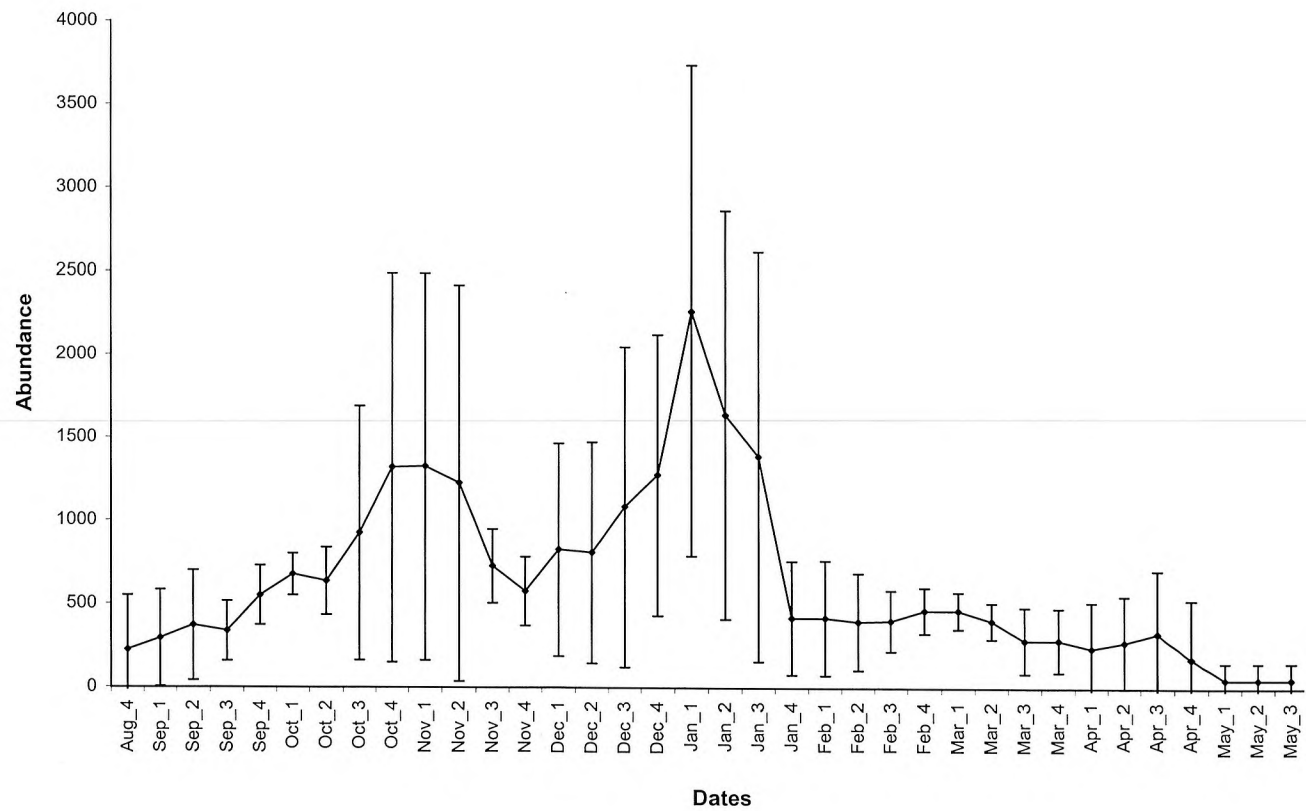
The pattern of spatial distribution of Teal at Lac des Oiseaux appear to be unchanged throughout the study period: upon their arrival ducks occupy northern shallow parts of the lake close to areas dominated by *Scirpus lacustris* and *Scirpus maritimus*. These parts are relatively secluded areas with the least human disturbance. The southern shore of the lake is visited fairly frequently by children and is thus often deserted by wildfowl. Between November and their departure, Teal regularly switched to the central, deeper part of the lake.

At dusk, ducks are observed to depart in the direction of the Mekhada marsh, a vast wetland (over 10,000 ha) dominated by *Scirpus maritimus*, *Scirpus lacustris* and *Typha angustifolia*, and at dawn are seen to return from the same direction. These records have been supported by direct observations of nocturnal feeding of Teal in the

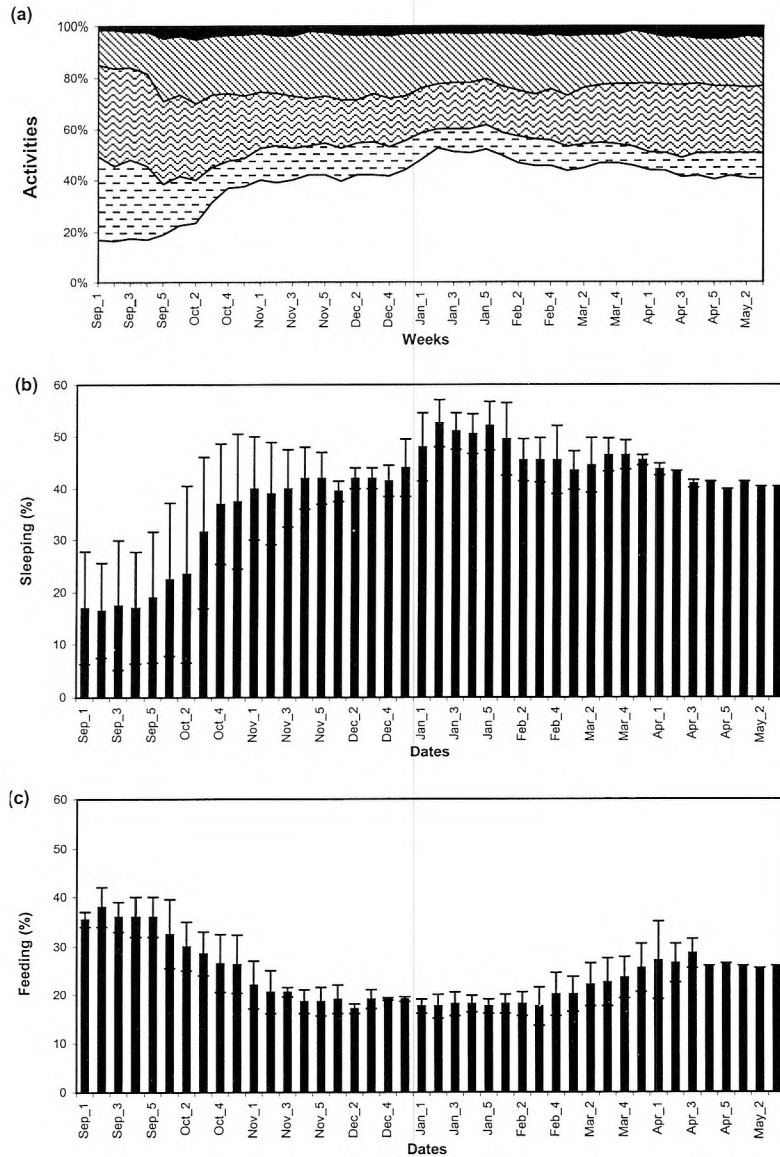
Mekhada marsh (unpublished).

The records of diurnal time budget of Teal at Lac des Oiseaux reveal that sleeping dominates all other activities with 45% (**Figure 3a**), followed by feeding (19%), swimming (18%), preening (13%) and flying (15%). The part devoted to sleeping steadily increases until it peaks in mid-winter. Time allocated to sleep remains high until ducks depart from the site (**Figure 3b**). A high percentage of diurnal time is spent feeding after ducks arrive at Lac des Oiseaux but this activity gradually decreases until mid-December before rising once more from March onwards (**Figure 3c**).

There is considerable between years fluctuations in the swimming activity of Teal (**Figure 4a**) but data suggest an increase of this behaviour, probably correlated with pairing and agonistic display, between end of September and December, followed by a relatively steady decrease of this activity during the rest of the wintering period. Preening is a major diurnal activity for Teal at the beginning of the wintering period (**Figure 4b**) but the percentage of time devoted to this activity decreases fairly rapidly and by mid-October it reaches a level which remains relatively constant throughout the rest of their stay. No significant trend over between and within years can be assigned to the flying activity of Teals (**Figure 4c**). This latter behaviour was usually prompted by Marsh Harrier *Circus aeruginosus* and occasionally by humans.



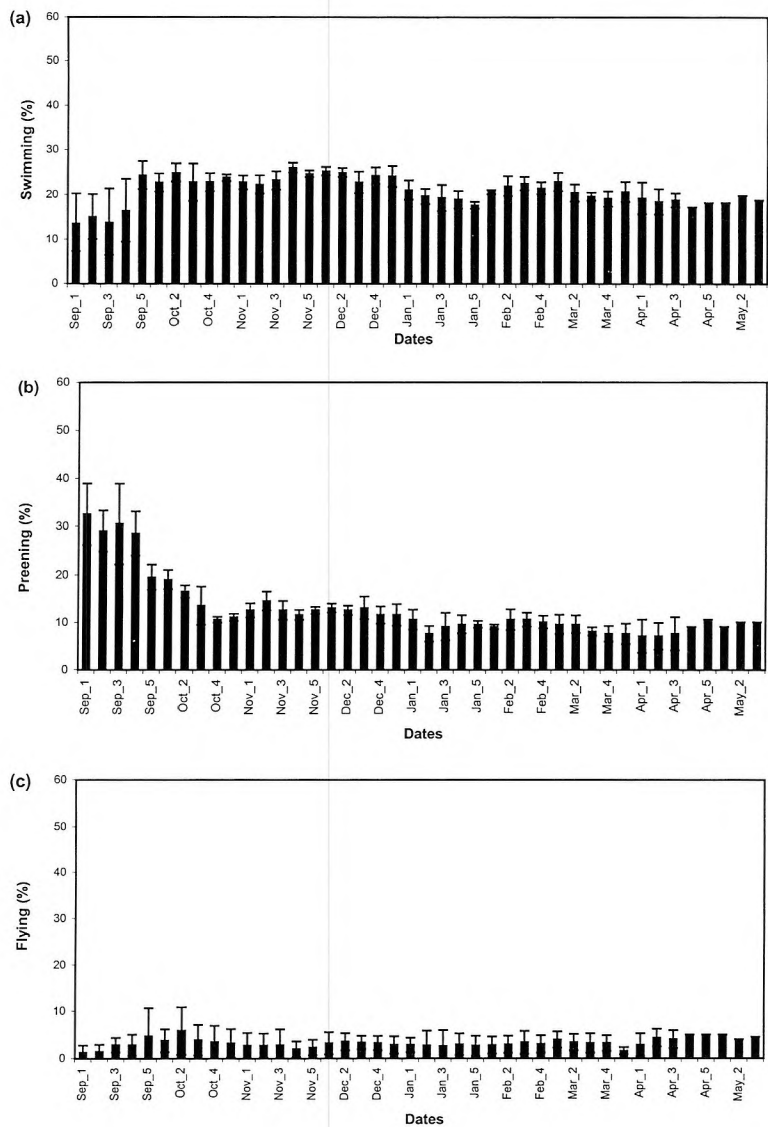
**Figure 2.** Weekly counts of Teal at Lac des Oiseaux for four periods: 1996-2000. Vertical lines are standard errors.



**Figure 3:** (a) Percentage of time allocated by Teal to diurnal activities:

■ Flying, ▨ Swimming, ▩ Feeding, ▤ Preening, and □ Sleeping.

Data have been averaged over four wintering periods. (b) Percentage of time allocated by Teal to diurnal sleeping at Lac des Oiseaux for four periods: 1996-2000. Vertical lines are standard errors. (c) Percentage of time allocated by Teal to diurnal feeding at Lac des Oiseaux for four periods: 1996-2000. Vertical lines are standard errors.



**Figure 4.** (a) Percentage of time allocated by Teal to diurnal swimming at Lac des Oiseaux for four periods: 1996-2000. Vertical lines are standard errors. (b) Percentage of time allocated by Teal to diurnal preening at Lac des Oiseaux for four periods: 1996-2000. Vertical lines are standard errors. (c) Percentage of time allocated by Teal to diurnal flying at Lac des Oiseaux for four periods: 1996-2000. Vertical lines are standard errors.

## Discussion

The present data utilise diurnal observations and thus can only give a partial overview of the time budget of wintering Teal at Lac des Oiseaux. These preliminary observations support data gathered elsewhere (Tamisier 1970, 1999) and point to a distinct pattern of behaviour dominated by sleeping throughout the wintering period (unpublished). A pattern of diurnal behaviour of Teal emerges from the study. Upon arrival, post-migrating ducks having presumably depleted their somatic reserves need to meet heavy energy requirements which cannot be answered fully by nocturnal feeding. A large portion of their diurnal activity is taken up by feeding in exposed, flooded parts of the site, far from any human interference. A great deal of time is also allocated to preening in the first few weeks as many ducks arrive in eclipse plumage. This period (end of August-October) may correspond to the "restoring period" (Tamisier & Dehorter 1997; Tamisier 1999).

The energy used to fulfil metabolic needs is expected to increase in mid-winter as temperature drops and a new pattern of activities is recorded, demonstrating the flexibility of the Teal's behaviour: during this second phase, time allocated to preening and feeding is curtailed as energy requirements are presumably met with night-time lengthening. This phase, which may correspond to the "pairing period" (Tamisier & Dehorter 1997;

Tamisier 1999), is marked by an increase of day-time sleeping (an efficient way to regulate body temperature) and swimming as ducks engage in agonistic and courtship behaviour prior to pairing (Johnson & Rohwer 1998).

As ducks are confronted with different requirements which correspond to distinct wintering periods, the third phase, the "fattening period" (Tamisier & Dehorter 1997; Tamisier 1999), displays a rise once more in daytime foraging as ducks prepare to migrate back to their reproductive quarters. However, it is not clear whether ducks are attempting to store up lipid and protein reserves or simply meeting their daily requirements as due to their smaller size, Teal might be unable to accumulate sufficient body reserves for reproduction (Rave & Baldassarre 1989; Paquette & Ankney 1998).

The data are consistent with results of investigations carried out in Europe (Szijj 1969; Tamisier 1974, 1985, 1999), although a direct comparison is not straightforward. One possible difference with the Camargue studies (Tamisier *et al.* 1995) is the larger proportion of time, at Lac des Oiseaux, devoted to diurnal feeding which might be accounted for by a larger need for local ducks to restore reserves after the Mediterranean crossing. Where energy depletion is more intense, ducks need to allocate more time to feeding.

As Teal apparently commute every night between Lac des Oiseaux and the



Mekhada marsh, the observations suggest that the model of "functional unit system" (Tamisier 1974, 1985) might well be applicable to the tandem Lac des Oiseaux-Mekhada marsh with the former playing a dual role of a resting and a feeding area. Recognition of the role of the Mekhada marsh for the biodiversity of the region has long been overdue. It is feared that the construction of the Mexenna dam on the river Kebir which winds its way through this unprotected marshland of 16,000 ha, may impact negatively on its function as a nocturnal feeding ground for waterbirds.

Future studies that focus on nocturnal behaviour, pairing, and the use of putative "functional units" may further the understanding on the winter exploitation of local wetlands by waterbirds.

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