

Original Research

"Gregariousness" behavior of little grebe *Tachybaptus ruficollis* (Pallas, 1764) at Morocco.

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ABSTRACT:

This study aims to identify the "gregariousness" behavior of the little grebe *Tachybaptus ruficollis* at Morocco from 2013 to 2014 in the hilly reservoir of Hassar dam in the province of Mohammedia at Morocco. The number of species varied to a great extent between January 2013 and August 2014. The population in 2013 was affected by high mortality probably due to intoxication after the release of highly polluted wastewater from the city of Mediouna, the village of Sidi Hejjaj and other villages present in the upstream of the dam reservoir.

We recorded 1492 individuals in January 2013 (the highest density of the species in Morocco) and the number fell sharply after then, and start increasing in May 2014 to reach 577 individuals in August 2014.

The population living in an area not exceeding to 1 km² manifest gregariousness behavior consistent with the groups that can reach 180 individuals at some instances. During breeding, the species showed no gregarious behavior and are seen only as pairs. These singles are usually remote and hounded by couples.

Keywords:

Little Grebe, *Tachybaptus ruficollis*, gregariousness, Hassar dam, Mohammedia, Morocco.

Web Address:
[http://jresearchbiology.com/
documents/RA0515.pdf](http://jresearchbiology.com/documents/RA0515.pdf)

Article Citation:

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Journal of Research in Biology (2015) 5(3): 1676-1688

Dates:

Received: 29 Mar 2015 **Accepted:** 30 Mar 2015 **Published:** 15 May 2015

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INTRODUCTION

The Hassar dam is a new hydrological infrastructure was commissioned in March 2005, but it houses a rich wildlife, varied with very high number of individuals especially the *Fulica atra* and *Tachybaptus ruficollis* (Rihane, 2014). These species exhibit a gregarious behavior in this environment.

Gregarious behavior or gregariousness is well known in many animal species and their herd instinct is known to all eco-ethologists and sociobiologists. The definition given by the CNRTL (2014) is that *the gregarious instinct is the instinctive tendency that drives individuals of the same species to come together and adopt the same behavior.*

According to the universal encyclopedia, gregariousness is defined as follows: It is a *"trend that pushes the individuals of same species to group by mutual attraction based on the issues and stimuli captured from one animal to another. Gregarious groups are distinguished by the crowd, where people come together under the pressure of environmental constraints."*

In birds, the gregarious state is well known among many species that aggregate in the presence of specific factors and disperse once the factors are absent.

Migration, reproduction, defense, group feeding are factors that can cause gregarious states. Thus the birds are grouped in pairs, families, troops or colonies. In some cases, birds exhibit herding behavior during sleep "dormitories".

The family of Podicipididae is a several species of birds having herd behavior, the best known is the Black-necked Grebe *Podiceps nigricollis* that shows gregariousness during winter. This attitude gives them additional security for reproductive episode (www.oiseaux.net, 2014). In Morocco, Cherkaoui *et al.*, (2013) studied the breeding population of this species in the Middle atlas. In addition to the present observation the Great Crested Grebe *Podiceps*

cristatus, are more lonely present.

In our case, the Little Grebe is known more solitary or in loose groups: *"After breeding the species undergoes a flightless wing-moulting period during which it may assemble in loose groups (Fjeldså 2004) (up to 700 Individuals) (Snow and Perrins 1998) and also behaves same in feeding rich areas (Fjeldså 2004). During the winter season the species is found to be largely solitary and occurs in small groups of 5-30 Individuals (Brown et al., 1982; Snow and Perrins 1998)"* (IUCN, 2014)

In the present study, which began in the lake of the Hassar dam in 2013, there seen more gregarious behaviour outside the breeding season.

Study area

The dam is located between 33°33'00,82 " and 33°34'28,90"N and 7°25'27,27 and 7°26'04,54"W in the province of Mohammedia, rural district of Chellalate (Fig.1).

This small reservoir water, pours through a valve in a pipe that runs along Oued Hassar to the waterfall. This water is used mainly for the irrigation purpose.

On the edges of the lake, the vegetation is rare, especially on the right bank. On the left bank, a few groves of *Acacia torrida* persist near an old immersed farm house and a belt of *Juncus acutus* are heavily grazed by livestock. The recent installation of the lake has not allowed the development of a characteristic vegetation, except some *Tamarix gallica* that persist to the strong grazing and some areas of reeds, tall grass *Rumex sp* and *Ruppia maritime* with rare species like *Ranunculus aquatilis* and *Spirogyra sp*. These latest plants are used by water birds to make their nests eg; *Podiceps cristatus*, (grebes), *Fulica atra* (coot) and *Tachybaptus ruficollis* (grebe).

The impoundment of the dam is dependent on weather conditions and the opening the of valves. The only water resource of the lake is , Oued Hassar which collects water from the very limited rainfall catchment

Table 1: Specifications of the Hassar Dam.

Parameter	Specifications
Name of the Dam	Dam Hassar
Name of the wadi	Oued Hassar
Date of completion	2004-2005
Date of first impounding	March 2005
Province	Mohammedia (some in the province of Mediouna)
Town	Rural town of Chellalate (some in the town of Sidi Hajjaj)
Length of the dam	160 m to the peak
Total length of the reservoir	3.3 km
Max.	250-350 m
Capacity	2, 3 Million ^m ³
Catchment area	284 km ²
Destination	IR-PI-Pi-AC *

* IR: Irrigation, PI: Piacenza, Pi: Protection against floods, AC: Watering livestock.

areas; This Oued also receives wastewater from the upstream villages.

The depth of water exceeds three meters in some places; this protects the bird against predators (foxes, stray dogs, cats etc ..).

However, it is noted that the water in the reservoir is not used by the resident neighbors of the lake but by farmers for irrigation.

Figure 3 summarizes the evolution of the water level in the reservoir since 2012.

We noticed that in 2013, the major water was received during winter and spring periods (heavy rains in March and early April), while the limited quantity of the water was stored in summer and before autumn rains.

Moreover, 2014 experienced a sharp reduction of water that could be explained by:

- Low rainfall during the growing season (2013-2014),
- High demand in downstream irrigation water,
- High evaporation caused by heat waves in May 2014.

The evolution of the water level on the dam plays a very important role in the group or scattered populations of birds living in the lake. The little Grebe doesn't occupy the southern or northern part of the lake, because of its dryness during the dry season or during low rainfall (as in 2014), so the little Grebe tends to occupy the central portion.

MATERIALS AND METHODS

Wildlife study methods

The first bird census study was conducted in the winter season on migratory birds. But high number of certain species has attracted the attention and it is found that there is necessary to conduct further study on seasonal variations of the fauna and the reproduction of some species such as the *Tachybaptus ruficollis* (Little Grebe).

For this, we used a pair of binoculars, a telescope and a reflex camera with a 50-500mm zoom.

Enumeration and identification of birds are done directly, sometimes it is difficult to identify due to the constant back and forth movement of the birds and the very high number of certain species.

To remedy to this problem, a series of photographs were taken covering much of the lake, then the birds were verified for its identity; the number of birds was counted based on the photos. This method proved to be more reliable and accurate than counting thousands of birds in the field with approximations.

Furthermore, the use of the photo helped us to verify the identification of some species especially birds that tend to move away to the opposite shore.

The wildlife monitoring is carried out for two years from 2013 and 2014 with 4 companions (two winter and two in late spring and early summer), but it felt very important to take monthly statements.

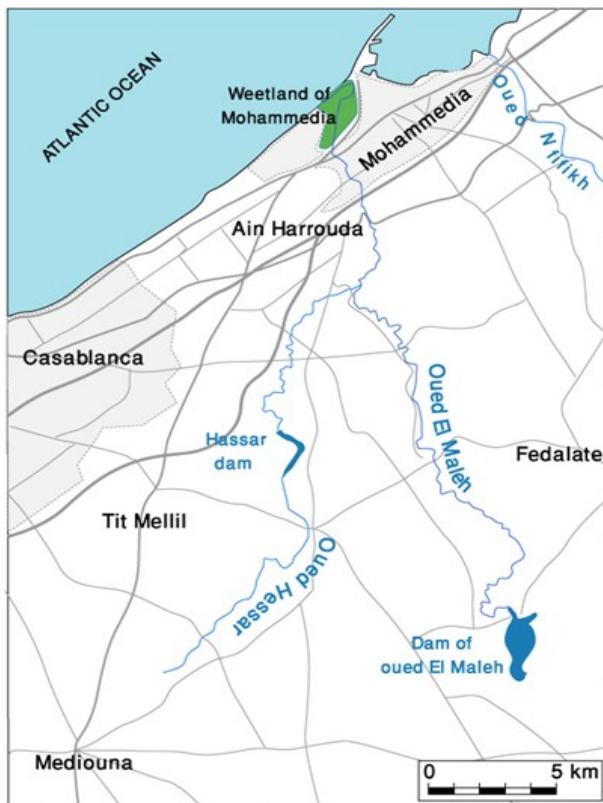
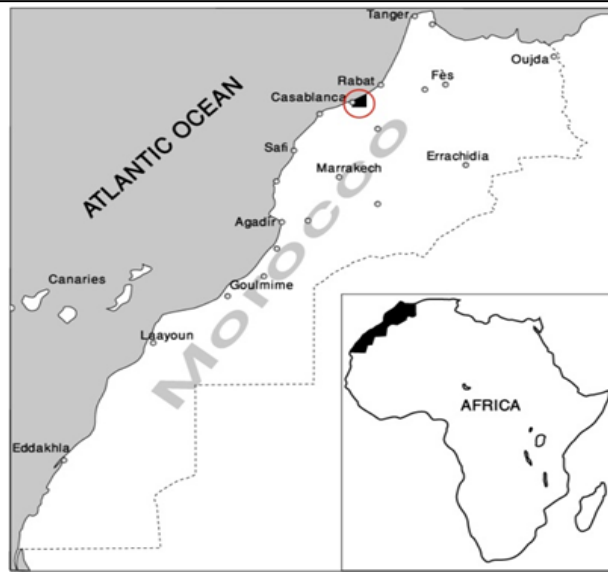


Figure 1 : Location maps of observation and study of the behaviour of Little Grebe in Hassar dam near Mohammedia

Presentation of bird under Study

The little grebe *Tachybaptus ruficollis* is a resident and common resident species but also a winter visitor.

From the synthesis of Thevenot *et al.*, (2003), the species is present in the wetlands along the

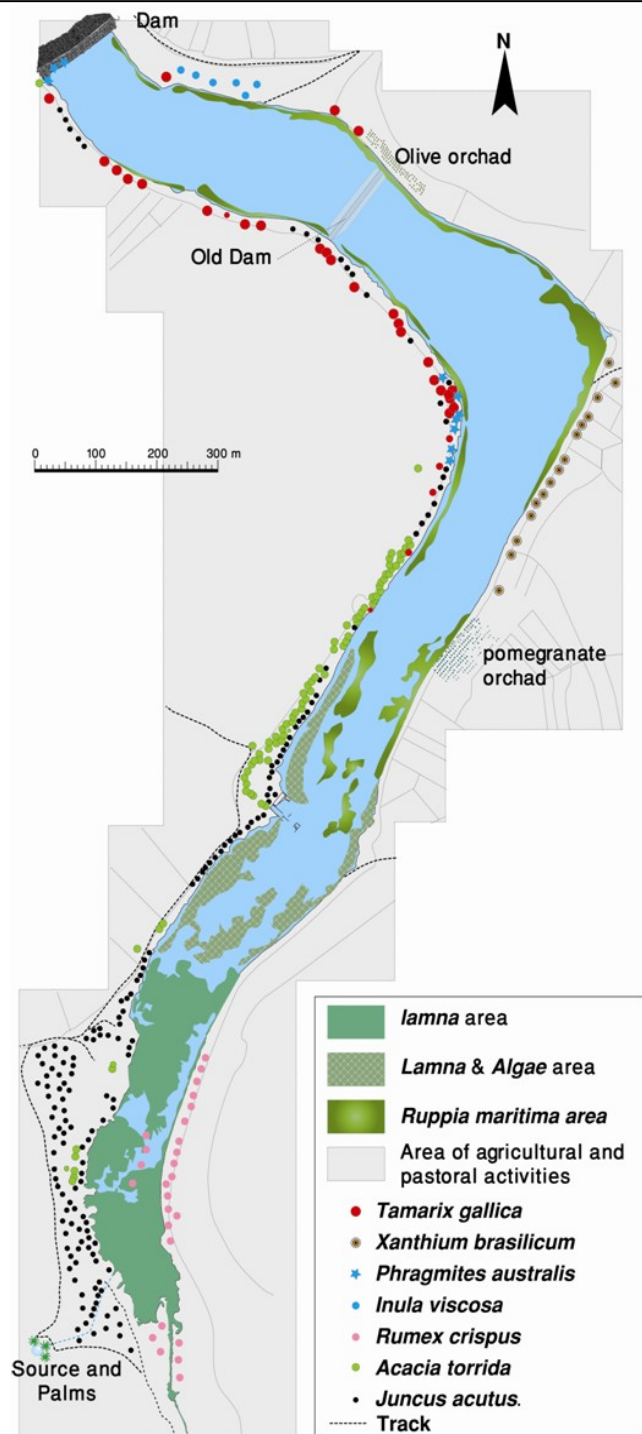


Figure 2 : Dimensions and characteristics of Hassar dam.

Mediterranean and Atlantic coasts until under the South. In eastern Morocco in the estuary of the Moulouya, in the Rif, to the dam of Al Hoceima, Restinga Smir -and along the valley of the Lower Loukkos in Atlantic Morocco, Merja Bargha at Merja Halloufa, Moulay Bouselham in Sidi Boughaba in Sidi

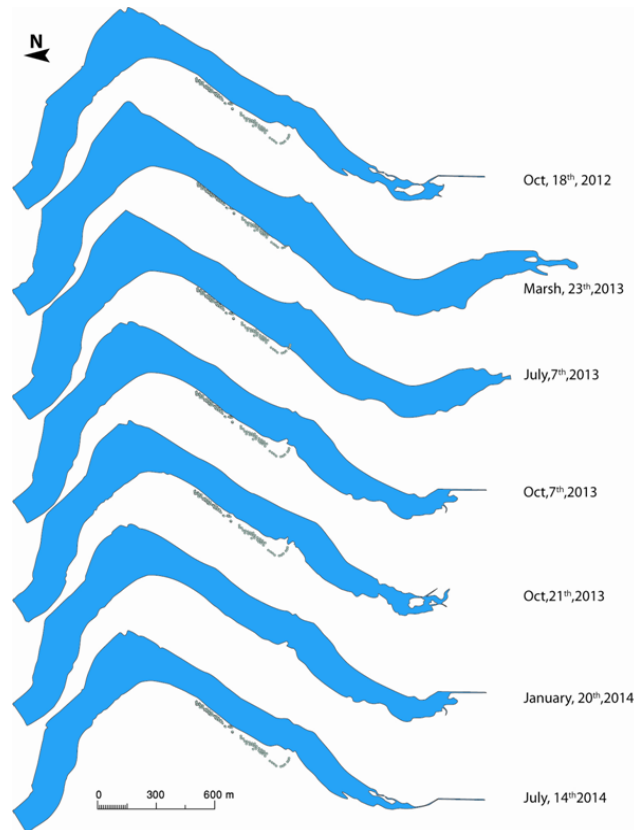


Figure 3 : Evolution of the waterbody in the reservoir of Hassar dam from 2012 to 2014.

Moussa-Oualidia, to estuaries Sous Massa, in the Saharan regions, Seguia Al Hamra near Laayoune, and bottom Draa near Goulmime.

The species also reproduced inside the country (Thévenot *et al.*, 2003) in the plains of north and central Atlantic Morocco (Gharb, Zemmour Zair, Doukkala, Haouz) in Sais (Aguemguem, Ain El Ouata and Douiyet) in the Middle Atlas (Annouceur, Amrhass, Zerrouka and Dayets Aoua and Afourgah) in the plains of eastern Morocco (dams Mechra Homadi and Mohamed V) in the highlands of eastern Morocco (near Debdou) and East Sahara (Tafilalt).

In the study area, Little Grebe breeds in the dam Oued El Maleh, in the wet zone of Mohammedia, in the permanent arms of Oued El Maleh and the Hassar dam (Rihane, 2014).

The number of eggs in the nests were studied in the four Wetlands of Mohammedia which varies between 3 and 8 (3, 5, 7 and 8) whitish eggs that get dirty quickly and viewed in red ochre (photos 2-4).



Photo 1:Two little Grebes in the Hassar dam, one is in breeding plumage and the other is in non- breeding plumage (March 15th, 2014).



Photo 2 : June 9th, 2011- Nest with five eggs, crafted using of algae and supported by the branch of a *Tamarix*.



Photo 3 : June 9th, 2011- Nest with three eggs crafted using of seaweed and various branches and floating directly on the water.



Photo 4 : June 9th, 2011- Adult incubating the nest with five eggs



Photo 5 : June 16th, 2011- Nest with 8 eggs, crafted using of algae and water plants (*Ruppia* and *Ranunculus*) and built on the branches of a dried shrub.

In Hassar dam, the nest is built directly on the water raft of aquatic plants mainly on *Ruppia maritima* which largely colonized the lake. After building the nest, couplings (Mating) are generally done on the nest (Photo 6).

During the period beginning with spring and ending in early July, the Little Grebes behave as couples and quarrel for their territory. The tendency to gregariousness or group behavior hasn't been observed here. The nearest nests are separated by more than six meters and can still hear the cries of threats and alarm among the closest couples.

Reproduction of this bird is threatened by egg collectors who are generally unaware children and unconscious shepherds, foxes, stray dogs and cats. But

the closest nests on the shallow banks are easily destroyed.

In general, the nests, being built on rafts on the surface of water are constantly under the threat of strong winds.

Evolution of workforce

The Hassar dam has the highest density ever recorded in Morocco with 1,492 individuals in January 2013 for a total area of 1 km² (total filling of the dam) which is about 15 individuals / Ha. The highest number recorded in Morocco was in January 1992 in the coastal swamps of Loukkos with 1234 individuals in 1300 Ha (Daki *et al.*, 2011), with a density of 0.95 inds / Ha.

From June 2013, the number has dropped too because of high mortality that affects this species



Photos 6 : a-submission of the female, b-mating, c- post-mating behavior. (February 5th, 2014)

(Rihane, 2014).

Figure 4 summarizes the evolution of the density of the Little Grebe on Hassar Lake.

In autumn and winter, the birds tend to disperse in all permanent or temporary water bodies, which explains the low densities recorded in the region.

Increasing density recorded during the summer is due to the limited availability of water and concentration of birds in the reservoir (especially food abundance and relative protection by the guards of the dam).

Despite occasional and uncontrolled waste water discharges and pollution, the lake sources remain as the least polluted in the region and we have no cases of eutrophication, or algal bloom. The installation of the treatment station of Mediouna greatly limited the

discharge of waste water from the town in Oued Hassar.

Herd behavior: Gregariousness

The region was studied since 2005 especially in the wetlands of Mohammedia but we have never observed a gregarious behavior or even a tendency to gregariousness. In general, small groups of a few individuals move together in different bodies of water studied.

At the annual census of 2013 in the Hassar dam, we were surprised by the high concentration of the water in little Grebes (*Tachybaptus ruficollis*) and coots (*Fulica atra*)

In every corner of the dam, Little Grebes groups are formed; become consistent, split into small groups and sometimes small groups merge into large groups in

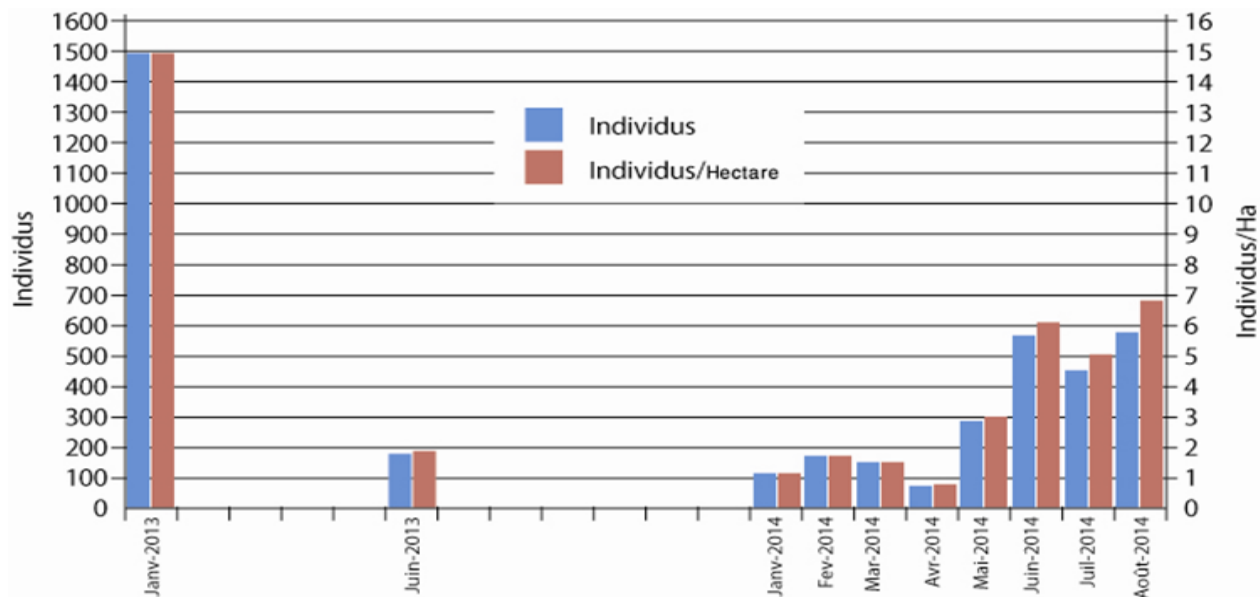


Figure 4 : Evolution of numbers and densities of the Little Grebe in Hassar dam between

which individuals are very tight.

Photo-7, take from the north to south of the lake, we can distinguish four coherent groups of Little Grebe of which two are in the process of merging (black arrows).

The group always takes the same direction of movement guided by individuals in the lead. sometimes the grouping of individuals is done quickly and within few minutes, the numbers may exceed one hundred in some cases (photo 8).

The dispersion is slow either by removal of individuals from one another, or by separation of (scindement) large groups to smaller and less populated groups.

Among these groups, some exceed 100 individuals. We could count 173 individuals in a group (Photo 8). This group is becoming looser and individuals are separated thereafter.

Another group moving towards the left bank of the lake (photos 9 & 10) is more consistent and individuals are tighter. Sometimes some Coots *Fulica atra* mingle with these groups without embarrassment.

The eight groups counted so far (Fig. 5), together have 806 individuals either 54.02% of the local population of this species, while small groups, isolated individuals or couples form 43.98%.

The formation of groups, can sometimes last for several hours (some lasts over 3 hours). In some cases, large groups can split into two small groups and in other cases small groups merge into larger groups.

In 2014, we observed more closely, the formation of several gregarious groups and their separation. We photographed several groups in July; the one presented here in a series of photos (10 Photos)

1. A small group is formed of 30 individuals (11h: 25 min)
2. After a minute, the number becomes 48 individuals.
3. The number of members in the group reached another 89 individuals in a minute.

4. The group shows a state of instability and consistency becomes loose.

5. At 11:45 min, the group gathered and become more consistent with 68 individuals.

6. The number continues to increase rapidly, reaching 78 individuals in a minute.

7. At 11:49 min, the number quickly reached 138 individuals.

8. This group split into two groups; 85 individuals were oriented north and the rest to the south.

9. At 11:56 min, grebes gathered again in one tight group of 163 individuals and 173 in a minute.

10. The group stays together for 45 minutes.

11. A small group split from the main group and moved towards the south (12: 39min).

12. At 12h 45 min, the group split itself into two.

13. The rest of the groups are moved toward the north.

During the gathering of individuals, we did not record any audible sound or characteristic call expect the trilling voice "bibibibibi ..." well known of this species. All moved at the same speed in the same direction and towards the open water and become free. The group remains consistent and individuals are much tighter.

During splitting, we can see disorientation in the middle of the group of individuals who choose to end the direction of one or the other subgroup.

Not far from this large group, another small group of about thirty individuals form and then disperse continually showing a very low degree of coherence.

Finally, some authors such as Fitter *et al.* (1974) suggest that winter troops have a set of clearly established social relationships and cohesion resulting from birds following each other both in flight or during meals, also birds have brands specific signals that are used to maintain the cohesion of the troupe. In our case, there are indications that the observed gregariousness are related to food (freshwater shrimp or small fish benches).



Photo 7 : Four Little Grebes groups in the southern part of the lake (black arrows). Note the high density of Coots. (January, 12th 2013).



Photo 8 : Group of 173 individuals Little Grebes, which begins to disperse (January 12th,2013)



Photo 9 : Coherent group of 96 individuals of Little Grebe. (January 12th,2013)

DISCUSSION AND CONCLUSION

From this study, we identified two elements of behavior in grebe: individualism and gregariousness.

In this family, gregariousness of groups with high and consistent groups is better known than the

Black-necked Grebe. So gregariousness studied here, which is a consistent gregariousness, is also an original behaviour of little Grebe.

During the breeding season, the birds are usually held in pairs for defending a breeding territory, building

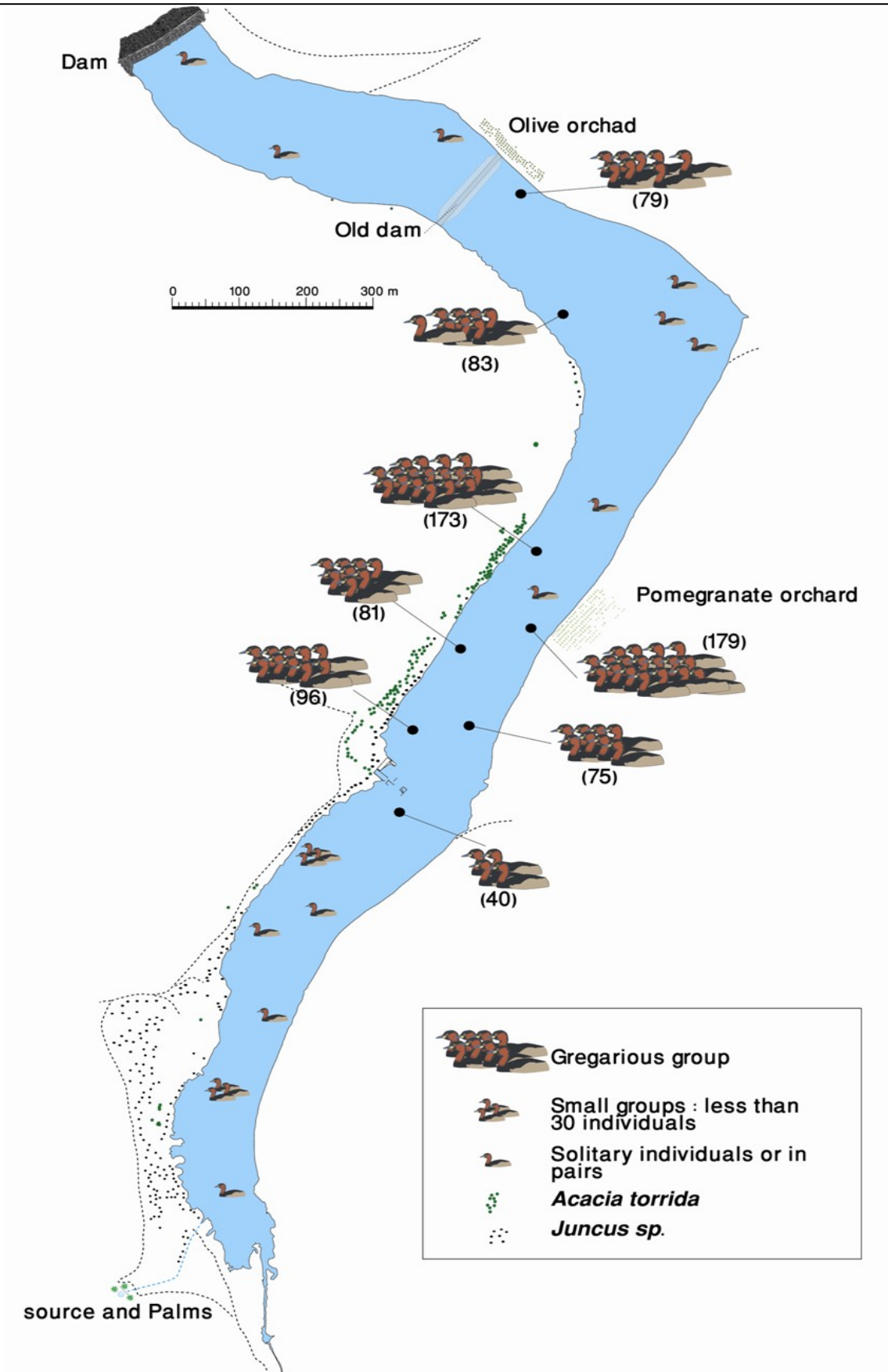


Figure 5 : Distribution map of Little Grebe's gregarious groups in Hassar lake (January 12th,2013)

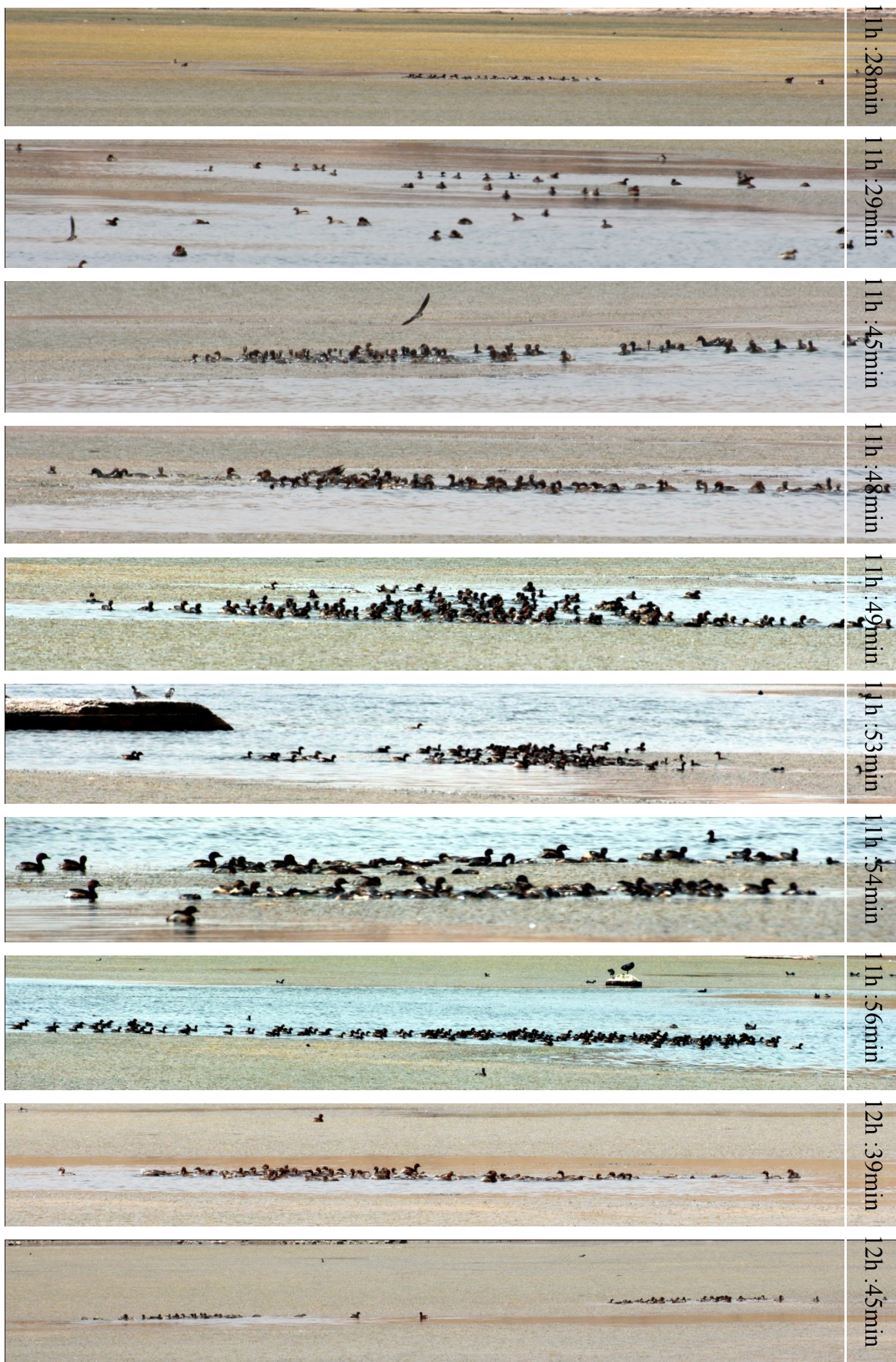


Photo 10 : Chronology and evolution of a group of Little Grebes at Hassar Lake (July14th,2014).



Photo 11 : Aspect of coherent gregariousness: individuals are very close (some Coots mingle with the group). (January 12th,2013)

nest, mating, laying eggs, breeding and raising their offsprings.

Outside this period, dense populations of Little Grebe tend towards a gregarious behavior with groups (crowds or troops) gathering or spitting triggered by particular behaviours.

Comparing the census in January 2013 and January 2014, we note the absence of gregariousness in this last year, as in 2013, we identified 1492 against 178 in 2014. The mass effect is shown here due to the factors triggering gregariousness. When numbers begin to rise in June, July and August 2014, gregariousness behaviour reappears. So the environment has a part in the emergence of the "gregarious" behavior.

Richard, 1975, discusses the importance of the environment in animal behaviour referring to a text from Skinner (1938), *"It is used to see nothing more in the environment than the place in which animals and men were acting. True, it could happen that they act differently in different environments, but not because the environments were different. The environment was there*

as an indispensable stage clean may promote or hinder behavior, but he doesn't determine the frequency or form "

When raptor attacks such as the Marsh Harrier and hawk these groups of Grebes, they remain more united and more consistent than the other birds such as Coot, which disperse and provide a great opportunity to capture the juveniles of these birds. Gregarious birds always take profits and benefits of this behavior (Fitter *et al.*, 1974):

- Group life increases the security of the individual who lives in groups that feed into clear areas. A predator would have little trouble getting hold of a solitary bird but will be embarrassed by the mass of volatile if it attacks a large troop.
- Birds feel more secure when they are grouped, there's a good chance that they could eat better because they can devote themselves entirely to this activity.
- Grouped birds easily find favorable feeding places and food that are distributed fairly.

The training group (band), orientation and

number are characteristic of the species, its habitat and it triggers this behavior.

It remains to find.,

- What other factors or vectors linking the environmental event in the animal that behaves (here gregariousness) in such a way in this environment?
- What are the stimuli acting directly or indirectly in triggering this behavior?
- How individuals govern to develop coherent gregarious behavior?

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