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The interaction of environmental and anthropogenic factors on the distribution of one species of Anura *Pelophylax saharicus* in El -Kala sub-humid areas' complex.

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ABSTRACT

Background: El Kala National Park was for many years the heart of a wetland conservation issue. Several hectares of wetlands have been lost and damaged in fire. Almost all of these areas were backfilled to enlarge land along Lake Tonga the result of increased human population and activities. Wetland habitats are known to be very rich backgrounds in different ecological processes and natural biological integrity. **Aims:** This study is devoted to in-depth knowledge on the favorable places in anuran populations' settling to highlight the influences of anthropogenic and environmental factors on their distribution in Tonga sub-humid areas' complex, an inventory was conducted from February to July 2011 at three sites of the area. It is based on a quantitative sampling of specimens, metamorphosed at 3 sites with different abiotic and floristic characteristics, with five stations at the low plain of Oued el Hout (urban), six stations in the dike (protected area) and four high altitude stations (forest area). Among anura species marked across the country, one species is remarkable: *Pelophylax saharicus*, this species was recorded in the surveyed regions and who will be the model of our work.This species was noticed during our field trip. **Materiel and methods:** Only 15 stations out of the 24 sampled have shown the presence of our Anura species, 5 stations in Oued el Hout swamps region (adjacent forest, temperate marshes on the right of the road and left, near lake Tonga, right on the lake shore, the flooded meadow), 6 in the swamps of the dam reserve (an area on Lake Tonga, 5 temperate marshes left of the asphalt road) and 4 stations in the Oued Bougous region (2 stations near the river and the 2 others in the forest of El Ghorra). **Results:** From the analysis of different stages of the study, it specifically appears that the marshes of small surface show the largest number of this species, shallow and rich in vegetation, and the best-provided site with anuras and marshes is that of the dike reserve. **Conclusion:** The fluctuation in anuran species' number in the study area is due to the increase in human population and their activities such as construction of linear infrastructure (roads, construction sites).

KEYWORDS: Anura, Pelophylax saharicus, Oued Bougous, El Ghorra, Oued el Hout, dike Lake Tonga.

INTRODUCTION

For an animal, the success of a movement in a landscape (Eg, from a habitat patch to another) depends on two main factors: its ability to notice the target habitat patch and to reach it. Detection is a problem of perception (ie, "perceptual range" sensu [1]) and this can vary depending on species, distance and weather [1,2,3].

To date, little were the experiences conducted on amphibian's hydric balance to address the problem of anthropogenic disturbance, which generate dry conditions, and their impact on amphibian populations.

El Kala National Park was for many years the heart of a wetland conservation issue. Several hectares of wetlands have been lost and damaged in fire. Almost all of these areas were backfilled to enlarge land along Lake Tonga the result of increased human population and activities. Wetland habitats are known to be very rich backgrounds in different ecological processes and natural biological integrity.

The study prime objective is to deepen knowledge on the state of anuran populations' places mainly two species in El Kala wetlands' complex and their distributions to provide important data on the changes of local populations. This data can then be used to:

- Understanding how populations within the landscape mosaic work.
- Identify the most attractive geographical areas, and habitats that need to be protected to prevent the disappearance of more Anura species.

MATERIAL AND METHODS

The studied area:

The study was conducted at the El Kala National Park (EKNP) which houses the country largest wetlands complex. It covers an area of 80000ha. It is in the extreme north-eastern of Algeria, bounded by the Mediterranean Sea to the north, Medjerda Monts in south, the Algerian-Tunisian border to the east and Annaba plains to the west. This complex includes lakes and wetlands in particular Lake El Mellah, Oubeira and finally Lake Tonga, a set of broad marshes rich in nourished vegetation mostly by Oued (El Kebir and El Aroug Bougous) tributaries, and from (Bouredim, Bougles and Oum El Bhaim) spring. The complex is perfectly suited to lush vegetation from the banks of Oued Bougous till the river mouth where the vast oak forest of Zeen Djbel Ghorra lies. While in the Tonga two areas lake and wetlands, two cork oak forests are developing: on the one hand Wadi El Hout forest in Lake Tonga Eastern side ,and in the other hand the reserve forest on dike swamp western side. The dam, which is El Kala one of the most important protected natural areas, and is definitly unique. In 1998 as forestry techniques experimentation area, the dam was then strictly devoted to protection and research based on natural processes observation. It was only eight kilometers away from Oued El Hout and fifteen kilometers from El Kala city, it lies within Tonga forest area. Despite its small surface, the dam reserve was selected to host ecology research program.

Prospecting method:

Twenty-four sites were counted and explored from the study area. They are divided into the complex different hydrological units. Fifteen stations were chosen including five stations located at Oued El Hout low plain region and adjacent forest temperate marshes; six at the dike reserve between Lake Tonga Highway and temperate marshes and four stations located in Bougous chosen region between Oued Bougous estuary and El Ghorra forest part.

The study was conducted from February to July 2011-2012, suitable time to meet anuran species' abundance peak in the site.

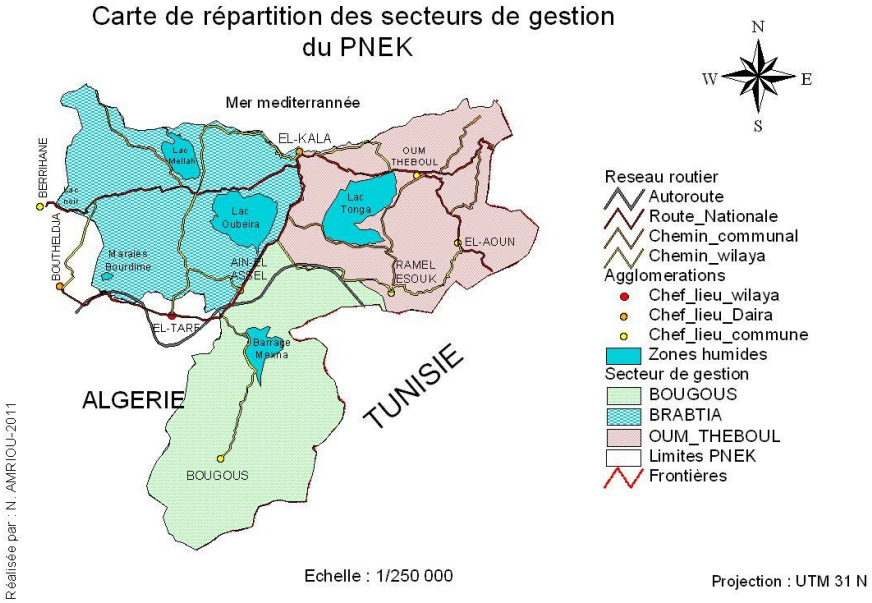

Fig. 1: Location of El Kala national park surveyed stations.

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Anura species detection protocol:

Anura detection relies on looking for adults, either in water or on land using a dip net and a flashlight.

- For early species' detection day-passing was carried out between February and March
- For lakes and deep pools, counting was done from the edge.
- In each of these passages, we traveled proximal land routes, while lifting the stones, the dead wood on the ground, close and around the water point.

Results:

Only 15 stations out of the 24 sampled have shown the presence of our Anura species. This species was observed during our inventory of the study area.

HAF = Oued El Hout adjacent forest
TMRF = temperate marshes right of the road near forest
TMLW = temperate marshes left the road near wastewater
LSP = Lake Shore near the pasture
FM = flooded meadow
ELPV = edge of lake poor in vegetation
CWL = constructed wetland on Lake.
DTM = deep temperate marshes
TMRV = temperate marshes rich in vegetation
STM = shallow temperate marshes
SSATM = small size artificial temperate marsh
DGS = Jebel El Ghorra spring
EGR = El Ghorra rivers
BF = Oued Bougous forest
BM = Oued Bougous estuary.

Table 1: Anura observed at each station of El -Kala sub-humid complex.

Stations	Africa green frog	
	Number of individuals	%
1-HAF	6	1 ,38
2-TMRF	8	1,85
3 -TMLW	6	1,38
4- LSP	46	10,62
5- FM	99	22,86
6- ELPV	21	4,85
7- CWL	4	0,92
8- DTM	18	4,16
9- TMRV	101	23,32
10- STM	22	5,08
11- SSATM	20	4,62
12- DGS	13	3,00
13- EGR	33	7,62
14- BF	3	0,69
15- BM	33	7,62
Total	433	

The African green frog obtains the highest distribution scores (86.77%) and abundance of 433 individuals.

The temperate marshes rich in vegetation fed by Lake Tonga reserve (TMRV) is the place where was the biggest gathering of African frog, with 101 species or 23.32% of the total. It is followed by marshes on the edge of the lake rich in vegetation (flooded meadow (FM)) Oued El Hout with the presence of 99 individuals

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(22.86%). We notice an apparent low presence of this species in our trip to the swamp (CWL) and the forest (BF).

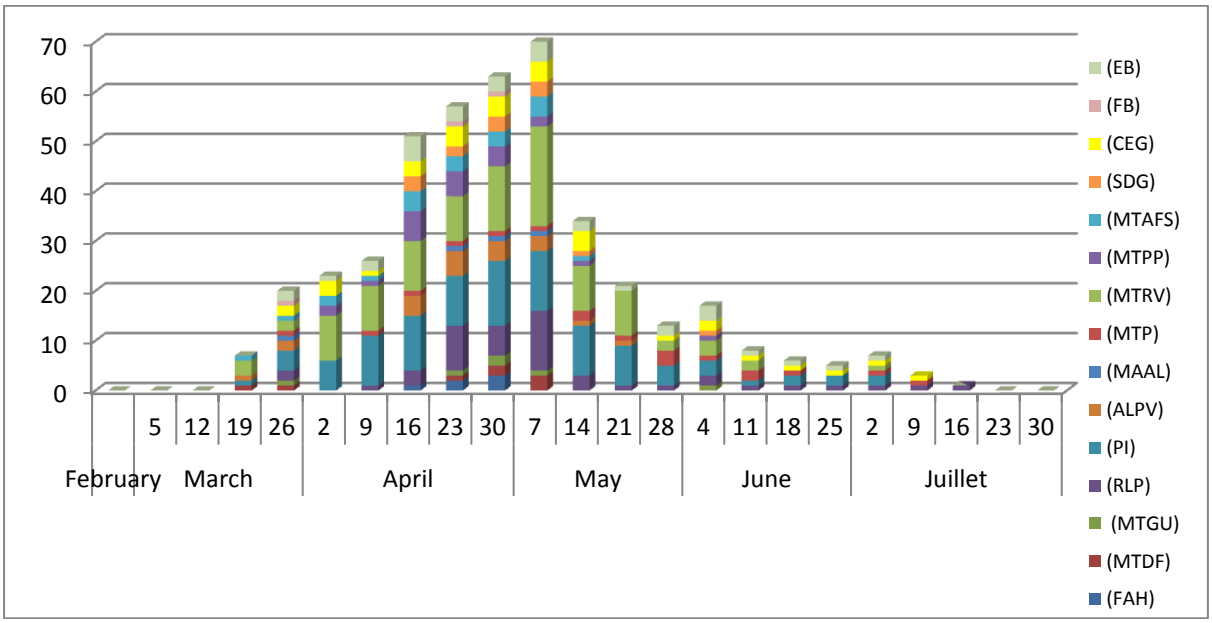

Fig. 2: Observation of *Pelophylax saharicus* species in the target stations in El-Kala study area complex (February - July).

In March, the African green frog low activity is noted with six individuals that were seen on March 19th. While Toad Mauretania was not observed in this month, we notice its short time appearance starting from April 30th.

From the end of March 26th, the group of the green frogs begins to grow until April 16th to May 7th when this species reaches its maximum. This species has delayed its number decrease from June 18th to July 30th.

Discussion:

Pelophylax saharicus (Boulanger in Hartert, 1913):

The Sahara frog Pelophylax saharicus is widely distributed from Morocco through Algeria and Tunisia to northern Libya and north-western Egypt. It is abundant where suitable aquatic habitats exists (from sea level to 2670 m asl) and is the most common amphibian of the Maghreb region [4,5].

It seems nevertheless able to live in forest environments close to watercourse. The dam reserve which is a protected environment provides good conditions for the African frog. It lives in open sunny habitats and temperate swamp strewed rich with vegetation in which it can take shelter.

For this species, the lack of vegetation in lakes and marshes is a limiting factor. In our present study, we could also correlate the abundance of this species with the presence of vegetation.

The Illustrated differences between the three environments are mainly due to the slope, sunshine and marsh richness in plants.

[6], which attempted to link the presence of species of Anura with vegetation and water physic-chemical variables, found out that plant communities are good indicators of amphibian's environment and almost all Anura avoid oligotrophic and acidic waters, while they can reproduce in waters more or less eutrophic or even polluted [7].

Several studies have shown that loss and habitat fragmentation resulting from the roads construction or some forestry and agricultural practices, reduce species richness and abundance of amphibian populations as well as their genetic diversity [8,9,10,11,12,13,14,15,16,17,18]. However, the mechanisms explaining these patterns, such dispersal movements, are still little studied [19,20,21], although they are essential elements of amphibian populations' dynamics.

Conclusion:

The study we conducted on anurans of El-Kala region sub-humid complex specifically *Pelophylax saharicus* allows to better understand the ecological requirements, landscape-related parameters that are complementary and vital to plan protective management of anuran species found in bocage areas (urban).

With the species diversity that it contains, the dam reserve is the most important site of Anura gathering. Therefore, its protection should be a top priority.

REFERENCES

[1] Zollner, P.A., et S.L. Lima. 1997. Landscape-level perceptual abilities in white-footed mice: perceptual range and the detection of forest habitat. Oikos., 80: 51-60.
[2] Yeomans, S.R., 1995. Water-finding in adult turtles: random search or oriented behaviour? Animal Behaviour., 49: 977-987.
[3] Gillis, E.A., et V.O. Nams, 1998. How red-backed voles find habitat patches. Canadian Journal of Zoology, 76: 791-794.
[4] Donaire-Barroso, D., I. Mart_ınez-Solano, A. Salvador, M. Garc_ıa-Par_ıs, E. Recuero Gil, T. Slimani, El E.H. Mouden, P. Geniez, T. Slimani, U. Joger, S.B. El Din, 2009. Pelophylax saharicus. IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. www.iucnredlist.org.
[5] Beukema, W., P. De Pous, D. Donaire-Barroso, S. Bogaerts, J. Garcia-Porta, D. Escoriza, O.J. Arribas, E.H. El Mouden, S. Carranza, 2013. Review of the systematics, distribution, biogeography and natural history of Moroccan amphibians. Zootaxa., 3661: 1-60.
[6] Strijbosch, H., 1979. Habitat selection of amphibians during their aquatic phase. Oikos., 33: 363-372.
[7] EL Hamoumi, R and Oumnia Himmi, 2010. Distribution et état des lieux des peuplements d'Amphibiens dans le complexe de zones humides du bas Loukkos (Larache, Maroc). *Bulletin de l'Institut Scientifique,* Rabat, section Sciences de la Vie, 32(2): 95-100.
[8] Nicolas, V., A. Mataame, P. Crochet, P. Geniez, A. Ohler, 2014. Phylogeographic patterns in North African water frog Pelophylax saharicus (Anura: Ranidae) J Zoolog Syst Evol Res doi: 10.1111/jzs.12094
[9] Petranka, J.W., M.E. Eldridge, et K.E. Haley, 1993. Effects of timber harvesting on southern Appalachian salamanders. Conservation Biology, 7: 363-370.
[10] Maynadier, P.G. and M.L.Jr Hunter, 1995. The relatioship between forest management and amphibian ecology: a review of the North American Literature. Environmental Review, 3: 230-261.
[11] Dupuis, L.A., 1997. Effects of logging on terrestrial amphibians of coastal British Columbia. Pages 291-308 *dans* D. M. Green, éditeur. Amphibians in decline: Canadian studies of a global problem. Society for the Study of Amphibians and Reptiles, Saint Louis, Missouri, USA.
[12] Findlay, C.S., et J. Houlahan, 1997. Anthropogenic correlates of species richness in southeastern Ontario wetlands. Conservation Biology, 11: 1000-1009.
[13] Waldick, R.C., 1997. Effects of forestry practices on amphibian populations in eastern North America. Pages 291-308 *dans* D. M. Green, éditeur. Amphibians in decline: Canadian studies of a global problem. Society for the Study of Amphibians and Reptiles, Saint Louis, Missouri, USA.
[14] Hitchings, S.P., et T.J.C. Beebee, 1998. Loss of genetic diversity and fitness in common toad (Bufo bufo) p1opulations isolated by inimical habitat. Journal of Evolutionary Biology, 11: 269-283.
[15] Vos, C.C., et J.P. Chardon, 1998. Effects of habitat fragmentation and road density on the distribution pattern of the moor frog *Rana arvalis*. Journal of Applied Ecology, 35: 44-56.
[16] Kolozsvary, M.B., et R.K. Swihart, 1999. Habitat fragmentation and the distribution of amphibians: patch and landscape correlates in farmland. Canadian Journal of Zoology, 77: 1288-1299.
[17] Grialou, J.A., S.D. West, et R.N. Wilkins, 2000. The effects of forest clearcut harvesting and thinning on terrestrial salamanders. Journal of Wildlife Management. 64: 105-113.
[18] Scribner, K.T., J.W. Arntzen, N. Cruddace, R.S. Oldham, et T. Burke, 2001. Environmental correlates of toad abundance and population genetic diversity. Biological Conservation, 98: 201-210.
[19] Davidson, C., H.B. Shaffer, et M.R. Jennings, 2002. Spatial tests of the pesticide drift, habitat destruction, UV-B, and climate-change hypotheses for California amphibian declines. Conservation Biology, 16: 1588-1601.
[20] Rothermel, B.B., et R.D. Semlitsch, 2002. An experimental investigation of landscape resistance of forest versus old-field habitats to emigrating juvenile amphibians. Conservation Biology, 16: 1324-1332.
[21] Johnston, B., et L. Frid, 2002. Clearcut logging restricts the movements of terrestrial Pacific giant salamanders (*Dicamptodon tenebrosus* Good). Canadian Journal of Zoology, 80: 2170-2177.