

## Barriers for conservation: Mitigating the impact on amphibians and reptiles by water cisterns in arid environments

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### **Supplementary material**

**Table S1.** Report on the Factorial ANOVA to compare the main effects of Zone and Management condition, and their interaction effect, on three dimensions (length, width, deep) of the water cisterns used in the north-western Sahara for assessing the mitigation effect that covering the cistern openings with wire mesh has on trapping amphibians and reptiles. Details on the variables in the main text.

Effect	Sum of squares	Degr. of Freedom	Mean Squares	F	P
<b>Cistern length</b>					
Intercept	3919.969	1	3919.969	307.661	<0.001
Zone	68.038	2	34.019	2.670	0.077
Management	0.169	1	0.169	0.013	0.909
Zone*management	62.489	2	31.244	2.452	0.094
Error	853.659	67	12.741		
<b>Cistern width</b>					
Intercept	977.572	1	977.572	580.833	<0.001
Zone	8.912	2	4.456	2.648	0.078
Management	1.132	1	1.132	0.673	0.415
Zone*management	2.499	2	1.250	0.743	0.480
Error	112.764	67	1.683		
<b>Cistern deep</b>					
Intercept	412.576	1	412.577	1825.104	<0.001
Zone	4.675	2	2.338	10.342	<0.001
Management	0.156	1	0.157	0.693	0.408
Zone*management	0.323	2	0.162	0.715	0.493
Error	14.919	66	0.226		

**Table S2.** Report on the Factorial ANOVA to compare the main effects of Zone and Management condition, and their interaction effect, on two dimensions of the water inlet (width, height) of the water cisterns used in the north-western Sahara for assessing the mitigation effect that covering the cistern openings with wire mesh has on trapping amphibians and reptiles. Details on the variables in the main text.

Effect	Sum of squares	Degr. of Freedom	Mean Squares	F	P
<b>Water inlet height</b>					
Intercept	52232.955	1	52232.955	801.697	< 0.001
Zone	286.684	2	143.346	2.200	0.119
Management	176.523	1	176.523	2.709	0.104
Zone*management	310.632	2	155.313	2.384	0.100
Error	4365.252	67	65.154		
<b>Water inlet width</b>					
Intercept	134397.44	1	134397.44	236.594	< 0.001
Zone	625.02	2	312.58	0.550	0.579
Management	270.55	1	270.55	0.476	0.492
Zone*management	1022.13	2	511.06	0.900	0.412
Error	38059.46	67	568.15		

**Table S3.** Number of trapped individuals per species of amphibians and reptiles inside unmanaged (control) and managed (by screening openings) water cisterns in the north-western Sahara, and IUCN categories at the regional level of Morocco (from Pleguezuelos et al. 2010). \* broad-fingered geckos that were considered trapped only if found drowned. LC, Low Concern, NT, Near Threatened.

Species	Control water cistern	Managed water cistern	IUCN categories
<b>Amphibians</b>			
<i>Amietophrynus mauritanicus</i>	2	2	LM
<i>Barbarophryne brongersmai</i>	4	-	NT
<i>Bufotes boulengeri</i>	53	12	LC
<i>Pelophylax saharicus</i>	3	1	LC
<b>Reptiles</b>			
<i>Acanthodactylus boskianus</i>	1	-	LC
<i>A. pardalis</i>	-	1	LC
<i>Agama impalearis</i>	16	4	LC
<i>Chamaeleo chamaeleon</i>	1	-	LC
<i>Chalcides polylepis</i>	3	-	LC
<i>Daboia mauritanica</i>	1	15	NT
<i>Hemorrhoids algirus</i>	1	1	NT
<i>H. hippocrepis</i>	5	3	LC
<i>Malpolon monspessulanus</i>	-	1	LC
<i>Psammophis schokari</i>	1	4	LC
<i>Pytyodactylus oudri</i>	-	1	LC
<i>Saurodactylus brosseti</i>	1	-	LC
<i>Stenodactylus mauritanicus</i>	1	-	LC
<i>Tarentola mauritanica</i>	2	3	LC
<i>Uromastix nigriventris</i>	1	-	LC

**Table S4.** Model-averaged coefficients and standard error of Poisson GLMM relating the number of species and individual of amphibians and reptiles trapped inside water cisterns in the north-western Sahara to explanatory variable in the best model.

Variables	Estimate	Std. Error
Number of species		
Intercept	-0.8395	0.1735
Management condition (Yes)	-1.0138	0.2813
Number of individuals		
Intercept	-0.7529	0.2376
Management condition (Yes)	-1.1722	0.3670

**Table S5.** Results of the GLM models (all models, included the null one) explaining variation in number of species and individuals trapped in water cisterns. In bold the best model in our analysis. Other models had a  $\Delta\text{AIC} > 2$  with respect to the best model (see Material and Methods section for details). Df: degrees of freedom, LogLik: log-likelihood.

Model	Df	LogLik	AIC	$\Delta\text{AIC}$	Weight
Number of species					
<b>~management condition</b>	<b>3</b>	<b>-175.24</b>	<b>356.6</b>	<b>0</b>	<b>0.769</b>
~management condition + zone	5	-174.72	359.7	3.12	0.162
~management condition + zone + zone*management	7	-173.5	361.5	4.91	0.066
~null	2	-181.81	367.7	11.1	0.003
~zone	4	-181.22	370.6	14.03	0.001
Number of individuals					
<b>~management condition</b>	<b>3</b>	<b>-255.14</b>	<b>516.4</b>	<b>0</b>	<b>0.764</b>
~management condition + zone	5	-254.57	519.4	3.01	0.17
~management condition + zone + zone*management	7	-253.63	521.7	5.37	0.052
~null	2	-260.4	524.8	8.46	0.011
~zone	4	-259.79	527.7	11.37	0.003

**Table S6.** List of mammals found trapped (and dead) inside 1050 water cisterns in south-western Morocco during the 2012-2016 period (unpublished data of the authors).

*Erinaceus algirus*

*Paraechinus aethiopicus*

*Crocidura tarfayensis*

*Crocidura sp.*

*Lepus capensis*

*Atlantoxerus getulus*

*Gerbillus sp.*

*Pachyuromys duprasi*

*Meriones crassus*

*Psammomys obesus*

*Apodemus sylvaticus*

*Acomys cahirinus*

*Eliomys melanurus*

*Jaculus jaculus*

*Canis lupus familiaris*

*Vulpes vulpes*

*Felis libyca*