Macedonian Journal of Ecology and Environment
Vol. 24, issue 1
pp. 5 - 15
Skopje (2022)
ISSN 1857 - 8330 (on-line)
ISSN 0354-2491 (print)
Original scientific paper
Available online at www.mjee.org.mk

Trophic ecology of the Algerian Hedgehog *Atelerix algirus* (Lereboullet, 1842) (Erinaceidae, Mammalia) in the nature reserve of the Reghaïa wetland

Samia Ouarab*[1], Jean François Voisin[2], Salaheddine Doumandji[3]

[1]*Animal Ecobiology Laboratory, Department of Biotechnologies, University of Saad Dahlab, Blida, Algeria*
E-mail: souarab2002@yahoo.fr

[2]*UMS 305, National Museum of Natural History, CP 51 (Mammals and Birds), 57 rue Cuvier, 75005 Paris, France*
E-mail: jfvoisin@mnhn.fr

[3]*Department of Zoology, National Agronomic Institute, El Harrach, Algeria*
E-mail: dmndjislhdn@yahoo.fr

Abstract

This work focuses on the study of the diet of the Algerian Hedgehog *Atelerix algirus* (Lereboullet, 1842) in the Reghaïa Wetland Nature Reserve located to the northeast of the Mitidja Plain. The analysis of 60 droppings identified 2681 prey items represented by 19 orders and 70 families and 173 prey species. Hymenoptera are the most consumed, with a rate of 69.8%. The most consumed species in this order are *Messor* sp. (28.4%), *Aphaenogaster testaceo-pilosa* (10.4%) and *Camponotus* sp. (8.2%). Then come the orders of Coleoptera, with 15%, and Dermaptera, with 4.6%. *Atelerix algirus* presents a diverse diet in our study station ($0.50 \leq E \leq 0.85$).

Keywords: Algeria, Algerian hedgehog, diet, diversity, relative abundance, Reghaïa Marsh.

Introduction

Hedgehogs are the most familiar small mammals characterized by the presence of a dense cap of spines on the upper part of the body and their ability to curl into a ball in case of danger. These same authors point out that these animals are not very demanding because they show surprising capacities of adaptation. They preferably live in hedged areas and on cultivated land. But they are also found in cities, parks and gardens. They are solitary with twilight and nocturnal activity, their activity being maximal at the beginning and the end of the night (Grasse 1955).

The Algerian Hedgehog *Atelrix algirus* (Lereboullet 1842) is a generally nocturnal mammal and frequents forests as well as fields and orchards (Heim de Balsac & Bourliere 1955; Frechkop 1981).

The Hedgehog is insectivorous, with an opportunistic omnivorous tendency. Insects form the basis of their diet which makes them eminently useful.

In Algeria, its distribution extends over the entire northern part of the country as well as the northern strip of the Algerian Highlands (Kowalski & Rzebik-Kowalska 1991).

This study aims to provide details on the insectivory of the Algerian Hedgehog in the Reghaïa wetland.

Submitted: 13.12.2021
Accepted: 31.01.2022

* Author for correspondence: souarab2002@yahoo.fr

Material and methods

Presentation of the study region

The Reghaïa Marshis a coastal wetland corresponding to the estuary of the Reghaïa river which discharges its waters into the Mediterranean Sea about thirty kilometers east of Algiers (Ledant *et al*. 1979). The Reghaïa wetland Marsh is made up of five ecosystems: marine, marshy, dune, lake and forest. The region surrounding Lake Reghaïa covers an area of 1,575 hectares. The Reghaïa wetland (36°46'to 36°47' N., 3°19' to 3°20' E, Fig. 1) is limited to the north by the Mediterranean Sea, to the east by wadi Boudouaou, to the south by wadi Reghaïa, and to the west by Ain El Kahla. Its climate belongs to the warm winter subhumid bioclimatic stage. Annual precipitation fluctuates between 200 and 800 mm. The surroundings of the marsh include fields, wasteland, eucalyptus groves and an olive grove.

Collection of droppings

The faeces pellets of *Atelerix algirus* were collected from January to June 2003 in different sites within the same study station, near the dike of the Reghaïa Marsh, near roads, trails and roads, and on the sidewalks of the aviaries of the hunting center, where 60 droppings werepicked up on the ground. The sample collection took place during field outings which were conducted three times a month, at the beginning, the middle and at the end of each month. Each collected excrement was placed in a paper cone on which indications bearing the name of the locality and the date of collection were written.

Method of analysis of excrements

In the laboratory, each dropping was placed into a Petri dish filled with 95% alcohol. Alcohol softens the excrement and promotes the detachment of sclerotinized parts. It also destroys any pathogenic germs present. When wet, the dropping peels easily. During this study, 10 droppings per month, or 60 excrements in total, were collected on the outskirts of the Reghaïa Marsh. Using flexible pliers, the elements constituting each poop were separated and observed under a binocular magnifying glass at 10x1.6 magnification. The sclerotinized fragments were removed to avoid breaking them further, while comparable elements were grouped together in another Petri dish, separating heads, thorax and elytra, legs and cerci. In order to facilitate the

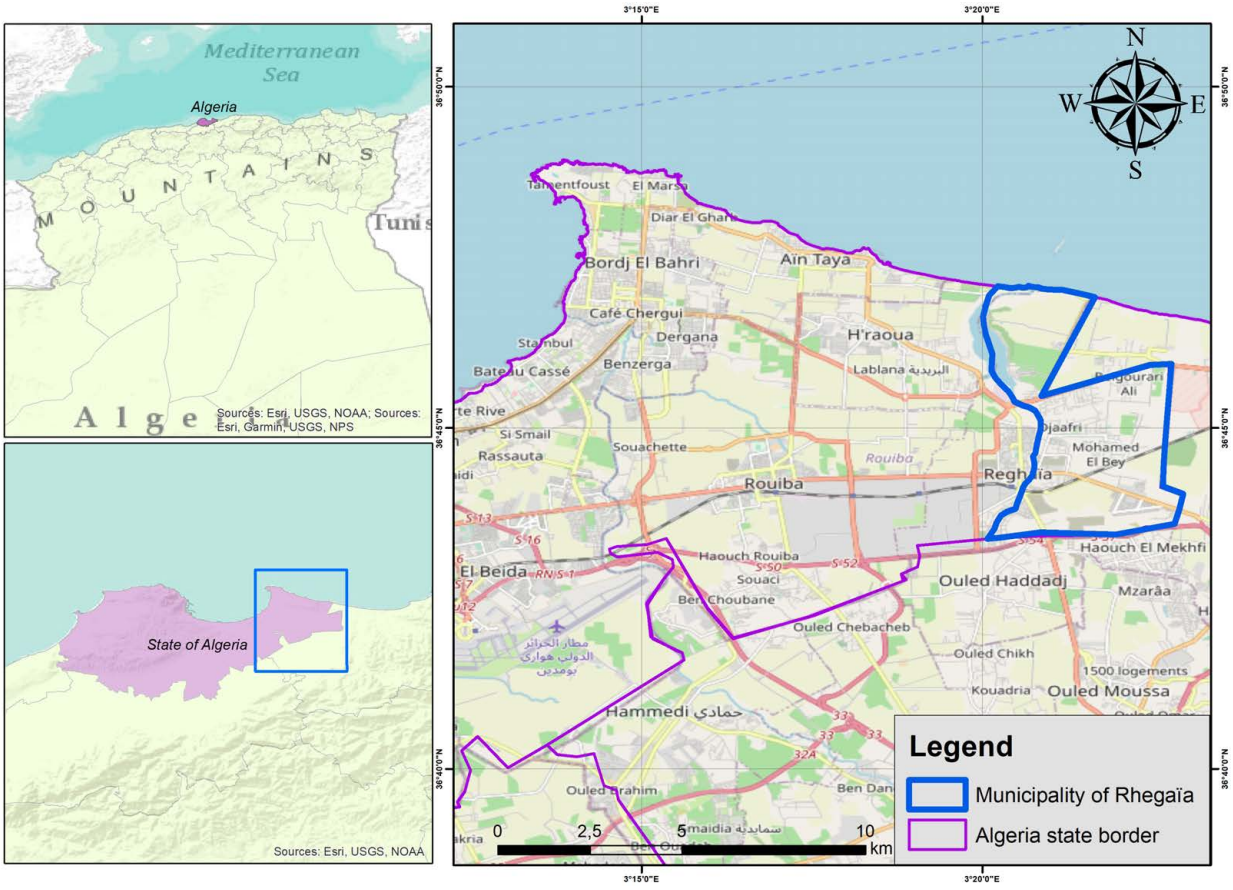

Figure 1. Geographical location of the Reghaïa wetland

examination of the various sclerotinized pieces, a grid wasdrawn using a stylograph. All similar pieces were placed within the same square. The determination of the insects found in the trophic regime of the hedgehog was based on the use of dichotomous keys such as those by Perrier (1923, 1927, 1935, 1940, 1983) for the Myriapoda and for the Insecta such as the Hemiptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera, by Paulian (1941) and Thery (1942) for Coleoptera, by Chopard (1943) and Dirsh (1975) for Orthopteroidea and by Bernard (1968) and Cagniant (1973, 1996, 1997) for Formicidae. Where possible, determination was performed down to the genus level (in most cases, very rarely to the species level). Morphological comparisons were made with samples from the reference collection of the Insectarium of the Department of Agricultural and Forest Zoology of the Higher National Agricultural School of El Harrach. The determinations and confirmations were made by a team of taxonomists.

The results were analyzed using different ecological composition indices, such as the total richness, which corresponds to the number of species present in all the droppings of the Algerian Hedgehog and the relative abundance - the percentage of the individual number of prey species (n_i) in relation to the total number of individuals of any species combined (N) (Dajoz 1970). Among the ecological structural indices, the Shannon diversity index $H' = - \Sigma q_i \log_2 q_i$ which takes into account the probability q_i of encounters with species *i* is retained (Bornard *et al*. 1996). The second index chosen is Species evenness *J'*, the ratio of the observed diversity H' to the maximum diversity H max.

Size class, using a strip of graph paper the sclerotinized piece found in the ball wasmeasured. From there, a potential estimate of the size of the individual was made. This operation is repeated for each species ingested by *Atelerix algirus*.

Results

A total of 2681 prey individuals have been identified in the trophic regime of the Algerian Hedgehog in the Reghaïa wetland. 173 prey species are distributed among 19 orders and 70 families (Tab. 1).

It should be noted that in the trophic menu of the hedgehog two orders are strongly represented in species. These are those of Coleoptera and Hymenoptera.

Relative abundances of prey species

The most consumed species by the Algerian hedgehog near the Marais de Reghaïa are Formicidae

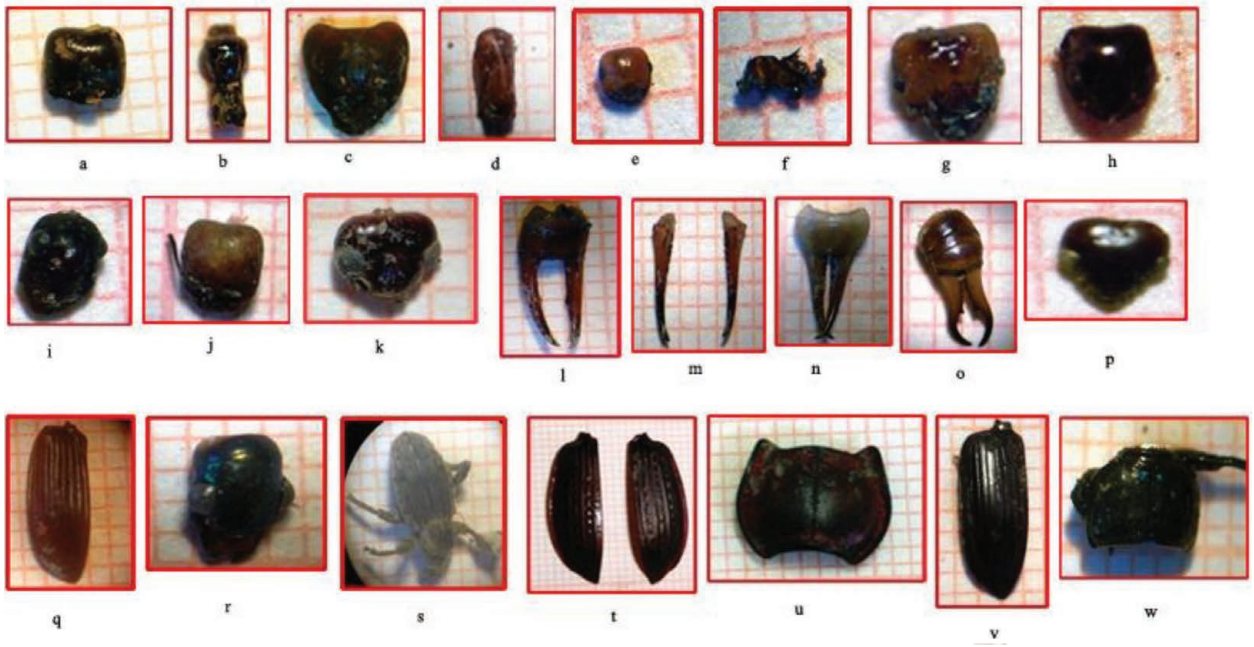

Figure 2. Fragments of some insect species eaten by the Algerian Hedgehog near the Reghaïa Marsh: a - Head of *Messor barbara*; b- Thorax of *Messor barbara*; c- Head of *Camponotus* sp.; d - Thorax of *Camponotus* sp.; e - Head of *Crematogaster* sp.; f - Thorax of *Crematogaster* sp.; g - Ocellated head of *Pheidole pallidula*; h - Head of *Tapinoma nigerrimum*; i - Thorax of *Aphaenogaster testaceo-pilosa*; j - Head of *Cataglyphis bicolor*, k - Thorax of *Labidura riparia*; l - Cerque male of *Labidura riparia*; m-n - Cerque female of *Labidura riparia*; o - Cerque male of *Forficula auricularia*; p - Head of *Forficula auricularia*; q - Elytron of *Harpalus* sp., r –Head of *Chlaenius* sp. ; s - *Otiorhynchus* sp.; t - Elytron of *Macrothorax morbillosus*; u - Thorax of *Macrothorax morbillosus*; v - Elytron of *Acinopus megacephalus*; w - Thorax of *Scarites* sp.

Table 1. Numbers and relative abundance of prey species consumed by the Algerian hedgehog at the Reghaïa Marsh

Order	Family	Species	ni.	RA %
Oligocheta	F. indet.	sp. indet.	3	0,11
Pulmonea	Helicidae	sp. indet.	5	0.19
		Helix aperta	4	0.15
	Helicellidae	*Helicella* sp.	5	0.19
		Helicella virgata	7	0.26
	Cochlicellidae	*Cochlicella barbara*	1	0.04
Acarina	Acari F. indet.	sp. indet.	2	0.07
	Ixodida F. indet.	sp. indet.	1	0.04
Aranea	Aranea F. indet.	sp. indet.	8	0.3
	Gnaphosidae (Drassidae)	sp. indet.	34	1.27
	Dysderidae	*Dysdera* sp.	10	0.37
	Sicariidae	sp. indet.	1	0.04
	Thomisidae	sp. indet.	2	0.07
	Lucosidae	*Lycosa* sp.	1	0.04
	Salticidae	sp. indet.	1	0.04
Ricinuleida	F. indet.	sp. indet.	1	0.04
Phalangida	Phalangidae	sp. indet.	26	0.97
Polydesmida	Polydesmidae	*Polydesmus* sp.	8	0.3
Julida	Iulidae	*Iulus* sp.	9	0.34
Chilopoda	F. indet.	sp. indet.1	13	0.48
		sp. indet. 2	4	0.15
		sp. indet. 3	1	0.04
Isopoda	Oniscidae	sp. indet.	2	0.07
		Tylos sp.	6	0.22
		Porcellio sp.	21	0.78
	F. indet.	sp. indet.	1	0.04
Blattodea	Blattelidae	sp. indet.	3	0.11
		Ectobiinae sp. indet.	1	0.04
		Ectobius sp.	3	0.11
Isoptera	F. indet.	sp. indet.	1	0.04
Orthoptera	Gryllidae	sp. indet.	3	0.11
		Thliptoblemmus sp.	1	0.04
		Gryllus sp.	2	0.07
		Gryllulus sp.	1	0.04
		Gryllulusalgirius	3	0.11
	Acrididae	sp. indet.	1	0.04
		Acrida turrita	1	0.04
		Aiolopus sp.	1	0.04
		sp. indet.	1	0.04
	Gryllotalpidae	*Gryllotalpa gryllotalpa*	3	0.11
Dermaptera	Forficulidae	*Forficula auricularia*	36	1.34
	Labiduridae	*Labidura riparia*	58	2.16
		Nala lividipes	23	0.86
	Labiidae	*Labia minor*	1	0.04
	Carcinophoridae	*Anisolabis mauritanicus*	4	0.15
Neuroptera	F. indet.	sp. indet.	1	0.04
	Myrmeleonidae	sp. indet.	1	0.04
Heteroptera	F. indet.	sp. indet.	1	0.04
	Pentatomidae	sp. indet.	1	0.04
		Brachypelta aterrima	1	0.04
		Cydninae sp. indet.	3	0.11
		Nezara viridula	1	0.04
		Sehirus sp.	21	0.78
	Pyrrhocoridae	*Pyrrhocoris* sp.	1	0.04

Order	Family	Species	ni.	RA %
		Pyrrhocoris apterus	28	1.04
	Lygaeidae	sp. indet.	2	0.07
		Lygaeus sp.	1	0.04
		Trapezonotus sp.	1	0.04
		Oxycarenus sp.	3	0.11
	Reduviidae	*Reduvius* sp.	8	0.3
Coleoptera	Coleoptera F. indet.	sp. indet.	4	0.15
	Carabidae	Carabidae gen. sp. 1 indet.	7	0.26
		Carabidae gen. sp. 3 indet.	19	0.71
		Carabus (*Macrothorax*) sp.	2	0.07
		Carabus (*Macrothorax*) *morbillosus*	1	0.04
		Siagona sp.	1	0.04
		Brachinus sp.	1	0.04
		Cymindis sp.	3	0.11
		Dromius sp.	1	0.04
		Harpalinae gen. sp. indet.	2	0.07
		Harpalus sp.	11	0.41
		Harpalus fulvus	1	0.04
		Ditomus sp.	3	0.11
		Carterus sp.	7	0.26
		Acinopus sp.	2	0.07
		Acinopus megacephalus	6	0.22
		Dicheirotrichus sp.	2	0.07
		Scarites sp.	1	0.04
		Chlaenius aeratus	9	0.34
		Chlaenius (*Chrysochlaenius*) sp.	1	0.04
		Chlaenius (*Chlaenius*) sp.	7	0.26
		Licinus silphoides	11	0.41
		sp. indet.	1	0.04
		Amara sp.	3	0.11
		Abax sp.	1	0.04
		Anchomenus sp.	1	0.04
		Calathus sp.	8	0.3
		Pterostichus purpurascens	2	0.07
	Scarabeidae	*Rhizotrogus* sp.	1	0.04
		Rhyssemus sp.	1	0.04
		Hybalus sp.	7	0.26
		Aphodius sp.	3	0.11
		Psammobius sp.	1	0.04
	Dermastidae	*Dermestes* sp.	8	0.3
		Attagenus obtusus	2	0.07
	Staphylinidae	*Xantholinus* sp.	2	0.07
		Oxytelus sp.	1	0.04
		Ocypus olens	4	0.15
		Dolichaon sp.	1	0.04
		Staphylinus sp.	3	0.11
		sp. indet.	3	0.11
	Tenebrionidae	Tenebrionidae sp. 1	3	0.11
		Tenebrionidae sp. 2	1	0.04
		Micrositus distinguendus	1	0.04
		Asida sp.	7	0.26
		Asida lefranci	3	0.11
		Pachychila sp.	2	0.07
		Lithoborus sp.	23	0.86
		Pedinus sp.	1	0.04

Order	Family	Species	ni.	RA %
		Opatroides sp.	1	0.04
		Scorus sp.	5	0.19
		Tentyria sp.	7	0.26
	Corylophidae	*Parmulus* sp.	1	0.04
	Thorictidae	Thorictidae sp. indet.	1	0.04
	Anthicidae	*Anthicus* sp.	1	0.04
		Anthicus floralis	2	0.07
	Coccinellidae	*Rhizobius* sp. 1	1	0.04
		Rhizobius sp. 2	2	0.07
		Rhizobius chrysomeloides	1	0.04
	Chrysomelidae	*Chrysomela* sp. 1	2	0.07
		Chrysomela sp. 2	4	0.15
		Chrysomela americana	5	0.19
		Chaetocnema sp.	3	0.11
		Podogrica cemirufa	2	0.07
		Pachnephorus sp.	2	0.07
	Curculionidae	sp. indet. 1	1	0.04
		sp. indet. 2	7	0.26
		sp. indet. 3	7	0.26
		sp. indet. 4	6	0.22
		sp. indet. 5	2	0.07
		sp. indet. 6	16	0.6
		sp. indet. 7	7	0.26
		sp. indet. 8	10	0.37
		Hypera sp.	28	1.04
		Hypera circumvaga	11	0.41
		Rhytirrhinus sp.	2	0.07
		Rhytirrhinus incisus	16	0.6
		Otiorrhynchus sp. 1	37	1.38
		Otiorrhynchus sp. 2	3	0.11
		Sitona sp.	2	0.07
		Cleonus sp.	1	0.04
		Apion sp.	1	0.04
		Alophus sp.	1	0.04
		Lixus sp.	1	0.04
	Silvanidae	Sp. indet.	1	0.04
	Elateridae	Sp. indet.	1	0.04
		Cryptohypnus sp.	1	0.04
	Silphidae	*Thanatophilus sinuata*	1	0.04
	Cerambycidae	*Parmena pubescens algirica*	2	0.07
Hymenoptera	Ichneumonidae	Ichneumonidae sp. indet.	1	0.04
	Formicidae	Sp. indet.	1	0.04
		Messor sp.	**760**	**28.35**
		Messor barbara	13	0.48
		Cataglyphis bicolor	3	0.11
		Monomorium sp.	33	1.23
		Aphaenogaster testaceo-pilosa	**278**	**10.37**
		Tapinoma nigerrimum	58	2.16
		Pheidole sp.	151	5.63
		Pheidole pallidula	74	2.76
		Camponotus sp.	**219**	**8.17**
		Camponotus barbaricus	14	0.52
		Crematogaster sp.	3	0.11
		Crematogaster scutellaris	32	1.19
		Tetramorium sp.	**210**	**7.83**

Order	Family	Species	ni.	RA %
		Tetramorium biskrensis	1	0.04
		Myrmilla sp.	1	0.04
	Sphecidae	*Philanthus apivorus*	1	0.04
	Vespoidea F. indet.	Sp. indet.	1	0.04
	Halictidae	*Lasioglossum* sp.	10	0.37
	Apidae	*Apis mellifera*	3	0.11
	Apoidea F. indet.	Sp. indet.	5	0.19
Lepidoptera	F. indet.	Sp. indet.	8	0.3
	Noctuidae	Sp. indet.	2	0.07
19	**70**	**173**	**2681**	**100**

ni : Number of individuals; RA% : Relative abundance.

such as *Messor barbara* (RA% = 28.4%; m = 0.58%), *Tapinoma nigerrimum* (RA% = 10,4%; m = 0.58%) and *Camponotus barbaricus* (RA% = 8.2%; m = 0.58%) (Table 1, Fig. 2). It should be noted that nine species of Formicidae dominate the other invertebrates ingested by the hedgehog.

Total and average richness

In total, 173 taxa were determined throughout the entire study period. The highest value wasin April and June, with 69 identified taxa, while the lowest was in February, with only 29 idenfied taxa. The average monthly richness was 5.37 + 1.82 (Table 2).

The total richness (S) is low in winter and highin spring.

Shannon index of prey species

The diversity indices calculated for the prey species consumed by the Algerian hedgehog in the immediate surroundings of the Reghaïa Marsh are high. They vary between 3.03 and 4.48 and reach 4.48 in January 2003 (Table 3).

Table2 – Total and average richness of animal species listed in the trophic diet of the Algerian Hedgehog near the Reghaïa body of water in 2003

	2003					
	January	**February**	**March**	**April**	**May**	**June**
Total richness S	31	**29**	59	**69**	65	69
Average richness Sm	5,37 ± 1,82					
Number of droppings	60					

Table 3– Monthly values of the Shannon diversity index and Evenness of prey species registered in *Atelerix algirus* faeces in the Reghaïa wetland

	2003					
	January	**February**	**March**	**April**	**May**	**June**
H'	4,11	4,14	4,48	4,09	3,03	3,98
Hmax	4,95	4,86	5,88	6,11	6,02	6,09
E	0,83	0,85	0,76	0,67	0,50	0,65

H': Shannon diversity index
Hmax: Maximum diversity index
E: Evennessindex

Evenness index

As for the eveness values calculated month by month, they fluctuate between 0.50 and 0.85. As a result, the numbers of *Atelerix algirus* prey species tend to be in equilibrium with each other (Table 3).

Size classes

The size classes of the prey consumed by *Atelerix algirus* range from 1 to 45 mm. (Tab. 4). The most frequent are those of 12 and 9 mm. Those that are 12 mm long are the most numerous on the menu of this mammal. They correspond to 160 individuals (14.6%). The 12 mm class is represented by Coleoptera like *Calathus* sp. (0.3%), *Asida* sp. (0.26%), Caraboidea sp. undet. (0.26%), *Harpalus* sp. (0.4%) and *Abax* sp. (0.04%) of Hymenoptera with *Camponotus barbaricus* (8.2%) and *Messor barbara* (28.4%) and Isopoda with *Oniscidae* sp. undet. (0.07%). The 9 mm class occurs with 142 individuals (13%) and includes Coleoptera such as *Chrysomela* sp. 1 (0.1%) and *Pedinus* sp. (0.04%), Hymenoptera with *Camponotus* sp. (2.8%) and Dermaptera with *Nala lividipes* (0.9%).

Discussion

List of prey species

In the menu of the Algerian Hedgehog near the Reghaïa Marsh in 2003, 173 prey taxa were inventoried. These belong to 70 families of 19 orders. The study of the diet of *Atelerix algirus* in the Beni Ghobri forest revealed 145 prey species distributed between 6 classes and 17 orders (Mimoun & Doumandji 2007). On the outskirts of the Reghaïa marsh the shelling of 19 *Atelerix algirus* droppings enabled us to count only 97 prey species distributed among 5 classes, 16 orders and 45 families (Ouarab & Doumandji 2010). It should be noted that in the Reghaïa wetland in the trophic menu of the hedgehog two orders are strongly represented in species, those being Coleoptera (90 species) and Hymenoptera (16 species). The present results confirm the remarks of Ouarab & Doumandji (2010) who underline that the two dominant orders are those of Coleoptera (52 species) and Hymenoptetra (9 species). They also agree with those of Brahmi *et al.* (2007) mentioned in the mountain of Bouzguène which highlights the importance of Hymenoptera with 754 individuals (80.5%) and Coleoptera with 98 individuals (10.5%) consumed by the Algerian hedgehog.

Total and average richness of prey species

The values of the total richness in the wetland of Reghaïa vary between 29 species in February and 69 species in April and June. Mimoun & Doumandji (2007) in the Beni Ghobri forest note a higher richness reaching 124 species. Apparently the values of total richness depend on the environment and the season. Indeed in Pisarky in the suburb of Brno, Obrtel & Holisova (1981) mention a richness which fluctuates between 5 species in May and 33 species in August. On the shores of Lake Ichkeul, Marniche (2001) notes that the highest abundance is recorded in spring with 90 species and the

Table 4 – Percentages by size class of Invertebrates consumed by *Atelerix algiruses* in the study area

Size classes (mm)	Number of individuals	%	Size classes (mm)	Number of individuals	%
1	2	0.18	16	9	0.82
2	17	1.56	17	16	1.46
3	64	5.86	18	18	1.65
4	21	1.92	19	4	0.37
5	21	1.92	20	13	1.19
6	46	4.21	21	2	0.18
7	72	6.59	22	5	0.46
8	112	10.25	23	1	0.09
9	142	12.99	24	1	0.09
10	127	11.62	25	10	0.91
11	137	12.53	26	1	0.09
12	160	14.64	30	1	0.09
13	26	2.38	32	1	0.09
14	19	1.74	35	3	0.27
15	40	3.66	45	2	0.18
			Totals	1093	100

lowest in winter with only 7 species. In the park of the National Agronomic Institute of El Harrach, Doumandji & Doumandji (1992b) mention 47 prey species in July and 11 species in February in 286 droppings of the Algerian hedgehog. On the outskirts of the Reghaïa Marsh the values of the average richness calculated per dung is 5.37 ± 1.82 species. Doumandji & Doumandji (1992b) give a high value for the average richness, i.e., 28.3 species.

Relative abundances of prey species

The species most consumed by the Algerian hedgehog near the Reghaïa Marshes are Formicidae such as *Messor barbara* (RA% = 28.4%). From this point of view, the present results confirm those of Mimoun & Doumandji (2007) who note that *Atelerix algirus* in the forest of Beni Ghobri consumes mostly Formicidae (91.9%), especially *Crematogaster auberti* (37.1 %). In the Laghouat region, among the most consumed insects by the desert hedgehog are Hymenoptera, which dominate with 2764 individuals (RA% = 78.4%) of which *Messor structor* appears with 1506 individuals (RA% = 29.9%). In Tigzirt. Talmat *et al*. (2004) report that Hymenoptera are noted in first place with 74.3% especially with *Messor barbara* (73.5%). In England, concerning another species of hedgehog *Erinaceus europaeus*, Yalden (1976) shows that insects occupy the first rank in the trophic regime of this species, of which the greatest proportion goes to Lepidoptera (caterpillars) and Coleoptera (Scarabeidae). The present results differ from those of Yalden (1976). Aubert (2005) notes a varied trophic regime for *Erinaceus europaeus*, with the predominance of living prey including Coleoptera larvae and imagoes, Orthoptera, earthworms, snails, slugs, spiders, snakes, lizards, young birds and bird eggs.

Shannon diversity index of prey species

The diversities calculated for the prey species consumed by the Algerian hedgehog in the immediate surroundings of the Reghaïa Marsh are high. They vary between 3.03 and 4.48 in 2003. These values confirm those of Ouarab & Doumandji (2010) who obtained 5.16. in the same wetland. Month by month, the value of *H'* equals 3.03 in January and increases to 4.50 in March. It decreases to 3.23 in April. The present results differ from those of Baouane *et al*. (2004) who obtained a very low value of the index on the outskirts of the Reghaïa Marsh, i.e., 1.75. The reduction in *H'* values at the end of autumn may be due to the lowering of the average temperature. It should be emphasized that the fluctuations in the values of the Shannon diversity index are very large from one poop to another. On the other hand, overall, it is at the end of summer that the values of *H'* rise noticeably, followed by a noticeable decrease from the second half of autumn. Mimoun & Doumandji (2007) in the Beni Ghobrit forest note a high diversity of prey species reaching 3.18. On the other hand, Derdoukh *et al*. (2008) noted low diversity of prey ingested by the Desert hedgehog (*H'*= 1.97) in September near Laghouat.

Index of the distribution of prey species

Evenness values calculated month by month fluctuate between 0.50 and 0.85. They are close to 1. As a result, the numbers of *Atelerix algirus* prey species tend to be in equilibrium with each other. The values obtained in the present study are in agreement with those of Ouarab & Doumandji (2010) who mention for the entire period of investigation a value of *E* (Equitability Evenness index) equal to 0.78. On the contrary, Baouane *et al*. (2004) obtain a low evenness (0.27). This trend towards an imbalance between the numbers of species present is explained by these same authors by the fact that among the prey species one of them dominates in terms of numbers. This is the case of *Messor barbara* which occurs with an abundance frequency of 77.8%. Indeed. some species of Formicidae are very abundant such as *Crematogaster* sp. which is widely consumed (37.1%) according to Mimoun & Doumandji (2007). These authors report an evenness of 0.44 which tends towards 0. In this case this mammal behaves like an opportunistic predator. In fact, it ingests just about any prey it encounters and when it finds abundant prey in a given location, it concentrates the consumption on that single prey species. It is a generalist predator with a strong insectivorous tendency and marked myrmecophagia.

Size classes

It can be seen that the size classes of the prey consumed by *Atelerix algirus* range from 1 to 45 mm. The most frequent are those of 12 and 9 mm. Those which are 12 mm long correspond to 160 individuals (14.6%). The 12 mm class is represented by Coleoptera such as *Calathus* sp. (0.3%), *Asida* sp. (0.26%), Caraboidea sp. undet. (0.26%), *Harpalus* sp. (0.4%) and *Abax* sp. (0.04%), by Hymenoptera with *Camponotus barbaricus* (8.2%) and *Messor barbara* (28.4%) and Isopoda with Oniscidae sp. undet. (0.07%). The 9 mm class occurs with 142 individuals (13%) and includes Coleoptera such as *Chrysomela* sp. 1 (0.1%) and *Pedinus* sp. (0.04%). Hymenoptera with *Camponotus* sp. (2.8%) and *Dermaptera* with *Nala lividipes* (0.9%). According to Ouarab & Doumandji (2010), it is found that the size classes of the prey consumed by *Atelerix algirus* range from 2 to 32 mm. The most frequent are those of 15 mm which correspond to Arachnida and of 7 mm class formed by Formicidae such as *Messor barbara*, *Camponotus* sp. and *Aphaenogaster testaceo-pilosa*. Doumandji & Doumandji (1992a) report that the small

prey consumed by the Algerian hedgehog is based on social insects such as Formicidae or Arthropoda with gregarious behavior.

Conclusion

By shelling 60 Algerian Hedgehog droppings 173 prey species were inventoried in their diet on the outskirts of the Reghaïa marsh. These are divided between 19 orders and 70 families. The highest monthly values of total richness are noted in mid-winter with 69 species (February) and as many in spring in April (69 sp.) and in June (69 sp.). Formicidae such as *Messor barbara* (RA% = 28.4%), *Tapinoma nigerrimum* (AR% = 10.4%) and *Camponotus barbaricus* (RA% = 8.2%) are the species most consumed by the Algerian hedgehog on the outskirts of the Reghaïa Marsh.

The largest size class on the menu of this mammal is the one that is 12 mm in length. It is represented by Coleoptera such as *Calathus* sp. (0.3%), *Asida* sp. (0.26%), Caraboidea sp. undet. (0.26%), *Harpalus* sp. (0.4%) and *Abax* sp. (0.04%) of Hymenoptera with *Camponotus barbaricus* (8.2%) and *Messor barbara* (28.4%) and of Isopoda with Oniscidae sp. indet. (0.07%).

References

Aubert, A. (2005). Un Insectivore hibernant: le Hérisson. *Bull. Ann. Comité météo M-et-L, Angers – Beaucouzé*, **53** : 1–13.

Baouane, M., Doumandji, S., Taleb, A. (2004). Contribution à l'étude du régime alimentaire du Hérisson d'Algérie *Atelerix algirus* (Lereboullet, 1842) (Mamalia, Erinaceidae) aux abords du marais de Réghaïa. 2ème Journée protection des végétaux, 15 mars 2004, Dép. Zool. Agri. for., Inst. Nati. Agro. El Harrach, p 31.

Bernard, F. (1968). Les fourmis (Hymenoptera, Formicidae) d'Europe occidentale et septentrionale. Ed. Masson et Cie, Paris, 411 pp.

Bornard, A., Cozic, P., Brau-Nogue, C. (1996). Diversité spécifique des végétation en alpage – influence des conditions écologiques des pratiques écologiques. *Ecologie* **27**(**2**): 103–115.

Brahmi, K., Doumandji, S., Baziz, B., Derdoukh, W. (2007). L' écologie trophique dela Genette commune *Genetta genetta*, de la Mangouste ichneumon *Herpestes ichneumon*, du Hérisson d'Algérie *Atelerix algirus* et de la Musaraigne musette *Crocidura russala* dans la montagne de Bouzeguène (Grande Kabylie). Journées Internati. Zoologie, Inst. Nati. Agro. El Harrach, 192 p.

Cagniant, H. (1973). Les peuplements de fourmis des forêts algériennes. Ecologie, Biocénotique, Essai biologique. Thèse Doctorat, Univ. Toulouse, 464 p.

Cagniant, H. (1996). Le genre *Tetramorium* du Maroc (Hymenoptera - Formicidae): clé et catalogue des espèces. Ann. Soc. Entomol. Fr. **32**(**1**): 87–100.

Cagniant, H. (1997). Le genre *Tetramorium* du Maroc (Hymenoptera-Formicidae): clé et catalogue des espèces. Ann. Soc. Entomol. Fr., (N.S.), **33**(**1**): 89–100.

Chopard, B. (1943). Orthoptéroïdes de l'Afrique du Nord. Ed. Librairie Larose, Paris, Coll. Faune de l'empire français, T. I, 450 p.

Dajoz R., (1971). Précis d'écologie. Ed. Dunod, Paris, 434 p.

Derdourkh, W., Guerzou, A., Benchikh, C., Doumandji, S. (2008). Aperçu sur le régime alimentaire du Hérisson du désert *Paraechinusa ethiopicus* (Ehrenberg, 1833) dans la région de Laghouat. 3ème Journées nationales Protec. Vég., 7–8 avril 2008, Insti. nati. agro., El Harrach, p. 64.

Dirsh, V. M., (1975). Classification of the acridomorphoïd insects. Classey, Oxon, 171 pp.

Doumandji, S. & Doumandji, A. (1992a). Note sur le régime alimentaire du Hérisson d'Algérie, *Erinaceus algirus* dans la banlieue d'Alger. *Mammalia*, **56**(**2**): 318–321.

Doumandji, S. & Doumandji, A. (1992b). Note sur le régime alimentaire du hérisson d'Algérie *Erinaceus algirus* Lereboullet, 1842, dans un parc d'El Harrach (Alger). *Mém. Soc. Belge Ent.* (**35**): 403 – 406.

Frechkop, S. (1981). Faune de Belgique – Mammifères. Ed. Institut Royal Sci. Natu. Belgique Bruxelles, 545 pp.

Grasse, P.P. (1955). Traité de Zoologie (Anatomie, Systématique, Biologie), T. XVII, Fasc. I et II, Mammifères, 136 pp.

Heim De Balsac, H., Bourliere, F. 1955. Ordre des Insectivores, systématique, pp. 1653 – 1712.

Kowalski, K., Rzebik-Kowalska, B. (1991). Mammals of Algeria. Wroclaw, 353 p.

Ledant, J.P., Jacob, J.-P., Hily, C. (1979). L'intérêt ornithologique du marais de Réghaïa. Séminaire international avifaune algérienne, 5 – 11 juin 1979, Inst. Nati. Agro. El Harrach, 15 p.

Marniche, F. (2001). Aspects sur les relations trophiques de la faune en particulier de l'avifaune de l'Ichkeul (Tunisie). Thèse Magister, Inst. Nati. Agro. El Harrach, 344 p.

Mimoun, K., Doumandji, S. (2007). Placedes insectes dans le régime alimentaire duHérisson d'Algérie *Atelerixalgirus* (Lereboullet, 1842) dans la forêt de Beni Ghobri (Tizi- Ouzou). Journées Internati. Zoologie, 8–10 avril 2007, Dép. Zool. agri. for., Inst. Nati. Agro. El-Harrach, p. 194.

Obrtel, R., Holisova, V. (1981). The diet of hedgehogs in an urban environment. *Folia Zoologica*, **30**(**3**): 193–201.

Ouarab, S., Doumandji, S. (2010). Insectivorie du Hérisson d'Algérie *Atelerix algirus* (Lereboullet, 1842) (Erinaceidae, Mammalia) dans la zone humide de

Réghaïa. *European Journal of Scientific Research*, **4**: 612–623.

Paulian, R. (1941). Faune de la France: Coléoptères Scarabeidés. Fédération franç. Sco. Ser. Off. Cent. Fau., T. 38, Paris, 800 pp.

Perrier, R. (1923). La faune de la France illustrée, Myriapodes. Ed. Delagrave, Paris, T.3. 158 pp.

Perrier, R. (1927). La faune de la France illustrée, Coléoptères, 1ère partie. Ed. Delagrave, Paris, T. V. 192 pp.

Perrier, R. (1935). La faune de la France illustrée, Hémipterers, Anoploures, Mallophages, Lépidoptères. Ed. Librairie Delagrave, Paris. 243 pp.

Perrier, R. (1940). La faune de la France, Hyménoptères. Ed. Librairie Delagrave, Paris, T. 7. 211 pp.

Perrier, R. (1983). La faune de la France illustrée. Diptères. Fasc. 3, Ed. Librairie Delagrave, Paris. 208 pp.

Talmat, N., Daoudi-Hacini, S., Doumandji, S. (2004). Place des insectes dans le régime alimentaire du Hérisson d'Algérie *Atelerix algirus* dans la région de Tigzirt en Grande Kabylie (Tizi Ouzou). Journée Protec. Vég., 15 mars 2004, Dép. Zool. Agro. For., Inst. Nati. Agro., El Harrach, p. 64.

Thery, C. (1942). Faune de France: Coléoptères Buprestidés. Fédération France Sco. Ser. Off. Cent. Fau., Paris, T. **41**, 1120 p.

Yalden, D.-W. (1976). The food of the hedgehog in England. *Acta Theriologica*, **21**(**30**): 401–424.