AENSI Journals

Advances in Environmental Biology

ISSN-1995-0756 EISSN-1998-1066

Journal home page: http://www.aensiweb.com/AEB/

Ectoparasitic ecology of Algerian hedgehog *Ateleris algirus* (Lereboullet, 1842) (Erinaceidae, Mammalia)in some localities of Edough Montain (W. Annaba, Northest Algeria)

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ARTICLE INFO

Article history:
Received 4 September 2014
Received in revised form 24 November 2014
Accepted 8 December 2014
Available online 16 December 2014

Keywords:
Insert keywords for your paper

ABSTRACT

Background: Parasites are ubiquitous in the biology of host components, and must therefore be sampled to analyze interspecific as well as other aspects of their natural history relationships, both hosts of parasites themselves**. Objective:** This study has focused on the ecology of ectoparasitic of Algerian hedgehog at the mountains of Edough, through sampling of host specimens and collection of ectoparasites for their identification and quantification. **Results:** The results showed that the 54 ectoparasites collected are divided into 25 ticks and 29 fleas. Taxonomic identification of ticks allowed us to distinguish *Rhipicephalus turanicus*, *Rhipicephalus bursa* and *Ixodes ricinus*. The identification of fleas allowed us to distinguish *Archaeopsylla erinacei*. The parasite rates also calculated determine the predominance of *Archaeopsylla erinacei*. **Conclusion:** The diversity and abundance of ecotparasites of Algerian hedgehog are highly dependent on climate, vegetation and lifestyle of the host species.

To Cite This Article: Feriel Sakraoui, Mehdi Boukheroufa, Walid Sakraoui, Mouiz El Bachir Madoui., Ectoparasitic ecology of Algerian hedgehog Ateleris algirus (Lereboullet, 1842) (Erinaceidae, Mammalia)in some localities of Edough Montain (W. Annaba, Northest Algeria). ***Adv. Environ. Biol., 8(21),*** *217-221, 2014*

INTRODUCTION

Many studies have confirmed that the small mammals are vectors and host of many parasites that can affect not only the health of their host [1] but transmit and cause many diseases [2]. Among small mammals, hedgehog occupies a prominent place given for all researches conducted throughout its range [3; 4; 5], especially in parasitic ecology [6; 7; 8]. Indeed, the hedgehog is an urban adapter easily catchable and manipulated, giving it the status of privileged biological model, particularly for the study of parasite – Host interactions [9]. In Algeria, Kowalski and Kowalska [10] described the life history traits of the Algerian hedgehog and desert hedgehog. Since then, few scattered studies were performed [11; 12; 13]. The latest one concerned the identification of parasites and pathogens in Algerian hedgehog and desert hedgehog [14; 15; 16]. Our present study is more focused on ecology of *Atelerix algirus* ectoparasites, in particular environment of northeastern Algeria, especially in the forest of Edough wich dominates the city of Annaba, and rises to over 1000 m above sea level. The objective is not only to characterize the ectoparasites biodiversity, but also to analyze the relationship between their dynamics and the environmental conditions of host.

MATERIALS AND METHOD

The study was conducted from October 2011 until the end of May 2012, in some plots of the forest of Edough (36 ° 55N / 7 ° 41E) (Fig. 1). The site is characterized by steep slopes and natural forest cover mainly consisting of Zeen oak and cork oak. The climate is Mediterranean with hot, dry season between May and November, and a wet rainy season and the rest of the year. The rainfall is 1000 mm per year.

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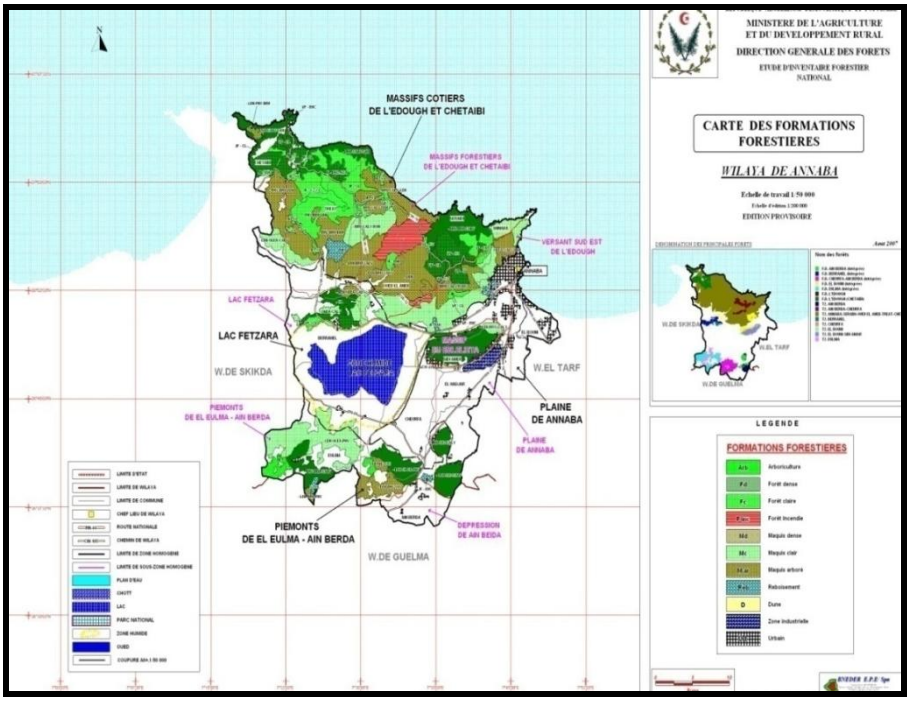

Fig. 1: Localization of Edough Montain (from Forest Department. W Annaba)

Fig. 2: Sample sites (Photos Taken by Sakraoui, 2012)

We conducted a survey on land including a systematic search of individuals from dusk until late into the night, taking into consideration the eating habits as well as interviewing residents. Despite an intensive search, only 07 individuals were captured. Ectoparasites are harvested in sealed vials and fixed in ethanol at 70 °. The parasites were identified as dichotomous keys for ticks [17] and for fleas [18]. Once ectoparasites identified, we calculated the parasite rates [19]. Prevalence (Pr: number of infected specimens on the number of individuals examined), the mean parasite intensity (I mean: ratio of the total number of individuals of a parasite species on the number of infested specimens), and parasite abundance (A: ratio of total number of individuals of a parasite species on the total number of examined specimens).

RESULTS AND DISCUSSION

1. Taxonomic characterization of ectoparasites:

After deworming, we proceeded to the taxonomic characterization of ectoparasites. The observation under binocular associated with the use of identification keys has allowed us to distinguish two taxonomic orders: these ticks (Acari) and fleas (Siphonaptera). This preliminary result is confirmed by Labnaoui study in the same stations [20], as well as by Khaldi *et al.*, on *Atelerix algirus* [15].

The key usage for Ticks [17] allowed us to identify two taxonomic genera: Ixodes and Rhipicephalus gender. For each genera. We pushed the species identification, either globally the following species: *Ixodes ricinus (A), Rhipicephalus bursa (B) and Rhipicephalus turanicus (c)* (Fig 3).

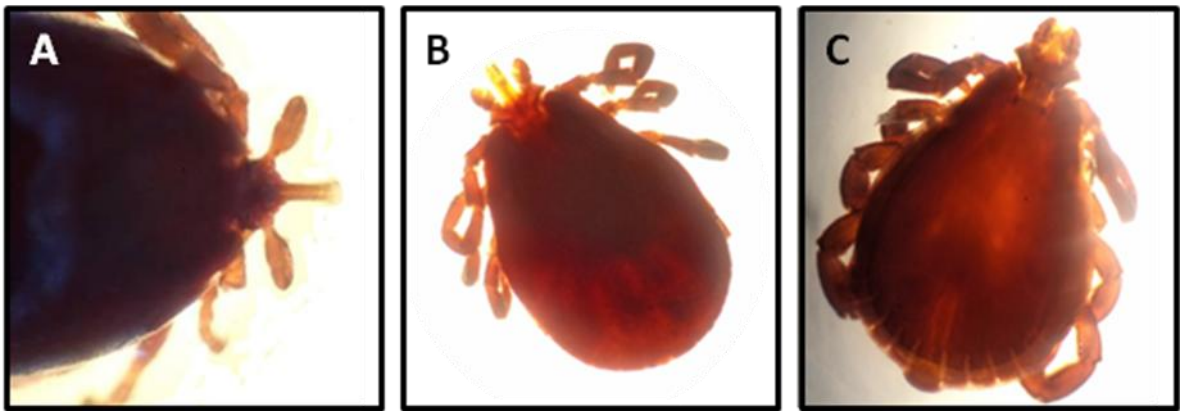

Fig. 3: Identification of *Ixodes ricinus* (A), *Rhipicephalus bursa* (B) and *Rhipicephalus turanicus* (C) (Gr X10, photo taken by Boukheroufa)

Many studies have highlighted habitats conducive to *Ixodes ricinus*. These are found in most of Europe, from England to the Caspian Sea and northern Africa to southern Scandinavia [21]. These zones are temperate and humid, composed of wooded pastures, gardens, hedgerows and woodland. Despite the presence of these habitats, the distribution of this species depends on environmental conditions at the scale of microhabitats and the presence of hosts, *Atelerix algirus*, if any. In Algeria, ixodidian fauna remains poorly understood both in terms of biodiversity and in terms of the specific biology [22]. Many authors have also identified the gender *Rhipicephalus*, including *Rhipicephalus bursa Rhipicephalus turanicus* and colonizing the Mediterranean region [23; 24].

For chips, the use of identification key [18], allowed us to distinguish a species it comes to *Archaeopsylla erinacei* (chip hedgehog).

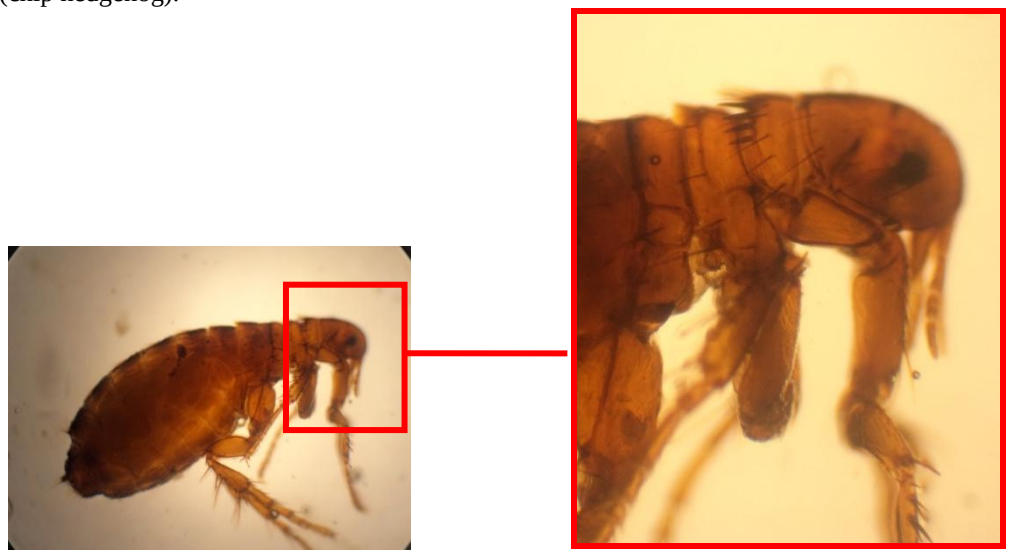

Fig. 4: *Hedgehog chip : **Archaeopsylla erinacei*** GrX 10 and X40 (Taken by Boukheroufa)

2. Analysis of parasite rates:

A total of 54 ectoparasites were collected with 29 chips and 25 ticks. Parasitic rates are exposed in the figure 5. The analysis of the parasitic abundance shows a predominance of *Archaeopsylla erinacei* (4.14), followed by respectively *Rhipiciphalus bursa* (1.71) *Rhipiciphalus turanicus* (1.43) and *Ixodes ricinus* (0.43). In the same way, the results show an infection rate *Archaeopsylla erinacei* largest with 85.71%, followed by a equal rate on *Rhipiciphalus bursa* and *Rhipiciphalus turanicus* (57.14%) and giving them the status of dominant species (> 50%) and *by Ixodes ricinus* (14.29%), which is considered like a satellite species.

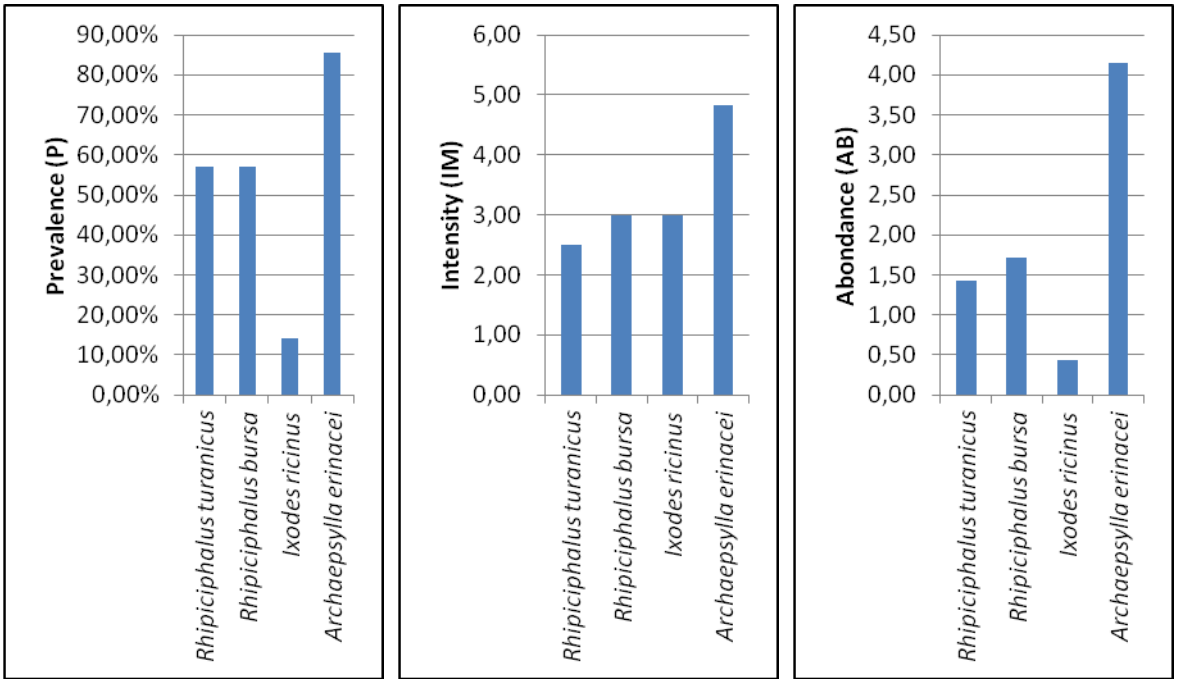

Fig. 5: Analysis of ectoparasites rates.

From parasitic indices calculated, we can already analyze the qualitative and quantitative trends in ectoparasites – hedgehog relationship. Tick species are associated with specific vegetation assemblages, witch represent an appropriate abiotic conditions for survival and the life cycle of the species [25]. Many studies have demonstrated the relationship between the abundance of ticks, host populations (*Atelerix algirus* in this study), plant communities and abiotic factors [26]. However, climate and vegetation can not explain all of its changes. The relationship between the tick population and landscape structure are influenced by interactions between host tick vectors responsible for the dispersion of individuals, and the availability of resources [27]. The influence of these interactions is different depending on the hosts [28].

Regarding the chips, even if it presents a degree of preference of their host (the case of *Archaeopsylla erinacei*, said hedgehog chip), they are by no means specific to a species and feed on other animals in the absence of their usual host. In fact, they tend to focus more on a nest as a host. Adults can feed on the blood of a variety of animals, but the larvae require more specific conditions associated in habitats and nesting habits of their hosts, rather than the characteristics of their blood. Our results are confirmed by different works on the same host [20; 15; 29]

ACKNOWLEDGMENT

The authors would like to express their gratitude to Dr. Dib Loubna (El Tarf University, Algeria), and to Forest department of Annaba, for their collaboration.

REFERENCES

[1] Korpimaki, E., P.R. Brown, J. Jacob and R. Pech, 2004. The puzzles of population cycles and outbreaks of small mammals solved. *Bioscience*, 54: 1071-1079.
[2] Abel, I.S., G. Marzagao, N.H. Yoshinari and T.T.S. Schumaker, 2000. Borrelia-like spirochetes recovered from ticks and small mammals collected in the Atlantic Forest Reserve, Cotia county, State of São Paulo, Brazil. Memórias do Instituto Oswaldo *Cruz*. 95: 621-624.
[3] Recio, M.R., R. Mathieu, R. Maloney and P.J. Seddon, 2011. Cost comparasion between GPS – and VHF – based telemetry: Case study of feral cats Felis catus in new Zeland. *New. Ze.l J. Ecol.* 35: 114-117.
[4] Hubert, P., R. Julliard, S. Biagiantia, M.L. et Poulle, 2011. Ecological factors driving the higher hedgehog (*Erinaceus europeaus*) density in an urban area compared to the adjacent rural area. *Landscape and Urban Planning*, 10: 34-43.
[5] Jones, C. and G. Norbury, 2011. Feeding selectivity of introduced hedgehogs *Erinaceus europaeus* in a dryland habitat, South Island, New Zealand. *Acta Theriol*. 56: 45-51.

[6] Skuballa, J., T.N. Petney, M. Pfaffle and H. Taraschewski, 2010. Molecular detection of Anaplasma *phagocytophilum* in the european hedgehog (*Erinaceus europaeus*) and its ticks. Vector borne Zoom Dis.
[7] Gaglio, G., S. Allen, L. Bowden, M. Bryant and E.R. Morgan, 2010. Parasites of European hedgehogs (*Erinaceus europaeus*) in Britain: epidemiological study and coprological test evaluation. *Eur J Wildl Res*. 56: 839-844.
[8] Pfa¨ffle. M., T. Petney, J. Skuballa and H. Taraschewski, 2011. Comparative population dynamics of a generalist (*Ixodes ricinus*) and specialist tick (*I. hexagonus*) species from European hedgehogs. *Exp Appl Acarol*., 54: 151-164
[9] Germain, M.S., 2008. Les hérissons. *Vecchi*. pp: 118.
[10] Kowalski, K., and B. Kowalska – Rzebik, 1991. Mammals of Algeria. *Ossolineum.* pp: 370.
[11] Mouhoub – Sayeh, C., J.P. Robin, P. Prevet, S. Monecke, S. Doumandji and M. Saboureau, 2009. Road mortality of the algerian Hedgehog Atelerix algirus in the Soummam Valley (Algeria). *Ecologie terre et vie.* 64 (2): 146-151.
[12] Ouarab, S., S. et Doumandji, 2010. Insectivorie du Hérisson d'Algérie *Atelerix algirus* (Lereboullet, 1842) (Erinaceidae ; Mammalia) dans la zone humide de Réghaîa. European Journal of Scientific Research, 44(04): 612-623.
[13] Derdoukh, W., A. Guerzou, F. Baaziz – Neffah, A. Khoudour, M. Dahou, A. Meribai and S. Doumandji, 2012. Selection of preys by Atelerix algirus in two stations of Mitidja (Algeria). *International Journal of Bio – Technology and Research*, 2(3): 51-62.
[14] Khaldi, M., C. Socholovski, B. Samso, S. Miquel, M. Biche, M. Benyettou, G. Barech, H.A. Benelkadi and A. Riba, 2012. Endoparasites (Helminthes and Coccidians) in the Hedgehogs *Atelerix algirus* and *Paraechinus aethiopicus* in Algeria. *Comparative Immunology, Microbiology and Infectious Diseases*. 35: 117-122.
[15] Khaldi, M., J. Torres, M. Benyettou, G. Barech, M. Biche, T. Kernif, D. Raoult and P. Parola 2012 - Rickettsiae in arthropods collected from the North African Hedgehog (Atelerix algirus) and the desert hedgehog (Paraechinus aethiopicus) in Algeria. *Comparative Immunology, Microbiology and Infectious Diseases*. 35: 117- 122.
[16] Tomas – Perez, M., M. Khaldi, C. Riera, D. Mozo – Leon, A. Ribas, M. Hide, G. Barech, M. K. Benyettou Seghiri, S. Doudou, R. Fisa, 2014. First report of natural infection in Hedgehogs with Leishmania major, a possible reservoir of zoonotic cutaneous Leishmaniasis in Algeria. Acta tropica., 135: 44-49.
[17] Walker, A.R., J.L. Camicas, A. Estrada –Pena, I.G. Horak, A.A. Latif, R.G. Pegram et P.M. Preston, 2003. Ticks of domestic animal in Africa : a guide to identification of specis, *Ed the university of Edinburgh.*, p: 227.
[18] Beaucournu, J.C., H. Launay, 1990. *Les puces* (Siphonaptera) *de France* et *du Bassin méditerranéen. in* Faune de France. France et régions limitmphes. no 76, Féd. fr. SCC. Sc. Nat.. Paris. pp: 548.
[19] Margolis, L.G., W. Esch, J.C. Holmes, A.M. Kuris, G.A. Chad, 1982. the use of ecological termin parasitology (report of ad hoc communittie of the american society of parasitologists). *Journal of parasitology*, 68: 131-133.
[20] Labnaoui, S., 2010. Bio écologie parasitaire du Hérisson d'Algérie en Numidie orientale. *Thèse de magister*. Univ. Annaba. pp: 57.
[21] Estrada-Peña, A., J.M. Venzal, C. Sanchez Acedo, 2006. The tick *Ixodes ricinus*: distribution and climate preferences in the western Palaeartic. *Medical and Veterinary Entomology*, 20: 189-197.
[22] Meddour – Bouderda, K., R. Meddour, 2006. Clés d'identification des Ixodina (Acarina) d'Algérie. *Sciences et technologie*, 24: 32-42.
[23] Dib, L., Z. Azzouz and M. Bensouilah, 2002. Ticks of Bovines in the algerian east : taxonomic approach and spatio temporal distribution. *Renc. Rech. Ruminants*. 9: 46.
[24] Halos, H., 2005. Détection de bactéries pathogènes dans leur vecteur, les tiques dures (Acarien : Ixodidae). Thèse de doctorat. *Institut agronomique Paris – Grignon*. pp: 175.
[25] Estrada- Peña, A., 2003. The relationships between habitat topology, critical scales of connectivity and tick abundance *Ixodes ricinus* in a heterogeneous landscape in northern Spain. Ecography, 26: 661-671.
[26] Dusbabek, F., and M. Daniel, 1994. Micrometeorological and microhabitat factors affecting maintenance and dissemination of tick-borne diseases in the environment. *Sonenshine, D. E. and Mather, T. N. (eds), Ecological dynamics of tick-borne zoonoses. Oxford Univ. Press*, pp: 91-138.
[27] Estrada-Peña, A., 2001. Distribution, abundance, and habitat preferences of *Ixodes ricinus* (Acari: Ixodidae) in Northern Spain. Journal of Medical Entomology, 38(3): 361-370.
[28] Boyard, C., J. Barnouin, P. Gasqui, G. Vourc'h, 2007.- Local environmental factors characterizing *Ixodes ricinu*s nymph abundance in grazed permanent pastures for cattle. Parasitology, 134: 987-994.
[29] Madoui, M.E.L., F. Sakraoui, M. Houhamdi and Z. Bouslama, 2014. Caractérisation et dynamique des peuplements de Puces de la faune sauvage et domestique : impact sur la santé. Faunisitc entomology, 67 : 3-13.