

A STUDY ON RODENT ECTOPARASITES IN BANDAR ABBAS: THE MAIN ECONOMIC SOUTHERN SEAPORT OF IRAN

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ABSTRACT

Rodents are one of the main health problems in the cities, especially in coastal area. These animals make economic damages and are potential health dangers in Bandar Abbas, the main economic southern port of Iran. In this study, rodents were captured from different parts of the city, before and after a control program during 2003-2004, transferred to the laboratory, identified and examined for ecto-parasites. Totally 105 rodents demonstrating four species: *Rattus rattus* (3%), *R. norvegicus* (78%), *Mus musculus* (3%) and *Tatera indica* (16%), were captured before the control program. The most frequency was observed in Ayatollah Ghafari quarter, 10 rodents per 24 traps. After 12 months, the duration of control program, rodents were re-captured to assessment the success of control activity. In this stage 35 small mammals demonstrated four species were obtained: *R.norvegicus* (51.4%), *R.rattus* (37.1%), *T.indica* (8.6%) and one weasel (2.9%). We found the most frequency in Khoon-sorkh quarter with 6 rodents per 24 traps. The identified ectoparasites were *Xenopsylla buxtoni*, *Rhipicephalus* sp., *Polyplax gerbilli*, *Haplopleura captiosa*, *Ornithonyssus bacoti*, *Laelaps nuttalli*, *Dermanyssus americanus*, *Dermanyssus sanguineus*, *Haemolaelaps glasgowi* and *Echinolaelaps echidninus*. The number of rodents reduced to one third after control program, shows the relative success of this program ($p < 0.05$).

Key word: Rodents, control, ecto-parasites

INTRODUCTION

A number of vertebrate animals will invade domestic and commercial premises in search of food and shelter. In doing so, they may be involved in the transmission of disease, soiling and destroying commodities and packing, damaging equipments, buildings and installations, and causing a nuisance. Rodents are the most important animal in this view (Burgess, 1998). The economic importance of rodents is fourfold: a) Destruction or contamination of foodstuffs by rodents amounts to millions of dollars annually. b) Damage to buildings and manufactured goods are estimated in the millions of dollars per annum. c) Damage to insulated wiring, earthen dams, and forest products costs additional dollars each year, and the damage to the insulation of electrical wiring creates fire hazards. d) To the costs of disease and of damage,

destruction, and contamination should be added to the cost of rodent control and totals billions of dollars. They are the largest order of mammals, representing 43% of specific global mammalian diversity, and including 443 genera and 2021 different species (Saluzzo and Dodet, 1999). Rodents together with arthropod ectoparasites can play an important role in distribution of the arboviruses, streptococcal infections, choriomeningitis, plague, tularemia, leptospirosis, spirochaetosis, etc (Manson and Stanko, 2005). Arthropod ectoparasites are a diverse and highly adapted group of animals that inhabit the external body surfaces of vertebrates. They may live permanently on their host, or occupy the host's nest and immediate environment, and visit the body of the host periodically. In either case, there is a close dependency on the host for various life-sustaining resources.

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Rodents are one of the main health problems in the cities, especially in ports and coastal areas. These animals make economic damages and are potential health dangers in Bandar Abbas, the main economic southern port of Iran. This study was conducted to determine the active rodent species of Bandar Abbas and estimation of their frequency in different quarters of the city, to design the control program. Beside the main proposed ecto-parasitic arthropods of the captured rodents were removed and identified.

MATERIALS AND METHODS

This descriptive investigation was carried out over a period of 24 months at Bandar Abbas city, Hormozgan province (25° 24' - 28° 57' N. and 52° 41' - 59° 15' E.). Bandar Abbas is located on the southern border of Iran, adjacent to the Persian Gulf. It is the main commercial port of the country. This city has subtropical weather and its mean temperature is ranged from 5 to 45°C in December and July, respectively. Relative humidity is different from 38 to 88%. The annual mean rainfall in the recent ten years is 76.4 mm/year.

Commensal (semi-domestic) rodents were collected by Sherman live traps from 19 parts of the city and its margin using tomato, cucumber and cheese baits, before and after control program during 2003-2004. Control was carried out by Facorat® anticoagulant rodenticide. The caught rodents were transferred to the parasitology laboratory of Bandar Abbas training and public health research center. After killing with sulfuric

ether, their morphometric characters were recorded for following identification (Etemad, 1978) and ectoparasites were recovered by combing their body hairs with a toothbrush on the water surface, pick up with fine needle from the water and conserved in ethanol 70%. They were mounted on permanent slides following the conventional techniques for each group and then identified using different keys (Johnson, 1960; Farhang-Azad, 1970; Baker, 1999).

The number of rodents before and after control program was compared using SPSS 11.5 and paired sample T-test.

RESULTS

105 rodents demonstrated four species were captured: *Rattus rattus* (3%), *R. norvegicus* (78%), *Mus musculus* (3%) and *Tatera indica*

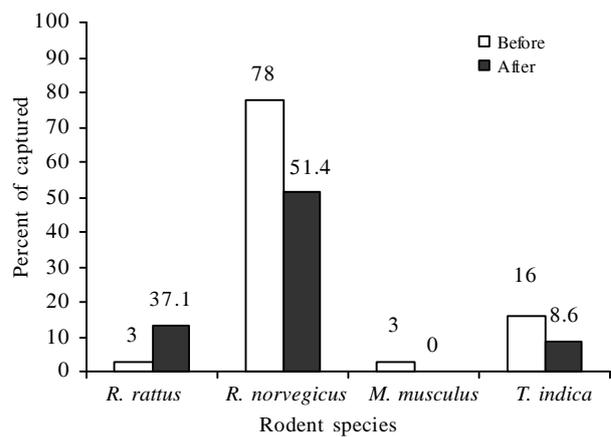


Fig. 1: Rodents capture rates during the control program, Bandar Abbas city, Southern Iran, 2003-2004

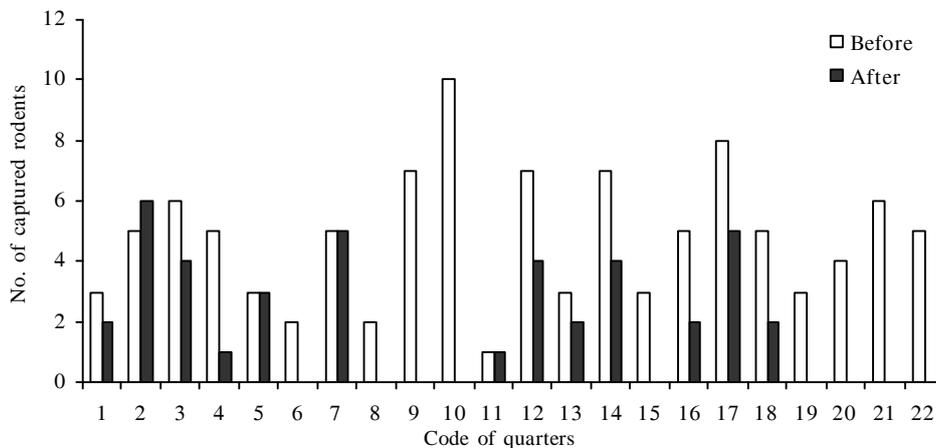


Fig. 2: Number of rodents captured per 24 traps before and after control program in different quarters of Bandar Abbas, Southern Iran, 2003-2004

(16%) before the control program (Fig. 1). The most frequency was observed in Ayatollah Ghafari quarter, 10 rodents per 24 traps (Fig. 2). After 12 months, the duration of control program, rodents were captured again to assessment the success of control activity. In this stage 35 rodents demonstrated four species were obtained: *R.norvegicus* (51.4%), *R.rattus* (37.1%), *T.indica* (8.6%) and one weasel (2.9%). The most frequency

was found in Khoon-Sorkh quarter with 6 rodents per 24 traps. The identified ectoparasites were *Xenopsylla buxtoni* (31.22%), *Rhipicephalus* sp. (3.17%), *Polyplax gerbilli* (14.42%), *Haplopleura captiosa* (11.09%), *Ornithonyssus bacoti* (0.95%), *Laelaps nuttalli* (32.17%), *Dermanyssus americanus* (0.79%), *Dermanyssus sanguineus* (0.32%), *Haemolaelaps glasgowi* (1.43%) and *Echinolaelaps echidninus* (4.44%) (Table 1).

Table 1: Fauna and number of ecto-parasites of rodents captured in Bandar Abbas city, southern Iran, 2003-2004

Rodent species	<i>Laelaps nuttalli</i>	<i>Dermanyssus americanus</i>	<i>Ornithonyssus bacoti</i>	<i>Haemolaelaps glasgowi</i>	<i>Echinolaelaps echidninus</i>	<i>Xenopsylla buxtoni</i>	<i>Polyplax gerbilli</i>	<i>Rhipicephalus</i> sp.	<i>Haplopleura captiosa</i>	<i>Dermanyssus sanguineus</i>
<i>Rattus rattus</i>	0	0	0	0	0	3	0	2	0	0
<i>Rattus norvegicus</i>	201	4	0	3	24	134	1	14	70	2
<i>Tatera indica</i>	2	1	6	6	4	60	90	4	0	0
Total	203	5	6	9	28	197	91	20	70	2
Percent	32.17	0.79	0.95	1.43	4.44	31.22	14.42	3.17	11.09	0.32

DISCUSSION

Domesticated animals or commensal rodents can serve as vertebrate amplifying hosts and bring these agents and their ectoparasitic arthropod vectors into direct association with humans and help maintain transmission cycles in densely populated urban areas. The reasons for the increase in these urban zoonoses are complex. Food materials, sweepings gathered in some parts of the city, illegal storing and transporting of some food materials such as wheat, corn are the main reasons for high frequency of rodents in some quarters of Bandar Abbas. Increasing the public health surveillance support is required to determine the rodent infected places and to design the implement control programs.

The rodent species captured in this survey, *R.norvegicus*, *R.rattus*, *T.indica* and *M.musculus* were also reported in another study that has been conducted previously in Bandar Abbas (Djafari & Asmar, 1986). These mammals have an important role in the cycle of zoonotic diseases such as plague, murine typhus, zoonotic cutaneous leishmaniasis (ZCL), Q fever, etc. Plague and ZCL are endemic vector-borne diseases in Iran. *Rattus* spp. is introduced as the reservoir host of plague in Kordestan province located in western part of the country (Dennis et al., 1999) and *Tatera indica* is the main reservoir host of ZCL in Ilam province, west of Iran (Javadian et al., 1998). Therefore,

they are potentially dangerous rodents in Bandar Abbas city, where an endemic focus of ZCL is about 50km far from it. Because infected rats may be transferred by ship from the other countries to Bandar Abbas, the control program must be continuous.

Some of the ecto-parasites that are identified in this study are potentially vectors of veterinary and medical importance diseases. So public health center have to train people and aware them to prevent close contact with rodents and report any contamination.

Studies in the city of Sari, northern coastal board of Iran near the Caspian sea, showed activity of 5 rodent species, *Rattus rattus*, *R. norvegicus*, *Mus musculus*, *Glis glis* and *Apodemus sylvaticus*. The most common species was *R.rattus* (35.7%). They reported *Echinolaelaps echidnini* mites, *Hoplopleura* sp. lice and *Rhipicephalus* sp. ticks on the captured rodents (Motevalli-Hagghi et al., 2000). Another study in this area showed 7 rodent species *R.rattus*, *R.norvegicus*, *M.musculus*, *G. glis*, *A. sylvaticus*, *Nesokia indica* and *Arvicola terrestris*. The ectoparasites that were found in these rodents were *Echinolaelaps echidninus*, *Rhipicephalus* sp., *Nosopsyllus fasciatus*, and also species of Ixodidae and Opiliacaridae (Motevalli-Hagghi et al., 2002). The study of rodents and their ectoparasites in the western province of Lorestan in Iran showed *R.rattus* was

infected with *Xenopsylla buxtoni*, *Haemolaelaps glasgowi*, *Ornithonyssus sylviarum* and *Haemaphysalis* sp (Rafinejad et al., 2005). Other ectoparasites that they reported on 9 rodent species were *N. fasciatus*, *Neohaematopins laeviusulus* and *Nosopsyllus iranus*.

Other studies on brown rats in the Middle East showed a prevalence of infection with *Hymenolepis diminuta* (17.6%) and *Xenopsylla buxtoni* (45.6%) in Qatar (Abu-Madi et al., 2001). Study on ectoparasites of commensal rodents in the Indonesia showed the *X. cheopis* was most common on *R. rattus*. Other arthropod species that parasitized black rat were *Hoplopleura pacifica* and *Polyplax spinulosa* sucking lice and *Laelaps nuttalli* mite (Durden and Page, 1991).

A two years study on ectoparasites of urban region in Brazil showed *X. cheopis*, *Ctenocephalides felis felis*, *Polyplax spinulosa*, *Laelaps nuttalli*, *Echinolaelaps echidninus* and *Atricholaelaps glasgowi* from *R. norvegicus* (Linardi et al., 1984). In the current study, number of rodents is reduced significantly ($P < 0.05$) to one third after control program, shows the relative success. Results of the previous control program in Bandar Abbas using Zinc phosphid and comatetril rodenticides showed that method was very effective against rodents, but because remaining the infestation factors, the population of rodents was increased after the control program (Djafari & Asmar, 1986). Among the rodent species, *R. rattus* shows an increase in after control captures. It may be due to it's living and food habitats that enable this species to escape from the toxic baits, meanwhile there are some reports of resistance to anticoagulant toxic baits (Lasseur et al., 2005). For better results, it is necessary to train people about the public health significance of rodents, rat proofing the buildings, correct repelling of trash, and doing a continuous control program with suitable rodenticides. The weather condition of the area is humid and warm, so it is recommended to change unused toxic baits in definite intervals. Because the reports of resistance to toxic baits, studying on the resistance status of rodents to the used rodenticides may be desirable.

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