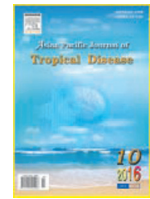




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Evaluation of biological control of rattus population by mongoose (Herpestidae, Carnivora) in Abu-Musa Island, Iran

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ABSTRACT

Objective: To evaluate the rattus biological control program in Iranian Persian Gulf Island, Abu-Musa.

Methods: This study was conducted on the Iranian island of Abu-Musa during April 2012 to March 2013. The rattus trapping was done using commercial live and baited rat trap, in different parts of the island. Also the island of Qeshm, with a similar weather and climatic conditions in the Persian Gulf was considered as a control area, which any comprehensive rattus control plan has not been implemented during the implementation of rattus biological control program on Abu-Musa Island. All ectoparasites were collected and stored at 70% ethanol. Ectoparasites, including fleas, lice and mites were identified using identification keys. In addition, a number of released mongooses were captured and identified.

Results: Despite a year of trapping on the island, no rattus were caught in the traps. While on the island of Qeshm, as a control location, rate of rat trappings was estimated 33.3%. Among the 27 captured rodents in two islands, a total of 89 ectoparasites including fleas, *Xenopsylla astia* (32 females, 18 males) and *Ctenocephalides felis* (9 females, 7 males), louse, *Polyplax spinulosa* (8 females, 2 males) and mite, *Laelaps nuttalli* (13 females and males) were collected.

In this study, the introduced mongoose on the island of Abu-Musa, which has established and increased their population and been distributed in all parts of the island, was identified as Indian gray mongoose, *Herpestes edwardsii*.

Conclusions: The introduced Indian gray mongoose has successfully eradicated the rattus population in island of Abu-Musa, but we have no information about its direct and indirect impacts on other native faunal elements of this island.

1. Introduction

The common commensal species of *Rattus* (Fischer de Waldheim, 1803) including Norway or brown rat, *Rattus norvegicus* (*R. norvegicus*) (Berkenhout, 1769) and roof or black rat, *Rattus rattus* (L, 1758) are important reservoirs or vectors of pathogens and threat public health[1]. These harmful rodents are among the main agricultural pests and have destructive impact on urban environment and also food crops[1,2].

The biological control of rats using their natural enemies such as predators and pathogens is carried out in many parts of the world[3]. In the past, the pathogens such as *Salmonella* and some predatory animals including the monitor lizard, mongoose, ferret, weasel, barn owl and also domestic and feral cats were used as the main agents for the biological control of rodents. Among them, mongoose is the most common biological control agent that has been used for rat control[4,5].

The mongooses are the small invasive carnivorous belonging to the family of Herpestidae, with 17–18 genera and 35–37 species[6-7]. The *Herpestes* is a genus of the mongoose with ten species that are usually distributed in the old world[8]. Mainly 8 species of these mongooses including Indian grey mongoose [*Herpestes edwardsii* (*H. edwardsii*)], small Asian mongoose or Javan mongoose [*Herpestes javanicus* (*H. javanicus*)], small Indian brown mongoose

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(*Herpestes fuscus*), crab-eating mongoose (*Herpestes urva*), small Indian mongoose [*Herpestes auro-punctatus* (*H. auro-punctatus*)], small short tailed mongoose (*Herpestes brachyurus*), ruddy mongoose (*Herpestes smithii*) and striped-necked mongoose (*Herpestes vitticollis*) are distributed in Asia[6,7,9]. In some cases, the small Asian mongooses and the small Indian mongoose are mistakenly considered as a single or sympatric species[6,8,10]. Two mentioned species and *H. edwardsii* are native to the Middle East and much of Southern Asia[8,9].

The *Rattus* biological control (RBC) using mongoose has been done for about 100 years during 1872 to 1979 in many parts of the world[5]. The mongooses, mainly *H. javanicus* and *H. auro-punctatus*, were widely introduced in new areas including the islands in the Pacific and Indian Oceans, the Caribbean and Atlantic Seas, Japan and some other regions of the world for biological control of rats and snakes[5,11]. The first introduction of mongooses to an island was occurred in 1872, when four males and five females were transferred from Calcutta of India to Jamaica[12]. Subsequent generations of breeding mongooses were moved to Cuba, Puerto Rico, Grenada, Barbados and Trinidad, also in 1883–1885, a relatively large number of mongooses were released on Hawaiian Islands[12,13]. Also during 1883–1910 a number of mongooses were released from India and Bangladesh on Fiji, Mauritius and Okinawa Islands, respectively. The latest instance of release on an island was occurred in 1979 on Amami-Oshima in Japan[12,13]. Today these mongooses are found in a large number of islands and a wide variety of habitats[5,7].

Also the Indian gray mongoose, *H. edwardsii*, which is mainly found in Southern Asia has been introduced on Japan and also probably on Adriatic islands, but is reported with another name, *Herpestes griseus*, synonym of *H. edwardsii*[8,11].

The southern ports of Iran and the Persian Gulf islands are highly infected by rats due to many ship traffic[14]. Therefore biological control of *Rattus* was conducted in the Iranian strategic island of Abu-Musa in the Persian Gulf by using mongoose (unpublished report). It is not well understood that which species of mongoose properly were introduced in this island.

The aim of this study was evaluation of RBC program on the island of Abu-Musa.

2. Materials and methods

2.1. Study site

This study was conducted on the island of Abu-Musa during April 2012 to March 2013. Abu-Musa with 25°51'–26°19' N, 54°26'–55°19' E and an area of 12.8 km², is located in the Persian Gulf in Southeastern of Iran (Figure 1). Halva Mountain with an altitude of 110 m is the highest point of the island. The climate is warm and humid on this subtropical island[15]. Abu Musa and Greater and Lesser Tunbs are the Iranian strategic islands in the Persian Gulf. The oil tankers and merchant big ships have to pass between these islands, due to the depth of sea in this area[15,16](Figure 1).

2.2. RBC program

According to the official statements of Abu-Musa Island and the documentation of military health departments in this island, RBC program was conducted in Abu-Musa during 2005–2006 by island authorities and with the help and under the supervision of Department of Environmental Protection of Hormozgan Province, in south of Iran. In this program, more probably three pairs of the mongoose, 3 males and 3 females, were released in the island of Abu-Musa. We didn't found further details of the RBC plan implementation. According to residents and military health documentation, the *Rattus* widely distributed on Abu-Musa such as other Persian Gulf Islands before the RBC program implementation, but there was no more scientific information about the abundance of *Rattus* on the island.

2.3. *Rattus* trapping

The *Rattus* trapping was done by the use of commercial live and baited rat trap, similar to Sherman rat trap, in size to 12 cm × 14 cm × 23 cm (Figure 2). Fresh cucumber, coconut and fish were also used as bait in traps[17]. The traps were placed in the evening and before sunset in high-activity areas of the rat or in places where rodent activity is more likely to happen including darkened corners, along

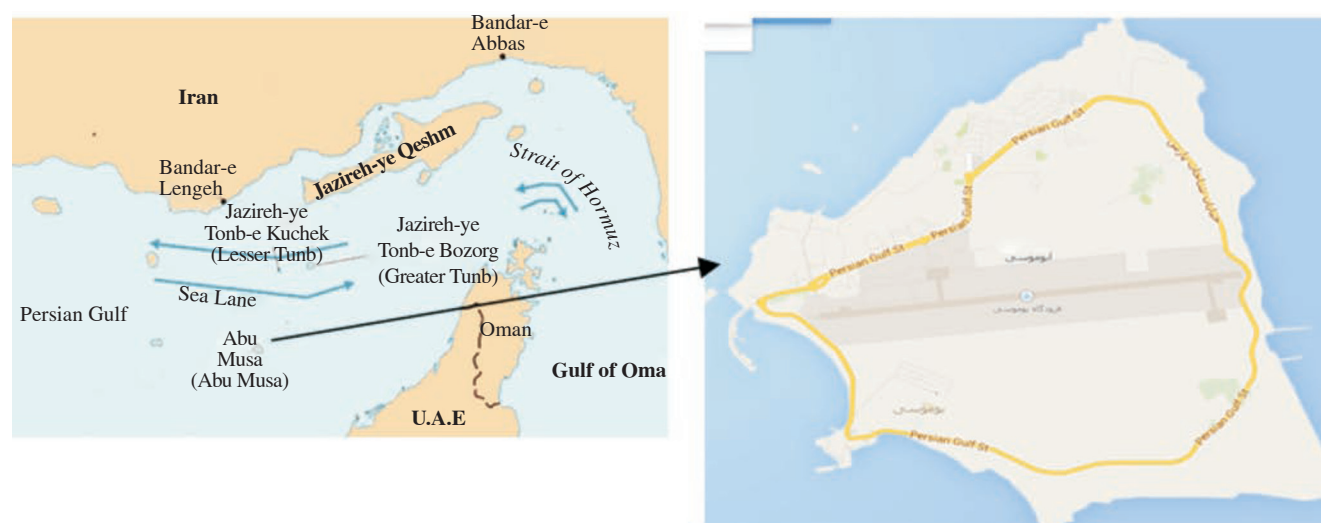


Figure 1. Location of Abu-Musa Island in Persian Gulf.

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