

Original Article

Faunestic Study of Ants with Emphasis on the Health Risk of Stinging Ants in Qeshm Island, Iran

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(Received 9 Aug 2009; accepted 5 Sep 2009)

Abstract

Background: Qeshm (26.75N, 55.82E), Iran, is 1500 km² island in the Strait of Hormuz. Qeshm is a free trade zone, acting as an important channel for international commerce, and has been the site of much recent development. There is potential risk of stinging ant attacks for residents and visitors that may occur in the island. The aims of this study were to find out the fauna, dispersion, and some of the biological features of ant species with special attention to those, which can play role on the public health of the island.

Methods: In this cross-sectional study, we surveyed ants around the island using non-attractive pitfall traps and active collection to evaluate potential threats to humans and other species during 2006–2007. All collected specimens were identified using the morphological ant keys.

Results: Only six ant species were found: *Pachycondyla senaarensis* (41%), *Polyrhachis lacteipennis* (23%), *Camponotus fellah* (16%), *Cataglyphis niger* (9%), *Tapinoma simrothi* (7%), and *Messor galla* (4%).

Conclusion: We were surprised not to find any cosmopolitan tramp ants so often associated with commerce and development. Instead, all six species may be native to the Middle Eastern region. The most common species, *P. senaarensis*, has a powerful sting and appears to do well around human habitations. This species may prove to be a serious pest on the island.

Keywords: *Pachycondyla senaarensis*, Public health, pests, African needle ant, Iran

Introduction

Ants (superfamily Formicoidea) have a worldwide distribution, some certain genera and species present in almost all countries and in all places. They are among the most successful insects which occurring everywhere in terrestrial habitats and outnumbering most of other terrestrial animals in individuals (Borrer et al. 1989, Taylor 2007).

Some ant species due to some certain characters such as their social organization are considered as the most successful invaders (Moller 1996, Williamson and Fitter 1996). Those ants that have principally spread throughout

the world human trade are considered as tramp species which living in close association with man. They have a wide distribution in the world and can find them in many areas even out of their original ranges. They tend to have widespread geographical distributions, and share life history characteristics including queen number, nest structure, and foraging behaviour (McGlynn 1999). They share several characteristics as unicoloniality resulting in an absence of intraspecific aggression, polygyny (multiple queens nests), high interspecific aggression and the small size of workers (Passera 1994).

All ant species are grouped into a single family, the Formicidae, which includes 10-20

subfamilies (Astruc et al. 2004). Subfamily Ponerae is one of the most known ones and comprises ten genera. The genus *Pachycondyla* [Smith (1858)], includes a large group of ants with about 200 described species, worldwide distribution, and mostly known from tropics and sub-tropics regions (Bolton 1995).

A few species have an obvious and functional sting, whereas other ants bite with their maxillae with no sting. The members of genus *Pachycondyla* have sting which use for their predatory activities. The majority species of the genus *Pachycondyla* are scavengers or predators of arthropods, the later subdue their pray with venom (Wild 2002, Orivel and Dejean 2001).

Some ant species capable of inciting hypersensitivity reactions include *P. sennaarensis* (Steen et al. 2005). There has also reported anaphylactic shock in humans following the stings form *P. sennaarensis* in the United Arab Emirates (Dib et al. 1995). This taxon is one of the eight genera of ants that have been associated with sting allergy worldwide.

Pachycondyla sennaarensis has been incriminated as an intermediate host for the poultry cestode, *Raillietina tetragona* in Sudan (Mohammed et al. 1988).

To date, occurrence of *P. sennaarensis* has been confirmed from southern parts of Iran (Tirgari et al. 2004, Tirgari and Paknia 2004, Tirgari and Paknia 2005, Akbarzadeh et al. 2006 a, b, Paknia 2006). However, there is little information on species composition, distribution, ecology, biology, behaviour and public health threat of stinging ants in Iran.

There are many public health concerns in Qeshm due to recent development of the island and increasing the population. Besides, there are many attractions, which make the island one of the most popular tourists' destinations in the region. There is potential risk of stinging ant attacks for residents and visitors that may occur indoors or outdoors.

This study was conducted to identify ant species, dispersion, and some of their bio-

logical and morphological features to throw light on status of *P. sennaarensis* as a public health pest in the island. It tends to provide preliminary information on ants in Qeshm for further prevention and control programs.

Materials and Methods

Study Site

Qeshm is situated at the entrance of the Persian Gulf in the Strait of Hormoz, in the 55 to 57 degrees longitude and 25 to 27 degrees latitude. It is 1500 km² in area with 136 km as length and 11 km as average width. The island is 30 km long at its maximum width. The highest point of Qeshm, on a salt field to its west, is 397 meters from sea level with the average height of 10 meters. The climate of Qeshm is warm and humid summers with scattered winds. The winters, are generally mild and spring like. The annual median of the daily average temperature is 27 degrees centigrade and the annual average of the maximum daily temperature is 32 degrees centigrade. The island's average humidity is 74, with a maximum rainfall of 456 mm, and a minimum of 41 mm, annually. There are 200 hectares of Mangrove sea forest and also tropical plants and trees with palm groves in Qeshm. Because of the tropical climate of the island, around 200 species of birds migrate or reside in natural Hara forest habitats. Among the wild life of Qeshm, eagle, fox and sea turtles are recognized in the island. Qeshm is one of the most important and largest Persian Gulf islands that recently, due to the new government policies, converted to one of the free Commercial-Industrial and touristy area. This island accommodates thousands Iranian and foreign tourists every year (Fig. 1).

Sampling methods

The present study was conducted in Qeshm Island, Hormozgan Province, 2006-2007. The island divided into 20 regions and

samplings were performed from over 20 stations with the aim of determining the ant species in the island. Each station was divided in 10 points of measure disposed in a regular grid in a 20 x 20 meters square. Sampling was carried out directly by searching the ant nests. Two different methods were used to collect the specimens of ants. Ten non-attractive pitfall traps were laid for 7 d on each station. They were grouped by two and placed in five points with 50 cm from each other. Each group was itself distant from the other two groups by 10 meters in a line. Pitfall traps consisted of plastic jars of fifty-five millimetre diameter and thirty-five millimetres deep, containers filled with 30 ml of ethanol at 35%. The second method was active collection. Specimens from nests or surrounding areas were transferred to the containers filled with ethanol at 70% by paintbrush. Visual observations were performed on different days at sample sites.

All specimens preserved in dish and relative information was recorded. Specimens were deposited in the Medical Arthropods Museum, the School of Public Health, Tehran University of Medical Sciences. The specimens were identified using the morphological keys of Bolton (1994), Collingwood and Agosti (1996) and Shattuck and Barnett (2001).

Results

The total number of samples identified was 1359. Six species of ants were identified belonging to three subfamilies includes Formicinae, Dolichoderinae, Myrmicinae. Of these six species, the most common was *P. sennaarensis* subfamily Ponerinea (41%), collected in pitfall traps and active collection on all twenty stations in urban and rural areas of the island (Table 1).

The other ants were identified as follow: *P. lacteipennis* Smith (Subfamily For-

micinae) 23%, *Camponotus fellah* Dall Torre (Subfamily Formicinae) 16%, *Cataglyphis niger* Andre (Subfamily Formicinae) 9%, *Tapi-noma simrothi* Krausse (Subfamily Dolichoderinae) 7% and *Messor galla* Mayr (Subfamily Myrmicinae) 4%.

Pachycondyla sennaarensis was the most common ant in various parts of the island. They are able to establish their colonies in every type of human environment present in Qeshm. The species distributed throughout Qeshmisland, which is the southern limit of its distribution in Iran (Table1).

This taxon is not an aggressive species through its distribution in the island. It feeds mainly on food waste in urban area but it also feeds on dead insects and attracts to sugary substances. In addition, they are scavenger or predator in some parts of the island. Their nests generally open on to the surface with circular apertures, each 3-5 mm in diameter in the yards, gardens, parks and roadside plantations partially exposed to the sun. However, they are able to build their nest inside the human premises. In one case, we found their nest in the third floor of a shopping centre. In other case, the nest was built in second floor of a house in Qeshm.

Discussion

By far the most common species we found on Qeshm was *P. sennaarensis* Mayr (1862) described *Pachycondyla sennaarensis* from Sennaar, Sudan (13.55N, 33.60E). Emery (1881) first reported *P. sennaarensis* on the Arabian Peninsula, from three sites in Yemen. Later reports have recorded *P. sennaarensis* from many parts of tropical Africa e.g., Angola, Burkina Faso, Cameroon, Congo, Djibouti, Ethiopia, the Gambia, Ghana, Guinea, Nigeria, Senegal, Sierra Leone, and Zaire; (Taylor 2007) and the Arabian Peninsula e.g., Kuwait, Oman, Qatar, Saudi Arabia, UAE, and Yemen (Collingwood 1985,

Collingwood and Agosti, 1996, Collingwood et al. 1997, Collingwood and van Harten 2001, 2005). Recently, several authors have reported *P. sennaarensis* from South-eastern Iran, adjacent to the Arabian Peninsula (Tirgari et al. 2004, Tirgari and Paknia 2004, Tirgari and Paknia 2005, Akbarzadeh et al. 2006 a, b, Paknia 2006). Paknia (2006) considered *P. sennaarensis* as an exotic species to Iran, its near continuous range across Africa and

Arabia. Other studies indicated that the species tend to have widespread towards the north of the country (Tirgari and Paknia 2005).

We were surprised that our surveys found none of the major pantropical tramp ant species, such as *P. longicornis* or *Tapi-noma melanocephalum*. This study did not even find the tramp *Monomorium destructor*, a species that is often a pest in semi-arid areas.

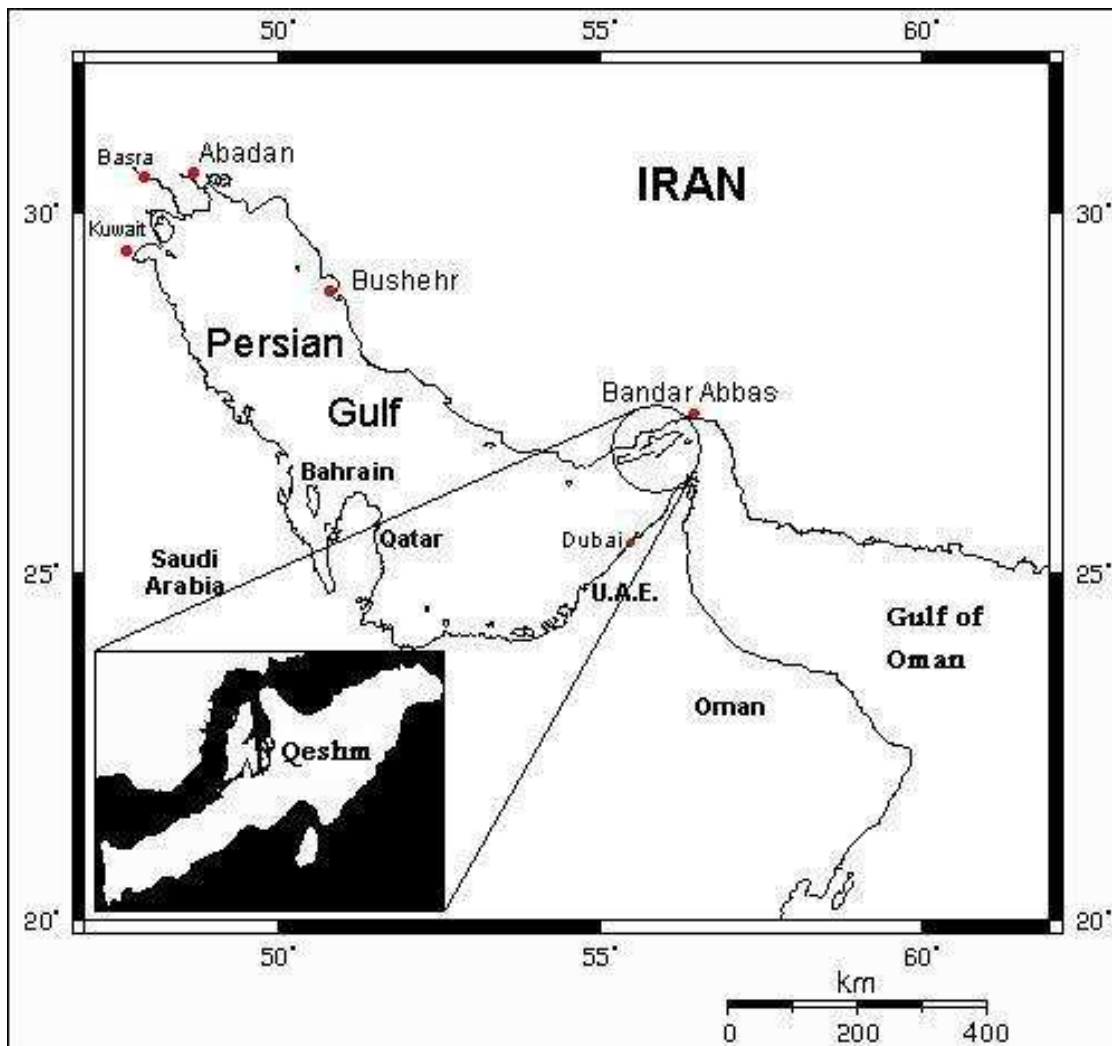


Fig. 1. Qeshm Island in southern Iran

Table 1. Locations where *P. sannaarensis* collected in Qeshm Island

No.	Collection site	No of observed colony	Location
1	Qeshm	18	Resident area, parks, open fields and wharf
2	Dargahan	7	Resident area , open fields and roadside plantations
3	Pay posht	3	
4	Laft port	5	Resident area
5	Gorzine	2	Resident area
6	Tabl	6	Resident area
7	Doolab	5	Resident area
8	Band Basaaaid	3	Resident area
9	Doostkoh	5	Resident area
10	Namakdan	6	Resident area
11	Salkh	3	Resident area
12	Direstan	2	Resident area
13	Masn Port	3	Resident area
14	Sosa Port	4	Resident area
15	Rhamkan	7	Resident area and roadside plantations
16	Direstan and Air port	7	Resident area
17	Toorian	8	Resident area and roadside plantations
18	Rham chah	12	Resident area and roadside plantations
19	Toola	2	Resident area
20	Tombak	4	Resident area

Although Akbarzadah et al. (2006 a, b) have recently used the "fire ant" for *P. sennaarensis*, it probably gives the false impression that this ant is related to genus *Solenopsis*. It seems that the common name "samsun ant" is more appropriate for *P. sennaarensis* and many authors use this name for the species in the region (Dibs et al. 1995, Tirgari et al. 2004, Tirgari and Paknia 2004, Tirgari and Paknia 2005, Al-Shahwan et al. 2006, Paknia 2006). Since *P. chinensis* is now called the "Asian needle ant", based on their similarity in behaviour and biology, it could be called *P. sennaarensis* "African needle ant".

This study revealed an enormous amount of the samsun ant, *P. sennaarensis* in resident areas in Qeshm. While this taxon described as an aggressive species in Africa and some countries in the Middle East (Collingwood 1985, Dib et al. 1995, Taylor 2007), it is not an aggressive species throughout its distribution in the island. Previous studies by Tirgari et al. in 2004 and Akbarzadeh et al. in 2006 have shown the threat of *P. sennaarensis* on human health

in south and southeast corner of the country. Comparison between morphological characters of the samsun ant from Qeshm and Sistan va Baluchistan province showed that they are identical and belong to the same species.

Many ant species, particularly those of tropical and subtropical origins, are easily transported around the globe by human commerce (Morrison et al. 2004). However, the island has been one of the most important islands of Iran from ancient times and it could be postulated that it has been transported from other places by human commerce.

Although the behaviour, nesting and social biology of *P. sennaarensis* are diverse in different parts of the world, it seems the species shares the same characters in its distribution in southern parts of Iran, which described by different authors (Tirgari et al. 2004, Tirgari and Paknia 2004, Tirgari and Paknia 2005, Akbarzadeh et al. 2006 a, b, Paknia 2006). They live in colonies and make their nests in ground. The majority of them make their nest near buildings, gardens, parks and roadsides.

The food preference of *P. sennaarensis* is varied in different part of the world. While in Africa, it is generally granivorous (Dejean and Lachaud 1994), in Qeshm the species feeds on human food and waste mainly. In such situation, it can consider as a commensal species. It appears this habit dependent on environmental factors, fauna and flora of the region and more importantly the availability of food. However, the species generally can be described as an omnivorous species, which feed on every available food sources such as food waste, fruits, nectarines or homopteran honeydew, small arthropods and dead animals. In urban area of the island, they also prefer to feed on the human's food.

Besides, as they live in colonies with a few dozen to a few thousand workers, it shows their potential as a real threat of public health to the residents and visitors. Although their control is very difficult, knowledge of ant biology is essential for successful control programs.

The strategic location of Qeshm in the Persian Gulf and increase commercial movements in the recent years needs more attention for related organization to prevent entering pest ant species. It is important to support those researches aimed to identify species composition, the ecology and behaviour of native either exotic ant in the region based on environmental factors. Besides, as there are no regional pest ant control programs in the Persian Gulf region, it is need to achieve, develop and improve safe strategies for the local and regional control of pest ant.

Acknowledgments

The authors are grateful to Tehran University of Medical Sciences and Qeshm branch of Islamic Azad University for their support. The authors declare that they have no conflicts of interest.

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