

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

The First Occurrence of Fire Ant *Pachycondyla sennaarensis* (Hym.: Formicidae), Southeastern Iran

¹Akbarzadeh Kamran, ²Siavosh Tirgari, ³Mehdi Nateghpour and ²Mohammad-Reza Abai

¹Department of Medical Entomology and Vector Control,
Iranshahr Station of Training and Health Research,
Imam St., Post Code: Iranshahr, 99137, Iran

²Department of Medical Entomology and Vector Control,
School of Public Health and Institute of Public Health Research,
Tehran University of Medical Sciences, P.O. Box 6446/14155

³Department of Medical Parasitology and Mycology,
School of Public Health and Institute of Public Health Research,
Tehran University of Medical Sciences, P.O. Box 6446/14155, Iran

Abstract: Following the first occurrence of fire ant, this study was conducted in order to identification of responsible species, determination of local dispersion and study on some biological and ecological features in Sistan and Balouchistan province, southeast Iran from 2003 to 2004. The collected samples are preserved in 70% alcohol and identified. All fire ant samples which collected from various areas were identified as *P. sannaarensis*, (Hym.: Formicidae). Dispersion area is occurred in the Iranshahr, Sarbaz and Nikshahr districts. The ability for colony making in fertilized workers was surveyed at the field condition using 20 plastic open cylinders at alfalfa farms. The winged ants appear in the early spring and early autumn. The casting system is not observed in the populations of any studied colonies. The threshold of vital temperature is ranged between 0 to 55°C. Their complicated underground gallery is about 1 m in deep with small barely opening. Their colonies were built in humid microclimates at the parks and loans, near irrigation channels, below man-made concrete surfaces at shadow of trees and alfalfa farms and so on. Domestic and global expansion of *P. sannaarensis* may boost following developing of transportation nets to studied area as well as increase in rainfall.

Key words: Fire ants, *Pachycondyla sannaarensis*, Sistan and Baluchistan, Iran

INTRODUCTION

Ants (super family Formicidae) are present in almost all countries and in all places (Khan *et al.*, 1999). They are probably the most successful of all insect groups, occurring everywhere in terrestrial habitats and outnumbering most of other terrestrial animals in individuals (Bolton, 1994). All ant species are grouped into a single family, the Formicidae, which is subdivided into anywhere from 10 to 20 subfamilies, according to various authors (Astruc *et al.*, 2004). Despite of public beliefs, a few species of ants have an obvious and functional sting, which named fire ants, as well as in members of subfamily Ponerinae.

Ponerinae is one of the ant subfamilies that its members have obvious and functional sting (Bolton, 1994). The absence of a morphologically specialized

queen cast in some ants is now well documented, occurring in about 100 species belonging to 10 genera (all in the subfamily Ponerinae). Newly mated workers do not establish new colonies independently of nest mates; they reproduce in the natal nest and colony fission occurs (a mother colony becomes divided into two autonomous groups) (Monnin and Peeters, 1998).

The genus *Pachycondyla* F. Smith 1858 is a large group of ants in the subfamily Ponerinae. There are around 200 described species worldwide, mostly known from the tropics and sub-tropics (Bolton, 1994). The nesting and social biology of *Pachycondyla* is variable. They live in colonies of a few dozen to a few thousands workers. Most species of *Pachycondyla* appear to be generalist scavengers and predators of arthropods, which they subdue with venom (Wild, 2002).

Corresponding Author: Akbarzadeh Kamran, Department of Medical Entomology and Vector Control,
Iranshahr Station of Training and Health Research, Imam St., Post Code: Iranshahr, 99137, Iran
Tel: 0547-3314655-3318517

There are a few documents concerning identification of ant species in Iran. Historical background of fire ants in Iran is not clear. For the first time, the infestation to fire ant *Pachycondyla senaarensis* (Hym.: Formicidae) is recorded of in Sistan and Balouchistan province, southeast Iran and its public health importance is noticed from 2003 to 2004. The objective of this research is determination of dispersion, identification of fire ant species, study of some biological and ecological features as well as introducing of *Pachycondyla senaarensis* as public health pest.

MATERIALS AND METHODS

The studied area comprise of Sistan and Baluchistan province with about 187502 km² area in the southeastern corner of Iran, bordering with Afghanistan and Pakistan countries. The Chabahar Port, at the south of the province, is the only way of Iran for connecting directly to free oceans. Iranshahr district is geographically situated at center of the province, where encounter as suitable site for costumers and refugees from neighboring countries, Afghanistan and Pakistan. Despite of seven years drought, this district is the most important agricultural area in Sistan and Baluchistan. The agricultural products are exported to other domestic district such as Chabahar and Sarbaz and a few neighboring counties in Pakistan.

In this study, all the cities of Sistan and Baluchistan province are searched for fire ants. The collected samples are preserved in 70% alcohol and referred to Medical Entomology Laboratory at Iranshahr Station of Training and Health Research. Identification of its species is carried out using keys of Bolton (1994) and Shattuck and Barnett (2001). Part of fire ant specimens was sent to Natural History Museum of London for confirming of its species. Some of specimens were deposited in the Entomology Museum, School of Public Health and Institute of Public Health School, Tehran University of Medical Sciences.

The biology and ecology features of fire ants were carried out at the Fajr Park in Iranshahr city as well as Abechkan village (30 km north of Iranshahr city) where various colonies of fire ant are present. The ability for colony making in fertilized workers was surveyed at the field condition using 20 plastic open cylinder (60 cm height × 30 cm diameter) which were placed 20 cm in the soil at an alfalfa farm where is encountered as natural breeding place of this ant. The farm was irrigated using flooding method twice in week. Top of each cylinder was covered with polyester net to prevent escaping of ants. Only one fertilized ant worker was introduced in each cylinder. The cylinders were observed daily up to 40 days.

RESULTS

Present systematic surveys revealed that all specimens which collected from various parts of Sistan and Baluchistan province are *Pachycondyla senaarensis* (Hym.: Formicidae) Fig. 1. Identification of this species confirmed by Prof. B. Bolton (Natural History Museum of London) and Dr. J.L. Cook (Sam Huston State University of Texas).

Morphological character of *P. senaarensis*: Workers and females are elongate with hard integument. Worker caste is monomorphic. Head, thorax, petiole and postpetiole are finely punctate. Labrum is without peg-like teeth. Eyes are present. Mandibles are triangular (Fig. 2). Mandibles have seven teeth (Fig. 2a). One of them is very small. Basal portion of mandible has a distinct circular pit or fovea dorsolaterally (Fig. 2b).

Frontal lobes are present and with head in full-face horizontal they cover and conceal the antennal sockets (Fig. 3).

Dorsal surface of middle tibia and middle basitarsus have not thickened peg-like setae. Metatibia has a large, pectinate posterior spur (Fig. 4b) and a much smaller simple anterior spur (Fig. 4a).

Pretarsal claws are simple, without teeth on the inner curvature behind the apical point. The petiole is consisting of 1 segment (abdominal pedicel), which is without an anterior peduncle and narrowly attached to the first gastral segment. First gastral segment has separated from the second only by a narrow girdling. Hypopygium with its lateral margins is smooth and without spines. Sting is developed and functional at gastral apex (Fig. 1).



Fig. 1: Fire ant of Iran, *Pachycondyla senaarensis* (Hym.: Formicidae), Photography: Museum of Medical Entomology, Public Health School of Tehran University of Medical Sciences, May 2003, original 250X

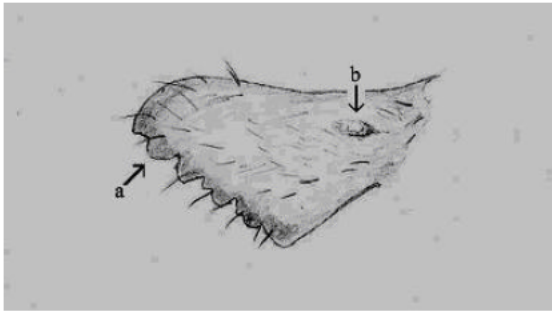


Fig. 2: Mandible of *P. sennaarensis* (Hym.: Formicidae), a) mandibular tooth, b) mandibular foveae, painter: author, 900X



Fig. 3: Frontal lobe of *P. sennaarensis* (Hym.: Formicidae). Photography: Museum of Medical Entomology, School of Public Health, Tehran University of Medical Sciences, May 2003, original 400X

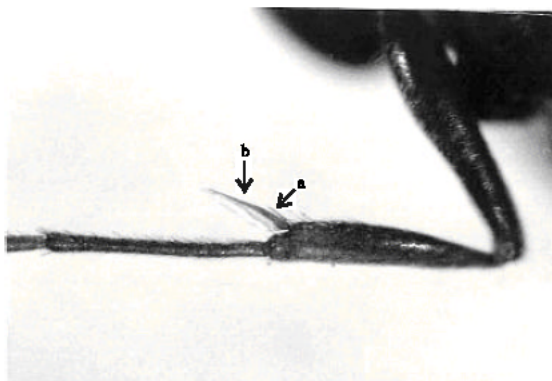


Fig. 4: Metatibia of fire ant *P. sennaarensis* (Hym.: Formicidae) a) much smaller simple anterior spur, b) large, pectinate posterior spur. Museum of Medical Entomology, Public Health School of Tehran University of Medical Sciences, May 2003, original 400X



Fig. 5: Dispersion of fire ant *P. sennaarensis* (Hym.: Formicidae) (highlighted area in map) in Sistan and Baluchistan province, southeast of Iran, 2004

Geographical distribution of the ants has shown in Fig. 5 (highlighted area). It is obvious that the ants is occurred in Iranshahr, Sarbaz and Nikshahr districts but have not revealed in Chabahar Port and other part of the province, which placed in neighboring of Afghanistan and Pakistan.

Complicated underground gallery of this ant is about 1 m in deep and have small barely opening (without any compact soil around) with about 0.5 cm diameter. We couldn't find any real queen in observed colonies of *P. sennaarensis*. Our surveys revealed that, winged ants of *P. sennaarensis* appear in early spring and early autumn in Iranshahr district. It seems that increasing of relative humidity after raining is the most important factor to flying of winged ants. Fertilized wingless workers were observed around colonies. These workers are longer about 1 mm than other workers. These workers can easily identified by observing base of loosed wings on thorax. On behalf of our studies, the largest number of population

in one colony was ranged to 850 workers. We didn't see any casting system in the populations of any surveyed colonies. It is revealed that humidity of soil is the most important factor to their survival. They are established their colonies in humid microclimates at the parks and loans, near irrigation channels, below man-made concrete surfaces at shadow of trees and so on. They also make their colony in human and animal premises. The openings of colony are easily visible at the corners of walls. We found a few of colonies in middle of alfalfa farm where irrigated using flooding method at 2-3 days interval. Their colonies were not found in dry and sandy soils. The estimation of vital temperature threshold is ranged between 0 to 55°C. This condition may be provided at other parts of Iran especially North Coasts of Oman Sea and Persian Gulf. Foraging is carried out by workers in random manner that have not any visible tracing model to the food resources. The laboratory and field observations showed that *P. sennaarensis* is omnivorous, feed from seeds of various plants, bodies of dead individuals of other ant colonies, larvae of a few dipteran flies, a few species of Isoptera and a few members of Isopoda such as *Porcellio* spp. They use their sting for anesthetizing their preys. Present surveys also revealed that any of the newly mated workers of *P. sennaarensis* (placed in jars) couldn't establish a new colony.

DISCUSSION

Invasive social insects are particularly harmful (Mediabadi and Lawrence 2002). It is experimentally revealed that fire ant *P. sennaarensis* detrimentally impact human health in Sistan and Baluchistan province. It is very obvious in meaning of its local name, Sochok. It means that it can induce inflammation. Its agricultural and ecological hazards are not clear.

Many ant species, particularly those of tropical and subtropical origins, are easily transported around the globe by human commerce (Morrison *et al.*, 2004). Despite of eight years drought in Sistan and Baluchistan province, the Iranshahr district has been remained as an important agricultural area in this province, benefiting underground water. Some foraging plants e.g., alfalfa, seasonal vegetables e.g., cucumber, tomato, green pepper, tobacco and fruits e.g., as date, orange, lemon, papaya, mango and so on have exported to other provinces of Iran. Developing of roads and other transportation nets to Sistan and Baluchistan province as well as increase in rainfall may boost their domestic and global expansion (through Chabahar port).

Exotic ants are among the most problematic invaders.

Some of these species are known to have wide ranging deleterious impacts on the native fauna of invaded region (Morrison *et al.*, 2004).

Control of fire ants is very difficult. Pesticides, which cost the United State millions of dollars annually, have failed to control fire ants effectively in US (Mediabadi and Lawrence, 2002). Therefore it seems that preventing from expansion of fire ants is recommendable.

ACKNOWLEDGEMENT

The authors would like to acknowledge with gratitude the assistance of Prof. Barry Bolton and Dr. J. L. Cook for identification of the samples.

REFERENCES

- Astruc, C., J.F. Julien, C. Errard and A. Lenior, 2004. Polygeny of ants (Formicidae) based on morphology and DNA sequence data. *Molecular Polygenetics and Evolution*, Molecular Polygenetics and Evolution, 31: 880-893.
- Bolton, B., 1994. Identification of the Ant Genera of the World. Harward University Press, Cambridge, Massachusetts, London, pp: 222.
- Khan, S.A., H.H. Shelleh, L.A. Khan and H. Shah, 1999. Black fire ant (*Solenopsis richteri*) sting producing anaphylaxis: A report of 10 cases from Najran. *Ann. Saudi Med.*, 19: 462-454.
- McGlynn, T.P., 1999. The worldwide transfer of ants: geographical distribution and ecological invasions. *J. Biogeography*, 26: 535-548.
- Mediabadi N.J. and E.G. Lawrence, 2002. Colony-level impacts of parasitoid flies on fire ants, *Proc. R. Soc. Lond.*, B 269: 1695-1699.
- Monnin, T. and C. Peeters, 1998. Monogyny and regulation of worker mating in the queenless ant *Dinoponera quadriceps*. *Anim. Behav.*, 55: 299-306.
- Morrison, L.W., S.D. Porter, E. Daniels and M.D. Korzukhin, 2004. Potential global range expansion of the invasive fire ant, *Solenopsis invicta*. *Biological Invasions*, 6: 183-191.
- Shattuck, S.O. and N.J. Bernet, 2001. Australian Ant Online, Copyright CSIRO Australia, <http://www.ento.csiro.au/science/ants/default.htm>.
- Wild, A. L., 2002. The genus *Pachycondyla sennaarensis* (Hymenoptera; Formicidae) in Paraguay. *Bol. Mus. Hist. Nat. Parag.*, 14: 1-18.