

# MEASURES BY ZURICH , SWITZERLAND, TO ERADICATE PHARAOH ANTS AND TO INSTRUCT PEOPLE ON THE USE OF HOUSEHOLD INSECTICIDES

ISABELLE LANDAU LUESCHER, MARCUS SCHMIDT,  
AND GABI MUELLER

Dept. of Health and Environment, Urban Pest Advisory Service,  
Walchestrasse 31, CH-8021 Zürich, Switzerland  
e-mails: [isabelle.landau@zuerich.ch](mailto:isabelle.landau@zuerich.ch)  
[marcus.schmidt@zuerich.ch](mailto:marcus.schmidt@zuerich.ch)  
[gabi.mueller@zuerich.ch](mailto:gabi.mueller@zuerich.ch)

**Abstract** The Urban Pest Advisory Service (UPAS) is responsible for urban pests in the city of Zurich, Switzerland. We give approximately 2,000 consultations per year concerning pests and their control; we survey the pest situation in the city and control rats in public areas. Through a survey made among pest control companies we found that pharaoh ants usually infest apartment buildings in Switzerland. In the last two years we found two major infestations of pharaoh ants (*Monomorium pharaonis*) in several houses in Zurich. In order to control the whole population we monitored their spread and ordered the eradication in all infested houses. Other tropical ant species have also been found in Switzerland. The current UPAS project to prevent the inappropriate use of insecticide sprays in households by tenants and house owners is presented.

**Key words** *Monomorium pharaonis*, tramp ants, insecticide spray

## INTRODUCTION

Zurich is the largest city in Switzerland and lies at the outlet of lake Zurich. Today it has approximately 370,000 inhabitants (Statistik Stadt Zürich, 2008). The city's total surface consists of 9,200 hectares (including 2,200 hectares of woodland and 550 hectares covered by water). The Urban Pest Advisory Service (UPAS) is financed by the city of Zurich and belongs to the Department of Health and Environment. The UPAS is responsible for hygiene issues caused by urban pests in Zurich, our main duties are: 1) Advising the public, authorities and pest control companies in cases of pest incidence and infestation, including arthropod species identification; 2) Survey and monitoring of the urban pest situation in Zurich; 3) Inspections in private buildings, restaurants and food stores following complaints of pest occurrence (mainly cockroaches, pharaoh ants, bed bugs and rodents); 4) Rodent control on public ground (Schmidt et al., 2006); 5) Since a reorganisation in 2004, pests in public buildings are controlled by private pest control companies and no longer by the UPAS; 6) Public relations, e.g. UPAS web site (Stadt Zürich, 2008), publications in different media, presentations and training workshops for those working in the public service; 7) Support of the department director in projects regarding public health.

The municipal council of Zurich sets goals for each four-year period between elections. One of these goals is to maintain a high standard of living for present and future generations. In the following we will present two projects that aim to improve this standard.

**1. Pharaoh Ants and Other Tramp Ants.** Infestations with pharaoh ants (*Monomorium pharaonis*, Linnaeus, 1758) are not very numerous in Zurich. But because this species has high potential for dispersion and as disease vector, we supervise every case to extinction, especially if a whole block of houses is involved. It is often noted in the literature that *M. pharaonis* is found in hospitals and therefore is especially dangerous (Weidner and Sellenschlo, 2003; Hedges, 1997; Eichler, 1993; Stein, 1986). Since we have had no reports from hospitals since 1991 (the UPAS did not register inquiries before), we wanted to find out more about

the distribution of pharaoh ants in Switzerland and made a survey among pest control companies in 2004. Apart from the pharaoh ant we also list infestations with other tramp ants.

**2. Insecticide sprays.** Our aim in this project is to advise people on the correct use of insecticide sprays in households and to reduce unnecessary applications. In our advisory work we often have people who try to get rid of insects or mites indoors with an insecticide spray, often without even knowing the species. When we tell them that the help of a professional pest control operator (PCO) is needed, the first thing they worry about is the poison this action will involve. They often do not consider that their use of insecticide sprays could be more harmful for their health because of the inhalation of aerosols with active ingredients. They usually do not know how, where, and how much insecticide to apply and do not use adequate protective equipment. They are usually also not aware that most sprays contain flammable solvents and can cause a fire or even an explosion. We aim to inform people on how to proceed when they encounter insects or mites.

## MATERIALS AND METHODS

We collected the data during the daily advisory work, inspections and control operations. They are registered in a SQL (Structured Query Language)-based database ([www.pagewerkstatt.ch](http://www.pagewerkstatt.ch)), which was especially designed for our purposes (Apel and Köhl, 2002). Further details are described in Müller et al. (2008) and in Landau et al. (1999).

### Pharaoh and Other Tramp Ants

Every reported infestation in the city of Zürich is pursued. If we suspect that neighbouring buildings could be infested, we also inspect those buildings and enforce control measures if necessary. Based on the “cantonal decree on public and private living hygiene” (Kanton Zürich, 1967), we can enforce the control of unhygienic pests like cockroaches, bed bugs, flies, pharaoh ants or rodents and impose costs on the owner of the building.

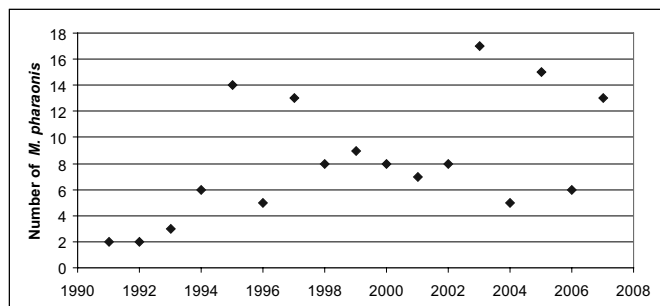
For the *M. pharaonis* survey conducted in 2004 we sent a questionnaire to 18 pest control companies in the region. It included questions about the number of infestations, the kind of infested buildings and how they are used, control measures, and success of the pest control. We also asked them to list every pharaoh ant infested object known to them.

## RESULTS

### Pharaoh Ants and Other Tramp Ants

Our database includes data since 1991 and contains over 30,500 data points (= inquiries). The number of inquiries fluctuates from 1,982 to 3,211 per year (Müller et al., 2008). The pharaoh ant inquiries are not representative for Switzerland because 93% come from the greater Zurich area (and 60% from the city of Zürich). The French and Italian speaking parts are not represented. The number of reported infestations of *M. pharaonis* ranges from 2 to 17 in the years 1991 to 2007 (Figure 1).

**Figure 1.** *M. pharaonis* reports in Zurich, Switzerland, from 1991-2007.



The survey conducted in 2004 was answered by eight companies. Five of them thought that the number of infestations has increased in the past few years. All companies used baits for the control and thought that the baits have improved. Only two companies used fresh liver baits before the control action. All companies

would appreciate if there were an official institution to enforce house owners to eradicate pharaoh ants by PCOs. The smaller companies gave us 33 addresses of buildings they knew were infested, whereas the two largest companies showed no interest or had no possibilities to give us their data.

In Switzerland mainly apartment buildings are infested. There were only few cases with a shop, bar or a small bakery on the ground floor of an apartment building. We know of one health centre and one shopping mall. Only five infested hotels have been reported. There are no reports from hospitals, laundries, old people's homes or greenhouses.

In 2005, five of seven apartment buildings built in a ring were infested and in 2007 we found seven infested apartment buildings in a row of eleven. In both cases we initially received ants from only one apartment. Only by inspecting the other apartment buildings the whole extent of infestation was discovered. In the two infested blocks *M. pharaonis* was successfully eradicated in all the buildings.

Apart from *M. pharaonis* the following tramp ant species have been reported from Switzerland: *Monomorium floricola* (Jerdon), *Tapinoma melanocephalum* (Fabricius), *Tapinoma sessile* (Say), *Technomyrmex albipes* (Fr. Smith) *Pheidole* sp., *Paratrechina longicornis* (Latr.), *Linepithema humile* (Mayr) (Table 1).

**Table 1.** Number of tramp ant infestations.

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
<i>M. pharaonis</i>	5	13	8	9	8	7	8	17	5	15	6	13	114
<i>T. melanocephalum</i>	1	3	-	1	1	1	-	-	5	1	2	3	18
<i>P. longicornis</i>	-	-	-	1	-	-	-	-	-	1	-	-	2
<i>Tapinoma sessile</i>	-	-	-	-	1	1	1	-	-	1	-	-	4
<i>M. floricola</i>	-	-	-	-	-	-	-	-	2	1	1	-	4
<i>T. albipes</i>	-	-	-	-	-	-	-	-	-	3	1	-	4
<i>Pheidole</i> sp.	-	-	-	-	-	-	-	-	-	2	-	-	2
<i>L. humile</i>	-	-	-	-	-	-	-	-	-	1	-	-	1

### Insecticide Sprays

We have published an information leaflet called "The reasonable handling of insecticide sprays" for the public (UPAS, 2006). We train employees of pharmacies to advise people on how to proceed when they have insect problems. This includes the adequate choice of insecticide sprays, if necessary.

## DISCUSSION

### Pharaoh Ants and Other Tramp Ants

In Switzerland pharaoh ants were found and identified for the first time in 1902 (Ineichen, 1997). Since then they have been present in Switzerland, but no major outbreak has been observed in the last 20 years, and the number of infestations is more or less constant (Ulrich Lachmuth, formaco pmc AG, 2008, pers. comm.). Unlike Zurich, in Denmark the number of infestations with pharaoh ants has gradually decreased from a peak of 82 registered infestations in 1995 to less than ten infestations since 2004 (Anne-Marie Rasmussen, Danish Pest Infestation Laboratory, 2008, pers. comm.). Pest control companies believe that this is partly due to more attractive bait with the growth regulator methoprene (Anne-Marie Rasmussen, 2004, pers. comm.).

The high fluctuation of infestations (Figure 1) is partly due to the structure of our database. One case corresponds to one single building. If a whole block is involved, as in 2005 (five buildings of seven) and 2007 (seven buildings of eleven), the number of infestations is much higher than in other years.

By surveying every case of *M. pharaonis* we aim to reduce the occurrence of infestations. To our advantage many PCOs rely on us for the determination of their ants before they start the treatment. This is confirmed by the fact that we already knew of 57% of the reported infestations in the survey in 2004. It was generally difficult to obtain data because no company kept records of all the inquiries; most of the companies had not even a list of the inquiries where they had made a bid for control measures.

Professional pest control operators know that not every small myrmicine ant is necessarily a pharaoh ant (Sellenschlo, 2002). On the other hand, one big problem is that we often do not know of an infestation for years. During this time pharaoh ants can spread into other buildings. It is often difficult to persuade a house owner to pay the expensive control measures for “a few tiny ants”. There was one infestation in the past where nine years after the first knowledge of *M. pharaonis*-infestation there were still ants in the building. In other cases it took two to four years until the house owner decided to let a PCO control the pest. The reason for this delay is that in the past we did not focus on each infestation to the point of forcing the house owner to call professional pest control. We further lacked legal support in our department before 2004. Now we can send an official decree to enforce professional control measures if a house owner does not cooperate. We also observe that the inhabitants wait for months or even years until they complain. *M. pharaonis* only becomes a nuisance when the number of ants becomes very high. Sometimes inexperienced companies are not able to control pharaoh ants. It can take years to successfully eradicate an infestation because control measures are complex and inhabitants often interfere. It therefore needs an experienced PCO. In the past two years we showed that if experienced pest control companies and the UPAS cooperate, the time from infestation to eradication can be minimized. Perhaps if city other health departments, experienced PCOs and house owners collaborated more often, the number of infestations would decline faster.

All tramp ants listed in Table 1 are of tropical origin (Hedges, 1997). They were all encountered inside buildings. We have only one observation of pharaoh ants in the summer on the outer walls of an infested building, which is exceptional. In our climate zone these ants are not invasive as they do not compete with other ant species outdoors but simply occupy an empty niche in buildings. In subtropical and tropical regions all these ants are encountered outdoors as well and some are invasive, as they aggressively displace other ant species in their surroundings (Hedges, 1997). In Switzerland there are until today only two major tramp ant species: pharaoh ants and ghost ants. With 77 % of all the tramp ants, pharaoh ants are much more predominant in Switzerland than in subtropical or tropical climates like for example in Florida with 11% (Klotz et al., 1995).

Ghost ants (*Tapinoma melanocephalum*) were introduced into a greenhouse of the Federal Institute of Technology (ETH) Zurich for the biological control of aphids in the late 1980s. The first known infestation in an apartment building dates from 1996 (Dorn et al., 1997). Some of the *T. melanocephalum* infestations can be linked to people who regularly frequent their homes in the Caribbean and South America; other infestations can be linked to imported tropical plants. We have been told of one case where ghost ants were distributed by a reptile pet store (Daniel Cherix, musée de zoologie Lausanne, 1999, pers. comm.).

The first described infestation of crazy ants (*Paratrechina longicornis*) in Switzerland was at the Zurich airport in 1999 (Freitag et al., 2000). The second infestation occurred at an international mechanical engineering company that may have imported the ants with their materials. In one case *Tapinoma sessile* ants were found on a pineapple bought in a grocery store, in another case this species was found in the kitchen of a lady who remembered that she had bought a fresh pineapple at the local market some days ago. Another infestation of *T. sessile* was in a private greenhouse with tropical plants and birds adjoining the house. The ants started to frequent the kitchen and were found outdoors in summer. They could not be controlled for years by an experienced pest control company.

*Monomorium floricola* has infested a hotel and in three cases apartment buildings. We were not able to trace the origin. We did not find any introductions with tropical plants as in Germany (Sellenschlo, 1991). All infestations of *Technomyrmex albipes* and *Pheidole sp.* were associated with plants. *T. albipes* was associated with orchids in two cases and in one case was found in the orchid greenhouse of the Zürich gardening department. There however the ants did not cause any problems. In one case of *Pheidole sp.*, the nest was located in a hollow stem of the hydroponic plant *Dracaena marginata* (Lam.) that had been imported from Holland. Removing the plant solved the problem.

The argentine ant *Linepithema humile* was imported with a tree fern from South America. These ants were attracted by honey and cookies. The pest control operator could eliminate the ants with two treatments of gel bait, the plant was thrown away. We have hardly any contact with zoological gardens, public or private tropical greenhouses, importers of tropical animals, or tropical plant importers or breeders. We however can imagine that there is a high probability that in these institutions there are and will be unintentional tramp ant imports.

## Insecticide Sprays

In many cases of insect annoyances in private households there are better alternatives to spraying. This depends on the involved insects, the local situation and the tolerance of the people involved. Harmless insects coming in from outdoors could for example be excluded with window fly screens. Spraying will not stop more insects from coming in. In the case of cockroach, pharaoh ant or bed bug infestation, sprays cannot solve the problem, so a PCO is needed. Our information leaflet explains that in certain cases a crack and crevice treatment with a spray is possible. People who buy sprays need to be instructed on its correct use, as they often do not read or understand the small printed instructions. The correct species identification is, however, the precondition.

In our training of pharmacists we instruct them in how to advise their clients who want to buy insecticide sprays. We also offer our advisory service to identify insects for their clients. In the case of pets with ectoparasitic problems (mainly fleas), veterinarians not only treat the pets, but often recommend one-shot aerosols to customers with flea problems in their apartment or house. One-shot aerosols cover all surfaces with insecticide and are often overdosed or applied in the wrong locations. Often people neither know the measure of a room in nor the biology and behaviour of the specific pest species concerned. We shall try to convince veterinarians that they should not sell one-shot aerosols against flea problems. Instead a PCO is the better choice in houses with flea infestations. We therefore plan to train veterinarians in the use of insecticides in the case of ectoparasitic problems of animals.

## ACKNOWLEDGEMENTS

We thank Prof. Wolf Blanckenhorn and Louisa Müller for their valuable comments on the manuscript. We also thank Stefan Apel for his data base assistance and Anne-Marie Rasmussen, Danish Pest Infestation Laboratory, for providing some pest species data of Denmark.

## REFERENCES CITED

- Apel, S. and Köhl, M. 2002.** Integrated web application with knowledge base.
- Dorn, K., Landau, I. and Cherix, D. 1997.** Einschleppung von *Tapinoma melanocephalum* (Formicidae) in der Schweiz. Mitt. Schweiz. Ent. Ges. 70:242-243.
- Eichler, Wd., 1993.** The spread and dissemination of *Monomorium pharaonis* in Central Europe. Appl. Parasitol. 34: 121-124.
- Freitag, A., Dorn, K. and Cherix, D. 2000.** First occurrence of the crazy ant *Paratrechina longicornis* (Latreille) (Hym. Formicidae: Formicinae) in Switzerland. Mitt. Schweiz. Ent. Ges. 73. 301-303.
- Hedges, S. A. 1997.** Ants. In: Mallis, A., Handbook of Pest Control, Eight Edition: Mallis Handbook & Technical Training Company.
- Ineichen, S. 1997.** Die wilden Tiere in der Stadt. Frauenfeld: Im Waldgut.
- Kanton Zürich 1967.** Verordnung über allgemeine und Wohnhygiene. § 17.
- Klotz, J.H., J.R. Mangold, K.M. Vail, L.R. Davis, Jr. and R.S. Patterson. 1995.** A survey of the urban pest ants (Hymenoptera: Formicidae) of peninsular Florida. Florida Entomologist 78(1). 109-118.
- Landau, I., Müller, G. and Schmidt, M. 1999.** The Urban Pest Advisory Service of Zurich (Switzerland) and the situation of some selected pests. In: Robinson, W.H., Rettich, F. and Rambo, G.W., eds. Proceedings of the 3<sup>rd</sup> International Conference on Urban Pests, Czech Republic: Grafické závody Hronov.
- Müller, G., Landau Lüscher, I. and Schmidt, M. 2008.** Temporal changes in the incidence of some household arthropod pest species in Zürich (Switzerland). Proceedings of the 6<sup>th</sup> International Conference on Urban Pests, Budapest.
- Schmidt, M., Landau Lüscher, I. and Müller, G. 2006.** Rat Management in the City of Zurich, Switzerland. In: Feare, C.J. and Cowan, D.P. eds. Advances in Vertebrate Pest Management, Vol IV. Fürth: Filander Verlag.
- Sellenschlo, U. 1991.** Braunrote Blütenameise, *Monomorium floricola* (Jerdon, 1851) (Hym., Myrmicidae) erstmalig nach Deutschland eingeschleppt. Anz. Schädlingskde., Pflanzenschutz, Umweltschutz 64: 111-115.

- Sellenschlo, U. 2002.** Eingeschleppte Ameisenarten und ihre Bestimmung, Teil 1. Der praktische Schädlingsbekämpfer 1: 10-12.
- Stadt Zürich 2008.** <http://www.stadt-zuerich.ch/internet/ugz/home/schaedlinge.html> (Jan. 20, 2008)
- Statistik Stadt Zürich 2008.** [http://www.stadt-zuerich.ch/internet/stat/home/key\\_figures/Wohnbevoelkerung.html](http://www.stadt-zuerich.ch/internet/stat/home/key_figures/Wohnbevoelkerung.html) (Jan. 18, 2008).
- Stein, W. 1986.** Vorratsschädlinge und Hausungeziefer. Stuttgart: Ulmer.
- UPAS 2006.** Merkblatt „Sinnvoller Umgang mit Insektensprays“. <http://www.stadt-zuerich.ch/internet/ugz/home/dokumente/merkblaetter/schaedlingsbekaempfung.html> (Jan. 20, 2008).
- Weidner, H. and Sellenschlo, U. 2003.** Vorratsschädlinge und Hausungeziefer. Bestimmungstabellen für Mitteleuropa. Heidelberg Berlin: Spektrum Akademischer Verlag.