Acta zoologica cracoviensia, **47**(3-4): 125-145, Kraków, 31 December, 2004

Some allergenic species of astigmatid mites (Acari, Acaridida) from different synanthropic environments in southern Poland

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Received: 15 June, 2003
Accepted for publication: 30 July, 2004

SOLARZ K., SZILMAN P., SZILMAN E., KRZAK M., JAGŁA A. 2004. Some allergenic species of astigmatid mites (Acari, Acaridida) from different synanthropic environments in southern Poland. *Acta zoologica cracoviensia*, **47**(3-4): 125-145.

Abstract: A survey of allergenic mites from bird nests, farming environments, and from cages and runs of animals of the Silesian ZOO was made. A total of 12,986 mite specimens were isolated including 7,570 mites from the order Acaridida (58.3%). The astigmatid mites were most abundant in farming environments and constituted 67.4% of all mites collected. They formed 46.7% and 58.6% of the total count from bird nests and the Silesian ZOO, respectively. More than 29 mite species were identified of which the most abundant were *Acarus farris*, *Acarus immobilis* (farms, Silesian ZOO) and *Hirstia chelidonis* (bird nests). *Caloglyphus oudemansi*, the acarid mite species new to the fauna of Poland was found in a cowshed in Majdan Górny. It is noteworthy that, to the best of our knowledge, samples from zoological garden were actually analysed for the first time on the occurrence of allergenic mites.

Key words: Acari, Astigmata, Glycyphagidae, Pyroglyphidae, acarofauna, allergenic mites, farming environments, bird nests, nests of mammals, Silesian ZOO, Poland.

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I. INTRODUCTION

The stored-product mites, especially several species from the families Acaridae, Glycyphagidae and Chortoglyphidae (Acari: Acaridida), are commonly found in different stored food products, hay, straw, granaries, barns and other farming and occupational environments, as well as in samples of house dust. The most abundant and most often reported are *Acarus siro* LINNAEUS, 1758, *Acarus farris* (OUDEMANS, 1905) and *Tyrophagus putrescentiae* (SCHRANK, 1781) from Acaridae, *Lepidoglyphus destructor* (SCHRANK, 1781), *Glycyphagus domesticus* (DE GEER, 1778) and *Gohieria fusca* (OUDEMANS, 1902) from Glycyphagidae and *Chortoglyphus arcuatus* (TROUPEAU, 1879) from Chortoglyphidae (LESKINEN & KLEN 1987; FRANZ et al. 1997; BOSTRÖM et al. 1997; MEHL 1998). These mites are also the source of clinically important allergens and the cause of an occupational allergy (known as an allergy to storage mites) among farmers, grain-storage workers and other agricultural workers (CUTHBERT et al. 1986; REVSBECH & ANDERSEN 1987; DUTKIEWICZ et al. 1988; GRIFFIN et al. 1989; ARMENTIA et al. 1997). They are also considered as an important oc-

cupational hazard for bakers, pastry-cooks, shopkeepers, millers, store-keepers, cheese-makers, horseriders, dock workers, transport workers, upholsterers and miners (TERHO et al. 1982, 1985; LUCZYNSKA et al. 1990; DE ZOTTI et al. 1994; SOLARZ & SOLARZ 1996; VAN HAGE-HAMSTEN & JOHANSSON 1992; 1998; TEE 1994; HALLAS & IVERSEN 1996).

House dust mites, especially several species from the family Pyroglyphidae (Acari: Acaridida), may cause atopic diseases in humans, known as house dust mite allergy or house dust mite atopy (WHARTON 1976; VAN BRONSWIJK 1981; ARLIAN 1991; POPE et al. 1993). The diseases are atopic asthma, atopic dermatitis (eczema) and allergic rhinitis (FAIN et al. 1990; PLATTS-MILLS et al. 1992; MAJORI et al. 2000; ARLIAN & PLATTS-MILLS 2001). Three of pyroglyphid mite species are primarily involved as cosmopolitan inhabitants of human dwellings in many parts of the world – *Dermatophagoides pteronyssinus* (TROUESSART, 1897)*, D. farinae* HUGHES, 1961 and *Euroglyphus maynei* (COOREMAN, 1950). These mites are the major sources of indoor inhalant allergens facilitating both the sensitization of atopic subjects and asthmatic (atopic) attacks in patients (TUROS 1979; ABE & ISHII 1987; FAIN et al. 1990; ARLIAN 1991; POPE et al. 1993; TSAI et al. 2000; TAKAHASHI et al. 2001). Recent studies have shown that pyroglyphid house dust mite allergenicity is not confined to a single major allergen as was initially suggested, but it rather is due to multiple antigens and allergens (ROBINSON et al. 1997; AALBERSE 1998; TSAI et al. 2000; ARLIAN & PLATTS-MILLS 2001). The natural sources of allergenic mites in dwellings or stores are still not quiet known (HALLAS & IVERSEN 1996). The possible sources of these mites in house dust and in stored products are nests of synanthropic birds or insects (CHMIELEWSKI 1971a, b, 1975, 1977, 1982, 1983a, b; HUGHES 1976; WHARTON 1976; VAN BRONSWIJK 1981; FAIN et al. 1990). On the other hand it was suggested that main part of mite population is brought from the cultivated field into the stores, and that open field is the main source of storage mite populations (HALLAS & IVERSEN 1996), whereas the bird nests are more less important (SANDNER & WASYLIK 1973).

Many species of mites that humans come in contact with, besides those found in house dust and stored products, induce allergic reactions. These include some species of spider mites (e.g., the 2-spotted spider mite *Tetranychus urticae* and *Panonychus ulmi*), which are common pests in orchards, yards, greenhouses, and gardens. These mites were recently discovered to induce IgE-mediated reactions (ARLIAN & PLATTS-MILLS 2001).

The aim of this work was to study an occurrence, prevalence and species composition of allergenic acarofauna in bird nests, certain farming environments, in cages and runs of animals of the Silesian ZOO, and an assignation of some sources of domestic mites in dwellings.

A c k n o w l e d g e m e n t s. This study was possible thanks to the kind advice and great help of the late Professor Antoni DERYŁO, to whom this paper is dedicated. We are also very grateful to Dr Marian BLASKI from Katowice for the determination of the bird species. We express special thanks to Prof. Andrzej SZEPTYCKI, Dr Zdzisława STEBNICKA and Prof. Krzysztof SIUDA from Kraków for helpful discussion.

II. MATERIALS AND METHODS

Agricultural environments

The study was carried out from June 1999 to September 2001. A total of 30 samples from certain farming environments, as cowsheds, barns and poultry houses, were analyzed. All samples were collected into plastic bags of 1 litre capacity. These samples were taken in ten farms of Majdan Górny (Lublin district; south-eastern Poland) (Figure).

Nests of birds

The survey was carried out from October 1997 to May 2003. A total of 31 birds' nests were examined for the occurrence of allergenic mites, including 3 nests of *Hirundo rustica*, 2 of *Passer do-*

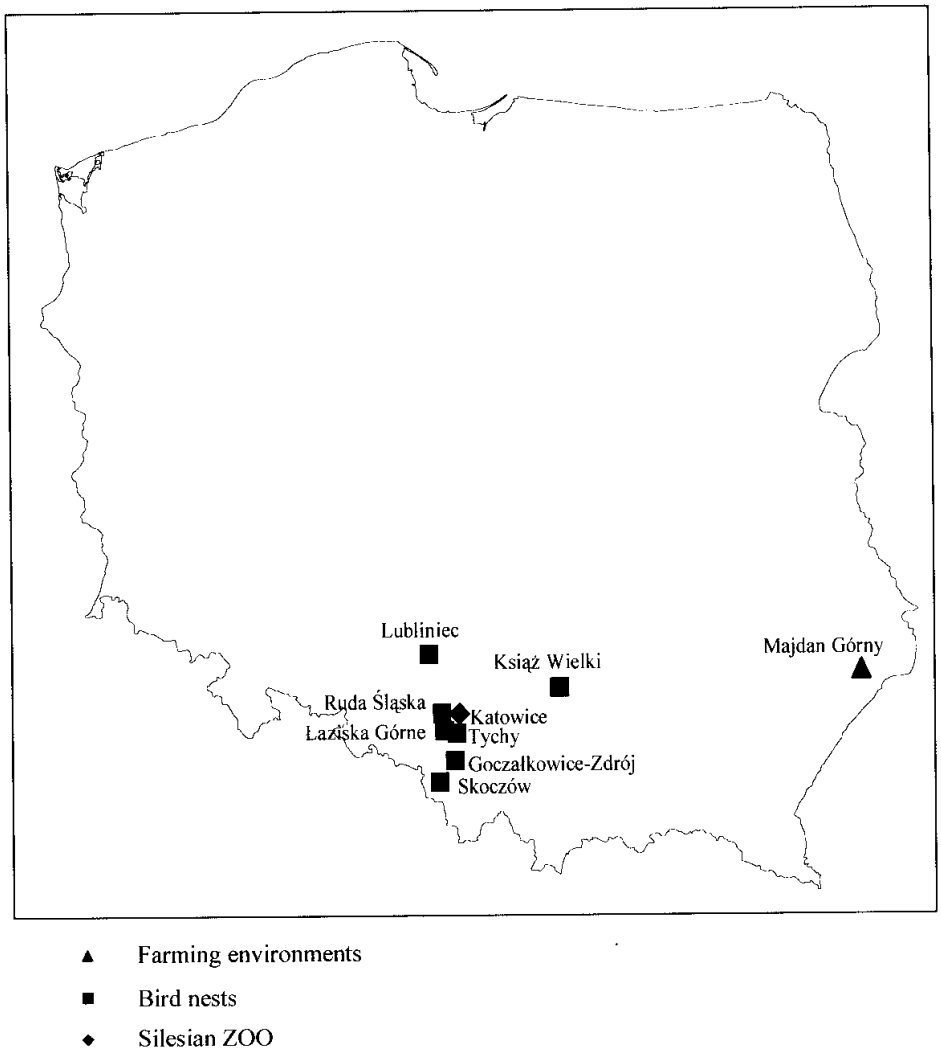

Fig. 1. Localities examined in Poland.

mesticus, 1 of *Sturnus vulgaris*, 6 of *Sylvia* sp., 7 of *Turdus merula*, 1 of *Columba livia,* 4 indet and 7 brood shelters (2 of *Parus major* and 5 of *Parus* sp.) The nests and brood shelters were collected in Tychy and vicinity, Solarnia near Lubliniec, Ruda Śląska, Łaziska Górne, Goczałkowice, Skoczów and Książ Wielki (Figure 1).

Silesian ZOO

The study were carried out in the Silesian ZOO (Katowice, Upper Silesia) (Figure 1), from April 2000 to March 2001. During this period 49 samples of dust, litter, debris and residues from cages and run-offs of mammals, birds and reptilians were examined for the presence of mites, especially the allergenic taxa.

It is noteworthy that, to the best of our knowledge, samples from zoological garden were actually analysed for the first time on the occurrence of allergenic mites.

Analysis of mites

The mites were extracted using the "BERLESE method" and preserved in 70% ethanol. For identification the mites were mounted in HOYER's medium on microscope slides.

Analyzing the relative abundance and occurrence of mite species collected, categories of dominance and frequency were calculated according to RAJSKI (1961). The following levels of dominance and frequency were adopted:

D: 1. eudominant, species forming more than 10% of the total mite population;
2. dominant, species forming between 5.1% and 10% of the total mite population;
3. subdominant, species forming between 2.1% and 5% of the total mite population;
4. recedent, species forming between 1.1% and 2% of the total mite population;
5. subrecedent, species forming less than 1.1% of the total mite population.

F: 1. euconstant, occuring in more than 25% of samples;
2. constant, occuring in 11-25% of samples;
3. accesory species, occuring in 1-10% of samples;
4. accidental species, occuring in less than 1% of samples examined.

III. RESULTS AND DISCUSSION

List of isolated mites and results of the analysis of mite dominance and frequency are presented in Table. A total of 12,986 mite specimens were isolated, including 7,570 members of the order Acaridida (58.3%). The remaining mites belong to 5 orders: Actinedida, Tarsonemida, Oribatida, Gamasida and Ixodida (Table I). Mites from the family Pyroglyphidae were the dominants only in nests of birds.

Agricultural environments

Mites were found in 28 of the 30 samples examined (approx. 96.1%). A total of 4,370 mite specimens were isolated, including 2,943 mites from the order Acaridida (67.35% of the total count). The astigmatid mites were found in 90% of the total samples examined. These mites most abundantly occurred in cowsheds (2,668 specimens; 61.05% of the total population) and distinctly more rarely in barns (868 ones; 19.86%) and poultry houses (834 mites; 19.08%). A total of 19 mite species of astigmatid mites were identified (Table I). *Acarus immobilis* was the dominant and constituted 34.6% of the total count of mites collected (Table I).

Nests of birds

A total of 3,519 mites were isolated from the examined nests, including 1,642 specimens from the order Acaridida (46.66% of the total count) (Table I). More than 13 mite species of astigmatid mites were identified. *Hirstia chelidonis* was the most abundant species (29.3% of the total population), especially in nests of *Passer domesticus* and *Hirundo rustica,* where it constituted about 90.3% and 73.8% of the total count, respectively. *H. chelidonis* was also the most frequent species, together with *Gymnoglyphus longior* (16.13% of total count of the nests) (Table I). *Dermatophagoides evans*i, the second most abundant species, was distinctly less numerous and less common than *H. chelidonis*; it formed only 8.64% of the total mite population and was found in 9.7% of all nests examined. *D. evansi* was collected only from the nests of titmice and warblers.

Silesian ZOO

Mites were found in 44 of 49 samples analysed (89.8%). A total of 5,097 mites were isolated, from which about 83% (82.7%) were collected from aviaries of parrots (*Ara ararauna* and *Nymphicus hollandicus*). A total of 10 species of acaridid mites were identified. Among them *Acarus*

Table I

Mites found in samples examined from farming environments, bird nests and the Silesian ZOO in Poland

Mite taxa	Farming environments		Bird nests		Silesian ZOO	
	Dominance (%) (N=4370)	Frequency (%) (n=30)	Dominance (%) (N=3519)	Frequency (%) (n=31)	Dominance (%) (N=5097)	Frequency (%) (n=49)
ACARIDIDA	67.35	90.0	46.66	61.3	58.56	61.22
Acarus immobilis	34.58	33.33	0.45	3.22	4.31	26.53
Acarus farris	1.92	13.33	0.0	0.0	34.05	10.20
Acarus siro	0.98	26.67	0.0	0.0	0.13	4.08
Tyrophagus longior	16.34	40.0	0.31	13.0	1.27	22.44
Tyrophagus silvester	0.96	3.32	0.0	0.0	0.0	0.0
Tyrophagus putrescentiae	0.09	6.67	0.0	0.0	4.68	30.61
Tyrophagus similis	0.0	0.0	0.0	0.0	0.19	4.08
Tyrophagus mixtus	0.0	0.0	0.26	3.22	0.0	0.0
Tyrophagus palmarum	0.0	0.0	0.88	9.7	0.0	0.0
Tyrophagus formicetorum	0.0	0.0	0.06	3.22	0.0	0.0
Mycetoglyphus fungivorus	0.0	0.0	0.03	3.22	0.0	0.0
Tyrolichus casei	0.02	3.33	5.48	9.7	0.0	0.0
Caloglyphus berlesei	0.78	6.67	0.0	0.0	0.0	0.0
Caloglyphus oudemansi	0.16	3.33	0.0	0.0	0.0	0.0
Rhizoglyphus echinopus	0.02	3.33	0.0	0.0	0.0	0.0
Rhizoglyphus robini	0.0	0.0	0.20	3.22	0.0	0.0
Schwiebea (S.) talpa	0.0	0.0	0.20	3.22	0.0	0.0
Lepidoglyphus michaeli	2.36	13.33	0.0	0.0	0.0	0.0
Lepidoglyphus fustifer	1.56	33.33	0.0	0.0	0.0	0.0
Lepidoglyphus destructor	0.23	10.0	0.0	0.0	0.37	16.32
Glycyphagus domesticus	0.32	13.33	0.11	9.7	0.0	0.0
Glycyphagus ornatus	0.02	3.33	0.0	0.0	0.0	0.0
Ctenoglyphus plumiger	0.46	10.0	0.0	0.0	0.0	0.0
Ctenoglyphus canestrinii	0.23	3.33	0.0	0.0	0.0	0.0
Chortoglyphus arcuatus	3.84	16.67	0.0	0.0	0.0	0.0
Dermatophagoides farinae	0.0	0.0	0.0	0.0	0.05	6.12
Dermatophagoides evansi	0.0	0.0	8.64	9.7	0.0	0.0
Hirstia chelidonis	0.0	0.0	29.30	16.13	0.0	0.0
Gymnoglyphus longior	2.10	3.33	0.23	16.13	0.0	0.0
other Acaridida	0.34	26.65	2.44	38.74	13.44	16.32
ACTINEDIDA	9.38	76.6	5.8	64.5	1.08	22.45
TARSONEMIDA	0.86	29.99	1.48	29.0	0.0	0.0
GAMASIDA	13.11	66.67	19.83	87.0	22.48	61.22
ORIBATIDA	6.59	20.0	24.30	61.3	17.77	57.14
IXODIDA	0.0	0.0	0.0	0.0	0.07	6.12

farris was predominant (approx. 34% of the total count), followed by *Tyrophagus putrescentiae* (4.7%), *Caloglyphus berlesei* (4.35%) and *Acarus immobilis* (4.31%); all species of the family Acaridae. *Dermatophagoides farinae*, the house-dust-mite species, was for the first time found in this environment. This allergenic mite constituted only 0.05% of the total population and was associated with parrots.

Review of the mite fauna

This review includes only the species from families Pyroglyphidae, Acaridae, Glycyphagidae and Chortoglyphidae from order Acaridida. Among these taxa only several species are considered as the typical domestic mites (COLLOFF 1991, 1998a, b; COLLOFF & SPIEKSMA 1992; POPE et al. 1993). The review excludes some unidentified specimens of the genera *Tyrophagus*, *Rhizoglyphus*, *Schwiebea* (*Jacotietta*), *Caloglyphus*, *Lardoglyphus*, *Lepidoglyphus*, and of families Acaridae and Anoetidae.

Ordo: Acaridida

Family: Acaridae

1. ***Acarus immobilis*** GRIFFITHS, 1964

An out-of-door species, probably cosmopolitan, known from England, Poland, former Czechoslovakia, former USSR, USA and Czech Republic. *A. immobilis* occurs mainly in different stored products, in bird nests, beehives, humus and ground vegetation. It has occasionally been found on unprocessed cereals in farms and storage premises, in grain residues and on cheese (CHMIELEWSKI 1971a; HUGHES 1976; ROSICKÝ et al. 1979; FRANZ et al. 1997). So far it has mainly been recorded from temperate regions. In Poland it was found in the surface dust sample from a kitchen located in a very damp dwelling in Sosnowiec (SOLARZ 1987), in nests of pigeons and domestic sparrows (CHMIELEWSKI 1982; SOLARZ et al. 2000), in coal-mine dust (SOLARZ & SOLARZ 1996), in beehives, pollen traps and honey (CHMIELEWSKI 1971a, 2002), in spices and grocery articles of consumption (CHMIELEWSKI 1971c), in stored plant seeds (CHMIELEWSKI 1983a), pin nests of pigeons (*Columba livia*) (SOLARZ et al. 2000), in samples of dust and residues from railway trucks (SOLARZ 1995), and in barns (SOLARZ et al. 1997).

In actual fact a total of 1667 specimens of *A. immobilis* were found, including:

– 1505 specimens in 7 samples from cowsheds (byres) (56.41% of all mites collected from byres), 5 ones in 2 samples from barns, and 1 specimen in a poultry house (0.12%) in Majdan Górny;

– 140 specimens in cages (3.05% of the total count from cages) and 80 specimens in runs (22.03%) of the Silesian ZOO; where this mite was associated with canids (35.15% of all mites associated with canids), felids (2.0%), artiodactyls (7.3%), primates (11.5%) and birds (2.5%);

– 16 specimens in the pigeon nest (19.41% of all mites collected from the nest).

Eudominant and euconstant in farming environments; subdominant and euconstant in the Silesian ZOO; subrecedent and accesory species in bird nests (Table I).

2. ***Acarus farris*** (OUDEMANS, 1905)

Species widely distributed, probably cosmopolitan, known from England, Scotland, Wales, Holland, Poland, Germany, Finland, former Czechoslovakia, USA and Kenya. Generally, it is a field species, but it has also been recorded from barley, dry grass, hay, cheese, poultry food, oats, birds' nests and the deep litter of poultry houses. *A. farris* is often abundant on farms particularly during August and/or September when it is associated with *Tyrophagus longior* (HUGHES 1976, TERHO et al. 1982; HALLAS & SOLBERG 1989; HALLAS et al. 1991; FRANZ et al. 1997). In Poland it was found in nests of domestic and tree sparrows (WASYLIK 1971, 1973; SANDNER & WASYLIK 1973; CHMIELEWSKI 1982), in barns and chaff-cutters (SOLARZ et al. 1997), in house dust samples

in Poznań (DZIĘCIOŁOWSKI 1994; CHMIELEWSKI 1995b), on houseflies (*Musca domestica*) (CHMIELEWSKI 1983b), in samples of dust and residues from railway trucks (SOLARZ 1995), in pollen traps, beehives and honey (CHMIELEWSKI 1971a; 1983a, b, 2002), spices and grocery articles of consumption (CHMIELEWSKI 1971c), stored herbs (KARNKOWSKI 1990) and on cereals (grain) (SANDNER & WASYLIK 1973).

In fact, 1734 specimens of *A. farris* were found in cages (37.87% of the total count from cages) and 2 specimens in runs (0.55%) of the Silesian ZOO. This mite was associated with birds (41.1% of the total) and felids (1.4%). Moreover, 84 specimens have been collected from 4 samples from barns in Majdan Górny (9.68% of all mites collected from barns).

Eudominant and euconstant in the Silesian ZOO; recedent and constant in farming environments (Table I).

3. ***Acarus siro*** LINNAEUS, 1758

Cosmopolitan mite species, often numerously occuring in many types of stored food products (mainly in cereal products), also in Poland. Moreover it is common and abundant in dust from farms, warehouses and grain elevators, in nests of birds (including poultry houses) and small mammals, in straw, hay and in byres (HUGHES 1976; ROSICKÝ et al. 1979; BOCZEK 1980a, 1999; VAN BRONSWIJK 1981; TERHO et al. 1982; DUBININA 1985; KORSGAARD et al. 1985; REVSBECH & ANDERSEN 1987; COLLOFF 1987; MUMCUOGLU & LUTSKY 1990; HALLAS et al. 1991; CHMIELEWSKI 1995a; HALLAS & IVERSEN 1996; FRANZ et al. 1997). It has also been found in the sputum of patients in China (LI & LI 1990). In many studies around the world, *A. siro* was found in homes prior to discovery of the genus *Dermatophagoides* as the most common inhabitant in house dust (MULLA & SANCHEZ MEDINA 1980; VAN BRONSWIJK 1981; FAIN et al. 1990; REE et al. 1997). In Poland occurs all over the country in granaries and warehouses, in food products, herbs, pollen traps (BOCZEK & GOŁĘBIOWSKA 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; JANICKI et al. 1959; BOCZEK 1999; BOCZEK et al. 1960, 1961; CHMIELEWSKI 1971c, 1972, 2002; WIĘCKO 1986; SOLARZ 1986; KARNKOWSKI 1990), in farming environments (cowshed, pigsty, stable) (ANDRZEJEWSKA 1979), on small mammals (LACHMAJER & WEGNER 1959), in nests of domestic sparrows and tree sparrows (CHMIELEWSKI 1982; SANDNER & WASYLIK 1973; WASYLIK 1959, 1964, 1971, 1973), in nests of barn swallows and pigeons (identified as *Acarus siro* complex) (SOLARZ et al. 1999), in beehives and honey (CHMIELEWSKI 1971a, c, 1977, 1983a, b, 1995a; BANASZAK 1980), in coal-mine dust (Upper Silesia) (SOLARZ & SOLARZ 1996; SOLARZ et al. 2002), in house dust samples (SOLARZ 1986, 1987, 1998, 2000a, 2001a, b; DZIĘCIOŁOWSKI 1994; CHMIELEWSKI 1995b), in samples of dust, residues and transported products (flour, fodder) from railway trucks (SOLARZ 1995), and in dust from ocean-going ships (WEGNER 1980).

A total of 50 specimens of *A. siro* have been collected, including:

– 18 specimens in 4 samples from barns (2.07% of all mites collected from barns), 16 ones in 3 samples from cowsheds (0.60%) and 9 specimens in 1 sample from a poultry house (10.8%) in Majdan Górny;

– 7 specimens in cages of the Silesian ZOO (0.15% of the total count of mites from cages), where this species was associated with birds (0.16% of all mites associated with birds).

Subrecedent and euconstant in farming environments; subrecedent and accesory species in the Silesian ZOO (Table I).

4. ***Tyrophagus putrescentiae*** (SCHRANK, 1781)

Cosmopolitan species, common on different stored products, and moreover in soil, litter, hay stacks, grain stacks, mushroom-growing cellars, poultry houses, nests of birds and rodents, insect cultures, zoological collections, on city pavements, and in dust from dwellings and farms (BOCZEK & DUTKIEWICZ 1972; HUGHES 1976; ROSICKÝ et al.1979; BOCZEK 1980a, 1999; MAURI & ALZUET 1980; VAN BRONSWIJK 1981; DUBININA 1985; SAMŠIŇÁK & VOBRÁZKOVÁ 1985; COLLOFF 1987;

FAIN et al. 1990; KARNKOWSKI 1990; MUMCUOGLU & LUTSKY 1990; CHMIELEWSKI 1995a; DUSBÁBEK 1995; FRANZ et al. 1997; REE et al. 1997). It has also been found in the sputum of patients in China (LI & LI 1990). In Poland it is common both in natural environments (bird and rodent nests, beehives, honey, plants, manure, pollen traps) and in warehouses, stables or mushroom-growing cellars, on different food articles (e. g. in stored herbs, corn-mealy products, fruit-vegetable products, spices and grocery articles of consumption) (LACHMAJER & WEGNER 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; WASYLIK 1959, 1963, 1964; BOCZEK et al. 1960, 1961; CHMIELEWSKI 1971a, c, 1972, 1977, 1982, 1983b, 1995a, 2002; ANDRZEJEWSKA 1979; BANASZAK 1980; BOCZEK 1980a, 1999; KARNKOWSKI 1990; SOLARZ et al. 1999), in samples of dust, residues and transported products (wheat, fodder) from railway trucks (SOLARZ 1995), in dust from harbour warehouses in Gdynia (WIĘCKO 1986), in house dust samples (SOLARZ 1986, 1997, 1998, 2000a, 2001a, b; HORAK 1987; HORAK et al. 1996; DZIĘCIOŁOWSKI 1994; CHMIELEWSKI 1995b), in coal-mine dust (SOLARZ & SOLARZ 1991, 1996; SOLARZ et al. 2002) and in dust samples from kitchens on ocean ships (WEGNER 1980).

A total of 200 specimens were collected from cages in the Silesian ZOO (4.36% of the total population from cages), 19 specimens from runs (5.23%) and 13 specimens from terrariums (8.33%). This species was associated with canids (8.7% of the total count of mites associated with canids), with artiodactyls (9.5%), primates (16.9%), birds (3.6%) and snakes (17.6%). Moreover, 2 specimens were found in a byre (cowshed) (0.07% of all mites collected from cowsheds) and 2 specimens in a barn (0.23%, respectively) in Majdan Górny.

Subdominant and euconstant in the Silesian ZOO; subrecedent and accesory species in farming environments (Table I).

5. ***Tyrophagus longior*** (GERVAIS, 1844)

Common mite species, occuring mainly in byres, hay, straw and grain stacks on a field, in stored products in storages (hay, straw, grain), in dry grass, in honey, in bird nests, poultry houses and beehives, in dust samples from the working environments of farms (CHMIELEWSKI 1969, 1995a; HUGHES 1976; ROSICKÝ et al. 1979; BOCZEK 1980a, 1999; TERHO et al. 1982; HALLAS & SOLBERG 1989; HALLAS et al. 1991; FRANZ et al. 1997). It also was found in house dust samples (DUBININA 1985; COLLOFF 1987). In Poland was noted from warehouses (BOCZEK 1980a; 1999) and from certain farming environments (barn, pigsty, cowshed) (ANDRZEJEWSKA 1979; SOLARZ et al. 1997), from honey (CHMIELEWSKI 1995a), beehives (CHMIELEWSKI 1971a), pollen traps (CHMIELEWSKI 2002) and bees (CHMIELEWSKI 1983b), from stored herbs, fruit-vegetable food products, spices and grocery articles (BOCZEK et al. 1961; CHMIELEWSKI 1971c; CHMIELEWSKI 1972; KARNKOWSKI 1990), nests of domestic sparrows, tree sparrows, blackbirds, common starlings and swallows, brood shelters of great titmice (WASYLIK 1959, 1963, 1964, 1971, 1973; CHMIELEWSKI 1977; ANDRZEJEWSKA 1979; SOLARZ et al. 1999, 2000), from samples of dust and residues from railway trucks (SOLARZ 1995), from house dust samples (CHMIELEWSKI 1995b; SOLARZ 2000a), and dust samples from vegetable stores on ocean ships (WEGNER 1980).

A total of 796 specimens of *T. longior* have been found, including:

– 392 specimens in 3 samples from poultry houses (47.0% of all mites collected from poultry houses), 277 specimens in 4 samples from barns (31.91%) and 45 specimens in 5 samples from cowsheds (1.69%) in Majdan Górny;

– 10 specimens in cages (0.21% of the total count from cages) and 61 specimens in runs of animals (16.8%) in the Silesian ZOO, where this species was associated with canids (11.9% of all mites associated with canids), with felids (24.3%), artiodactyls (1.7%), primates (0.5%) and birds (0.15%);

– 11 specimens in 4 nests of common blackbirds (0.56% of the total count from the nests of blackbirds).

Eudominant and euconstant in farming environments; recedent and constant in the Silesian ZOO; subrecedent and constant in bird nests (Table I).

6. ***Tyrophagus palmarum*** OUDEMANS, 1924

The cosmopolitan species, occuring in stored products (e.g. herbs), beehives, bird nests, soil samples, litter and debris from a cowshed, in grain and hay stacks on an open field, and on plants (GILYAROV & KRIVOLUTSKIJ 1975; HUGHES 1976; BOCZEK 1980a, 1999; KARNKOWSKI 1990; MADEJ & SOLARZ 1998). It was also found in house dust samples and in dust samples from the working environments of farms (VAN BRONSWIJK 1981; FRANZ et al. 1997). In Poland it occurred in nests of domestic and tree sparrows, barn swallows and common blackbirds, and in brood shelters of great titmice (WASYLIK 1971, 1973; SANDNER & WASYLIK 1973; SOLARZ et al. 1999, 2000), in the surface soil of grasslands (Ojców National Park) (SOLARZ et al. 2001), in a dust sample from a desk in a library (SOLARZ 1986, 1998, 2000a), in stored herbs (in Grudziądz) (KARNKOWSKI 1990), on the communal refuse dump (in Bielsko-Biała) (MADEJ & SOLARZ 1998), and in cowsheds (southern Poland) (SOLARZ et al. 1994, 1997).

In actual fact 17 specimens of *T. palmarum* were isolated from 1 barn swallow's nest (0.45% of the total count from nests of barn swallows) and 14 ones from 2 nests of common blackbirds (1.56%).

Subrecedent and accesory species in bird nests (Table I).

7. ***Tyrophagus silvester*** ZACHVATKIN, 1941

Mite species known from Poland, former USSR, Bulgaria, former Czechoslovakia, England and Australia; it occurred in oats, barley, on cheese and in the dust from granaries and warehouses (SAMŠIŇÁK 1962; GILYAROV & KRIVOLUTSKIJ 1975; HUGHES 1976). In Poland was found in dust samples from warehouses, in stored grain and herbs, flax seeds and hemp seeds (KLIMASZEWSKA & KWIATKOWSKA 1959; BOCZEK et al. 1960, 1961), in soil and litter (SOLARZ et al. 1994) and in nests of tree sparrows (*P. montanus*) (WASYLIK 1963, 1964, 1971, 1973; SANDNER & WASYLIK 1973).

A total of 42 specimens of *T. silvester* have been found in a barn located in Majdan Górny (1.57% of all mites collected from barns).

Subrecedent and accesory species in farming environments (Table I).

8. ***Tyrophagus similis*** VOLGIN, 1949

Common mite species, occurring mainly on grassland, in soil and on plants such as *Phlox,* spinach, mushrooms etc. It has also been recorded from old hay, chaff, in an eider duck nest and a nest of *Bombus ionellus*. Mite species known from British Isles, New Zealand, Belgium, Germany, Iceland, Faroe Islands, Subantarctic Island (Kerguelen), Holland, Poland, former USSR, USA and Australia (SAMŠIŇÁK 1962; GILYAROV & KRIVOLUTSKIJ 1975; FAIN 1976; HUGHES 1976; HALLAS & SOLBERG 1989). In Poland it has been reported from nests of tree sparrows and domestic sparrows (WASYLIK 1964, 1971, 1973; SOLARZ et al. 1998, 1999), and from the surface soil and litter of woodlands (near Lubliniec) (SOLARZ et al. 1994).

Ten specimens have been found in cages in the Silesian ZOO (0,21% of the total count from cages). This species was associated with artiodactyls (1.7% of all mites collected from cages of artiodactyls) and birds (0.2%).

Subrecedent and accesory species in the Silesian ZOO (Table I).

9. ***Tyrophagus mixtus*** VOLGIN, 1948

Mite species known from former USSR (Smolensk, Tomsk), Czech Republic, Poland and USA. It has been found on eggs of beetles *Sitotroga cerealella*, on roots of pot flowers, in a litter of a cedar forest (VOLGIN 1948; SAMŠIŇÁK 1962; JOHNSTON and BRUCE 1965; GILYAROV & KRIVOLUTSKIJ 1975). In Poland it has been found in nests of domestic sparrows and warblers (*Sylvia* sp.) (SOLARZ et al. 1999, 2000).

Nine specimens were isolated from 1 nest of *Sylvia* sp. (1.70% of the total count from nests of warblers of the genus *Sylvia*).

Subrecedent and accesory species in bird nests (Table I).

10. ***Tyrophagus formicetorum*** VOLGIN, 1948

Mite species known from ants *Formica rufa* and bird nests (former USSR, former Czechoslovakia and Poland) (VOLGIN 1948; SAMŠIŇÁK 1962; JOHNSTON and BRUCE 1965; GILYAROV & KRIVOLUTSKIJ 1975; FAIN 1987; SOLARZ et al. 2000).

Two females were isolated from a barn swallow's nest (0.18% of the total count from nests of barn swallows).

Subrecedent and accesory species in bird nests (Table I).

11. ***Mycetoglyphus fungivorus*** OUDEMANS, 1932

Species known from England, Germany, Hungary, former USSR, USA and South Africa, commonly occuring on grasslands and beneath stacks of hay and straw. OUDEMANS' original specimens came from mushrooms in Sussex (UK). It has also been collected from celery waste, lettuce, decaying radishes and from wet decaying wood debris, from moles' nests and nests of ants *Camponotus ligniperda* (GILYAROV & KRIVOLUTSKIJ 1975; HUGHES 1976). In Poland it was found in nests of common blackbirds (*Turdus merula*) (SOLARZ et al. 2000), house dust samples and in dust from ocean-going ships (WEGNER 1980; SOLARZ 1986).

One female was found in a blackbird's nest (0.11% of all mites collected from the nests of common blackbirds) (Table I).

12. ***Tyrolichus casei*** OUDEMANS, 1910

Cosmopolitan species, common in stored food, on cheese, grain, damp flour, old honey-combs, dogmeal, and in insect collections. It has also been found on ergot of rye, under the bark of old tree stumps, in a mouse nest, in beehives, in a vessel containing human urine, and in dwellings (HUGHES 1976; DUBININA 1985; TAREEV & DUBININA 1985; BOCZEK 1999). In Poland it was found in house dust samples (SOLARZ 1986, 2001a, b), on fungal cultures, on different food articles (e. g. in stored herbs, on cheese, oil-containing seeds, halva), in nests of tree and domestic sparrows (*Passer domesticus*, *P. montanus*), in nests of titmice (*Parus palustris*, *Parus* sp.) (WASYLIK 1959, 1971, 1973; BOCZEK et al. 1961; SANDNER & WASYLIK 1973; SOLARZ et al. 1999, 2000), in pollen traps (CHMIELEWSKI 2002) and in samples of dust from ocean ships (WEGNER 1980).

A total of 193 specimens of *T. casei* were found in 4 brood shelters of great titmice (*P. palustris*) (39.38% of all mites collected from titmice nests or brood shelters). Moreover, 1 female has been found in a barn located in Majdan Górny (0.11% of the total count from barns).

Dominant and accesory species in bird nests (Table I).

13. ***Rhizoglyphus robini*** CLAPAREDE, 1869

Species widely distributed, probably cosmopolitan, occuring on *Narcissus* and *Freesia* bulbs, on potato bulbs and *Gladiolus* corms, on onion and garlic, in soil (HUGHES 1976; GERSON et al. 1981; GERSON & CAPUA 1982; BAKER 1983; BIELSKA 1983; LUXTON 1995), in dust from poultry houses (Israel) (MUMCUOGLU & LUTSKY 1990), and in house dust samples (REE et al. 1997). In Poland it is common in soil, compost, retting plants and rarely in warehouses (on decaying potato bulbs, on narcissi and gladioli) (BOCZEK et al. 1960; 1999; BIELSKA 1983; CHMIELEWSKI 1977). It has been also found in coal mine dust in Upper Silesia (SOLARZ & SOLARZ 1996), in a floor dust sample from a dwelling in Katowice (SOLARZ 1986, 2000a), in nests of barn swallows (SOLARZ et al. 2000) and on the communal refuse dump and adjacent meadow in Bielsko-Biała (MADEJ & SOLARZ 1998).

Seven specimens were isolated from a barn swallow's nest (0.62% of the total count from nests of barn swallows).

Subrecedent and accesory species in bird nests (Table I).

14. ***Rhizoglyphus echinopus*** (FUMOUZE et ROBIN, 1868)

Cosmopolitan species, occuring on bulbs of bulbous plants, in soil, compost and retting plants. *R. echinopus* was found on potato, tulip, hyacinth, lily and onion bulbs. It has also been obtained from *Calla* bulbs, from wet and decaying wheat spillage, and from the fatty debris in a lard factory (HUGHES 1976; GERSON et al. 1981; BIELSKA 1983; BOCZEK 1980a, 1999). Also in Poland, it occurs commonly in soil, compost, rotting plants, and rarely in warehouses (on decaying potato, flaxseeds, stored herbs, hyacinth and tulip bulbs, on beets etc., sporadically in a damp grain and onion) or in barns (debris, litter) (BOCZEK et al. 1960, 1961; SANDNER & WASYLIK 1973; BOCZEK 1980a, 1999; BIELSKA 1983; SOLARZ et al. 1994, 1997). It has also been found on houseflies (hypopi) (CHMIELEWSKI 1983b), on leaves of plants in hospitals (SOLARZ 1986), in samples of dust and residues from railway trucks (SOLARZ 1995), and in dust from ocean-going ships (WEGNER 1980).

One female was found in a barn located in Majdan Górny (0.11% of all mites collected from barns) (Table I).

15. ***Caloglyphus berlesei*** (MICHAEL, 1903) s. BERLESE, 1923

Species widely distributed, probably cosmopolitan, occuring in insect cultures, in poultry houses, in house dust samples and sporadically in stored food (HUGHES 1976; TIMMS et al. 1981). It was also detected in dust from city pavements (SAMŠIŇÁK & VOBRÁZKOVÁ 1985) and in the sputum of patients in China (LI & LI 1990). In granaries and warehouses this species requires extremely high moisture (HUGHES 1976; VAN BRONSWIJK 1981; MUMCUOGLU & LUTSKY 1990). Moreover in Poland it was found in dust from vegetable stores on ocean ships (WEGNER 1980) and in an industrial chicken fattening (RAJSKI & STASZEWSKA 1976). *C. berlesei* has also been found on surface of leafs of a common fig (a hall of hospital in Katowice) and in floor-dust sample from a cloak-room of a hospital in Sosnowiec (SOLARZ 2000a).

A total of 34 specimens were found in 2 samples from cowsheds (1.27% of all mites collected from cowsheds) in Majdan Górny.

Subrecedent and accesory species in farming environments (Table I).

Moreover, 222 specimens *Caloglyphus* sp. have been found in cages of birds in the Silesian ZOO (5.26% of all mites associated with birds)

16. ***Caloglyphus oudemansi*** (ZACHVATKIN, 1937)

Mite species known from England, Italy, former USSR, Java, India and Australia. This mite was originally found in the nests of the ant *Plagiolepis longipes.* It also occurred on stored damp nuts (Brazil nuts, groundnuts), on damp grass, decaying plants, beneath haystacks, and in the deep litter of broiler houses (HUGHES 1976).

Seven specimens of *C. oudemansi* were found in 1 sample from a cowshed in Majdan Górny (2.53% of all mites collected from cowsheds). This species is new for the fauna of Poland.

Subrecedent and accesory species in farming environments (Table I).

17. ***Schwiebea* (*Schwiebea*) *talpa*** OUDEMANS, 1916

Cosmopolitan species; it has been found on beetles of the family Carabidae (*Carabus jankovskii*), in humus, in rotting leaves, in humid soil, bird nests, and in subterranean springs situated under the ground of the city of Vienna (Austria) (MANSON 1972, FAIN 1976, 1982; BUGROV 1995; SOLARZ et al. 1999). It is usually associated with more moist environments such as bog mosses (*Sphagnum*) and mudstreams or muddy river-beds (FAIN 1982). In Poland it has been reported from mine galleries at Tarnowskie Góry (SKUBAŁA et al., in press), from the meadow located

near a refuse dump in Bielsko-Biała (MADEJ & SOLARZ 1998), and nests of warblers and thrushes (SOLARZ et al. 1999, 2000).

Seven specimens were isolated from 1 nest of a common blackbird (0.78% of the total count from nests of blackbirds).

Subrecedent and accesory species in bird nests (Table I).

Family: Glycyphagidae

18. ***Glycyphagus domesticus*** (DE GEER, 1778)

Cosmopolitan species, but it is more frequently reported from Europe, than from North America, Japan or Australia (HUGHES 1976; FAIN et al. 1990). It occurs mainly on both plant and animal residues in food stores, in pigsties, stables, barns and houses. It has been also found in different sorts of animal and plant food materials (in flour, wheat, grain, cheese, ham, linseed, dried meat) and moreover in tobacco, hay, sugar beet seed, in beehives, mammal and bird nests, in stacks of hay on an open field, in byres, hay and grain storages, in natural museum exhibits (herbarium) (BARKER 1968; CHMIELEWSKI 1969, 1971a; HUGHES 1976; ROSICKÝ et al. 1979; BANASZAK 1980; MAURI & ALZUET 1980; TERHO et al. 1982; TAREEV & DUBININA 1985; HALLAS & SOLBERG 1989; HALLAS & IVERSEN 1996; BOCZEK 1980a, 1999), and in damp houses – on mattresses, upholstery furniture (with rush, sea grass fibre or green fibre), on wallpapers or in other house dust samples (BLASCO SABIO et al. 1975; HUGHES 1976; MAURI & ALZUET 1980; VAN BRONSWIJK 1981; COLLOFF 1987; DUSBÁBEK 1995; HALLAS & KORSGAARD 1997). Alike in Poland *G. domesticus* occurs in warehouses and different home-food products, in debris from cowsheds, barns, rabbit cages and lofts, and on an open field – in hay, on bees and in beehives, on beetles (Scarabaeidae), in pollen traps, nests of domestic and tree sparrows, nests of pigeons, blackbirds and barn swallows (BOCZEK & GOŁĘBIOWSKA 1959; JANICKI et al. 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; WASYLIK 1959, 1964, 1971, 1973; BOCZEK et al. 1960, 1961; CHMIELEWSKI 1969, 1971a, c, 1972, 1982, 1983b, 2000, 2002; BOCZEK & DUTKIEWICZ 1972; SANDNER & WASYLIK 1973; ANDRZEJEWSKA 1979; BANASZAK 1980; BOCZEK 1980a, 1999; KARNKOWSKI 1990; SOLARZ et al. 1994, 1997, 1998, 1999, 2000), in house dust samples (ROMAŃSKI et al. 1977; DZIECIOŁOWSKI 1994; CHMIELEWSKI 1995b; SOLARZ 2000a, 2001a, b), in coal-mine dust (SOLARZ & SOLARZ 1996; SOLARZ et al. 2002), and in dust from ocean ships (WEGNER 1980).

In actual fact 18 specimens of *G. domesticus* were collected, including:

– 6 specimens in 2 samples from cowsheds (0.22% of all mites collected from cowsheds) and 8 specimens in 2 samples from poultry houses (0.96%) in Majdan Górny;

– 2 specimens were isolated from the pigeon's nest (2.98% of the total count), and single specimens from the common blackbird's nest (0.11%) and the barn swallow's nest (0.09%).

Subrecedent and constant in farming environments; subrecedent and accesory species in bird nests (Table I).

19. ***Glycyphagus ornatus*** (KRAMER, 1881)

Mite species known from England, Denmark, Germany, Holland, France, Italy, former USSR, Poland, former Czechoslovakia and Israel (GILYAROV & KRIVOLUTSKIJ 1975; HUGHES 1976). It is common in the spillage from wheat, hay, and oil-containing seeds. *G. ornatus* has also been found in flour residue from a London wharf, in mud scraped from horses, in animal feeding stuffs, in a beech woodland soil and litter in Denmark, and in the nests of a number of different species of animals (e. g. in nests of moles, bumble-bees, sparrows, Levant voles, shrews and a number of other rodents and insectivores) (WASYLIK 1959; HUGHES 1976; LUXTON 1995). In Poland *G. ornatus* was found in nests of tree and domestic sparrows (WASYLIK 1959, 1963, 1964, 1973), in nests of swallows, in farming environments (cowshed, pigsty) (ANDRZEJEWSKA 1979) and in grannaries (grain, stored herb mixtures, sweepings) (JANICKI et al. 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; BOCZEK et al. 1961; CHMIELEWSKI 1972; SANDNER & WASYLIK 1973).

One male was found in a sample from a barn located in Majdan Górny (Table I).

20. ***Lepidoglyphus destructor*** (SCHRANK, 1781)

The cosmopolitan and one of the commonest species among storage mites; most often occurs in different stored products, peculiarly in stored grain, linseed, cereals, dried fruits, sugar beet seed, meal (CHMIELEWSKI 1969; HUGHES 1976; ROSICKÝ et al. 1979; BOCZEK 1980a, 1999; FAIN et al. 1990). It also was found in stacks of grain, straw and hay (on a field or in farm-houses, storages and barns), in floor debris samples from granaries, byres and stables, in grain dust from grain storages (HALLAS 1981; TERHO et al. 1982, 1985; HALLAS & GUDMUNDSSON 1985; FAIN et al. 1990), in soil samples (old grassland, agricultural zones), in nests of rodents, birds, bees and bumble-bees, on zoological exhibits (insects, mammals), in poultry houses, and moreover in dump dwellings – under wallpapers, in mattress stuffing or in house dust (BLASCO SABIO et al. 1975; HUGHES 1976; ROSICKÝ et al. 1979; BANASZAK 1980; VAN BRONSWIJK 1981; CHMIELEWSKI 1982; DUBININA 1985; COLLOFF 1987; HALLAS & SOLBERG 1989; HALLAS et al. 1991; VARGAS & MAIRENA 1991; DUSBÁBEK 1995; BOCZEK 1999). In Poland *L. destructor* was the mite most often found in stored food products (grain, dried herbs, grinding products, linseeds, sugar beet seeds, corn-mealy products, spices and grocery articles, fruit-vegetable products, natural honey, home-food products) and in sweepings from warehouses and granaries (BOCZEK & GOŁĘBIOWSKA 1959; BOCZEK et al. 1960, 1961; BOCZEK 1999; BOCZEK & DUTKIEWICZ 1972; CHMIELEWSKI 1969, 1971a, c, 1972, 1977; JANICKI et al. 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; KARNKOWSKI 1990; SOLARZ 1986). Moreover it was found in farming environments (sweepings and litter or debris from barns, poultry houses, cowsheds) (ANDRZEJEWSKA 1979; SOLARZ et al. 1994, 1997), in sparrow nests (WASYLIK 1963, 1964, 1971, 1973; SANDNER & WASYLIK 1973; ANDRZEJEWSKA 1979; CHMIELEWSKI 1982), in beehives (BANASZAK 1980), pollen traps (CHMIELEWSKI 2002), in house dust (ROMAŃSKI et al. 1977, DZIĘCIOŁOWSKI 1994; CHMIELEWSKI 1995b; SOLARZ 2000a, 2001a, b), in dust from warehouses and harbour buildings in Gdynia (WIĘCKO 1986), dust from ocean ships (WEGNER 1980), and in coal-mine dust samples (SOLARZ & SOLARZ 1996; SOLARZ et al. 2002).

A total of 30 specimens of *L. destructor* have been collected, including:

– 8 specimens in 2 samples from barns (0.92% of all mites collected from barns) and 2 specimens in 1 sample from a cowshed (0.07%) in Majdan Górny;

– 10 specimens in cages (0.21% of the total count) and 10 specimens in runs (2.75%) of the Silesian ZOO, where this species was associated with canids (2.73% of the total), felids (2.7%), artiodactyls (4.5%), and primates (1.0%).

Subrecedent and accesory species in farming environments; subrecedent and constant in the Silesian ZOO (Table I).

21. ***Lepidoglyphus michaeli*** (OUDEMANS, 1903)

Mite species widely distributed in Europe, known from France, England, Germany, Holland, Sweden, former USSR, Poland, Hungary, former Czechoslovakia and Bulgaria. *L. michaeli* is not so common in stored food as the previous one. It is abundant in dried vegetable matter, in granaries, stables (on hay and fodder), in rodent and insectivore nests. In addition, it has been found in house dust samples, in brewer's yeast and on moist grain (GILYAROV & KRIVOLUTSKIJ 1975; HUGHES 1976; VAN BRONSWIJK 1981). In Poland it was found in barns (hay, straw, sweepings and litter or debris) (ANDRZEJEWSKA 1979), in warehouses or granaries (flax-seeds, herbs, grain, sweepings) (JANICKI et al. 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; BOCZEK et al. 1960, 1961; SANDNER & WASYLIK 1973).

In actual fact, a total of 80 specimens were found in 1 sample from a cowshed (2.30% of all mites collected from cowsheds), 22 ones in 2 samples from barns (2.53%), and 1 specimen in the sample from a poultry house (0.12%) in Majdan Górny.

Subdominat and constant in farming environments (Table I).

22. ***Lepidoglyphus fustifer*** (OUDEMANS, 1903)

Mite species known from Germany, England, Holland, Sweden, former USSR, Poland and former Czechoslovakia. *L. fustifer* is not so widely distributed as the previous one, but it is more common in stored food. This species was found originally on furniture in a house. It has also been found on rye, cotton, poppy and turnip seeds (GILYAROV & KRIVOLUTSKIJ 1975; HUGHES 1976; DUBININA 1985; TAREEV & DUBININA 1985). In Poland it was found in house dust samples (SOLARZ 2001a, b), in stored herbs (BOCZEK et al. 1961), in sweepings and litter or debris from barns and cowsheds (SOLARZ et al. 1994, 1997).

Twenty two specimens were found in 4 samples from barns (2.53% of all mites collected from barns), 26 specimens in 3 samples from poultry houses (3.12%), and 20 ones in 3 samples from cowsheds (0.75%) in Majdan Górny.

Recedent and euconstant in farming environments (Table I).

23. ***Ctenoglyphus plumiger*** (KOCH, 1835)

Mite species widely distributed, known from England, Northern Ireland, Italy, Germany, Holland, France, Hungary, Poland, former USSR and Australia; probably cosmopolitan. It occurs frequently under hay and straw stacks, and sparingly in damp oats, wheat, barley and grass seed. It has also been collected from spillage of fishmeal, from honeycombs and nests of sparrows (HUGHES 1976; CHMIELEWSKI 1982). In Poland was found in nests of domestic sparrows (ANDRZEJEWSKA 1979; CHMIELEWSKI 1982), in sweepings and litter or debris from cowsheds and barns (SOLARZ et al. 1994, 1997).

Twenty specimens of *Ct. plumiger* were found in 3 samples from barns (2.30% of all mites collected from barns).

Subrecedent and accesory species in farming environments (Table I).

24. ***Ctenoglyphus canestrinii*** (ARMANELLI, 1887)

Mite known from England, Northern Ireland, Italy, Hungary, Poland and former USSR. It is found in the dust of stables and hay lofts, often associated with *Ct. plumiger*, and under haystacks or straw stacks. *C. canestrinii* has been also recorded from a manure heap, in spillage from a country oat mill and also in soil obtained from a stable (HUGHES 1976). In Poland was found for the first time in sweepings and litter or debris from barns (SOLARZ et al. 1994, 1997).

Ten specimens of *Ct. canestrinii* have been found in 1 sample from a byre (cowshed) in Majdan Górny (0.37% of all mites collected from cowsheds).

Subrecedent and accesory species in farming environments (Table I).

Family: Chortoglyphidae

25. ***Chortoglyphus arcuatus*** (TROUPEAU, 1879)

The cosmopolitan and one of the commonest species among storage and domestic mites. This species is common in the floor dust of barns, stables, mills and granaries, and in flour and heaps of old straw. It has also been found in wheat, rye, oats and grass seed, on red clover seed, on cereals and stored poultry mixtures, in rice, in sparrow nests, in the litter of broiler houses, in house dust samples and in dust samples from the working environments of farms (BLASCO SABIO et al. 1975; HUGHES 1976; ROSA & FLECHTMANN 1979; MAURI & ALZUET 1980; MULLA & SANCHEZ MEDINA 1980; VAN BRONSWIJK 1981; CHMIELEWSKI 1982; TAREEV & DUBININA 1985; VARGAS & MAIRENA 1991; FRANZ et al 1997; REE et al. 1997). In Poland it has been found in nests of domestic sparrows (WASYLIK 1959; CHMIELEWSKI 1982), in grannaries and warehouses (grain, sweepings, stored herbs, hemp seeds, stored food products) (JANICKI et al. 1959; KLIMASZEWSKA & KWIATKOWSKA 1959; BOCZEK & GOŁĘBIOWSKA 1959; BOCZEK et al. 1960, 1961; SANDNER & WASYLIK 1973; CHMIELEWSKI 1971c, 1972; KARNKOWSKI 1990), in house dust samples from

houses in Bielsko-Biała (SOLARZ & KRAJEWSKI-SIUDA 1998; SOLARZ 2001a, b), in dust from dry food stores on ocean ships (WEGNER 1980), and in sweepings and litter or debris from cowsheds and chaff-cutters (SOLARZ et al. 1994, 1997).

A total of 166 specimens were found in 4 samples from barns (19.12% of all mites collected from barns) and 2 ones in 1 sample from a poultry house in Majdan Górny (0.24% of the total count from poultry houses).

Subdominat and constant in farming environments (Table I).

Family: Pyroglyphidae

26. ***Dermatophagoides farinae*** HUGHES, 1961

The house dust mite species, probably cosmopolitan, occuring in house dust almost throughout the world, especially on drier, and moreover in stored plant products, in poultry houses, beehives, in associations with mammals. It was also found on city pavements, and occasionally on a lesional skin of patients with atopic dermatitis or in a sputum of patients with pulmonary acariasis (DUSBÁBEK 1995; HUGHES 1976; BOCZEK 1980a, b, 1999; VAN BRONSWIJK 1981; DUBININA 1985; SAMŠIŇÁK & VOBRÁZKOVÁ 1985; COLLOFF 1987; MUMCUOGLU & LUTSKY 1990; LI & LI 1990; HALLAS 1991). In Poland it was found in samples of house dust (SAMOLIŃSKI et al. 1989; DZIĘCIOŁOWSKI 1994; HORAK 1987; HORAK et al. 1996; RACEWICZ 2001; SOLARZ 1986, 1997, 1998, 2000a, b, 2001a, b), in dust from harbour buildings in Gdynia (WIĘCKO 1986), from cabins on 5 ocean-going ships (WEGNER 1980), in sweepings from mills and warehouses (BOCZEK & DUTKIEWICZ 1972; BOCZEK & CZAJKOWSKA 1973; CHMIELEWSKI 1975), and in brood shelters of *Parus palustris* (SOLARZ et al. 1999; SOLARZ 2001b).

Two heteromorphic males of *D. farinae* have been found in cages (0.04% of the total count) and 1 specimens in runs (0.27%) in the Silesian ZOO. This species was associated with canids (0.45% of the total), artiodactyls (0.56%), and birds (0.02%)

Subrecedent and accesory species in the Silesian ZOO (Table I).

27. ***Dermatophagoides evansi*** FAIN, HUGHES et JOHNSTON, 1967

Mite species frequently found in nests of birds. In the USA it has been collected from nests of *Quiscalus quiscala* (Icteridae) (near Wooster), nests of unidentified birds (near New York), from the nest of a cave swallow (New Mexico) and from a moth (*Noctuidae*) (New York) (FAIN 1967; TREAT 1975; FAIN et al. 1990). It is also known from the nest of a tree swallow in Canada (Winnipeg, Mannitoba) (FAIN et al. 1990), from the nest of a sparrow (East Lansing, USA), and from chicken litter in Israel (MUMCUOGLU & LUTSKY 1990). Moreover, *D. evansi* has been found in house dust samples (DUBININA 1985; TAREEV & DUBININA 1985; FAIN et al. 1990). In Poland it has been reported from nests of domestic sparrows, barn swallows and warblers (*Sylvia* sp.), brood shelters and nests of titmice (SOLARZ et al. 1995, 1998, 1999, 2000; SOLARZ 2001b), and from a sample of pine wood dust (near Somińskie Lake) (SOLARZ et al. 1995).

A total of 263 specimens of *D. evansi* were isolated from 2 nests of great titmice (30.95% of the total count from nests of titmice), and 41 ones from 1 nest of *Sylvia* sp. (7.8%).

Dominat and accesory species in bird nests (Table I).

28. ***Hirstia chelidonis*** HULL, 1931

This mite was described from a nest of the common house martin (*Delichon urbica*) in Belford (England) and from a nest of *Passer domesticus* in Belgium (as *Dermatophagoides passericola*, most probably a synonim) (FAIN et al. 1990). It has also been collected from the nests of several other species of birds (e. g. *Apus apus*, *Passer montanus*, *Hirundo rustica*, *Parus caeruleus*, *Sturnus vulgaris*), from dwellings (bed clothes, stair-carpets) and farming environments (CHMIELEWSKI 1975, 1977, 1982; DUBININA 1985; TAREEV & DUBININA 1985; FAIN et al. 1990; MEHL 1998; SOLARZ et al. 1997). Alike in Poland it was found in nests of swallows (*D. urbica* and *H. rustica*),

sparrows (*P. domesticus* and *P. montanus*), common starlings (*S. vulgaris*), song thrushes (*Turdus philomelos*), penduline tits (*Remiz pendulinus*), warblers (*Sylvia* sp.) and titmice (*Parus* spp.) (CHMIELEWSKI 1975, 1977, 1982; SOLARZ et al. 1998, 1999, 2000; SOLARZ 2001b), and in byres (SOLARZ et al. 1994, 1997; SOLARZ 2001b). In addition, it has also been reported from samples of house dust (SOLARZ 2001a, b).

In actual fact 759 specimens of *H. chelidonis* have been isolated from 3 nests of barn swallows (73.8% of the total count from nests of barn swallows), 250 ones from 1 domestic sparrow's nest (90.3%), and 22 from the common blackbird nest (2.46%).

Eudominant and constant in bird nests (Table I).

29. ***Gymnoglyphus longior*** (TROUESSART, 1897)

The cosmopolitan species, occasionally occuring in house dust (DUBININA 1985; TAREEV & DUBININA 1985; SOLARZ 2000a). It was noted from grain dust, stored food, bird nests, dust from pigeon and chicken houses, dust from primate cages in a ZOO, dust from an attic (inhabited by *Myotis dasycneme*), in dust samples from the working environments of German farms, and in dust from mammal skins (VAN BRONSWIJK 1981; ROSICKÝ et al. 1979; FAIN et al. 1990; FRANZ et al. 1997). In Poland was found in nests of domestic sparrows, barn swallows and thrushes, in brood shelters of great titmice (CHMIELEWSKI 1975, 1977, 1982; ANDRZEJEWSKA 1979, SOLARZ et al. 1999, 2000; SOLARZ 2001b), in farming environments (byre, barn litter, poultry house) (SOLARZ et al. 1994, 1997; SOLARZ 2001b), and in house dust from a basement flat in Poznań (CHMIELEWSKI 1995b) and from an old flat located in Tarnowskie Góry (SOLARZ 2000a).

Six specimens of *G. longior* were collected from 3 brood shelters of great titmice (2.19% of the total count from titmice nests), 1 specimen from the barn swallow nest (0.09%) and 1 specimen from the common blackbird nest (0.11%). Moreover, 92 specimens of *G. longior* were found in 1 sample from a poultry house in Majdan Górny (11.3% of all mites collected from the poultry houses).

Subrecedent and constant in bird nests; subdominant and accesory species in farming environments (Table I).

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