

The high rate of infestation of chewing lice (Phthiraptera) in Rock Pigeons (*Columba livia* Gmelin 1789) in Pakistan

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Sixty-eight feral Rock Pigeons (*Columba livia intermedia* Strickland 1844) and five wild Rock Pigeons (*C. livia neglecta* Hume 1873) were examined for chewing lice (Phthiraptera) in the Karachi Region of Pakistan. At least one species of chewing louse was found on every bird examined. Seven species of chewing lice were identified. Their overall prevalence and mean intensities (within parentheses) were: *Colpocephalum turbinatum* Danny 1842 (35.3%; 1437.1), *Colpocephalum* Nitzsch 1818 (7.35%; 5.4), *Hohorstiella lata* Piaget 1880 (51.4%; 230.1), *H. streptopeliae* Eichler 1953 (1.47%; 4), *Campanulotes compar* Burmeister 1838 (58.8%; 614.3), *Columbicola columbae* Linnaeus 1758 (70.5%; 467.4), *C. tschulyschman* Eichler 1942 (2.94%; 5). Only three species of lice, *C. turbinatum*, *C. columbae* and *C. tschulyschman*, were found on wild pigeons. Over 50% of pigeons examined were heavily infested (500-3007 lice per bird). Serious damage to the plumage and overall health of the birds is discussed. Feral pigeons parasitized with so many lice may pose a threat to racing pigeons in the Karachi Region.

KEY WORDS: chewing lice, Phthiraptera, feral Rock Pigeons, wild Rock Pigeons, Karachi, Pakistan.

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INTRODUCTION

The Rock Pigeon, *Columba livia* Gmelin 1759 (Columbidae Columbi-formes), is a very common domestic and wild bird in Karachi, Pakistan, especially in association with human populations. Pigeons may affect domestic animal and human health by transmitting pathogens directly or indirectly (WEBER et al. 1979, JOHNSTON 1992, TORO et al. 1999).

Feral and wild pigeons are *C. l. intermedia* Strickland 1844 and *C. l. neglecta* Hume 1873, respectively. In Karachi, people love to domesticate white- and brown-feathered pigeons, which are a little larger in size and weight, quite costly and commonly called feral pigeons (*C. l. intermedia*). Grey-feathered pigeons (*C. l. neglecta*) are smaller in size and weight and considered the wild type; they are not domesticated. The wild type interbreeds readily with feral pigeons in the settled areas of Pakistan (ROBERTS 1991).

There are 12 species of chewing lice recorded from *Columba livia* worldwide (PRICE et al. 2003), namely three Amblycera: *Bonomiella columbae* Emerson 1957; *Colpocephalum turbinatum* Denny 1842; *Hohorstiella lata* (Piaget 1880), and nine Ischnocera: *Campanulotes compar* (Burmeister 1838); *Coloceras aegypticum* (Kellogg & Paine 1911); *C. damicornis* (Nitzsch 1866); *C. israelensis* (Tendeiro 1974); *C. liviae* (Tendeiro 1974); *C. tovornikae* Tendeiro 1973; *Columbicola columbae* (Linnaeus 1758); *C. tschubyschman* Eichler 1942 and *Physconelloides zenaidurae* (McGregor 1917). Among these 12 louse species, the most commonly reported are *Columbicola columbae*, *Campanulotes compar*, *Coloceras damicornis* and all three amblyceran species (EMERSON 1972, LEDGER 1980, MEY 2003), while the other six species are very rare or local (EMERSON 1957, GALLOWAY & PALMA 2008). Only *Columbicola columbae* has been previously reported on *Columba livia* from Pakistan (LAKSHMINARAYANA 1979).

A thorough knowledge of the pathogenic agents carried by wild type and feral populations of pigeons is needed to understand the epidemiology of some diseases affecting domestic stocks. Furthermore, free-living pigeon populations may be a threat to the poultry industry (TORO et al. 1999), especially when the most pathogenic species of poultry lice, i.e. *Menacanthus stramineus* (Nitzsch 1818) and *Menopon gallinae* (Linnaeus 1758), are known to occur on pigeons (BROWN 1971, DRANZO et al. 1999). In addition, pigeon farming is popular in Pakistan, not only for the commercial sale of pigeon squabs, but also for the sport of racing homing pigeons. There is very little recent information on how chewing lice prevalence and infestation intensity may affect the economic importance of pigeon farming. Our objectives were to study the occurrence of chewing lice on feral and wild pigeons in Pakistan, and to determine the prevalence, intensity of infestation and abundance of individual louse species.

MATERIAL AND METHODS

Between May 2004 and September 2007, 73 pigeons were examined for lice. Sixty-eight feral pigeons, *Columba livia intermedia* Strickland 1844 were trapped

with a net in different buildings at different localities within Karachi. Five wild pigeons, *Columba livia neglecta* Hume 1873 were also examined. Lice were collected by applying insecticide (Permethrin), applied under wings, tail and body feathers with the help of a plastic squeeze-bottle. After being sprayed, the bird was put into a plastic bag with its head outside. Due to suffocation, lice shed off in the bag within 15-20 min, from where they were collected by filtration through a fine mesh. In 15 birds, a subsequent feather-by-feather examination, mainly in the head region, was carried out with the help of a brush dipped in 80% ethanol and glycerine solution. Lice were preserved in the same solution and mounted in Canada balsam following the technique in PALMA (1978). Lice were identified based on literature reports (EMERSON 1957, SELIM et al. 1968, ADAMS et al. 2005).

The prevalence, mean intensity, intensity of infestation and mean abundance were determined sensu BUSH et al. (1997). We used the following categories to designate the rates of infestation: very light infestation, 1 to 25 lice per bird; light infestation, 26 to 100 lice; medium infestation, 101 to 1000 lice; heavy infestation, 1001 to 2500 lice; very heavy infestation, more than 2500 lice. These categories can be considered analogous to those used for poultry lice by HARSHBARGER & RAFFENSPERGER (1961) and modified by DERYLO (1974).

Table 1.

Prevalences, mean intensities (\pm SE), intensity ranges, mean abundances, sex ratios and age ratios (\pm SE) of chewing lice on feral (F; $n = 68$) and wild (W; $n = 5$) rock pigeons from Pakistan.

	Prevalence (%)	Mean intensity \pm SE	Intensity range	Mean abundance \pm SE
F <i>Colpocephalum turbinatum</i> ¹	35.3	1437.1 \pm 165.5	376-3007	232.5 \pm 75.4
F <i>Colpocephalum</i> sp. ²	7.35	5.4 \pm 0.7	3-7	0.4 \pm 0.2
F <i>Hoborstiella lata</i> ³	51.4	230.1 \pm 27.3	87-740	60.9 \pm 15.9
F <i>Hoborstiella streptopeliae</i> ⁴	1.47	4	4	0.1 \pm 0.1
F <i>Campanulotes compar</i> ⁵	58.8	614.3 \pm 24.5	268-829	135.5 \pm 32.1
F <i>Columbicola columbae</i> ⁶	70.5	438.2 \pm 29.4	155-906	161.1 \pm 29.7
W <i>Columbicola columbae</i> ⁷	100	715.8 \pm 206.5	152-1186	715.8 \pm 206.5
W <i>Columbicola tschulyschman</i> ⁸	2.94	4.5	4-5	0.1 \pm 0.1
Total ⁹		593.8 \pm 63.8	87-3107	593.8 \pm 63.8

¹ $n = 15,808$; ² $n = 27$; ³ $n = 4142$; ⁴ $n = 4$; ⁵ $n = 9215$; ⁶ $n = 10,956$; ⁷ $n = 3579$; ⁸ $n = 9$; ⁹ $n =$ Since we lost samples of *C. turbinatum* from three wild pigeons, we are unable to give any parasitological parameters for this species and the total for wild pigeons.

RESULTS

Seven species of chewing lice were collected on rock pigeons in the Karachi region (Table 1), three of which were Philopteridae (Ischnocera) and four Menoponidae (Amblycera). Three species are new records and one species of *Colpocephalum* is new to science, with its description in preparation.

Chewing lice were found on every bird examined, with individual birds infested with one to four species. In the case of feral pigeons, the dominant species was *Colpocephalum turbinatum*. Their prevalence was: *Columbicola columbae* 70.5%, *Campanulotes compar* 58.8%, *Hohorstiella lata* 51.4%, *Colpocephalum turbinatum* 35.3%, *Colpocephalum* sp. 7.35%, *Columbicola tschulyschman* 2.94% and *Hohorstiella streptopeliae* 1.47%. The last three species were found on only 5 and 1 pigeons in the total count of the hosts, respectively. In total, 22.05% of feral pigeons were infested with only *Columbicola columbae*. Two and three species of lice were found on 35.29% and 38.23% of birds, respectively. Infestations of four species of chewing lice were found on three (4.41%) birds. Total prevalences, intensities, mean abundances, sex ratios and age ratios are given in Table 1. *Colpocephalum turbinatum*, *Columbicola columbae* and *C. tschulyschman* were found on five wild pigeons. Two birds were infested with only *C. columbae*. One pigeon harboured *Columbicola columbae* and *Colpocephalum turbinatum* and all three species of lice were present on two pigeons. Each pair of congeneric species was found co-infesting five pigeons in the case of *Colpocephalum* spp., two pigeons with *Columbicola* spp., and one with *Hohorstiella* spp.

Medium infestation was the main category of infestation (in 86.30% of pigeons). Heavy infestations were found in 10.9% of pigeons. Only 2.73% were very heavily infested (2829 and 3007 lice on each bird). Heavy infestations were caused by *C. turbinatum*. The infested birds were in discomfort, generally weakened and with poor health conditions. Many individuals of *Colpocephalum turbinatum* were also observed inside the quills of rectrices. Some pigeons had deformed bills and were apparently unable to preen. Two wild pigeons were also heavily infested with 1101 and 1186 *C. columbae*, but they showed none of the pathological symptoms described for the feral pigeons.

DISCUSSION

This study is the first published survey of chewing lice from rock pigeons in Pakistan, with practically all the louse species identified here being recorded for the first time for Pakistan, with the exception of *Columbicola columbae*. *Campanulotes compar*, *Colpocephalum turbinatum*, *Columbicola columbae* and *Hohorstiella lata* are cosmopolitan species and among the most common louse species recorded from rock pigeons (NELSON & MURRAY 1971, EMERSON 1972, PILGRIM 1976, LEDGER 1980, MEY 2003). *Columbicola tschulyschman* is known from three species of pigeons of the genus *Columba*, including *C. livia neglecta* (GRIMMETT et al. 1999), but there is no record of this louse species from feral pigeons (ADAMS et al. 2005). Our results support JOHNSTON's (1996) contention

that this subspecies is probably still isolated from feral pigeons in Pakistan. The typical host of *Hohorstiella streptopeliae* is *Streptopelia turtur arenicola* Hartert 1894 (PRICE et al. 2003). We believe that our record of *H. streptopeliae* on rock pigeons is a case of straggling. The finding of a new species of chewing lice of the genus *Colpocephalum* from such a common bird is interesting.

No common species of poultry louse was found on the rock pigeons examined. DRANZOA et al. (1999) mentioned three economically important species of poultry lice from feral pigeons — *Menopon gallinae*, *Menacanthus stramineus* and *Chelopistes meleagridis* Linnaeus 1758. Conversely, they found only one species of pigeon lice, *Columbicola columbae*. It is surprising that those authors did not find other cosmopolitan species of pigeon lice, such as *Bonomiella columbae*, *Hohorstiella lata* or *Campanulotes compar* (PILGRIM 1976).

There is little information on the prevalence or infestation intensity of lice on rock pigeons. In most studies of external parasites of pigeons, only *C. columbae* and *C. compar* are usually reported. The reported ranges of prevalence and mean intensity are 59-98.6 and 17.9-179.3% for *C. columbae* and 26-91.8 and 5.4-153.6% for *C. compar* (SELIM et al. 1968, ČERNÝ 1970, BROWN 1971, RÓZSA 1990, TORO et al. 1999, OLIVEIRA et al. 2000, GALLOWAY & PALMA 2008). The highest numbers of *C. columbae* and *C. compar* on individual hosts usually vary from 665-811 and 655-782 lice, respectively (BROWN 1971, GALLOWAY & PALMA 2008). NELSON & MURRAY (1971) found up to 2772 *C. turbinatum* on one pigeon. Very large numbers of lice (*C. columbae*, *C. compar* and *H. lata*) were also reported by ASH (1960) and NELSON & MURRAY (1971), but without details. They mentioned that such a large number of lice may have been responsible for the death of some of the pigeons examined. Although our prevalence values are a little smaller, they are still comparable to records from the papers mentioned above. On the other hand, we found the highest mean intensity of infestation that may have ever been recorded for any louse. Our finding that *C. turbinatum* was most abundant parallels data in NELSON & MURRAY (1971). Although a common parasite, there is no information on its prevalence or infestation intensity in feral pigeons and its economic importance for pigeon farming, except for a study by SELIM et al. (1968). They found *C. turbinatum* on three of 16 pigeons examined with an intensity of infestation of 5.8. It should be mentioned that the categories for infestation were initially intended for lice on poultry (HARSHBARGER & RAFFENSPERGER 1961, DERYLO 1974), which are larger than pigeons. On the basis of our observations, we assume that an infestation with more than 500 lice per bird would affect a pigeon negatively, resulting in unthriftiness. In this case, 50% of the pigeons examined were heavily infested (500-3007 lice per bird).

Living mainly on the skin, amblyceran lice may cause the affected birds to be restless, unable to sleep, suffering from overall weakness, reduced food intake with a consequential loss of weight, resulting in decreased resistance to pathogens, as well as their potential ability to reproduce (WALL & SHEARER 2001, MULLEN & DURDEN 2002). In pigeons used for racing, the intensity of ectoparasite infestation may decrease their power of flight (SELIM et al. 1968). In particular, heavy infestations with *Colpocephalum* species may cause severe damage to the flight feathers. Lice can perforate the large wing- and tail-feathers. These perforations increase

during heavy infestations, with considerable loss of areas of the wing surface and lower flight efficiency (SELIM et al. 1968). In heavy infestations, lice can also be observed inside the feather quills (BACH & EICHLER 1954, SELIM et al. 1968, FASUNGOVA et al. 2008). As shown by RÓZSA (1993), birds with deformed bills have high louse burdens. Preening is the most important defence against lice and birds that cannot preen efficiently may experience substantial increases in infestation (CLAYTON & WALTHER 2001, PRICE et al. 2003).

The poor overall fitness of the pigeons examined in our study is probably related to the high intensities of infestation. We found that rock pigeons in the Karachi region of Pakistan were infested with seven species of chewing lice. About 50% of the examined pigeons were heavily infested (500-3007 lice per bird). We found serious damage to their plumage, as well as a poor overall state of health. Pigeons are gregarious and tend to forage and roost in loosely-knit flocks (CLAYTON 1990, 1991). Despite their predilection for particular feeding places, they might fly to relatively distant locations and interact with birds from other populations, including pigeons bred and kept by humans. Feral pigeons parasitized with so many lice may be a threat to pigeon fanciers in the Karachi region.

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