



Article

Species in the genus *Bonomiella* Conci, 1942 (Phthiraptera: Menoponidae) from Argentina and Chile

ARMANDO C. CICCCHINO¹ & DANIEL ALFONSO GONZÁLEZ-ACUÑA^{2,3}

¹Laboratorio de Artrópodos, Departamento de Biología, Universidad Nacional de Mar del Plata, Funes 3300, 7600 Mar del Plata, Buenos Aires Province, Argentina. Research Career of the National Council of Scientific and Technical Research (CONICET).

E-mail: cicchino@copetel.com.ar

²Departamento de Ciencias Pecuarias, Facultad de Medicina Veterinaria, Universidad de Concepción, Chillán, Chile.

E-mail: danigonz@udec.cl

³Corresponding autor

Abstract

Species of the genus *Bonomiella* Conci, 1942, are a parasitic on bird species belonging to the family Columbidae (Aves, Columbiformes). In the present study we redescribe the species *Bonomiella columbae* Emerson, 1957 from Argentinean specimens, and describe the new species *B. zenaidae* **sp. nov.** from *Zenaida auriculata virgate* Bertoni, 1901, and *Z. auriculata auriculata* (des Murs 1847) from Argentina and Chile. Descriptions include male and female diagnostic features, and also descriptions of nymphal instars II and III. Also, we include a full diagnosis of the genus *Bonomiella* and an annotated checklist of the six species known to date, with their respective hosts.

Key words: *Bonomiella*, chewing lice, new species, bird lice, ectoparasites, Argentina, Chile

Introduction

Five species are currently included in the chewing lice genus *Bonomiella* Conci, 1942 (Phthiraptera: Amblycera: Menoponidae), parasitic on species belonging to the columbid genera *Columba* Linnaeus, 1758, *Streptopelia* Bonaparte, 1855, and *Turtur* Boddaert, 1783 (Aves: Columbiformes: Columbidae) (Price *et al.* 2003:93). Pigeon and doves are medium-sized and compact birds with small heads. Food is mainly plant material (grain, seeds, shoots, fresh leaves). The young are fed on “pigeon-milk” from the crop (Svensson, 2009).

Louse samples from two subspecies of *Z. auriculata* available to us belong to a new species which we describe and name in this paper. *Bonomiella zenaidae* **sp. nov.** is so far the only species of this genus known to parasitize one out of six dove species included in the genus *Zenaida* Bonaparte, 1838. Therefore, records made by Emerson (1972) of *B. columbae* Emerson, 1957 on *Z. macroura* (Linnaeus, 1758), Conti & Forrester (1981) on *Z. macroura* and *Z. asiatica* (Linnaeus 1758), and Galloway & Palma (2008) on the latter should be regarded with the same caution as shown by Di Mare (2003), who regarded all *Bonomiella* collected from *Z. asiatica* in Costa Rica as belonging to an unidentified species. Records of *B. columbae* on *Z. auriculata* by Cicchino (1987) and Cicchino & Castro (1998: 102) from Argentina must be referred to the new species described herein; leaving *B. columbae* still unrecorded for this country at the time. Our purpose is to describe the new species *Bonomiella zenaidae* from Argentinean and Chilean adult specimens, as well as the nymphal instars II and III.

Also we (1) include a diagnosis of the genus *Bonomiella*; (2) redescribe *B. columbae* based on Argentinean specimens, giving male and a female diagnostic features; and (3) include an annotated checklist of the species known to date with their respective hosts.

Material and methods

Lice were slide-mounted following conventional procedures, staining some of them with Yellowish Eosin in order to reveal the sclerites more clearly (Cicchino & Castro, 1978). Drawings were made using a *camera lucida* attached to a Wild m-20 microscope. All measurements were taken from mounted specimens by means of a calibrated eyepiece, reduced to those considered less affected by curatorial procedures, expressed in millimeters and identified by the following abbreviations: HL head length, HW maximum width of the head, PW prothorax width, MTW metathorax width, AL abdominal length, AW maximum width of the abdomen, TL total body length, GL male genitalia length, GW maximum width of the male genitalia. Measurements include ranges, in addition to the means plus sample standard deviations within parentheses. Cephalic index (CI) is the ratio of HW/HL.

Identification of the nymphal instars: as is the rule for many menoponids (see Cicchino & Castro, 1978), nymphs may be identified by the number of gular setae: 3+3 in N III, and 2+2 (rarely 2+1) in N II. They were sexed on the basis of specimens containing the pharate of the next developmental stage, in a descending order. Therefore, from three N III all containing female pharate are attributed to female N III, a single N II containing the pharate of female N III is attributed to female N II. Finally, a single N II containing no pharate and showing simplified terminal abdominal chaetotaxy and smaller body dimensions was tentatively attributed to a male N II on the basis that similar features have been found in the nymphal instars of one or more species of the genera *Menacanthus* Neumann, 1912, *Leremenopon* Dalglish & Price, 2003, *Machaerilaemus* Harrison, 1915 and *Pseudomenopon* Mjöberg, 1910 (ACC, unpublished).

Descriptions were made in a comparative form, adding comments to the description of the closest species. Nomenclature of cephalic setae follows Clay (1969) and nomenclature of male genital armature follows Yoshizawa & Johnson (2005).

Deposition of specimens: holotype and some paratypes in the collection of Museo de La Plata, La Plata, Provincia Buenos Aires Province, Argentina. The remaining paratypes in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Ciudad Autónoma de Buenos Aires, Argentina. Other specimens in the entomological collection of the Universidad de Concepción (Sede Chillán), Chillán, Chile.

Results and discussion

Diagnosis of the genus *Bonomiella*

The number of specimens examined permitted us to add more features to those given by Clay (1947, 1969) and Cicchino (1987) referring exclusively to the adult stage, as follows

Head: somewhat wider than long (cephalic index w/l ranging from 1.01 to 1.45). Temporal area slightly expanded laterally. Chaetotaxy: seta 23 anterior to 22, 24 and 25 small, 26 shorter and slender than 27, with their respective basal alveoli very close one another. Preocular setae 8 to 10 long, 11 and 14 small, 15 and 16 moderately long, 17 and 18 minute. Ocular setae 19 small and slender, 20 long (fig. 23). Last antennal segment short, without trace of division and with sensilla located apically. Gular plate poorly defined, bearing 3–7 setae each side, usually 4+4 (fig. 23). No sensilla were located in the dorsum of the head in the available mounted specimens.

Thorax: pronotum with 2 minute setae each side (pronotal dorsal setae of Clay, 1969), with one short and one long setae on each side setae along its posterior margin. Meso- and metathorax can be discerned, but the line of separation is not clearly, bearing 6 long setae along the posterior margin of each one. Prosternal plate slightly developed, neither tapered nor pointed posteriorly (fig. 28); mesosternal plate bearing two 2 setae placed near the middle in addition to 0–2 shorter ones near the posterior edge (fig. 29), and metasternal plate with more than 2 setae, typically 4, being the posterior pair being longer (fig. 30).

Legs: trochanters with 3 sensilla, hind femur with 3–5 spiniform setae located ventrally and not arranged in a brush-like patch (fig. 25). Euplantulae not banded. Claws with a typical wide basal process (fig. 24).

Abdomen: ovoid, with long tergo-central setae complemented with 0–3 small setae each side. Sternum II of females with a brush of 6–10 small and spiniform setae; sternum I with an inconspicuous brush of 1–5 setae. Male lacking such brushes. Sternocentral setae medium to long, in addition to 0–4 minute setae located anteriorly. Female anal fringe essentially uniform and lacking lateral setiferous processes (fig. 20).

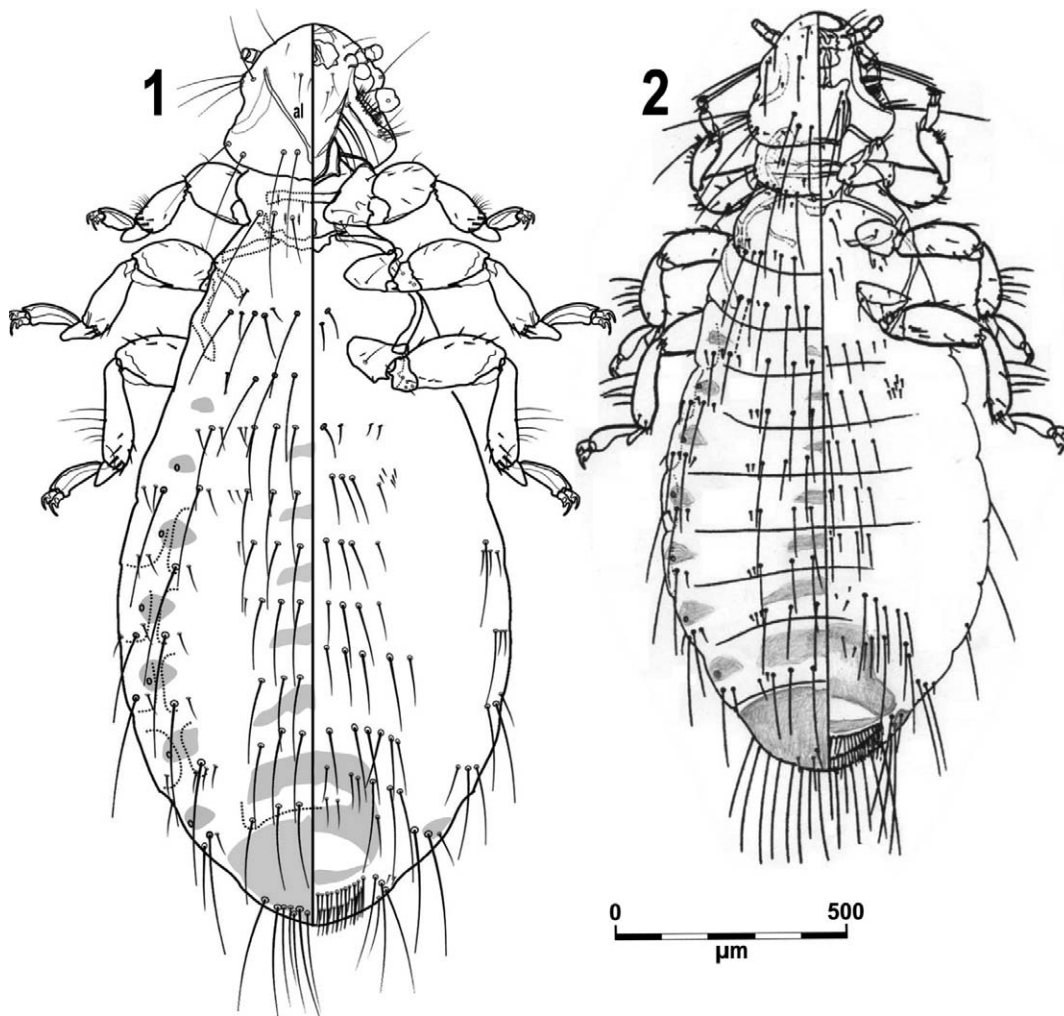
Male external genitalia with a basal plate widened near the middle, arcuate to somewhat angulated parameres with a sub-tuberculate sensillum bearing a small seta located near the middle, and a second sensillum and a small seta placed at the apex; endophallus simple and well sclerotized, and internal sac minutely speculated, with spiculae around the ostium being somewhat larger (figs. 5–6).

***Bonomiella columbae* Emerson, 1957**

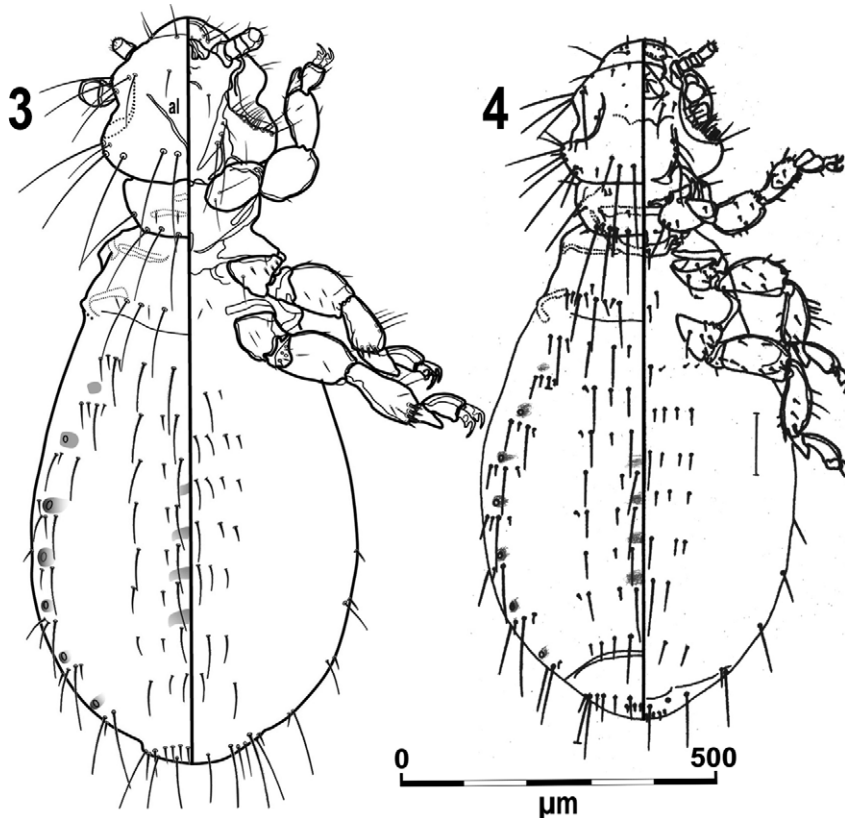
(Figs. 1, 3 and 5)

Female: habitus as in fig. 1. Head almost as long as wide (CI = 1.01). Tergoventral setae: metathorax 6, tergites II–VIII 6, IX–X with 6–7 small and 14–17 very long setae, II–VIII flanked with 0–2 minute setae on each side. Abdominal sternal setae: II 2–3 and III–VI 3–5 long setae each side, VIII 4–7 minute setae located in the middle, flanked by 3–7 long setae on each side (total 14–20), subgenital plate with 8–10 anterior and 5–8 posterior setae, brush of sternite II with 1–5 short, brush of III with 6 short and spiniform setae, in addition to a minute one on one side. Anal fringe with 42 dorsal and 33 ventral setae (figs. 19–20). Body measurements: HL 0.300, HW 0.367, PW 0.340, MTW 0.505, AW 0.840, TL 1.921.

Male: habitus as in fig. 3. Head slightly wider than long (cephalic index = 1.10). Tergoventral setae: metathorax 6, tergites II–VIII 6, IX–X 6–7 small and 3 very long setae. Sternal setae: II 4, III–IV 8, V–VI 6, VII–VIII 4. Genitalia: basal plate noticeably widened in the middle, parameres widened at their base, tapering gradually to apex (fig. 5). Body measurements: HL 0.255, OW 0.280, PW 0.220, MTW 0.350, AW 0.520, GL 0.310, GW 0.115, TL 1.180.



FIGURES 1–2. 1–2. Female of *Bonomiella*: *B. columbae* Emerson, 1957 (1), *B. zenaidae* sp. nov. (2). Abbreviations: **al** = abscission line.



FIGURES 3–4. Males of *Bonomiella*: *B. columbae* Emerson, 1957 (3), *B. zenaidae* sp. nov. (4). Abbreviations: **al** = abscission line.

Type host. *Columba livia* Gmelin, 1789.

Specimens examined. 1 male and 1 female, Los Hornos, La Plata District, Buenos Aires Province, Argentina, 12-XI-1972, A. C. Cicchino.

Remarks. This species has been reported from a number of countries around the world: USA (Emerson, 1957, 1962, 1972; Hill & Tuff, 1978); Canada (Galloway & Palma, 2008), Germany (Ribbeck, 1972), Ukraine (Fedorenko & Kharchenko 1976), Hungary (Rozsa, 1990), Poland (Złotorzycka & Lucińska, 1967; Złotorzycka 1976, Rem & Złotorzycka, 1976), Belgium (Hellenthal *et al.*, 2004), Spain (Selva *et al.*, 1987; Martín Mateo, 2002, 2006), Egypt (Selim *et al.*, 1968), New Zealand (Pilgrim, 1976; Hill & Tuff, 1978; Pilgrim & Palma, 1982), southern Africa (Ledger, 1980), and Brazil (Ribeiro *et al.*, 1998). Its probable presence in Argentina has been pointed out by Cicchino & Castro (1998: 102) and is here confirmed. See additional comments under *B. insolitunquicolata*.

Bonomiella zenaidae, new species

(Figs. 1–27)

Bonomiella columbae Cicchino, 1987:24–26, figs. 1–8 (Misidentification)

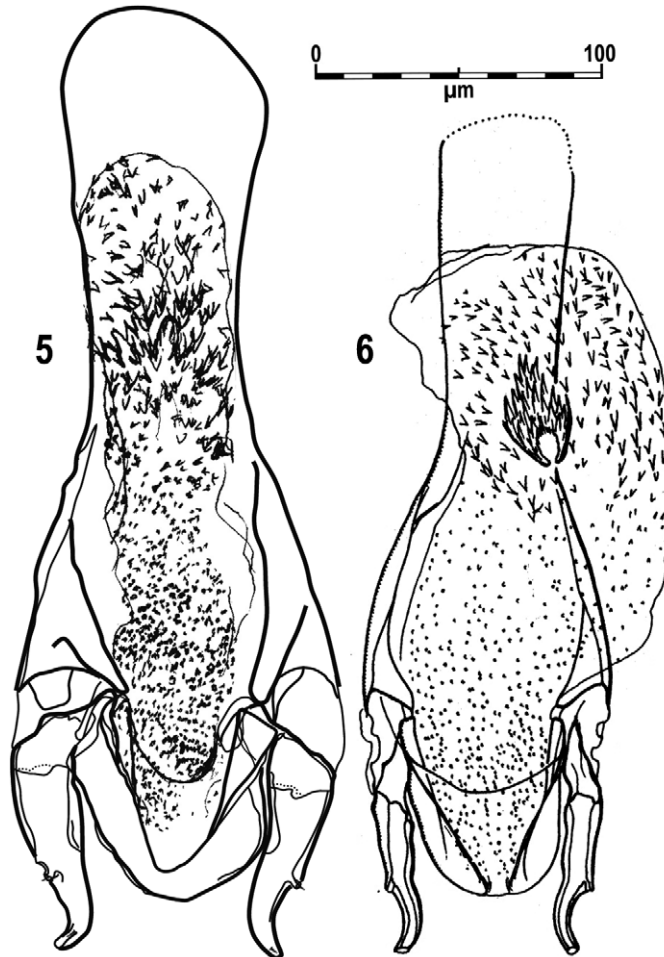
Bonomiella columbae Cicchino & Castro, 1998: 102 (Misidentification)

Bonomiella sp. González *et al.* 2004: 38.

Female (fig. 2): habitus as in fig. 2. Head slightly wider than long (cephalic index 1.09–1.10). Tergocentral setae: metathorax 6, tergites II–VIII 6, IX–X with 6–7 small and 14–17 very long setae, II–VIII flanked with 1–3 (usually 2) minute setae on each side. Abdominal sternal setae: II 4–6, III–VI 7–9, VIII 14–20 (a set of 4–7 minute setae located in the middle, flanked by 3–7 long setae each side), subgenital plate with 8–10 anterior and 5–8 posterior setae, brush of II with 1–5 short, brush of III with 7–9 short and spiniform setae. Anal fringe with 41–50 dorsal and 34–37 ventral setae (fig. 20). Measurements (n = 9): HL 0.289–0.294 (0.292 ± 0.03), HW 0.313–0.328 (0.319 ± 0.006), PW 0.250–0.275 (0.263 ± 0.009), MTW 0.470–0.588 (0.508 ± 0.041), AL 0.946–1.093 (1.005 ± 0.005),

AW 0.676–0.053 (0.729 ± 0.063), TL 1.703–2.004 (1.785 ± 0.114). Cephalic index (n=9) 1.081–1.117 (1.093 ± 0.014).

Male: (fig. 4): Head slightly wider than long (CI = 1.06). Tergocentral setae: meso- and metathorax 6, tergites II–VIII 6, IX–X with 5–6 short setae each side (fig. 4), being II–VII flanked by 0–1 small seta on each side. Abdominal sternal setae: II 4, III–IV 8, V–VI 6, VII–VIII 4. *Genitalia*: basal plate not widened towards the basis of paramere. Parameres not widened at their base, tapering gradually from middle to apex, and endophallus with larger spiculae concentrated near the ostium (fig. 6). Body measurements (n = 1): HL 0.245, HW 0.260, PW 0.220, MTW 0.350, AL 0.670, AW 0.530, GL 0.275, GW 0.085, TL 1.150.

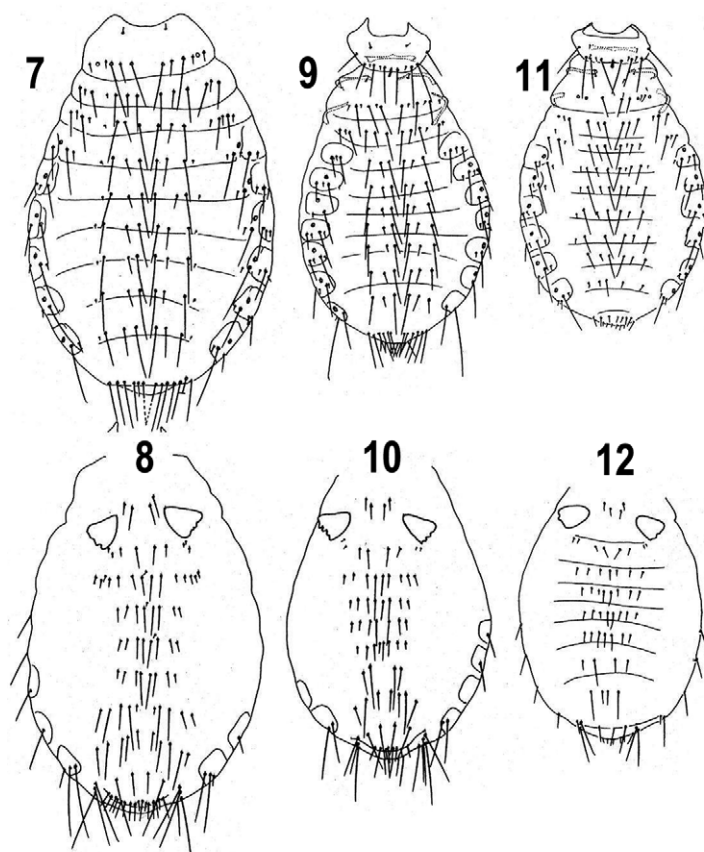


FIGURES 5–6. Male external genitalia: *B. columbae* Emerson, 1957 (5), *B. zenaidae* sp. nov. (6).

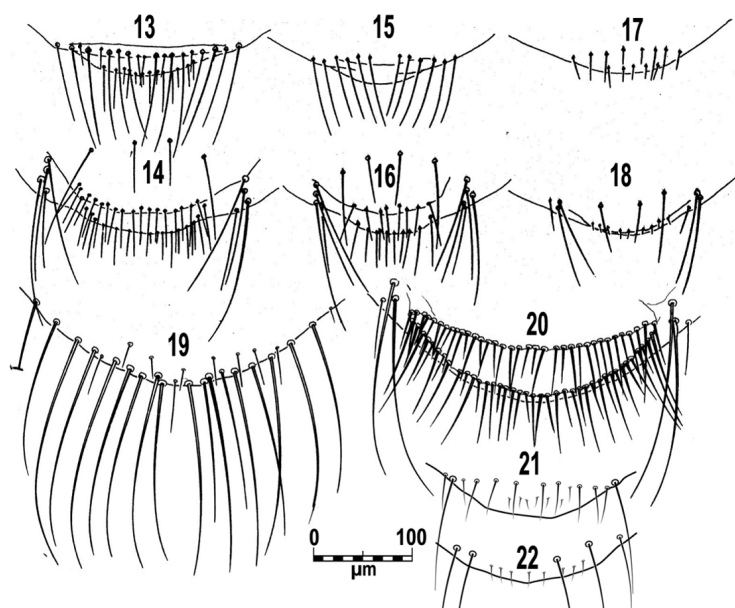
Third nymphal instar (figs. 7, 8, 13 and 14). Female: head almost as long as wide (CI = 1.01); gular plate with 3+3 unequal setae (fig. 27); thorax and abdomen as in figs. 7–8. Abdominal tergal setae: II–VIII much as for adult female except for their length, IX with 17–18 setae (fig. 13), II–VIII flanked with one small seta on each side. Abdominal sternal setae: II–VI with 4 medium long setae, VII with 4 long and 1 small inner seta on each side, VIII with 5 medium to long setae on each side, brush of II with 0–1 and III with 5 small setae, anal fringe with 18 dorsal and 16–17 ventral setae (fig. 14). Body measurements: HL 0.278–0.289 (0.279 ± 0.009), HW 0.267–0.289 (0.282 ± 0.013), AL 0.582–0.600 (0.590 ± 0.009), TL 1.182–1.311 (1.260 ± 0.069). Male third instar unavailable.

Second nymphal instar (figs. 9–12 and 15–18): Gular chaetotaxy 2+2 (or 2+1) (fig. 26). Head almost as long as wide (cephalic index = 0.98). Female individual: pro-, meso- and metathoracic chaetotaxy as for female N III. Tergocentral setae essentially as for female N III, except for IX–X bearing six long setae each side (fig. 15), and lacking of small seta flanking tergites II–VIII. Abdominal sternal setae: II–VII with 4 (rarely 3) sternocentral setae, II–VI flanked by 0–3 small setae each side, VIII with 3–4 medium to long setae each side, anal fringe with 8 dorsal and 10 ventral setae (fig. 16). HL 0.267, HW 0.260, AL 0.489, TL 1.067. Probable male individual: thoracic and abdominal setae much as for female N II (figs. 17–18), except for tergite IX with 8 short setae (fig. 17) and anal

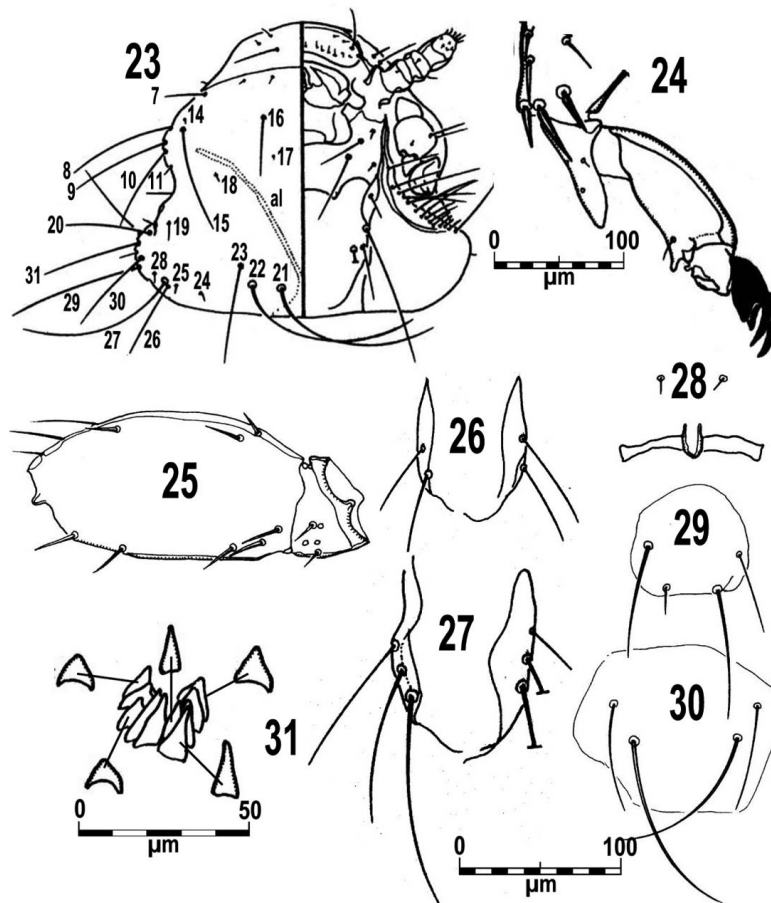
fringe with 5 dorsal and 6 small setae (figs. 17–18). Body measurements: HL 0.249, HW 0.244, AL 0.478, TL 1.015.



FIGURES 7–12. Thorax and abdomen of third and second nymphal instars of *B. zenaidae* sp. nov., in dorsal (top) and ventral views (bottom): female NIII (7–8) (prothorax not shown in fig. 7), female NII (9–10), probably male NII (11–12). See explanations in the text.



FIGURES 13–22. Abdominal dorsal terminalia and anal fringes of nymphs and adults of *B. zenaidae* sp. nov.: female N III (13–14), female N II (15–16), male (?) N II (17–18), female (19–20), male (21–22).



FIGURES 23–31. Features of *B. zenaidae* sp. nov.: male head, dorsal and ventral, showing diagnostic cephalic setae (notation after Clay, 1969) (23); male distal portion of tibia and tarsus III, ventral view (24); male trochanter and femur III, ventral view (25); gular plate of female N II (26); female N III gular plate (27); male pro-, meso and metasternal plates, respectively (28–30); male crop teeth, showing shapes of some individual teeth (31). Abbreviations: **al** = abscission line.

Type host. *Zenaida auriculata virgata* Bertoni, 1901.

Specimens examined. From *Z. a. virgata*: female HOLOTYPE and 9 female paratypes, 3 female nymphs III, 1 female nymph II, 1 male nymph II from Baradero, Partido de Baradero, Buenos Aires Province, I-1983, A.C. Cicchino; 1 female, 1 male paratypes from La Plata, Buenos Aires Province, ARGENTINA, 16-I-1983, A.C. Cicchino.

Additional specimens. From *Z. a. auriculata* (Des Murs, 1847): 8 females, Chillán, Ñuble Province, CHILE, XII-2004, D. González-Acuña (in absence of males, these specimens are not designated as paratypes).

Remarks. Females are readily separable from all other species by cephalic index and body measurements, except *B. beieri*, from which it differs by having consistently larger head measurements (see Table I). If the male genitaliae of *B. columbae* and *B. concii* are very similar one another as stated by Złotorzycka (1976: 23) prove to be similar, then the genitalia of *B. zenaidae* n. sp. differs greatly from both, in shape of the basal plate and the parameres, as well as being also smaller (see figs. 5–6). Female specimens from *Z. a. auriculata* are morphologically undistinguishable from those of *Z. a. virgate*, so both “populations” probably be conspecific. However, the true identity of other *Bonomiella* species recorded from other *Zenaida* species deserve more careful studies, because they may involve some misidentifications (e. g. Emerson (1972), Conti & Forrester (1981), Galloway & Palma (2008), non identification (Di Mare 2003) or even cases of straggling or contaminations.

Annotated checklist of the species of *Bonomiella*

Bonomiella insolitunquicolata Conci, 1942

Conci 1942. *Studi Trentini di Scienze Naturali* 23 (2): 2–4, figs 1–5.

Hopkins & Clay 1952: 51.

Price *et al.* 2003: 93.

Type host. “Colombo”.

Remarks. female body measurements given by Conci (1942: 4, repeated in Tendeiro 1980: 51) fall within the range given by Złotorzycka & Lucińska (1967: 344) for *B. columbae*. Furthermore, drawings and body measurements given by Conci (1942: figs. 1–5) fit well with those given by Emerson (1957, fig 1), Złotorzycka & Lucińska (1967) and Ribbeck (1972) for *B. columbae*, as well as with the female of this species examined by us (see above, fig. 1 and Table 1). Regarding its type host, Hopkins & Clay (1952: 51) stated that it is “(Colombo) = Some member of the Columbidae”, and Price et al. (2003: 93) as “Some columbiform”. It must be noted that in Italian language the word “Colombo” currently refers to the male of the rocky pigeon (*C. livia*) while “Colomba” if for female, and “Piccione” for this species including both sexes. In spite of this, it is reasonable to think that the type host may be, in fact, *C. livia*. If this assumption proves to be correct, *B. columbae* would become a junior synonym of *B. insolitanguicolata*, the type-species of the genus. To solve this intriguing question is to examine the type specimens (3 females), if still in existence, presumable housed at the Genoa Museum. An early attempt to examine then has been carried out by one of us (ACC) in 1972 asking Dr. Conci about the returning and destination of the specimens examined by him in 1941–42. In an extensive letter he informed that he returned them to the Genoa Museum in 1942, just in the full development of the Second World War, and ignoring if Genoa Museum received these specimens. By 1973 the authorities also informed that the referred specimens have not been still found in the entomological collections, at that date in process of cataloging. Since that time, we no longer insisted on this subject.

TABLE 1. body measurements and cephalic indexes of *Bonomiella*-species. For explanations of abbreviations, see text. Notes: (1) average of 11 females and 1 male. (2) average of the range given in page 23. (3) taken using the scale of illustration of the paper, (4) average of 6 specimens, (5) average of 4 specimens. (6) for 1 male, 1 female, (7) average of the ranges provided in the text, from 3 specimens.

BONOMI ELLA SPECIES	<i>B. zenaidae</i>		<i>B. concii</i>		<i>B. beieri</i>		<i>B. afra</i>		<i>B. columbae</i>				<i>B. insolitun- guicolata</i>	
	Present study (1)		Eichler 1947 female	Złotorzycka 1976 (2) male female	Eichler 1959 female	Tendeiro 1980 female	Emerson 1957 (3) male female	Złotorzycka & Lucińska 1967 (4) female	Ribbeck 1972 (5) female	Present study (6) male female		Conci 1942 (7) female		
SEX	male	female	female	male	female	female	male	female	female	female	male	female	female	
HL	0.245	0.292	0.280	–	–	0.260	0.220	0.241	0.300	0.300	0.295	0.255	0.300	0.305
OW	0.260	0.319	0.370	–	–	0.280	0.320	0.289	0.380	0.350	0.375	0.280	0.367	0.365
PW	0.220	0.263	0.290	–	–	–	0.250	0.247	0.330	–	–	0.220	0.340	0.315
MTW	0.350	0.508	–	–	–	–	0.470	0.349	0.490	0.510	–	0.350	0.505	–
AW	0.530	0.729	0.790	–	–	–	0.670	0.530	0.840	0.900	0.870	0.520	0.840	0.835
MGL	0.275	–	–	–	–	–	–	–	–	–	–	0.310	–	–
MGW	0.085	–	–	–	–	–	–	–	–	–	–	0.115	–	–
TL	1.150	1.785	1.630	1.200	1.800	–	1.43	1.093	1.860	1.88	1.960	1.180	1.920	1.685
CI (w/l)	1.06	1.09	1.32	–	–	1.08	1.45	1.20	1.27	1.17	1.27	1.10	1.01	1.20

Bonomiella concii Eichler, 1947

Eichler 1947. *Tierärztliche Umschau*, 2(21/22): 264–265, figs. 1–5.

Hopkins & Clay 1952: 51.

Złotorzycka 1976: 23, figs. 18–19.

Price et al. 2003: 93.

Ledger 1980: 48.

Greenwood & Bowden 1984 : 62.

Hellenthal et al. 2004: 7.

Type host. *Streptopelia decaocto decaocto* (Frivaldszky, 1838).

Remarks. A medium-sized species, described from a single female. Złotorzycka (1976: 23) keyed this species against *B. columbae*, providing additional features to distinguish males and females of both species, and recording *B. concii* from Poland. The dimensions and cephalic index of the female (1.32) clearly distinguishes this species from *B. beieri* (see below). Following Złotorzycka (1976:23), features of the male genitalia of this species differ little from those of *B. columbae*.

***Bonomiella columbae* Emerson, 1957**

Emerson 1957. *The Florida entomologist* 40(2): 63–64, figs. 1–3.

Emerson 1962: 161; 1972: 37.

Złotorzycka & Lucińska 1967: 341–344, figs. 1–5.

Selim *et al.* 1968: 76.

Ribbeck 1972: 129–133, figs. 1–5.

Złotorzycka 1976: 23, figs. 14–17.

Fedorenko & Kharchenko 1976: 84–85.

Pilgrim 1976: 160, figs. 4–5.

Rem & Złotorzycka 1976: 216.

Hill & Tuff 1978: 316

Ledger 1980: 47, fig. 32 abc.

Pilgrim & Palma 1982: 23.

Selva *et al.* 1987: 246.

Rósza 1990: 117, 118.

Ribeiro *et al.* 1998: 104, fig. 4.

Martín Mateo 2002:45; 2006: 26.

Price *et al.* 2003: 93.

Hellenthal *et al.* 2004: 7.

Galloway & Palma 2008: 215.

Type host. *Columba livia livia* Gmelin, 1789.

Remarks. See comments under *B. insolitunigicolata*. The other alleged hosts for *B. columbae*, i.e. two species of *Zenaida* cited by Emerson (1972), Conti & Forrester (1981) and Galloway & Palma (2008) should be regarded with suspicion, because they may not harbour this species, as it has been pointed out above.

***Bonomiella beieri* Eichler, 1959**

Eichler 1959. *Das Deutsche Gesundheitswesen*. 11: 1173–1175.

Hill & Tuff 1978: 316.

Emerson 1972: 37.

Price *et al.* 2003: 93.

Type host. *Streptopelia chinensis ceylonensis* (Reichenbach, 1851).

Remarks. The original description, based on a single female, gives few features to distinguish unequivocally. However, the combination of the head measurements (HL 0.26 and OW 0.28 mm) and cephalic index (OW/HL = 1.08) seems to be distinctive, although not conclusively different from other described species.

***Bonomiella afra* Tendeiro, 1980**

Tendeiro 1980. *Annales Musée Royale d'Afrique Centrale, Série Zoologie.*, 232: 48–53, photos 9–11, fig. 12.

Price *et al.* 2003: 93.

Type host. *Turtur afer afer* (Linnaeus, 1766).

Remarks. This species, known from a single female, seems to be very characteristic by the proportions of the head (cephalic index = 1.45) as well as by its small dimensions and relatively slender abdomen.

***Bonomiella zenaidae*, sp. nov.**

Type host. *Zenaida auriculata virgata* Bertoni, 1901.

Other probable host: *Z. a. auriculata*. See also remarks under *B. columbae*.

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