Chewing lice species (Phthiraptera) found on a European Shag (Phalacrocorax aristotelis) in Turkey: new records of a genus and two species for the Turkish fauna of Phthiraptera

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Abstract: This study was carried out on a young European Shag (Phalacrocorax aristotelis) caught in the sea in Akçay, Balıkesir, in August 2015. The lice collected from the European Shag were put into 70% alcohol solution and were mounted to slides with Canada balsam after being made transparent in 10% potassium hydroxide. The lice Eidmanniella pellucida and Pectinopygus brevicornis were determined as a result of the microscopic examination of the 54 louse specimens. This study is the first for the louse species related to the European Shag in Turkey. Additionally, the genus Eidmanniella and the species Eidmanniella pellucida and Pectinopygus brevicornis are reported for the first time from Turkey.

Key words: Eidmanniella pellucida, Pectinopygus brevicornis, cormorant, European Shag, Phalacrocorax aristotelis, Balıkesir, Turkey, new records

Lice (Insecta: Phthiraptera) are wingless, obligatory ectoparasites of birds and mammals. The species of the suborders Amblycera, Ischnocera, and Rhynchophthirina are known as chewing lice, while the species of the suborder Anoplura are known as blood-sucking lice. Of the approximately 5000 species described to date, approximately 4000 species are parasitic to birds and 800 species parasitize mammals. Although some have cosmopolitan features, most are host-specific. Lice can be found on every continent and on almost all bird and mammal species (Price et al., 2003; Taylor et al., 2007).

Although there has been a steady increase in the number of studies carried out on the lice of the wild birds of Turkey recently, the lice of cormorants have not been researched. In these studies, more than 200 bird species have been investigated and more than 150 species of chewing lice have been reported (İnci et al., 2010a, 2010b; Açıci et al., 2011; Aksin and Oncel, 2011; Dik et al., 2011, 2013, 2015). In addition, some louse species from the genera Pectinopygus and Piagetiella parasitizing the cormorant species have been observed on the Great White Pelican and Dalmatian Pelican in Turkey; P. titan from the genus Piagetiella and P. forficulatus from the genus Pectinopygus have been described (Dik, 2006; Dik and Uslu, 2006, 2008; Dik et al., 2013; Girişgin et al., 2013).

To date, two louse species have been described on the European Shag: Eidmanniella pellucida (Rudow, 1869) and Pectinopygus brevicornis (Denny, 1842). Various studies have been conducted in different countries on the louse species seen on cormorants (Phalacrocoracidae). In a study carried out by Ryan and Price (1969) on the genus Eidmanniella, the presence of the species Eidmanniella pellucida, E. eurygaster (Nitzsch [in Giebel], 1866), and E. nancyae (Ryan and Price, 1969) was described in cormorants. Ryan and Price also gave detailed information about their morphology, preparing identification keys for the species of the genus Eidmanniella. In a study conducted in Alaska on the species Phalacrocorax pelagicus of the cormorant family, the species Pectinopygus insularis (Clay, 1973) and E. pellucida were found (Choe and Kim, 1987). In a study carried out in Spain, the species Pectinopygus brevicornis was detected in P. aristotelis (Martin Mateo, 1992). In a study done in Chile on the cormorant species Phalacrocorax bougainvillii, the species E. pellucida, Piagetiella transitans (Ewing, 1930), and P. capituncism (Eichler, 1950) were observed; it was also stated that the specific host of P. capituncism is Phalacrocorax gaimardi and that the infection could probably have taken place from this type of cormorant (Sepulveda et al., 1997). In the Phalacrocorax auritus species of cormorant in Canada,
the species Piagetiella incomposita (Kellogg and Chapman, 1899), P. farallonii (Kellogg, 1896), and E. pellucida were reported (Kuiken et al., 1999). Galloway (2005) described the species Pectinopygus gyricornis (Denny, 1842) and E. pellucida in Phalacrocorax carbonavaehollandiae with a study carried out in New Zealand. Dik and Halajian (2013) detected the species P. gyricornis and E. pellucida in Phalacrocorax carbo with a study carried out in Iran. In Saudi Arabia, studies on Phalacrocorax nigrocallosus reported the presence of E. nancyae (Nasser, 2015), and another study reported E. nancyae and P. socotranus (Nasser et al., 2015).

This study was carried out on a young European Shag (Phalacrocorax aristotelis) caught in the sea and brought to a veterinary clinic in the Akçay District of Balıkesir Province for treatment purposes in August 2015. In the clinic, the European Shag was put in a cage with a white paper laid on its floor and it was treated with propoxur (Bolfo, Bayer, Turkey). The lice falling on the white paper were collected and put into bottles with a 70% alcohol solution. After the treatment process, the European Shag was released back to the sea.

The lice were made transparent in 10% potassium hydroxide solution for 24 h and then put into a series of distilled water, 70% alcohol, and 99% alcohol before being mounted on microscope slides with Canada balsam. The slides were observed with a microscope and the samples were identified with the help of the relevant resources (Timmermann, 1964; Ryan and Price, 1969; Clay, 1973).

Fifty-four lice were collected from the European Shag; after microscopic examination, the louse species were identified as E. pellucida (19♀ 6♂, 1N) and P. brevicornis (8♀ 14♂ 6N). Some morphological values of these species are presented in Tables 1 and 2.

**Table 1.** Some morphological values of the Eidmanniella pellucida (mm).

<table>
<thead>
<tr>
<th></th>
<th>Female (n: 3)</th>
<th>Male (n: 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head length</td>
<td>0.37</td>
<td>0.38</td>
</tr>
<tr>
<td>Head width</td>
<td>0.68</td>
<td>0.74</td>
</tr>
<tr>
<td>Head index</td>
<td>0.51</td>
<td>0.54</td>
</tr>
<tr>
<td>Thorax length</td>
<td>0.58</td>
<td>0.61</td>
</tr>
<tr>
<td>Prothorax width</td>
<td>0.55</td>
<td>0.57</td>
</tr>
<tr>
<td>Pterothorax width</td>
<td>0.77</td>
<td>0.82</td>
</tr>
<tr>
<td>Abdomen length</td>
<td>1.50</td>
<td>1.57</td>
</tr>
<tr>
<td>Abdomen width</td>
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<td>1.18</td>
</tr>
<tr>
<td>Total length</td>
<td>2.42</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Values are given in mm, except head index (head length : head width).
Pectinopygus brevicornis (Denny, 1842) (Figures 6–9)

Host: Phalacrocorax aristotelis.

Material investigated: 8♀ 14♂, 6N.

Female: It is a relatively small species; the body is well chitinized (Figure 6).

Table 2. Some morphological values of the Pectinopygus brevicornis (mm).

<table>
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</tr>
<tr>
<td>Abdomen width</td>
<td>0.58</td>
<td>0.74</td>
</tr>
<tr>
<td>Total length</td>
<td>2.03</td>
<td>2.20</td>
</tr>
</tbody>
</table>

Values are given in mm, except head index (head length : head width).

Pectinopygus brevicornis (Denny, 1842) (Figures 6–9)

Host: Phalacrocorax aristotelis.

Material investigated: 8♀, 14♂, 6N.

Female: It is a relatively small species; the body is well chitinized (Figure 6).

The head is triangular and narrower towards the front. Hyaline margin is present. Mandible is well developed, especially the end part. The antennae are 5-segmented; the first segment is thicker than the others, the third and the fourth segments are distinctly shorter than the others.
Figure 3. Eidmanniella pellucida female, prosternal-metasternal plate.

Figure 4. Eidmanniella pellucida male.

Figure 5. Eidmanniella pellucida male, genitalia.

Figure 6. Pectinopygus brevicornis female.
The eyes, located just behind the antennae, are apparent. The ocular seta is of medium length. The hypopharyngeal sclerite is strongly chitinized. The gular plate is rounded and towards the front is a bit more chitinized and pointed.

The prothorax is trapezoidal, narrowing slightly to the front; the posterior is close to being flat with a slight convex curve. In the posterolateral angle, a long seta and a single spine are present. The pterothorax is also trapezoidal; it is larger towards the back, and the posterolateral angles are slightly rounded.

In the posterolateral angle, a hair bundle composed of a single long seta and 5 very long setae are present on both sides. The prosternal plate is underdeveloped; it has 3–5 long hairs in the posterior. The pterosternal plate is also underdeveloped. The legs are short and strong; they have 2 short claws each on the ends.

The abdomen is cylindrical. The segmentation is evident. The segments are divided into two by a thin line in the medial. In the medial, there are two very long tergal setae on each side. In the first six segments in the medial, there are two sternal setae on both sides.

In the first two segments, there are no postspiracular setae, while the setae on the 4th and 5th segments are a bit shorter than the others.

Male: Although it resembles the female, the structures of the antennae and the abdominal segments separate it from the female (Figure 7). The 1st segment of the antenna is thicker than longer compared to the others, while the 4th and 5th segments are markedly thinner than the others (Figure 8). Terga II–IV are vertically divided into two in the middle, while other segments are in single pieces. The male genitalia are as seen in Figure 9.

The number of studies carried out on the lice of the wild birds in Turkey has been steadily increasing; however, the number of bird species investigated and the number of lice species reported have only reached 200 and 150 respectively during the last decades. More than half of the bird species found in Turkey have not been examined in relation to lice, either because lice have not been found on some bird species investigated or the bird species described in the past have not been detected. The results of the literature review showed that not a single species of the order Suliformes, which includes the European Shag, has been studied with respect to lice. Therefore, this study is the first study to focus on the lice of the European Shag in Turkey.

Studies conducted in different countries throughout the world on various species in the Phalacrocoracidae family of sea birds have shown the presence of the following louse species: *P. insularis* and *E. pellucida* in *P. pelagicus* (Choe and Kim, 1987); *P. brevicornis* in *P. aristotelis* (Martin Mateo, 1992); *E. pellucida*, *P. transitans*, *P. insularis*, and *E. pellucida* in *P. pelagicus*.
and *P. capitincisum* in *P. bougainvillii* (Sepulveda et al., 1997); *P. incomposita*, *P. farallonii*, and *E. pellucida* in *P. auritus* (Kuiken et al., 1999); *P. gycornis* and *E. pellucida* in *P. carbo* (Dik and Halajian, 2013); and finally *E. nancyae* and *P. socotranus* in *P. nigrogularis* (Nasser, 2015; Nasser et al., 2015).

Various species of chewing lice belonging to the genera *Eidmanniella*, *Pectinopygus*, *Piagetiella*, and *Quadraceps* have been reported to parasitize on cormorants (Price et al., 2003). In studies conducted in Turkey, louse species from the genera *Piagetiella* and the *Pectinopygus* that parasitize on cormorants were encountered in bird species from the order Pelecaniformes. The lice recorded on *E. pellucida* and *P. brevicornis* have been described as present on 14 different species of cormorants, while the other species, *P. brevicornis*, has been found only on the European Shag in Turkey.

Price et al. (2003) reported that two louse species parasitize the European Shag. Both of those louse species were detected on the European Shag observed in this study. Of these species, *E. pellucida* has been described as present on 14 different species of cormorants, while the other species, *P. brevicornis*, was detected on various other bird species and with more samples.

**Acknowledgment**

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**References**


There have been various studies conducted on different species of cormorants in the world. In a Spanish study on the European Shag, only *P. brevicornis* was observed (Martin Mateo, 1992). *Piagetiella* species live in the oral cavity of their hosts. Although there have been *Piagetiella* species recorded on some cormorant species, no *Piagetiella* species have been reported for the European Shag. The oral cavity of the European Shag observed in this study was not examined. Therefore, it is normal that *Piagetiella* species were not encountered.

The morphological characteristics observed during the microscopic examination of both of the species are the same as the characteristics described in the literature (Timmermann, 1964; Ryan and Price, 1969; Clay, 1973).

As a result, the presence of chewing louse species in the European Shag of Turkey has been demonstrated for the first time with this study. In addition, the genus *Eidmanniella* and species *E. pellucida* and *P. brevicornis* are reported for the first time in Turkey. To reveal the louse fauna of Turkey, similar studies need to be carried out on various other bird species and with more samples.


