Different species of lice (Phthiraptera), fleas (Siphonaptera) and ticks (Ixodida) collected from livestock, poultry, reptile and companion animal in Leyte Island, Philippines

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Different species of lice (Phthiraptera), fleas (Siphonaptera) and ticks (Ixodida) collected from livestock, poultry, reptile and companion animal in Leyte Island, Philippines

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Abstract

Ectoparasite serves as vector of zoonotic and economic diseases, and degrades the welfare of animal. A gap of knowledge concerning ectoparasite fauna has remained in livestock, poultry, companion and exotic animals in Philippines where limited record existed and none in remote regions such as in Leyte Island, Philippines. The present study was carried out to determine the species of lice, fleas and ticks infesting various animals in Baybay, Leyte. A total of 577 ectoparasites were collected, processed and identified morphologically. There were 19 different species identified: 14 lice, 2 fleas, and 3 ticks. Chicken lice recorded were Goniocotes gallinae, Goniodes dissimilis, Lipeurus caponis, Oxylipeurus dentatus, Menopon gallinae, and Menacanthus stramineus. Lice isolated from rock pigeon and turkey were Columbicola columbae and Chelopistes meleagridis, respectively. Damalinia caprae and Linognathus spp. were observed in goats; D. ovis in sheep; Heterodoxus spinigera in dog; Haematopinus tuberculatus in both carabao and cattle; and H. suis in pig. Fleas isolated from dogs were Ctenocephalides felis and Pulex irritans, the former was also seen in cat. Rhipicephalus sanguineus, R. microplus and Aponomma spp. were recorded from dog, large ruminant and reticulated python, respectively. Knowledge in ectoparasite distribution and taxonomic composition will lead to better understanding of vector and vector-borne diseases. This will result in the improvement of diagnosis, prevention and control strategies in the region.

Keywords: Arthropod vector, ectoparasite, tropical parasite

INTRODUCTION

Ectoparasites affect the well-being of animals and serve as vector of zoonotic and economic diseases. Three of these important ectoparasites belong to suborder Ixodida (ticks), and orders Siphonaptera (fleas) and Phthiraptera (lice) (Bowman 2009). Ticks and tick-borne diseases can cause major production losses in ruminant and threat to public health by transmitting zoonotic bacteria, viruses and protozoa (Ahmed et al 2007). They are also nuisance to companion animals causing skin damage and irritation. Meanwhile, fleas serve as carrier of known human and animal pathogenic microorganisms such as Yersinia, Rickettsia and Bartonella. They are annoying biters leading to discomfort, secondary infection and skin allergy (Dieme et al 2015; Wall and Shearer 1997). Lice transmit and serve as reservoir of pathogens like swinepox and Rickettsia (Wolf 2010). Their chewing and blood feeding habit will result to anaemia, skin
irritation and decrease in production capacity among poultry and livestock (Wall and Shearer 1997). Therefore, ectoparasites are serious pests with vital role in disseminating vector-borne diseases, decreasing animal production and debilitating animal welfare (Campbell-Lendrum et al 2015; Fuehrer et al 2012).

The distribution of ectoparasites certainly varies by location and climate. Tropical and subtropical climates favor good habitat for parasite survival and reproduction, thus infestations are common in Southeast Asian countries (Changbunjong et al 2009; Petney et al 2007). In the Philippines, published reports of ectoparasites fauna in domestic and exotic animals are very few especially in the islands of Visayas. Profile of ectoparasites species (i.e. lice, fleas and ticks) has focused mainly in wild animals from Luzon Island, the northern part of the country.

Researchers have isolated lately some old and new arthropod parasite from Philippine wild birds and small mammals. Common avian lice of the genus Menacanthus, Goniocotes, Menopon and Lipeurus were reported from wild birds in a rescue center (Sia Su et al 2013). Lice of the genus Columbicola, Auricotes, Strigiophilus, Colpocephalum, Kurodaia, Pseudomenopon, Rallicola, and Eulaemobothrion were found in selected Philippine wild birds, in which novel lice species were identified (Eduardo 2014; Eduardo 2012; Desemero and Eduardo 2011). Fleas collected from small mammals belonging to genus Polyplax, Xenopsyllia, Lentistivalius, Thaumapsylla, Ischnopsyllus, Sigmacentus, and Medwayella with new characterized species were also reported (Hastriter and Bush 2014; Durden and Beaucournu 2000; Luyon and Salibay 2007). Moreover, old reports of tick’s species isolated among Philippine wild pigs, Philippine deer and varanid lizards were from the genus Dermacentor, Haemaphysalis and Amblyomma, respectively (Auffenberg 1988; Wassef and Hoogstraal 1988). On the other hand, species of ectoparasites identified from domestic animals in Luzon were limited to Haematopinus tuberculatus (sucking louse of buffalo), Ctenocephalides felis (cat flea), Rhipicephalus sanguineus (brown dog tick) and R. microplus (tropical cattle tick) (Wolf 2010). Avian lice species documented from domestic chickens in the country were M. gallinae, L. caponis, M. pallidullus, G. dissimilis, and O. dentatus (Manuel and Anceno 1981).

Studies that address identification and distribution of parasite fauna in remote regions of developing countries, like in Leyte Island, are very limited and not given enough attention. Given their ability to transmit dreadful human and animal diseases, the need for profiling is therefore urgent. Ectoparasites distribution and taxonomic compositions are key points to improve the diagnosis, prevention and control programs in an area for zoonotic pathogens, as well as for economically important vector-borne diseases (Fuehrer et al 2012). Hence, this paper presents a list of morphologically identified ectoparasites from different animals in Baybay, Leyte, Philippines.

**MATERIALS AND METHODS**

**Study Area**

The study was carried out in Baybay, Leyte Island which is located in the eastern Visayas, central part of the Philippines at coordinate 10.6521412 °N, 124.8525626 °E. The climate is characterized by high humidity (80-90%) and temperature (27.2 to 28.2°C). There’s no seasonal demarcation in the area, but possessed high rainfall throughout the year (annual average = 2,500 mm). The eastern part is forested and highly elevated with gradual decrease in elevation to the west towards the shore. Farming and fishing are the two common livelihood of the local people, though some are involved in hunting and collecting forest resources (LGU-Baybay 2013).
Parasite Collection, Preparation and Identification

Ectoparasites were collected in different villages of Baybay, Leyte, Philippines and processed at the Parasitology Laboratory of the College of Veterinary Medicine, Visayas State University. External parasites were removed manually from the body of the host using forceps and placed in vials containing Alcohol-Formalin-Acetic acid (AFA) for preservation. Afterwards, they were processed and mounted in the slide following the technique described by previous studies (Eduardo 2012; Palma 1978). Identification of the parasite to the genus and species level was carried out using holistic approach, which includes the parasitized hosts, location and finally the morphological key of ectoparasite identification (Wall and Shearer 1997; Pratt and Stojanovich 1992; Stojanovich and Pratt 1992; Soulsby 1982; Emerson 1956).

RESULTS

A total number of 577 ectoparasites were collected from avian, ruminant, swine, canine, feline and reptile in Baybay, Leyte, Philippines (Table 1). This constitutes 322, 71 and 184 numbers of lice, fleas and ticks, respectively. We have identified a total of 19 different species (lice = 14 species; fleas= 2 species; and ticks = 3 species).

Lice (Phthiraptera)

Among the 322 number of lice, 14 species were morphologically identified with 11 chewing type (8 species from order Ischnocera; and 3 species from order Amblycera), and 3 sucking type (order Anoplura). Chewing type lice were mainly observed in avian hosts, whereas sucking type lice were only seen in mammalian. Species of chewing lice found to infest chickens in the study area were Goniocotes gallinae (n=6), Goniodes dissimilis (n=4), Lipeurus caponis (n=24), Oxylipeurus dentatus (n=25), Menopon gallinae (n=15), and Menacanthus stramineus (n=10) (Fig. 1). Large numbers of ectoparasite in chicken were identified as L. caponis and O. dentatus. Columbicola columbae (n=50) and Chelopistes meleagridis (n=6), which are both chewing lice, were observed from rock pigeon and turkey, respectively.

In mammalian host, 3 species of chewing lice and 2 species of sucking lice were identified. Goats were infested by Damalina caprae (n=21) and Linognathus spp. (n=23). Sheep were solely infested by D. ovis (n= 19), while dogs were infested by Heterodoxus spinigera (n=32). Furthermore, the sucking louse of buffalo (H. tuberculatus) were found in both carabao (n=70) and cattle (n=12). In pigs, H. suis (n=5) was observed (Fig. 2).

Fleas (Siphonaptera)

The study has found 71 numbers of fleas infesting dogs and cats, these are Ctenocephalides felis (n=70) and Pulex irritans (n=1) (Table 1). Majority of the fleas were C. felis which was found to infest both dogs and cats. Pulex irritans (human flea) was recorded in dog (Fig 3). On the other hand, the study was not able to find C. canis.

Ticks (Ixodida)

A total of 184 hard ticks from 3 different species were found in dog, cattle, carabao and reticulated python (Table 1). Brown dog ticks (Rhipicephalus sanguineus) (n=93) were the only species identified in dogs. The tropical cattle ticks (R. microplus) (n=89) were found in both cattle and carabao. The study has found Aponomma spp. (n=2) in reticulated python (Fig. 4).
Table 1. List of species of lice, fleas and ticks found in domestic and exotic animals in Baybay, Leyte, Philippines.

<table>
<thead>
<tr>
<th>Ectoparasite</th>
<th>Scientific Name</th>
<th>Host</th>
<th>Ecto (n)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lice (Phthiraptera)</td>
<td>Colombicola columbae</td>
<td>Rock Pigeon (<em>Columba livia</em>)</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Chelopistes meleagridis</td>
<td>Turkey (<em>Meleagris gallopavo</em>)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Goniocotes gallinae</td>
<td>Chicken (<em>Gallus g. domesticus</em>)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Goniodes dissimilis</td>
<td>Chicken (<em>Gallus g. domesticus</em>)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Lipeurus caponis</td>
<td>Chicken (<em>Gallus g. domesticus</em>)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Oxylepeurus dentatus</td>
<td>Chicken (<em>Gallus g. domesticus</em>)</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Damalinia caprae</td>
<td>Goat (<em>Capra hircus</em>)</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Damalinia ovis</td>
<td>Sheep (<em>Ovies aries</em>)</td>
<td>19</td>
</tr>
<tr>
<td>Amblycera</td>
<td>Menopon gallinae</td>
<td>Chicken (<em>Gallus g. domesticus</em>)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Menacanthus stramineus</td>
<td>Chicken (<em>Gallus g. domesticus</em>)</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Heterodoxus spinigera</td>
<td>Dog (<em>Canis l. familiaris</em>)</td>
<td>32</td>
</tr>
<tr>
<td>Anoplura</td>
<td>Haematopinus tuberculatus</td>
<td>Carabao (<em>Bubalus b. carabanensis</em>)</td>
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<tr>
<td></td>
<td></td>
<td>Cattle (<em>Bos indicus</em>)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pig (<em>Sus s. domesticus</em>)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Linognathus spp.</td>
<td>Goat (<em>Capra hircus</em>)</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 322</td>
</tr>
<tr>
<td>Flea (Siphonaptera)</td>
<td>Ctenocephalides felis</td>
<td>Dog (<em>Canis l. familiaris</em>)</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cat (<em>Felis catus</em>)</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Pulex irritans</td>
<td>Dog (<em>Canis l. familiaris</em>)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 71</td>
</tr>
<tr>
<td>Tick (Ixodida)</td>
<td>Rhipicephalus sanguineus</td>
<td>Dog (<em>Canis l. familiaris</em>)</td>
<td>93</td>
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<tr>
<td></td>
<td>Rhipicephalus microplus</td>
<td>Cattle (<em>Bos indicus</em>)</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carabao (<em>Bubalus b. carabanensis</em>)</td>
<td>11</td>
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<tr>
<td></td>
<td>Aponomma spp.</td>
<td>Reticulated Python (<em>Python reticulatus</em>)</td>
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<td></td>
<td></td>
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<td>Total 184</td>
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<td></td>
<td></td>
<td></td>
<td>Grand Total 577</td>
</tr>
</tbody>
</table>

* Ecto (n) = Number of ectoparasites
Different species of lice (Phthiraptera), fleas (Siphonaptera) and ticks (Ixodida) collected from livestock, poultry, reptile and companion animal in Leyte, Philippines.

**Figure 1.** Avian lice collected in Baybay, Leyte, Philippines. (A) *Columbicola columbae*, (B) *Lipeurus caponis*, (C) *Oxyleipurus* spp., (D) *Menacanthus stramineus*, (E) *Chelopistes meleagridis*, (F) *Menopon gallinae*, (G) *Goniodes dissimilis*, (H) *Goniocotes gallinae*. Magnification: 100x

**Figure 2.** Ruminant and swine sucking lice collected in Baybay, Leyte, Philippines. (A) *Haematopinus tuberculatus*, (B) *Linognathus* spp., (C) *H. suis*. Magnification: 100x
Different species of lice (Phthiraptera), fleas (Siphonaptera) and ticks (Ixodida) collected from livestock, poultry, reptile and companion animal in Leyt...

Figure 3. Fleas and lice found in dog and cat. (A) Ctenocephalides felis, (B) Pulex irritans, (C) Heterodoxus spinigera. Magnification: 100x

Figure 4. Ticks found in domestic and exotic animal in Baybay, Leyte, Philippines. (A) Rhipicephalus sanguineus, (B) R. microplus, (C) Aponomma spp. Magnification: 40x

DISCUSSION

The present list of ectoparasite under the orders Phthiraptera (lice) and Siphonaptera (fleas), and suborder Ixodida (ticks) were identified based on holistic approach, taking into account initially the host and location where the parasites were collected, and finally according to morphological keys for diagnosis published by different authors (Wall and Shearer 1997; Pratt and Stojanovich 1992; Stojanovich and Pratt 1992; Soulsby 1982; Emerson, 1956). Identifying parasites in holistic way usually give an efficient process and reliable result when confirmed by microscopy. Through this, morphological identification becomes straightforward.

The present study reported 8 species of avian lice from Baybay, Leyte, Philippines (Fig. 1). Lice identified from chicken confirms the study of Manuel and Anceno (1981) who reported M. gallinae, L. caponis, M. pallidullus, G. dissimilis, and O. dentatus in northern Philippines. Interestingly, common lice from domestic chickens such as M. stramineus, Goniodes spp., Goniocotes spp., M. gallinae, and L. caponis were observed in wild birds kept in rescue center in Quezon City, Philippines (Sia Su et al 2013) despite the relative host specificity of many lice species. Though this is possible when wild birds are in contact with infested chickens since the degree of host specificity among lice is dictated by its ability to disperse among multiple host species (Brooke and Nakamura 1998). Furthermore, 3 lice species (L. caponis, G. dissimilis and M. gallinae) observed in Tak Province, Thailand were also observed in the study area (Changbunjong et al 2009). We have identified C. columbae as main lice infesting rock pigeons.
and *C. meleagridis* infesting turkey. Their occurrence has also been reported in many parts of the world causing host debilitation (Galloway and Lamb 2015; Radfar et al 2011).

The identified lice from ruminants include *D. caprae*, *D. ovis*, *H. tuberculatus*, *Linognathus* spp. and *H. spinigera*. In the Philippines, other species of *Damalinia* was found to infest Philippine deer (Eduardo 2000) and *H. tuberculatus* usually infest carabao (Del Rosario and Manuel 1983). In terms of public health concern, a study conducted by Wolf (2010) showed that *H. tuberculatus* collected from carabao in Luzon was positive for *Rickettsia felis*, the causative agent of human spotted fever. We also recorded another sucking louse (*Linognathus* spp.) that infests goats. This ectoparasite morphologically differ from Haematopinus by the presence of smaller first pair of legs with stout claws compared to the second and third pairs (Wall and Shearer, 1997). The three known lice to infest dogs are *Linognathus setosus, Trichodectes canis* and *H. spinigera*. According to Thompson (1939), it is rare to find these 3 species co-occurring in one dog. However, there’s a great chance that the occurrence of *H. spinigera* in dogs in Southeast Asian countries will persist due to better lice adaptability, increased population of stray dogs, and pet popularity (Irwin and Jefferies 2004).

Two species of fleas were recorded in our study. We found *C. felis* in both dog and cat, and *P. irritans* in dogs. Dogs are not the common host of the two identified fleas. *C. felis* is more common in cat. Similarly, *P. irritans* (human flea) infest mainly pigs and jump to human in contact. Indeed, fleas are facultative parasites capable of infesting multiple hosts. A study in Israel showed that these two species could transmit zoonotic diseases such as Bartonella risking human having pet dogs (Sofer et al 2015). In fact, fleas are transmitter of numerous parasites, bacteria and virus to animals and humans (Bowman 2009).

In Southeast Asia, *R. sanguineus* and *R. microplus* are the most common ticks in dog and large ruminant, respectively (Changbunjong et al 2009). While in reptiles, *Aponomma* spp. has also been recorded in some Asian countries (Petney et al 2007). Likewise, our study found these three mentioned species infesting dog, ruminant and reticulated python, respectively. In central Philippines, *R. sanguineus* and *R. microplus* were proven to carry zoonotic microorganisms (e.g. *Anaplasmaplatys*) (Ybañez et al 2012). Also, *Aponomma* spp. has been reported to transmit the pathogens Cowdria and *Rickettsia*, which causes Heartwater disease in ruminant and spotted fever in human, respectively (Burridge et al 2000).

The result of our study offers the first list of ectoparasite fauna in Baybay, Leyte, Philippines. Knowing their distribution and taxonomic composition means a better understanding in terms of diagnosis, prevention and control of vector and vector-borne diseases. Further studies are needed to evaluate their spatiotemporal pattern and analyse its direct impact to animals and human in remote and agricultural regions of the country.

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