

## DIVERSITY OF ENDOPARASITIC FAUNA INFECTING MIGRATORY BIRDS VISITING WET LAND NICHES OF PUNJAB, PAKISTAN

W. Ahmad<sup>1</sup>, M.S. Sajid<sup>1,2</sup>, M. Mohsin<sup>3</sup>, A. Shamim<sup>4</sup>, M. Hassan<sup>5</sup>, M. Maqbool<sup>1</sup> and M.A. Malik<sup>1</sup>

<sup>1</sup>Department of Parasitology, Faculty of Veterinary Sciences University of Agriculture Faisalabad.

<sup>2</sup>One health Laboratory, Center for Advanced Studies in Agriculture and Food Security,

<sup>3</sup>Institute of Microbiology University of Agriculture Faisalabad,

<sup>4</sup>Department of Pathobiology, University of the Poonch Rawalakot, Azad Kashmir,

<sup>5</sup>Department of Pathobiology, Arid Agriculture University Rawalpindi Punjab Pakistan

Corresponding Author's E-mail: email: asimshamim@upr.edu.pk

**ABSTRACT:** Birds migration is a seasonal activity and being influenced by climatic changes. Birds especially migratory birds act as vector for many pathogens including bacteria, virus, parasites and fungi. Parasites are potent pathogens having significant importance in veterinary and public health sectors. Present study was designed to check the endo-parasitic prevalence in the migratory bird population of various sentinels of Punjab province, Pakistan using qualitative and quantitative microscopic examination. Overall, highest prevalence of trematodes (41.37 %) was recorded followed in order by nematodes (36.78%) and cestodes (21.83%). Non-significant association was found among the bird species; however significant variations are found among selected districts screened the bird population for endoparasitic fauna and information regarding migratory pattern and probable risk factors may help understanding the disease distribution pattern of disease from wild birds to the livestock and humans population in the selected niches of Punjab, Pakistan. The migratory nature of birds helps identify the threats for the countries involved in their routes of migration.

**Keywords:** Migratory birds, Helminthes, Punjab, Pakistan.

(Received 15.11.2019

Accepted 20.12.2019)

### INTRODUCTION

Birds are the most populous life form on ecosystem consisting of 10,417 species worldwide; of which 778 are also present in Pakistan (Roberts, 1991). Birds used to travel long distances for search of proper climatic conditions required for their growth, development, feeding and reproduction (Jourdain *et al.*, 2007). Birds migration is a seasonal activity and basic reason behind this migration is feeding, breeding and habitat during extreme weather conditions. Wet lands play important role in migration. Location of Pakistan is favorable for migratory birds and each year host almost one million migratory birds. These birds travel from Siberia and Central Asia to escape from bitter cold and settled in different wetland habitats distributed across Pakistan. (Raza *et al.*, 2017).

Based on migratory routes, birds are divided into four classes: local migrant, short-distance migrant, nomadic migrants and long-distance (Hubalek, 2004). Billions of birds migrate twice in a year and due to their ability to fly freely and cover long distances birds play important role in zoonoses (Abulreesh *et al.*, 2007). Birds act as vectors for transmission of pathogens including bacteria (*Escherichia coli*, *Mycobacterium* sp. and *Listeria monocytogens*), viruses (Western Equine Encephalitis virus, avian influenza virus, Crimean Congo

Hemorrhagic fever virus etc.) and parasites (*Plasmodium* spp. *Capillaria contorta*, *Trichomonas* spp. etc.) (Tsiodras *et al.*, 2008; Ricklefs *et al.*, 2017).

A recent study has identified CTX-M-15 Type ESBL-producing *Klebsiella pneumoniae* type from migratory bird population of Pakistan (Raza *et al.*, 2017). Systematic survey on parasitic fauna prevalence in birds has been reported from Pakistan (Ghazi and Bilqees, 2002; Bilqees *et al.*, 2003,2007; Bilqees and Khan, 2005, 2006; Rehman *et al.*,2007, 2010; Channa *et al.*, 2009); however, distribution of helminths in the migratory bird population has not so far been investigated in Pakistan. Current study was designed with the aim to determine the endoparasitic fauna of migratory bird population from the selected niches of Punjab, Pakistan to access the role of migratory birds as potential reservoirs of parasitic infections in the country.

### MATERIALS AND METHODS

**Study area:** Present study was conducted in different areas of Punjab, Pakistan including, Head Marala (Sialkot) (72° 8' 47" E, 31° 8' 42" N), Shorkot-Jhang (72° 8' 47" E, 31° 8' 42" N), IBalloki-Kasur (73° 51' 32" E, 31° 13' 19" N), Rasul Barrage (32° 40' 49" N, 73° 31' 15" E), and Chashma-Mianwali (71° 27' 45" E, 32° 23' 25" N) (Fig.-1a). Faecal samples were collected using

convenient sampling through local hunting or through nesting of live birds. Collected samples were preserved in 70% ethanol and transported to the Molecular Parasitology Laboratory, University of Agriculture, Faisalabad and stored at -4 °C till further processing.

Microscopic examination of the collected samples was done following the standard parasitological protocol as given by Soulsby (1982). Qualitative and quantitative microscopic examination was done through centrifugal flotation method and McMaster egg counting technique, respectively.

**Route of migratory birds to Pakistan:** International route for migratory birds in Pakistan is depicted in Figure 1. Asian Houbara (*Chlamydotis macqueenii*) found in Cholistan desert of Pakistan and fly through the mountains of Tien Shan, Himalaya, Pamir & Hindu Kush (Fig-1b)

**Statistical analysis:** Prevalence of GI helminths in the migratory bird population of the selected study areas was analyzed by using analysis of variance (ANOVA), odd's ratio (OR) at 95% confidence level and multiple logistic regression was used for the determinants (area and bird species) influencing GI parasitism in the migratory birds. All the analyses were carried out by using SAS software package (SAS, 2010).

## RESULTS AND DISCUSSION

Birds are the most prevalent life form present in the ecosystem and are known as indicator for a healthy ecosystem. A large proportion of bird's food is consisted of insects that are injurious to the human beings. Birds also play role as consumer of weed seeds, harmful insects and other agricultural pests. Predatory birds are also important in minimizing the rodent's population and avoid damage to the crops, medicinal plants, flowers and vegetables. Among predator birds, owls, eagles and hawk are most important. Birds are also important during pollination process and help in germination process. Birds are chief source of protein by supplying egg and meat to the humans (Guppy *et al.*, 2017). Total 162 birds of different species including Weigon Duck, Quails, Gadwell Duck, Starling Poached Duck, Geese, Coot and Poached are screened from different selected areas during winter (2015-2016). Among total sampled birds,

87 birds (53.74%) were found infected with gastrointestinal parasites (helminths).

Six species of gastrointestinal parasites *viz*; *Tetrameres americana*, *Prosthogonimus species*, *Daviena (D.) proglotina*, *Raillietina (R.) cesticillus*, *Strongyloides (S.) avium*, and *Ascaridia (A.) galli* were found prevalent. Trematodes were found more prevalent (41.37%) as compared to nematodes (36.78%) and cestodes (21.83%) in birds. Higher trematode prevalence in coot is in accordance with previous report of Canaris and Waldmann (2017). Prevalence of trematodes infection in Gadwell duck is reported to be 50 % which is correlated with previous study conducted in Iran showing prevalence 50% by Fakhari *et al.* (2016) where schistosomes were found prevalent in the wild migratory as well as domestic ducks. Prevalence of helminths in starlings in the current study recorded 62% which is in accordance with the previous studies conducted by Valente *et al.* (2014) showing prevalence about 62% in Argentina and Al-Moussawi and Al-Hamdany (2015) in Bagdad, Iraq. In geese, the prevalence of helminths in the present study is not different from those reported by Amundson *et al.* (2016) in Alaska, USA. In the present study two cestodes species were collected which are *D. proglotina* and *R. cesticillus* have earlier been reported from *gallus domesticus* (Valente *et al.*, 2014). Nematodes are collected in the highest numbers including: *T. americana*, *Strongyloides sp.* and *S. avium*. They can reproduce through parthenogenesis which can boost nematode infection and chances of bird to bird transmission increases (Umar *et al.*, 2018).

Distribution of helminth infections can be affected by change in feeding habits, climate, parasite lifecycle conditions, variation in larvae and intermediate hosts. Transmission of these parasites through migratory birds is an upcoming issue in Pakistan. Country wide surveillance through certain epidemiological approaches needed for screening migratory bird's population from wetland niches and further molecular screening for the specie specific detection of parasites which may harbor human and indigenous livestock population. Migratory birds screening confirms the helminths prevalence and devised control measures to decrease the spread of migratory birds borne diseases which have a potential benefit to humans and livestock (Umar *et al.*, 2018).

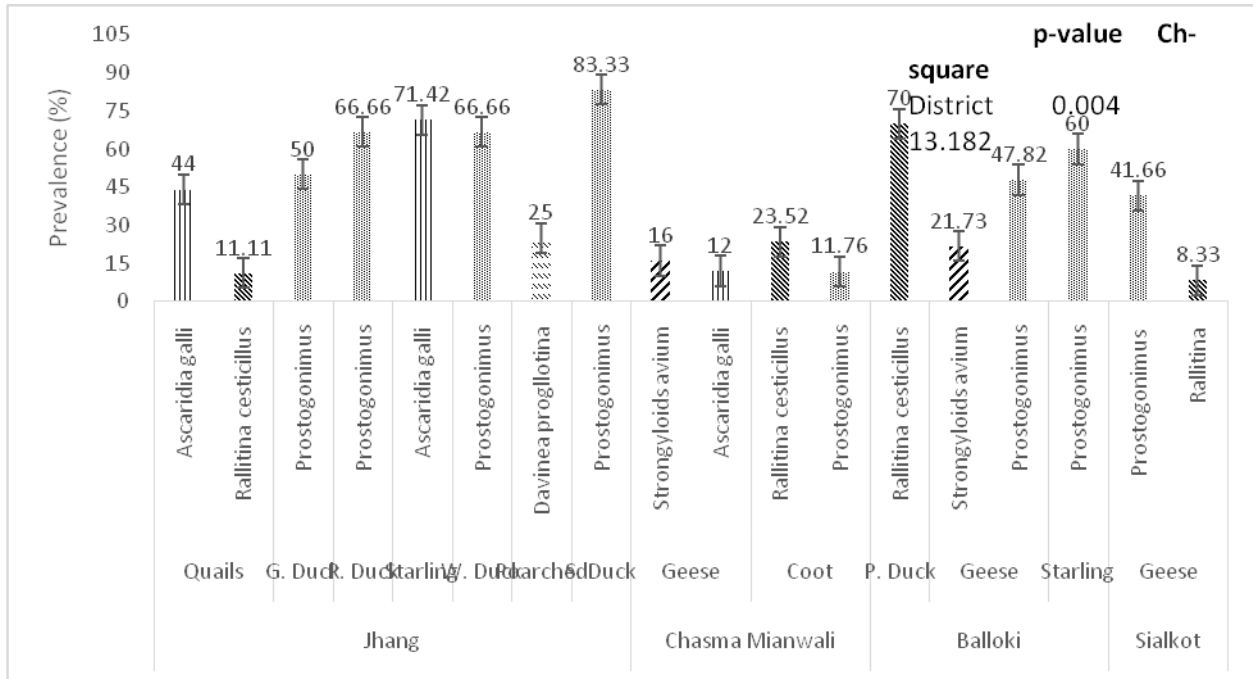


Figure-2. Prevalence of parasite species prevalent in the migratory birds screened from selected wetland niches of Punjab.

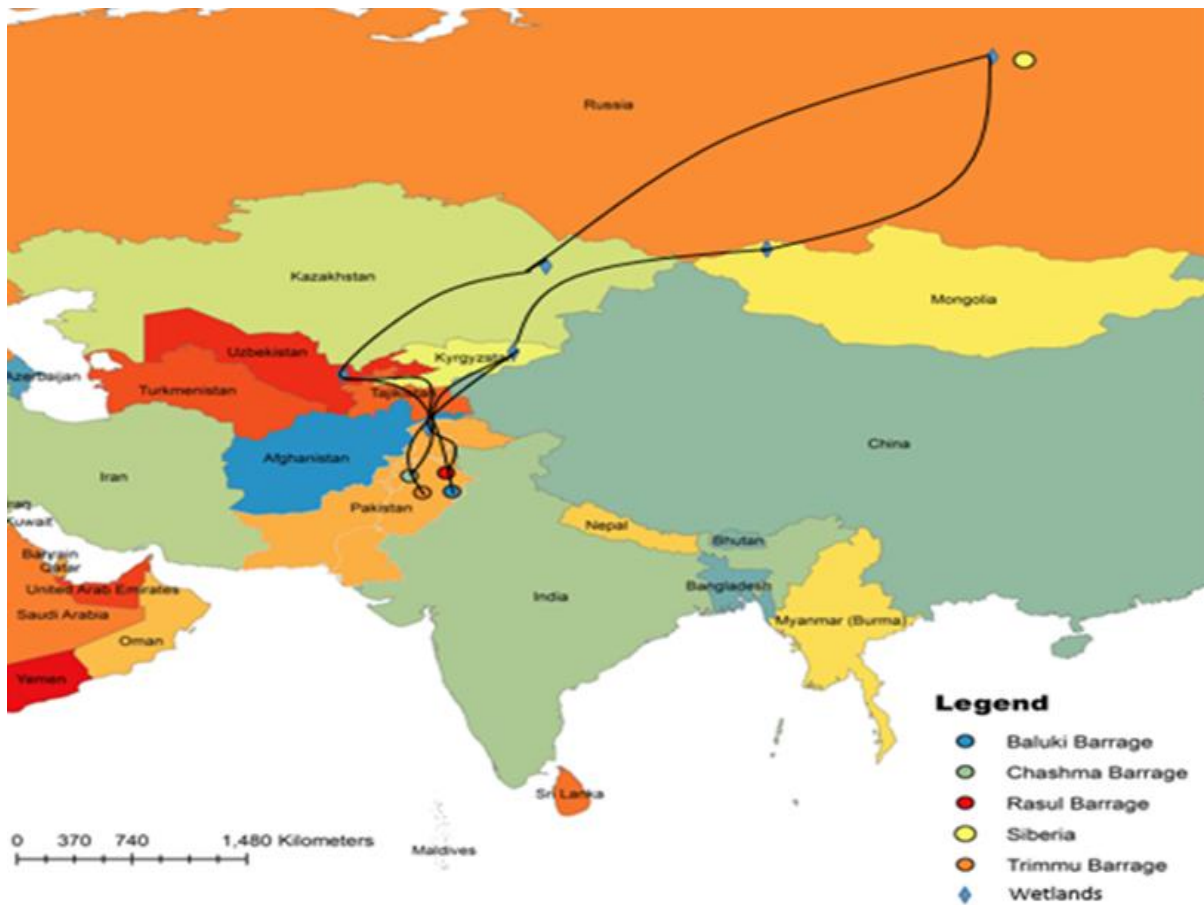


Figure-1b. International migratory route (# 4) for migratory birds. The route is also called as the *Green Route*.



Figure-1a. The selected study sites for collection of droppings of migratory birds for parasitological examination.

## REFERENCES

- Abulreesh, H.H., R. Goulder and G.W. Scott (2007). Wild birds and human pathogens in the context of ringing and migration. *Ringing & Migration*. 23(4): 193-200.
- Al-Moussawi, A.A. and H.S. Al-Hamdany (2015). Parasitic helminths of the Starling *Sturnus vulgaris* Linnaeus, 1758 in Baghdad city, central Iraq. *Bull. Iraq Nat. Hist. Mus.* 13(2): 51-58.
- Amundson, C.L., N.J. Traub, A.J. Smith-Herron and P.L. Flint (2016). Helminth community structure in two species of arctic-breeding waterfowl. *Int. J. Parasitol.: Parasites and Wildlife*. 5(3): 263-272.
- Bilqees, F.M. and A. Khan (2005). Two new helminth parasites from Pakistan with re-description of the acanthocephalan, *Centrorhyncus fasciatum*. *Pak. J. Zool.* 37: 257-262.
- Bilqees, F.M. and A. Khan (2006). A new trematode from the intestine of Kite, *Milvus migransmigrans*. *Pak. J. Zool.* 38: 75-76.
- Bilqees, F.M., M.F. Haseeb and R.R. Ghazi (2003). *Cotugniakarachiensis* n.sp. (Cestoda: Cyclophyllidae: Davaineidae) from the bird *Psittaculakrameri* in Karachi. *Proc. Parasitol.* 37: 45-49.
- Bilqees, F.M., A. Khan, N. Khatoon and S. Khatoon (2007). Acanthocephala from eagle of Karachi with description of two new species. *Proc. Parasitol.* 43: 15-26.
- Canaris, A.G. and M.E. Waldmann (2017). Metazoan Parasites of the American Coot, *Fulica americana*, from the Rio Grande Valley in Colorado and Southwest, Texas, USA, with a Checklist of Parasites for North America and West Indies. *Comp. Parasitol.* 84(2): 102-110.
- Channa, M.A., M.M. Khan, A.A. Shaikh and A.M. Dharejo (2009). *Echinochasmus jamshorensis* from Pond Heron, of Jamshoro, Sindh, Pakistan. *Proc. Parasitol.* 48: 151-158.
- Fakhar, M., M. Ghobaditara, S.V. Brant, M. Karamian, S. Gohardehi and R. Bastani (2016). Phylogenetic analysis of nasal avian schistosomes (*Trichobilharzia*) from aquatic birds in Mazandaran Province, northern Iran. *Parasitol. Int.* 65(2): 151-158.
- Ghazi, R.R. and F.M. Bilqees (2002). *Neoraillietinapsittaculi*, spp. (Cestoda: Davainidae) from the avian host *Psittacula krameria* Karachi, Sindh. *Proc. Parasitol.* 33: 47-56.
- Guppy, M., S. Guppy, R. Marchant, D. Priddel, N. Carlile and P. Fullagar (2017). Nest predation of woodland birds in south-east Australia: importance of unexpected predators. *Emu-Austral. Ornithology*. 117(1): 92-96.
- Hubálek, Z. (2004). An annotated checklist of pathogenic microorganisms associated with migratory birds. *J. Wildlife Dis.* 40(4): 639-659.
- Jourdain, E., G.C. Michel, D.J. Bicout and P. Sabatier (2007). Bird migration routes and risk for pathogen dispersion into Western Mediterranean Wetlands. *Emerg. Infect. Dis.* 13(3): 365-372.
- Muti-ur-Rehman, A. Khan, F.M. Bilqees and N. Khatoon (2008). Description of *Polymorphus mohiuddin* n.sp. (Acanthocephala: Polymorphidae) from the Owl (*Strix leptogrammica Temminck*). *Proc. Parasitol.* 46: 101-107.
- Muti-ur-Rehman, A. Khan, N. Khatoon and F.M. Bilqees (2010). A new acanthocephalan species *Porrorchis jonesae* from a bird, *Acridotheres tristis* (Lin) from Karachi, Sindh. *Pak. J. Zool.* 42(2): 157-159.
- Raza, S., M. Mohsin, W.A. Madni, F. Sarwar, M. Saqib and B. Aslam (2017). First Report of bla<sub>CTX-M-15</sub>-Type ESBL-Producing *Klebsiella pneumoniae* in Wild Migratory Birds in Pakistan. *Eco health.* 14 (1): 182-186.

- Ricklefs, R.E., M. Medeiros, V.A. Ellis, M. Svensson-Coelho, J.G. Blake, B.A. Loiselle, L. Soares, A. Fecchio, D. Outlaw, P.P. Marra and S.C. Latta (2017). Avian migration and the distribution of malaria parasites in New World passerine birds. *J. of biogeography*. 44(5): 1113-1123
- Roberts, E.B. (1991). *Entrepreneurs in high technology: Lessons from MIT and beyond*. Oxford University Press.
- SAS (2010) *SAS/STAT User Guides version 6.12*. SAS Inst. Inc. Cary, NC, USA.
- Soulsby, E.J.L. (1982). *Helminths, Arthropods and Protozoa of Domesticated Animals*. 7th Edition Bailliere Tindall, London, UK: 809
- Tsiodras, S., T. Kelesidis, I. Kelesidis, U. Bauchinger and M.E. Falagas (2008). Human infections associated with wild birds. *J. of Inf.* 56(2):83-98.
- Umar, M., M. Hussain, G. Murtaza, F.A. Shaheen and F. Zafar (2018). Ecological concern of migratory birds in Pakistan, A Review. Punjab University. *J. of Zoo.*33 (1): 69-76.
- Valente, R., L.M. Ibañez, E. Lorenti, V.D. Fiorini, D. Montalti and J.I. Diaz (2014). Helminth parasites of the European starling (*Sturnus vulgaris*) (Aves, Sturnidae), an invasive bird in Argentina. *Parasitol. Res.* 113(7): 2719-272.