

Viral Ecology of Long-Distance Migratory Birds in the Coastal Amazon During the Wintering Period

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THEMATIC AREA AND ODS

Field of Knowledge/Subfield:
Area 02 Biological Sciences - Genetics
RELATED ODS(s): ODS 15 - Life on Land

INTRODUCTION

Recent research indicates that the next pandemic may resemble the current one, with RNA zoonotic viruses transferring from non-human animals to humans and spreading from person to person (Thompson & Paulson, 2021; Farlow et al., 2023). Understanding the dynamics of viral transmission between species and the environmental factors that facilitate the spread of these diseases is essential for preventing future outbreaks (Albery et al., 2020). Migratory birds are known to act as zoonotic reservoirs and vectors for viruses, contributing to the dissemination of pathogens that can cause severe diseases in humans and other species (Hubálek, 2004; Chan et al., 2015). Recent investigations of the virome in wild birds have revealed a significant diversity of viruses, including novel viral genomes that may have zoonotic potential (Shan et al., 2022). This study focuses on the analysis of the virome of the migratory bird *Actitis macularius*, aiming to advance the understanding of resistance and tolerance to viral infection and contribute to the identification of potential risks to human health.



Figure 1 - *Actitis macularius*. In A, non-breeding plumage; in B, breeding plumage, Da Cunha et al.

MATERIALS AND METHODS



Collection and Perfusion

Collection was conducted using a mist net, followed by perfusion with saline and RNA Later.



Craniotomy

Care was taken to avoid damaging the tissue and to separate the telencephalon.



RNA extraction

TRIzol™ protocol. Purification of mRNA and subsequent conversion to cDNA.



Sequencing (NGS)

Ion Chef, Ion 540™ Chip, and Ion S5 GeneStudio System. FASTQ files.



Filtration

Software FASTQC.
Software Trimmomatic.
Table PHREAD.



Viral Identification

Reading VIRTUS2.
NCBI database.
Reading VIRTUS1.

RESULTS AND DISCUSSION

The neurotranscriptome of **A. macularius** indicated that 11 viral particles may belong to viruses known to infect humans (Table 1). Therefore, there are viral strains within the animal under study that may reveal the history related to the migratory patterns of the species, considering its multiple stops along the trajectory. Furthermore, it is worth noting that the pauses for rest during migration may help restore the constitutive immune function, which can be compromised during the migratory process (Eikenaar et al., 2020).

Table 1 - Human viruses found in the genome of *Actitis*, IFPA 2023.

UNIQID	Family	Genus	Name	Host
NC_012959.1	Adenoviridae	Mastadenovirus	Adenovirus 54	<i>Homo sapiens</i>
AC_000007.1	Adenoviridae	Mastadenovirus	Adenovirus 2	<i>Homo sapiens</i>
NC_006273.2	Herpesviridae	Cytomegalovirus	Herpesvirus 5 Strain Merlin	<i>Homo sapiens</i>
NC_000898.1	Herpesviridae	Roseolovirus	Human Herpesvirus 6B	<i>Homo sapiens</i>
NC_040309.1	Não encontrado	Não encontrado	DNA Vírus Homo Sapiens	<i>Homo sapiens</i>
NC_001798.2	Orthoherpesviridae	Simplexvirus	Herpesvirus 2 Strain HG52	<i>Homo sapiens</i>
NC_001806.2	Orthoherpesviridae	Simplexvirus	Herpesvirus 1 Strain 17	<i>Homo sapiens</i>
NC_009333.1	Orthoherpesviridae	Radinovirus	Herpesvirus 8 Strain GK18	<i>Homo sapiens</i>
NC_001457.1	Papillomaviridae	Nupapillomavirus	Papillomavirus Type 4	<i>Homo sapiens</i>
NC_039089.1	Papillomaviridae	Nupapillomavirus	Papillomavirus Type 71	<i>Homo sapiens</i>
NC_039199.1	Pneumoviridae	Metapneumovirus	Metapneumovirus Isolate 00-1	<i>Homo sapiens</i>

During the analysis of the virome of *Actitis*, out of the 11 human viruses found, 5 are variants of herpesviruses, including human cytomegalovirus associated with Kaposi's sarcoma, and herpes simplex viruses type 1 and 2, known for causing sexually transmitted infections. A pneumovirus was also identified, belonging to the order Mononegavirales, which are known to cause respiratory infections in humans and animals (Van den Hoogen et al., 2020).

CONCLUSION

The analysis of the virome of *Actitis macularius* identified zoonotic viruses, including herpesviruses that can infect humans. These results highlight migratory birds as reservoirs of viruses. The findings emphasize the importance of monitoring these birds to predict and prevent outbreaks, maintaining global surveillance in areas of contact between humans and birds.

REFERENCES

