

Birds and mammals of Nunavik in a context of press and pulse



Laurent Godet



Nicolas Lecomte

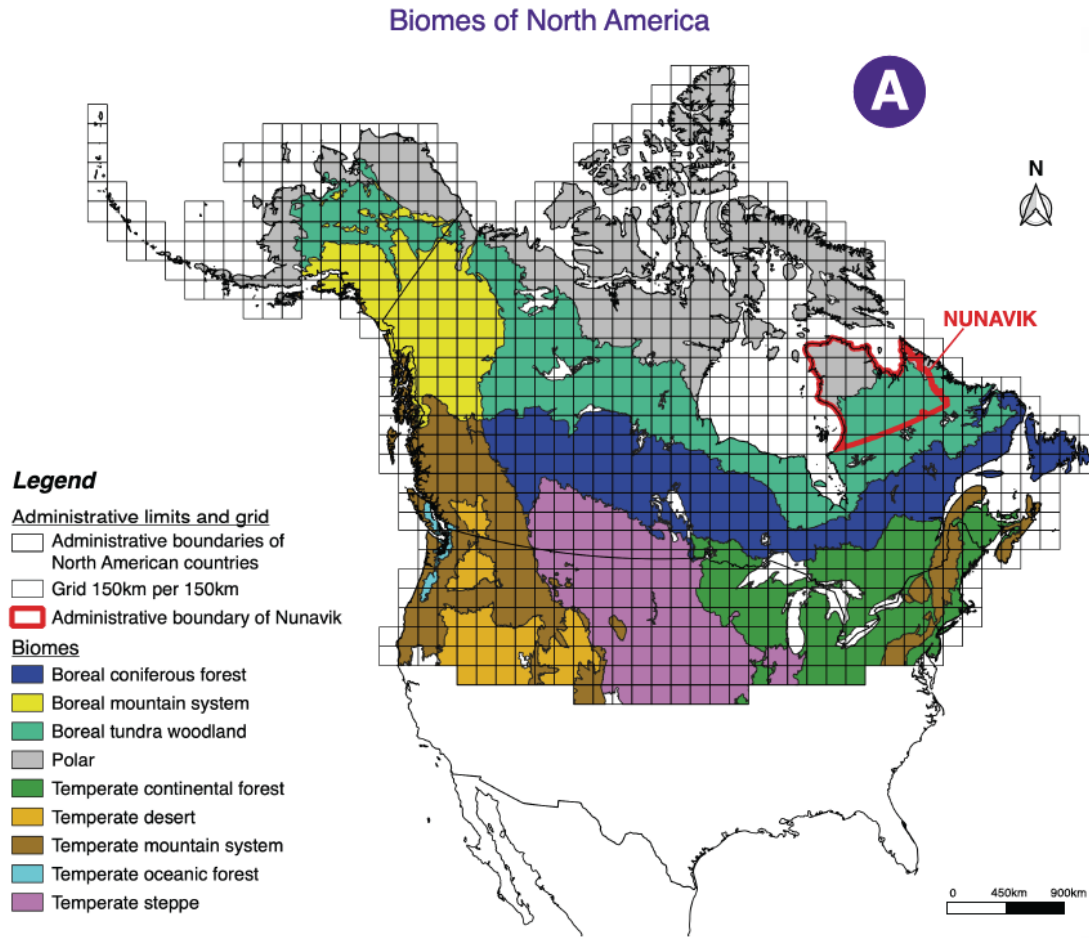
INTRODUCTION



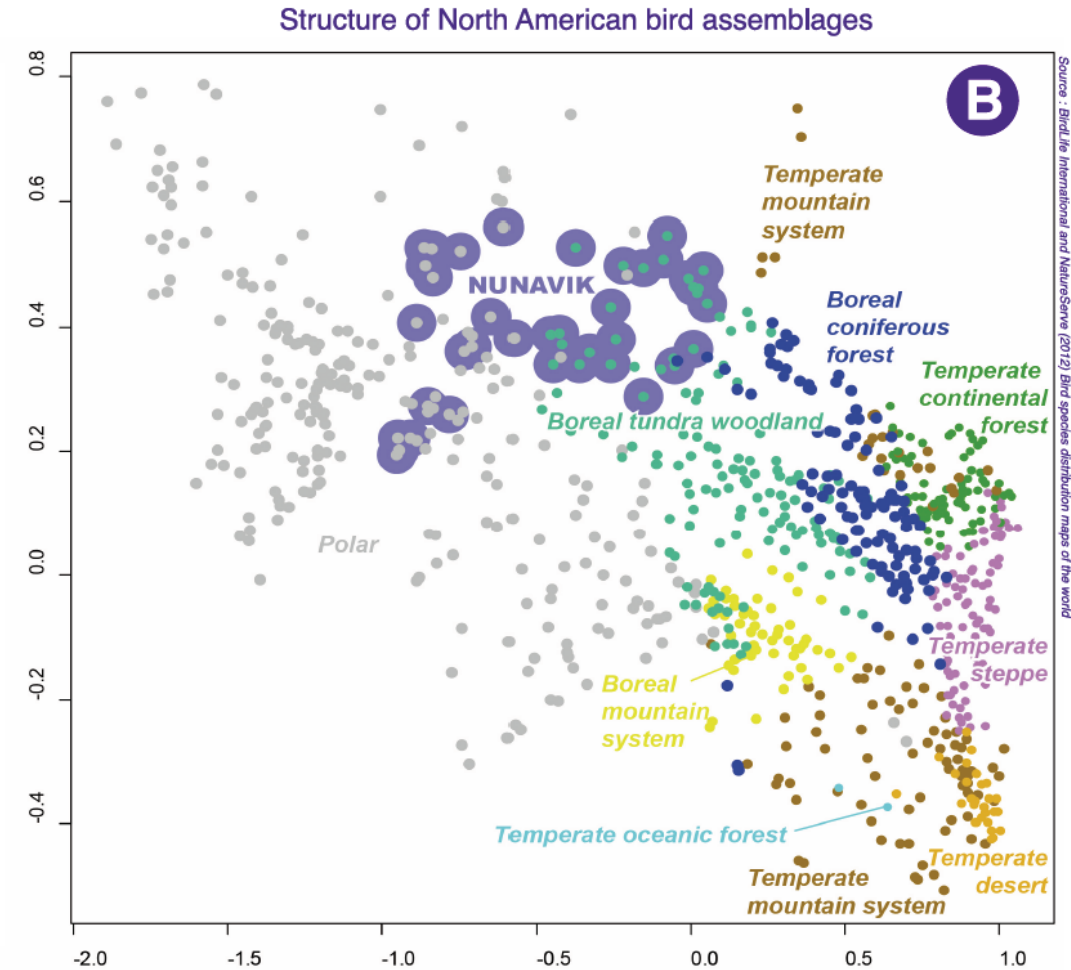
Socioecological framework: Biogeographic originalities



Gaël Sarrazin
M1 internship
2023



Source : Commission for Environmental Cooperation (CEC), 2022. "Forests of North America". North American Forest Commission (NAFC)



Socioecological framework: human originalities



How birds and mammals of Nunavik react to « Press and Pulse » ?

Founding events at two temporal scales




ECOLOGY
ECOLOGICAL SOCIETY OF AMERICA

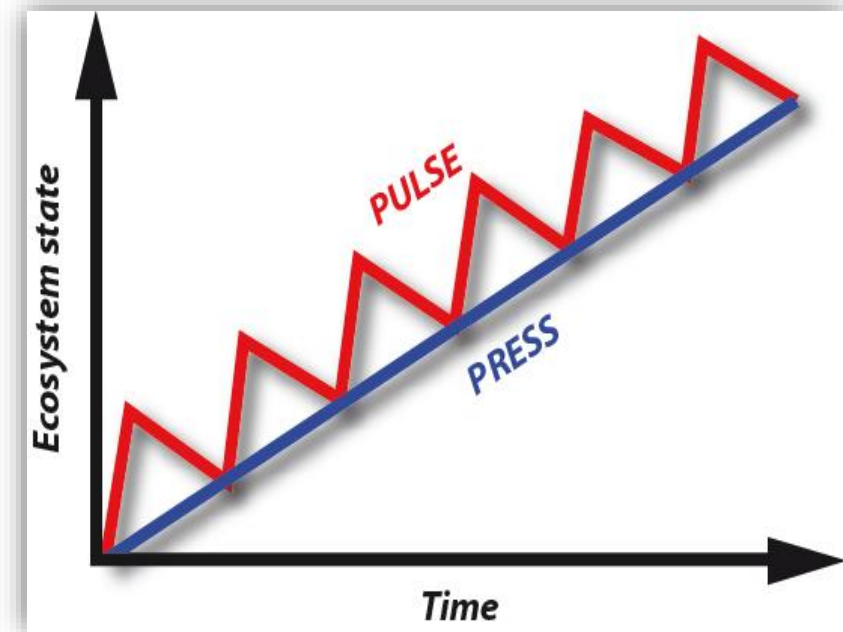
Article

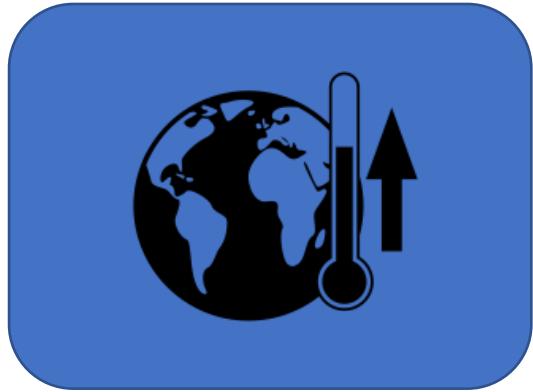
Perturbation Experiments in Community Ecology: Theory and Practice

Edward A. Bender, Ted J. Case, Michael E. Gilpin

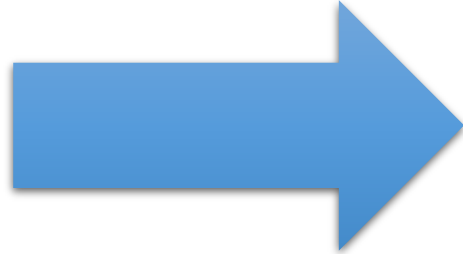
First published: 01 February 1984 | <https://doi-org.inee.bib.cnrs.fr/10.2307/1939452> | Citations: 764

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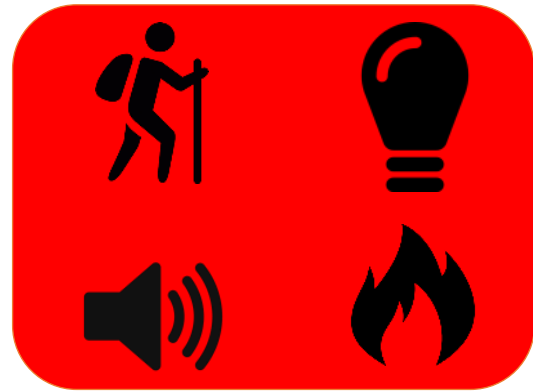




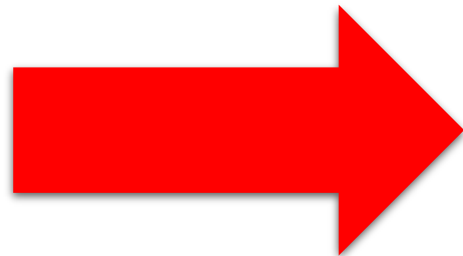
PRESS



Change in breeding bird arrival dates
Animal community reassembly



PULSE

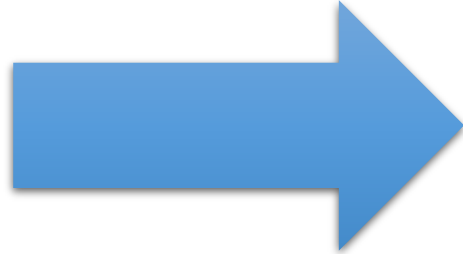


Change in animal activity rhythms

Change in animal spatial distribution
(landscape of fear)



PRESS



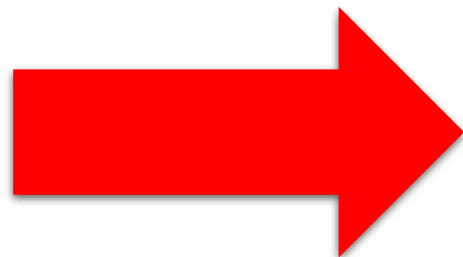
Long-term (several years) data

Change in breeding bird arrival dates

Animal community reassembly



PULSE



Short-term (few days, weeks) data

One-shot surveys

Change in animal activity rhythms

**Change in animal spatial distribution
(landscape of fear)**

Two focus models

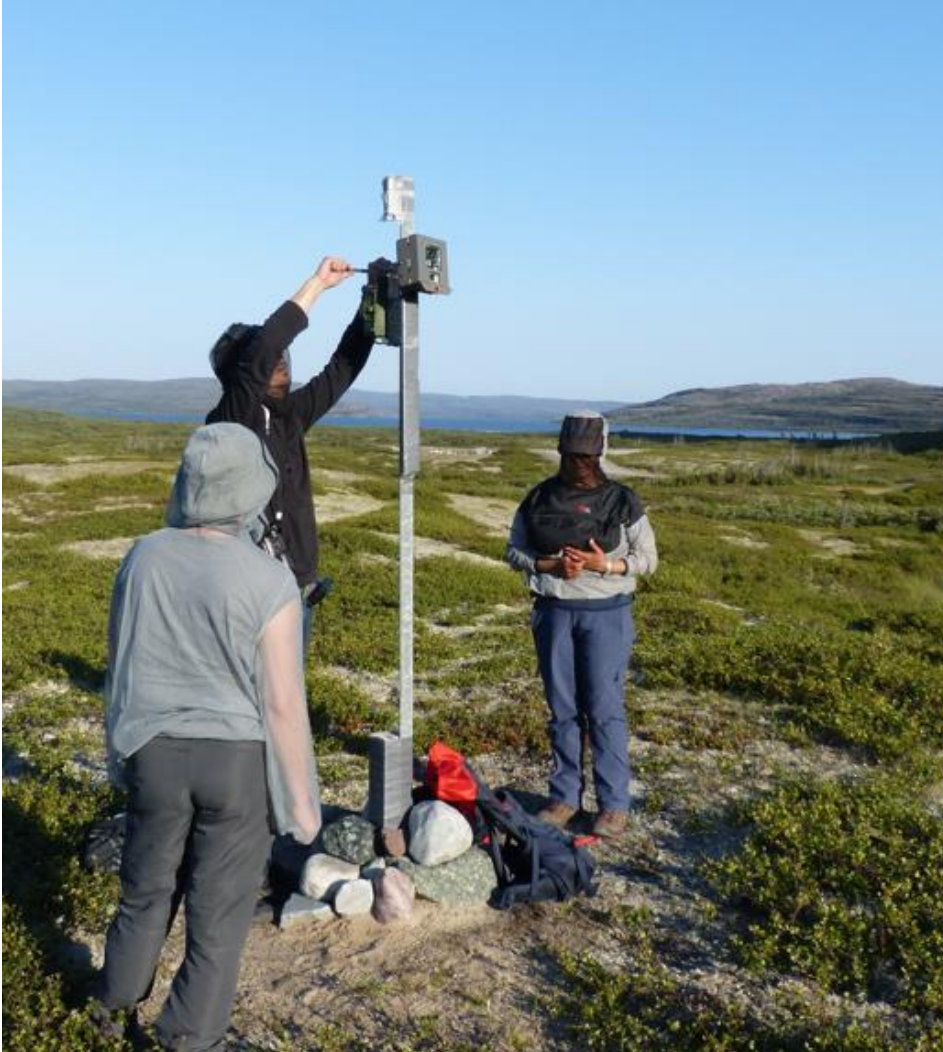
MAMMALS



BIRDS



2022-2023: a pilot survey



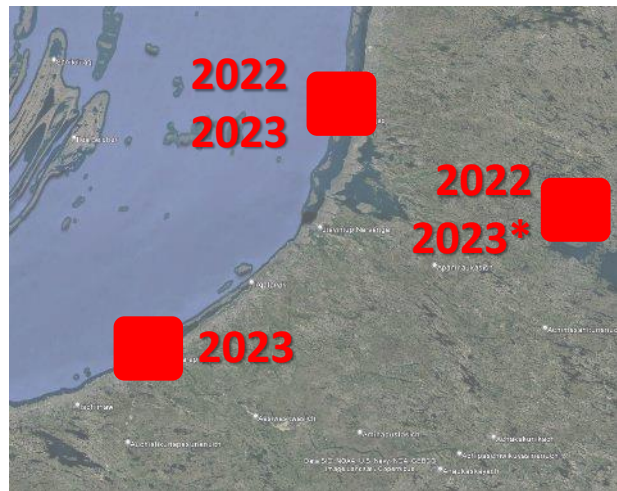
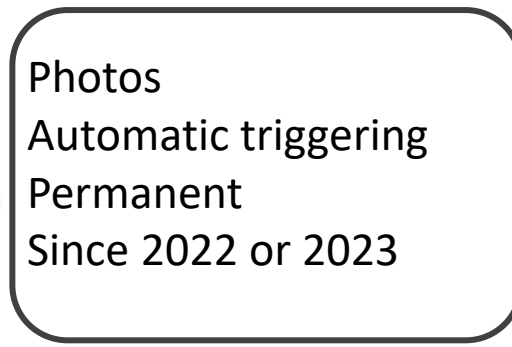
Goals

1. Feasibility

Material, memory, batteries, data quality

2. First results

Birds and mammals inventory,
spatiotemporal distribution of mammals,
bird arrival dates, bird song phenology,
daily song chronology





Photos
Automatic triggering
Permanent
Since 2022 or 2023



Audio (wav)
5 min / each day (7h30)
1st-April - Summer





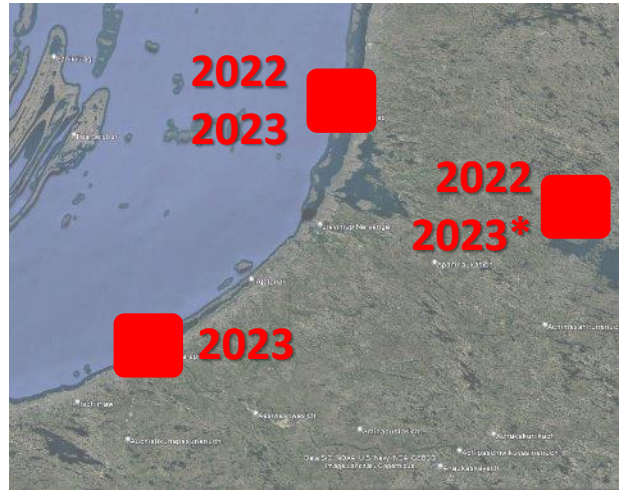
Photos
Automatic triggering
Permanent
Since 2022 or 2023



Audio (wav)
5 min / each day (7h30)
1st-April - Summer



Audio (wav)
24 h
During field survey

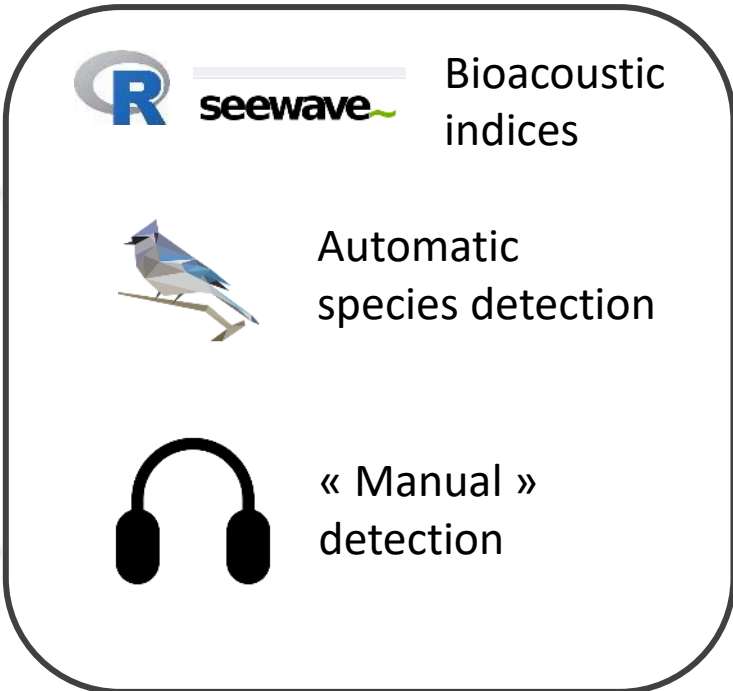




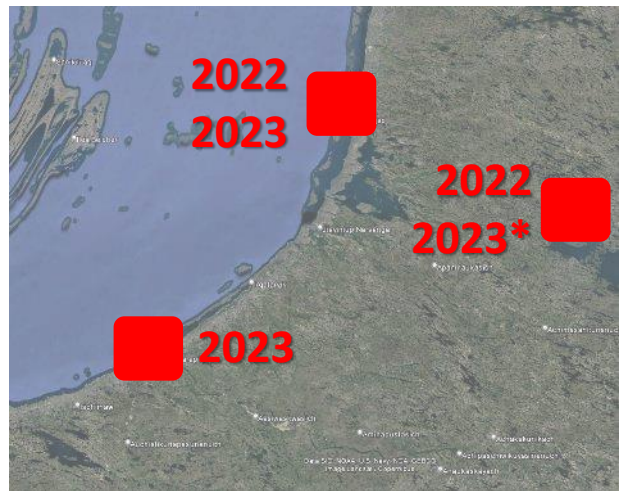
Photos
Automatic triggering
Permanent
Since 2022 or 2023



Audio (wav)
5 min / each day (7h30)
1st-April - Summer



Audio (wav)
24 h
During field survey





Camera traps


Photos
Automatic triggering
Permanent
Since 2022 or 2023


Deep Learning « Manual »

Audio trap

Audio (wav)
5 min / each day (7h30)
1st-April - Summer

  Bioacoustic indices

 Automatic species detection

 « Manual » detection

Audio trap

Audio (wav)
24 h
During field survey

Field obs.

Binocular / telescope
Point counts

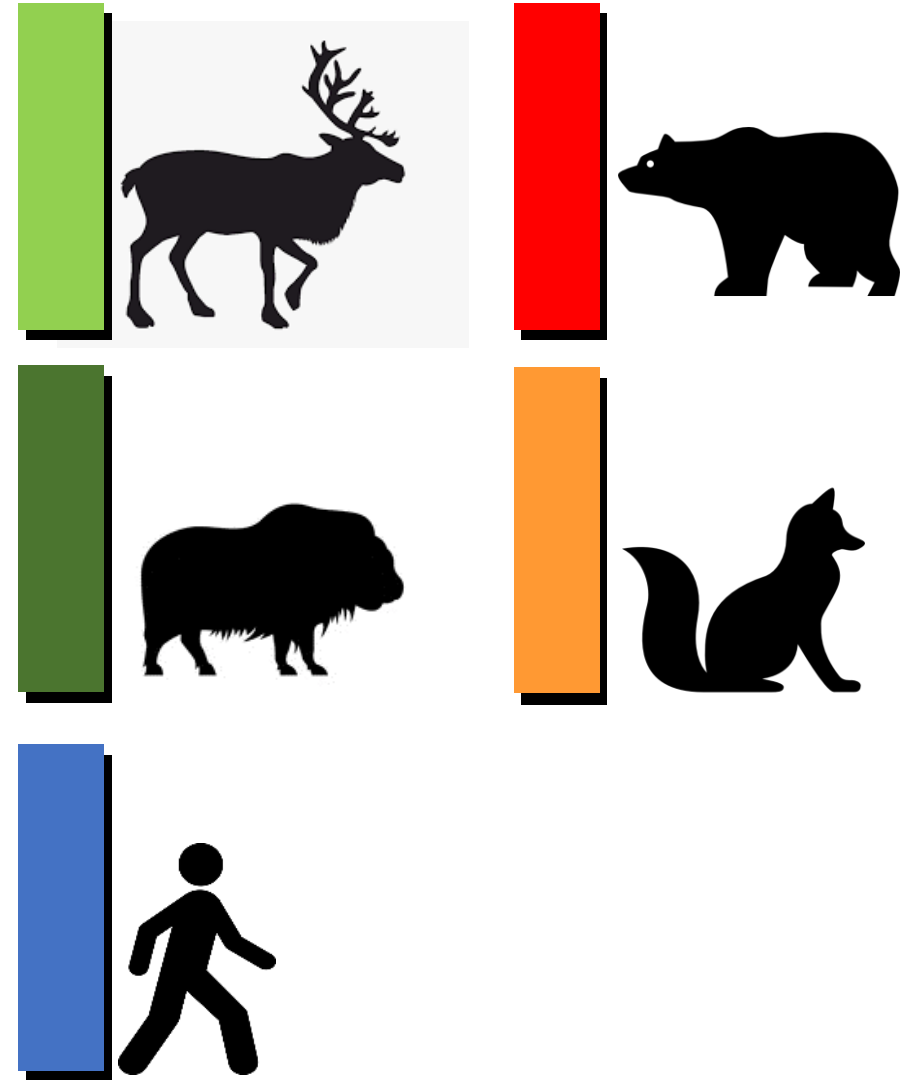
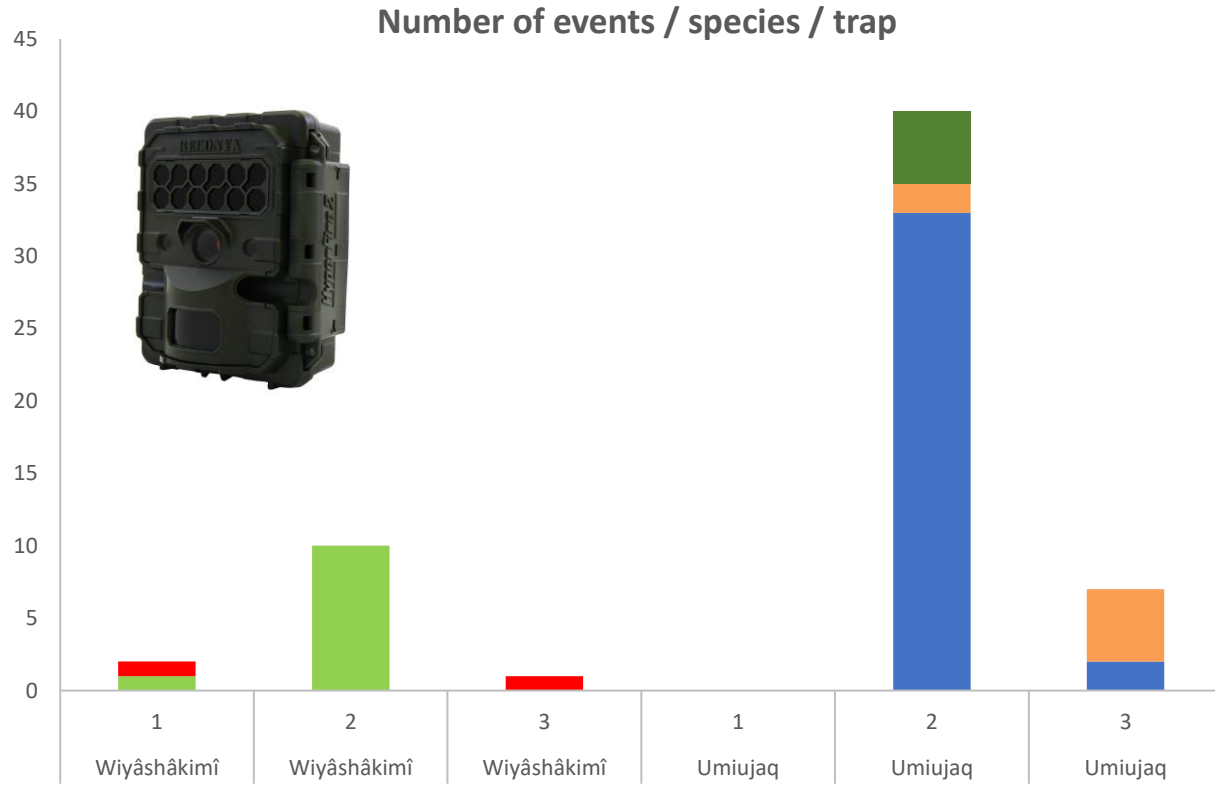
RESULTS



10 mammal species

Species	Kuujuarapik	Umiujaq				Wiyâshâkimî			
	Field	Tracks/Indices	Field	Audio trap	Photo trap	Field	Tracks/Indices	Audio trap	Photo trap
American black bear			X				X		X
Eastern deer mouse			X		X				
Eastern meadow vole	X		X		X				
Muskox			X		X				
North American beaver		X							
North American river otter							X		
Red fox			X		X				
Red squirrel	X					X			
Reindeer						X	X		X
Wolf							X		

A very low number of events! 10 mammal events / trap / year



2022-09-08 09:12:44

M 1/3

13°C



HYPERFIRE 2 COVERT



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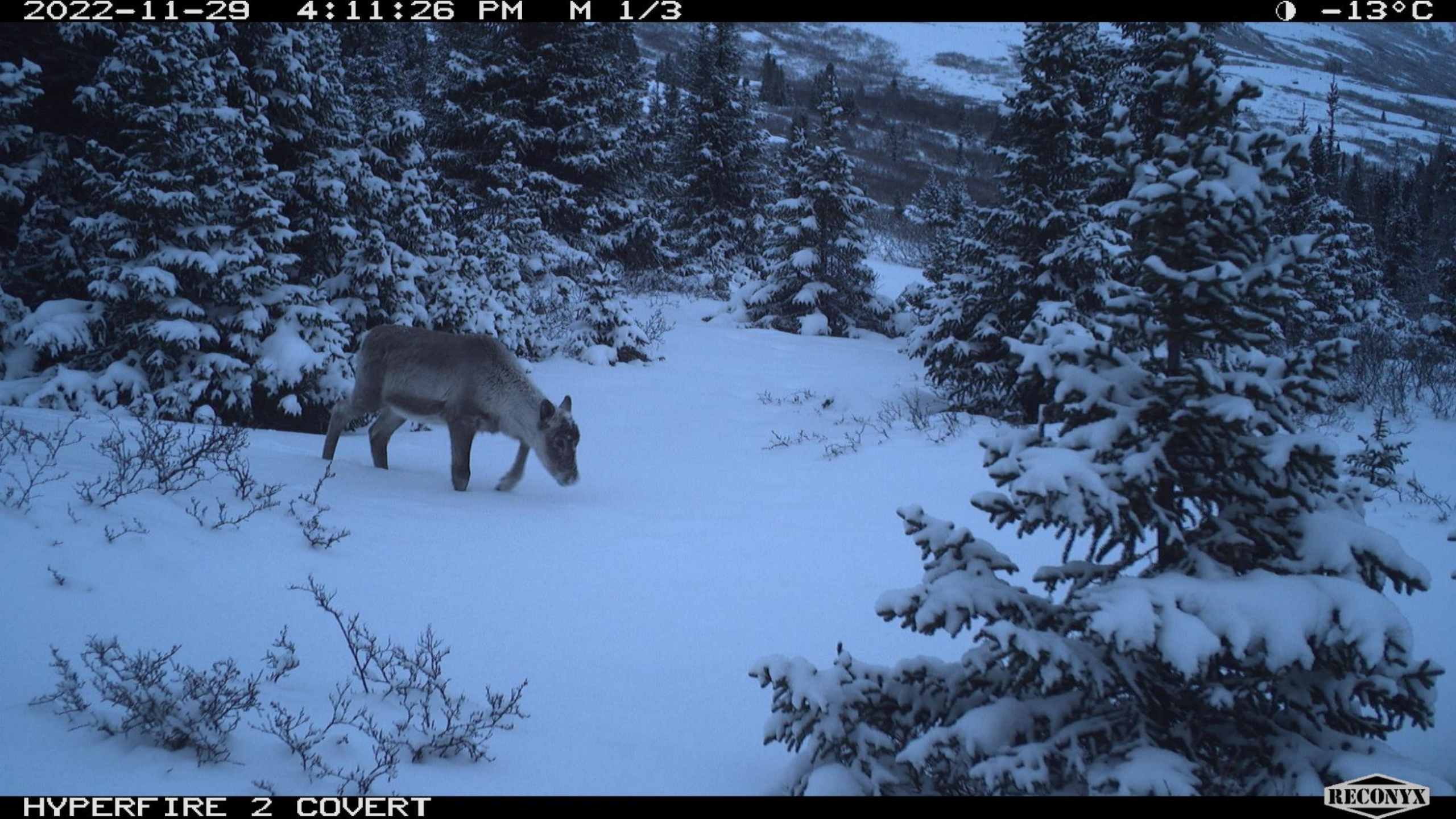
○ -11°C



HYPERFIRE 2 COVERT







2022-10-19 09:34:29

M 1/3

● -1°C



HYPERFIRE 2 COVERT









52 bird species

Species	Kuujjuarapik			Umiujaq			Vigāshākimi		
	Field	Field	Audio trap	Photo trap	Field	Tracks/Indices	Audio trap	Photo trap	
Alder flycatcher			X						
American crow	X	X	X						
American pipit		X	X		X				
American robin	X	X			X		X		
American tree sparrow		X	X		X		X		
Bald eagle		X							
Blackpoll warbler			X		X		X		
Boreal chickadee					X				
Canada goose					X		X		
Canada jay	X				X		X	X	
Common grackle	X								
Common loon	X	X			X				
Common raven	X	X		X	X		X		
Common redpoll	X	X	X		X		X		
Dark-eyed junco	X						X		
Fox sparrow	X	X			X		X		
Glaucous gull	X	X			X				
Golden eagle					X				
Golden-crowned kinglet							X		
Gray-cheeked thrush		X	X						
Great black-backed gull		X							
Greater scaup	X								
Green-winged teal		X							
Hermit thrush							X		
Herring gull	X	X			X				
Least sandpiper					X				
Lincoln's sparrow		X							
Merlin	X								
Mourning dove	X								
Northern harrier					X				
Northern pintail		X							
Northern shrike					X				
Northern waterthrush	X	X	X						
Orange-crowned warbler	X				X				
Pine grosbeak	X								
Red-breasted merganser					X				
Ruby-crowned kinglet	X						X		
Savannah sparrow	X	X			X				
Semipalmated plover					X				
Short-eared owl		X							
Spotted sandpiper		X							
Spruce grouse					X				
Tennessee warbler	X								
Tree swallow	X	X			X				
White-crowned sparrow	X	X	X		X		X		
White-throated sparrow	X	X							
White-winged scoter		X							
Willow ptarmigan			X				X		
Wilson's snipe		X	X		X				
Wilson's warbler	X								
Yellow warbler	X	X			X				
Yellow-rumped warbler	X				X		X		



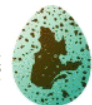
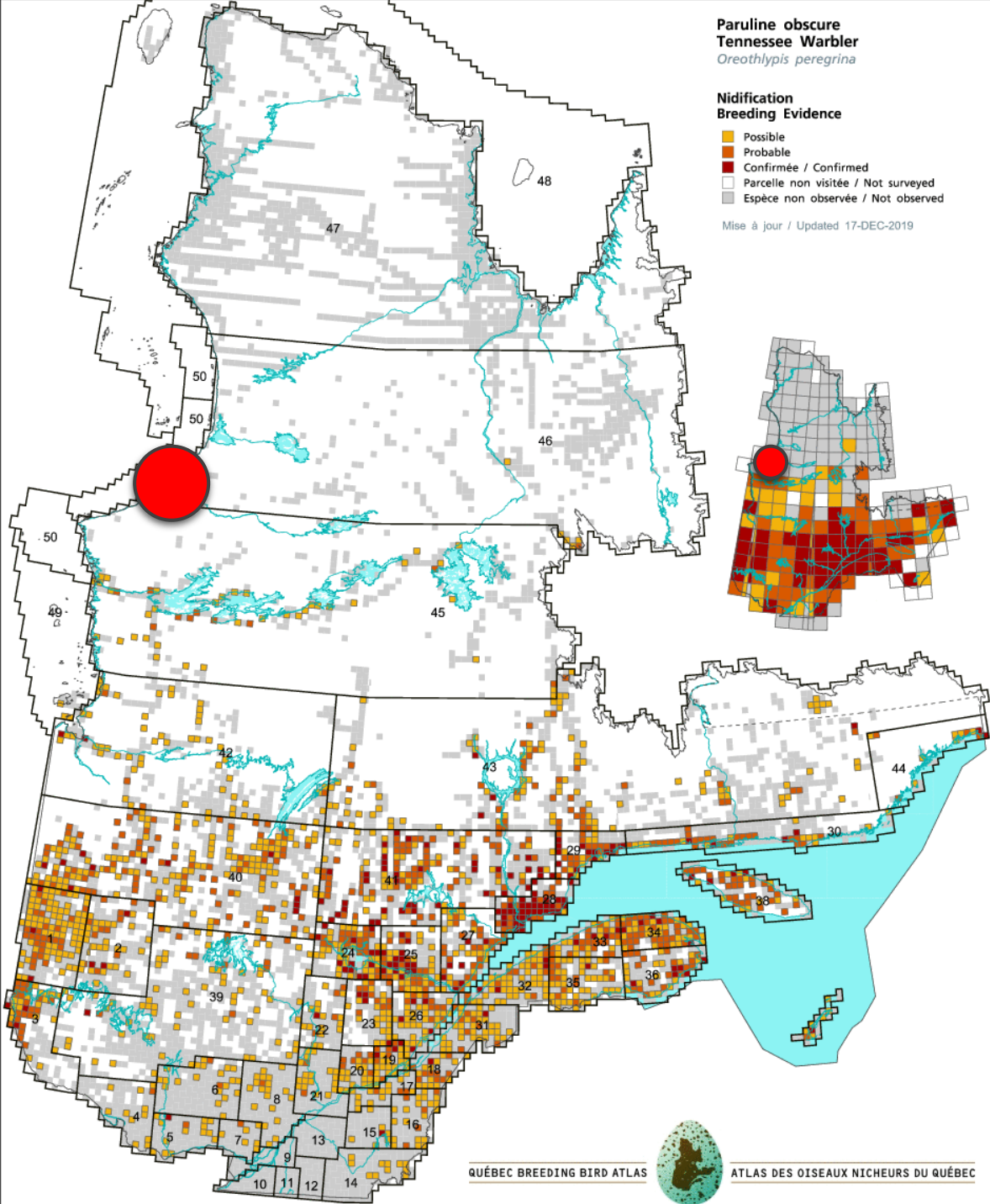
Different contacts of « southern » species

Paruline obscure
Tennessee Warbler
Oreothlypis peregrina

Nidification
Breeding Evidence

- Possible
- Probable
- Confirmée / Confirmed
- Parcelle non visitée / Not surveyed
- Espèce non observée / Not observed

Mise à jour / Updated 17-DEC-2019

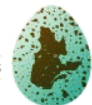
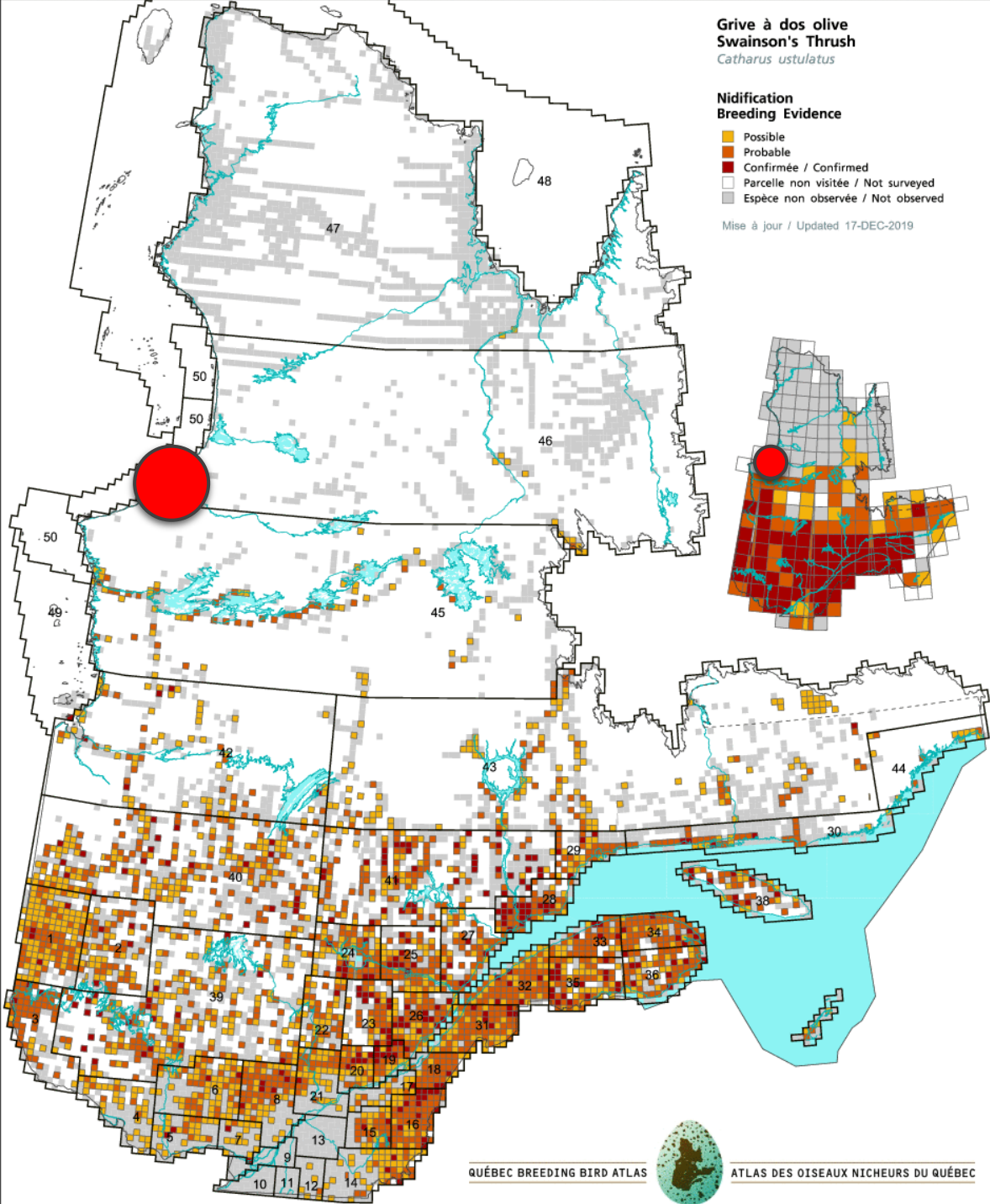


Grive à dos olive
Swainson's Thrush
Catharus ustulatus

Nidification
Breeding Evidence

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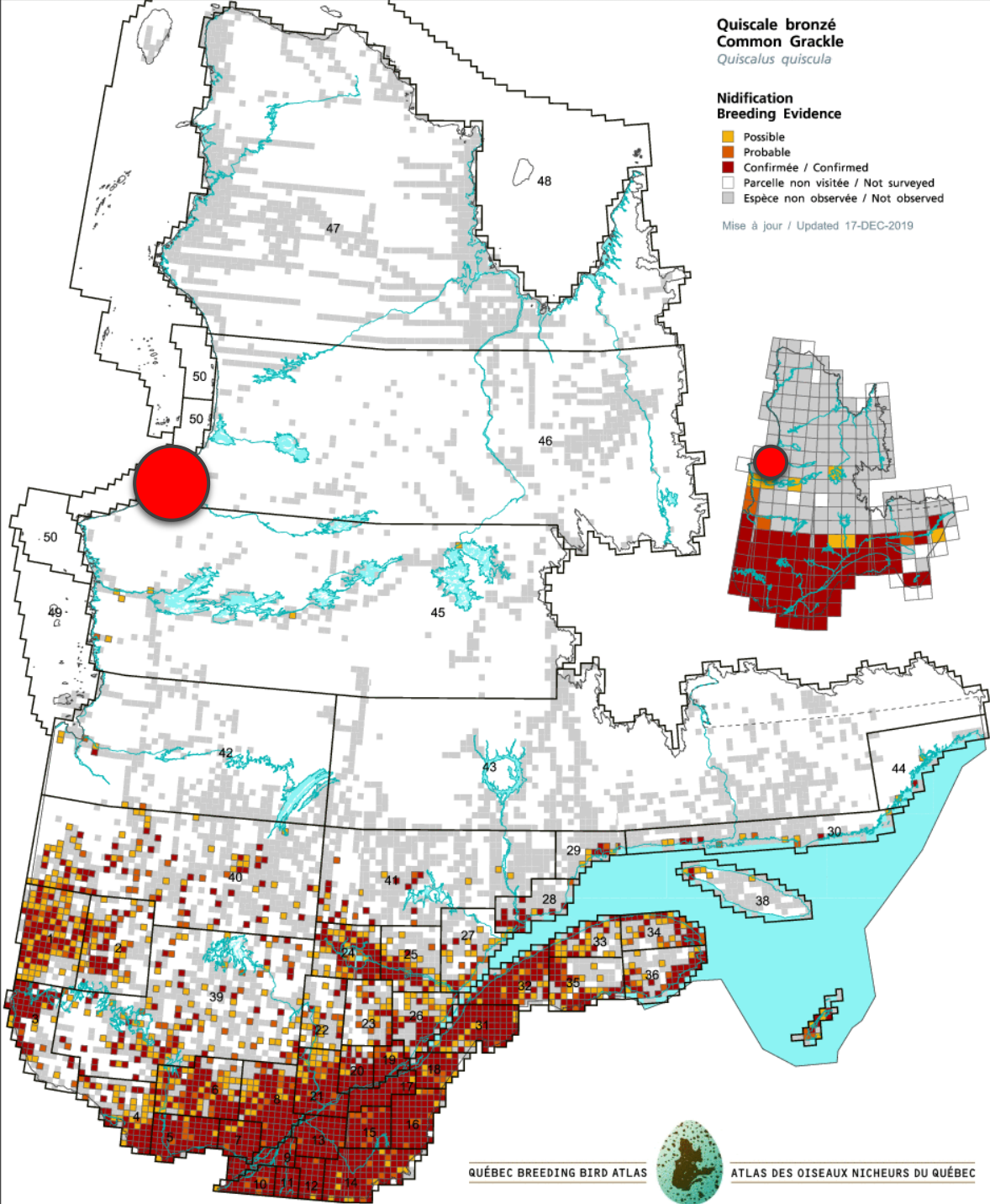


Quiscale bronzé
Common Grackle
Quiscalus quiscula

Nidification
Breeding Evidence

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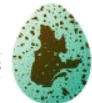
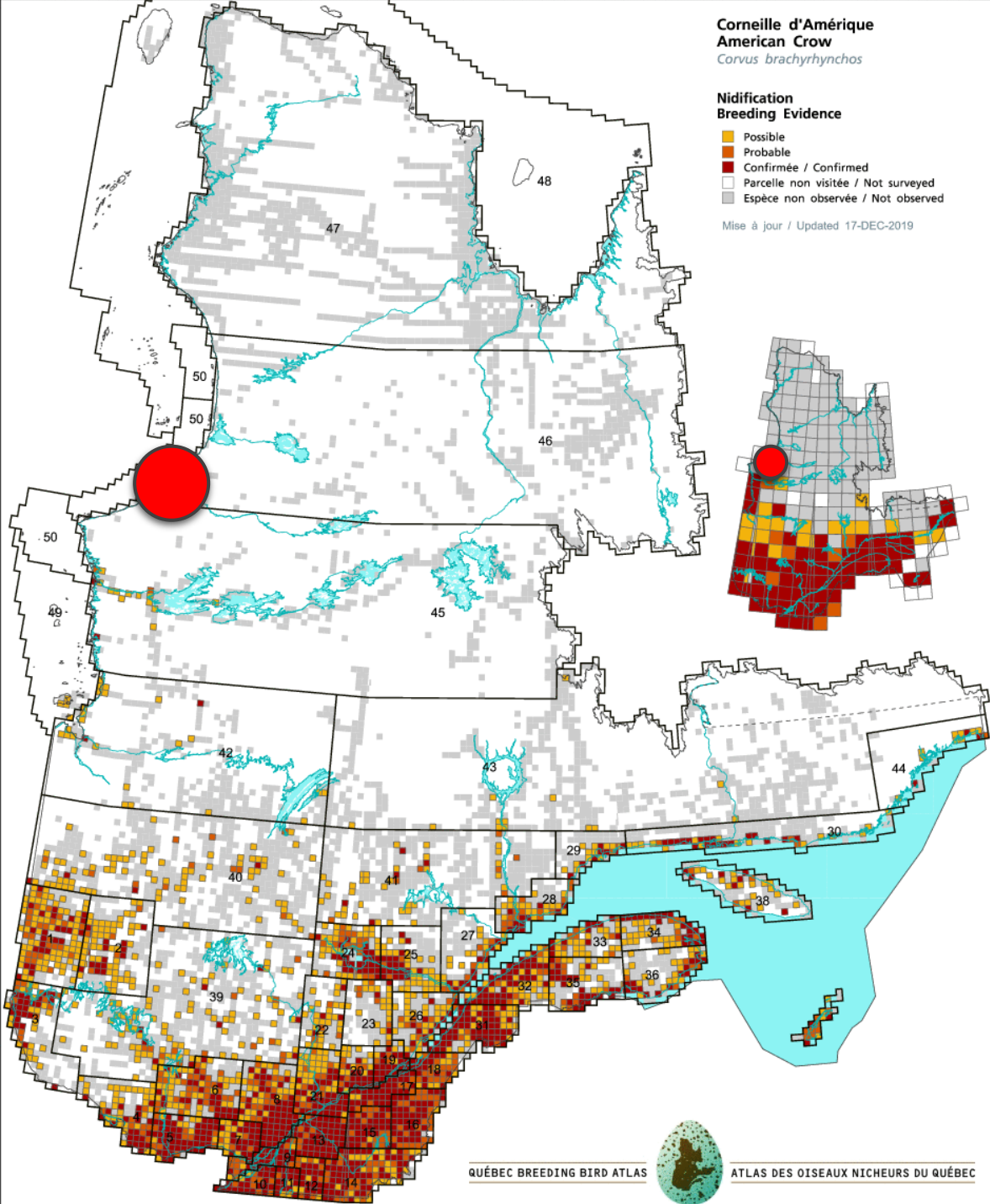


Corneille d'Amérique
Corvus brachyrhynchos

Nidification
Breeding Evidence

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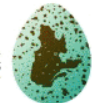
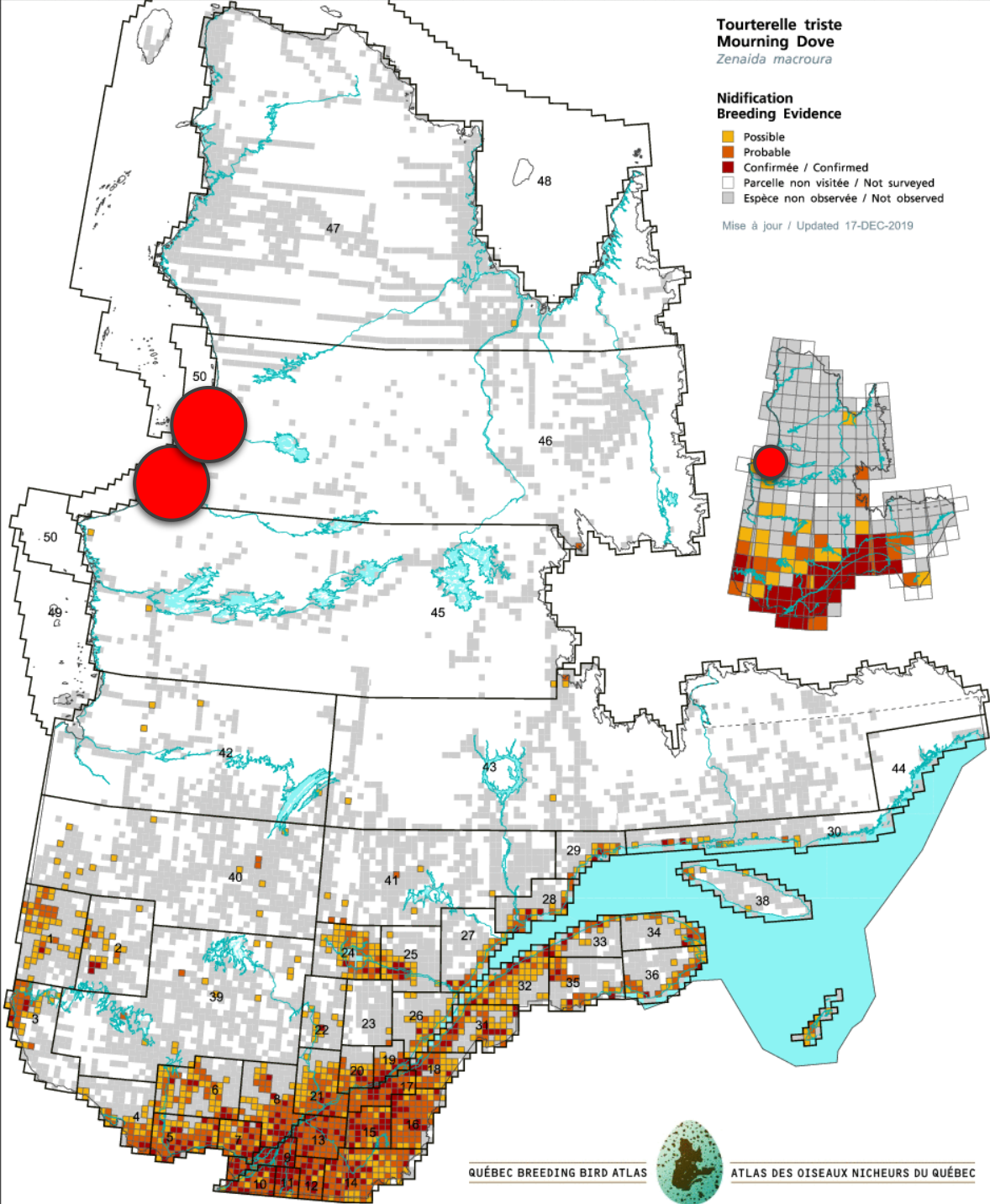


Tourterelle triste
Mourning Dove
Zenaida macroura

Nidification
Breeding Evidence

- Possible
- Probable
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Mise à jour / Updated 17-DEC-2019



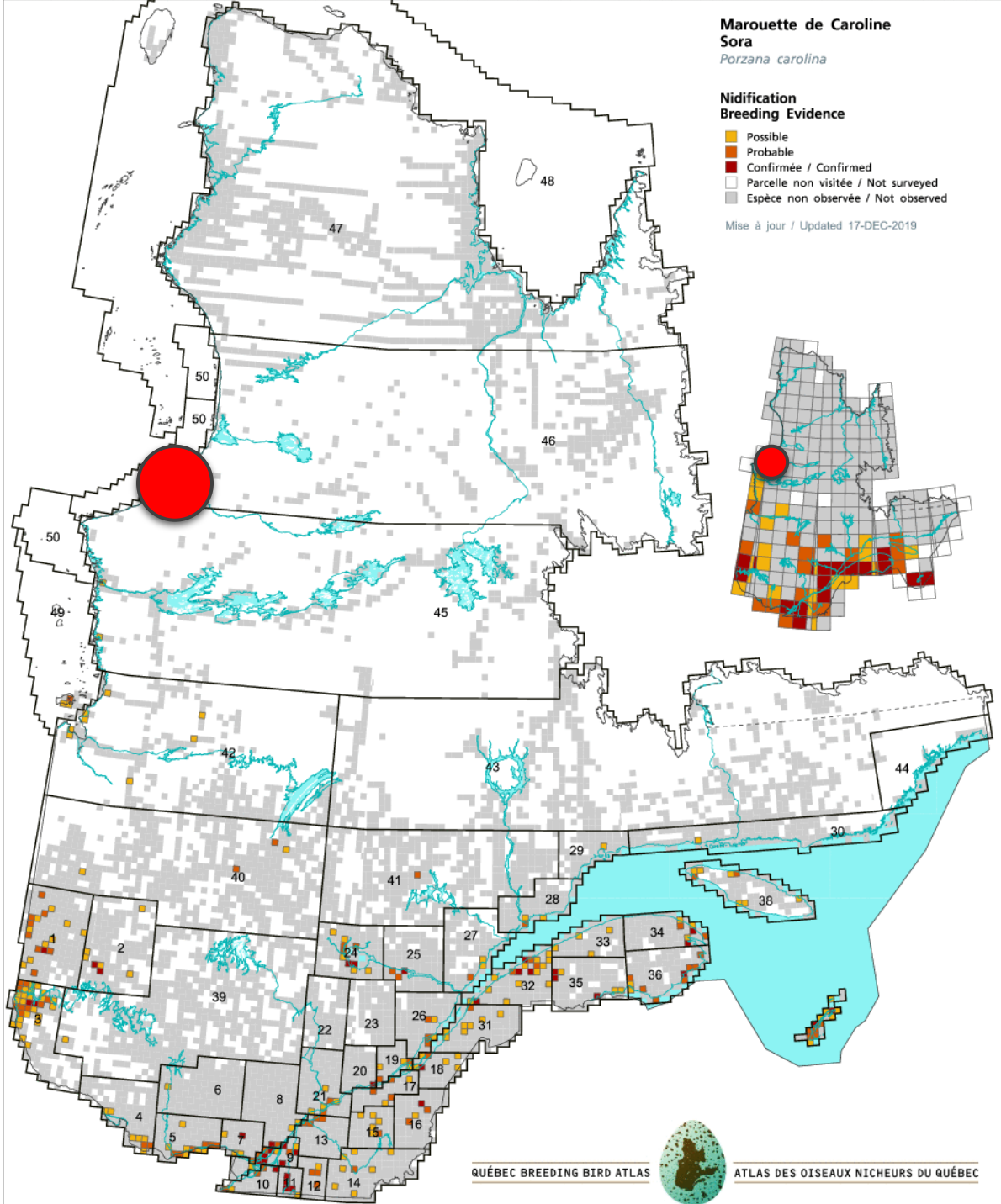
Marouette de Caroline
Sora

Porzana carolina

Nidification
Breeding Evidence

- Possible
- Probable
- Confirmée / Confirmed
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- Espèce non observée / Not observed

Mise à jour / Updated 17-DEC-2019



DAILY SONG CHRONOLOGY

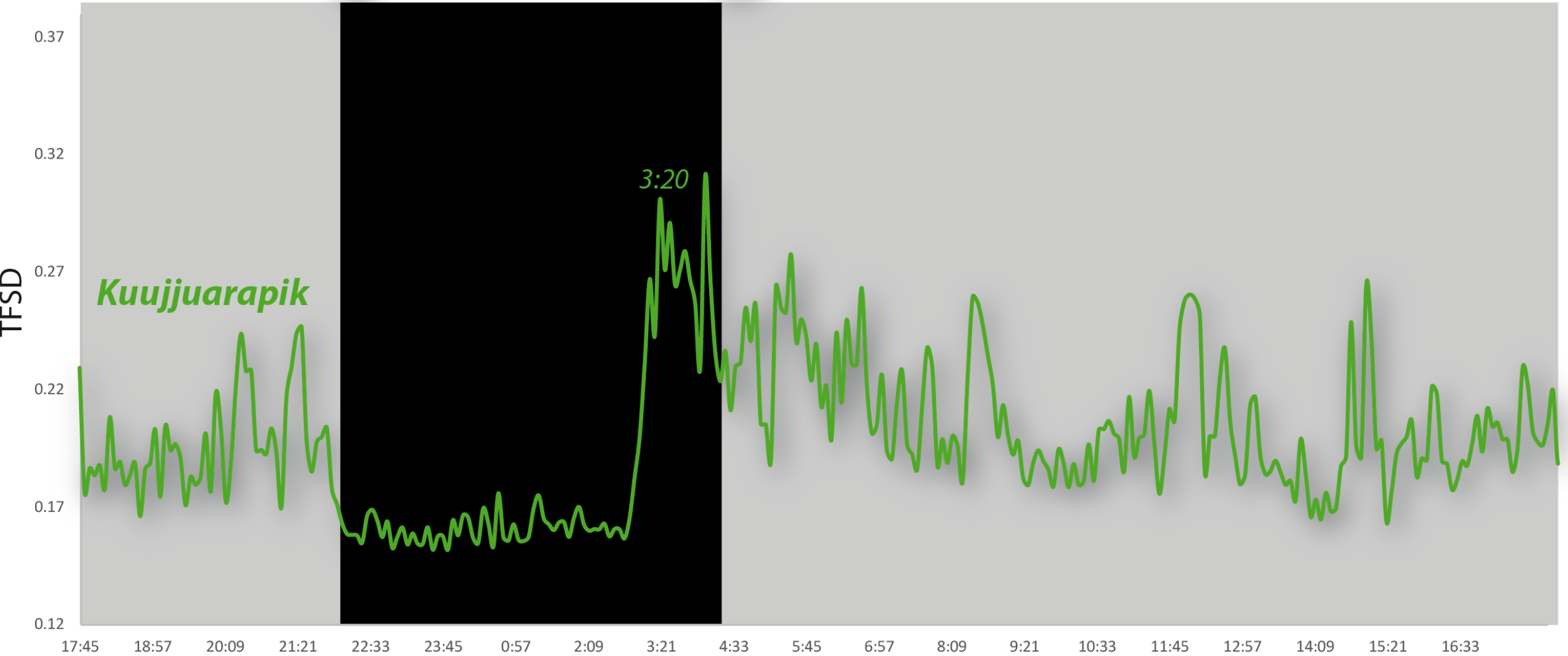
community approach



21:57



04:24

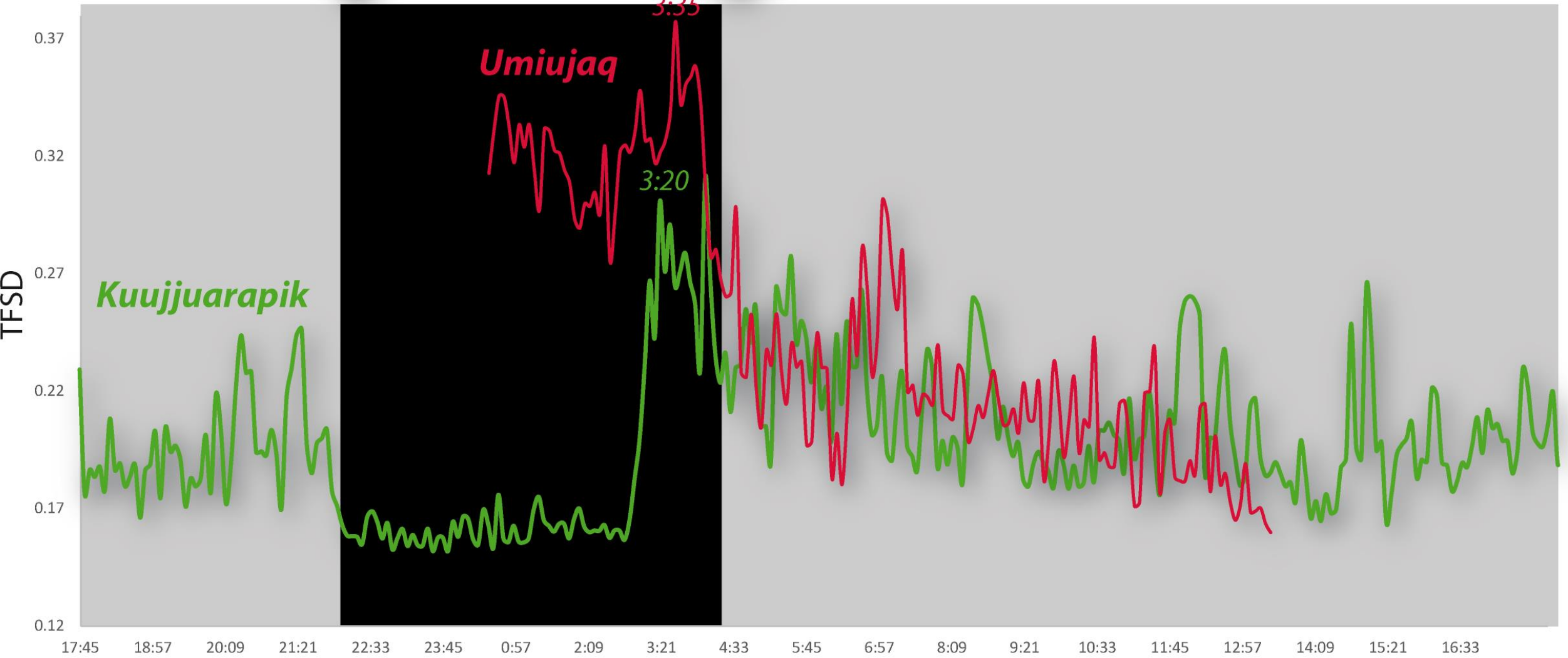


TFSD = Time Frequency Second Derivative. Frequent time variations within specific frequency bands, which are characteristic of tonal or harmonic sounds such as voices or birds (Aumond et al. 2017)

21:57



04:24



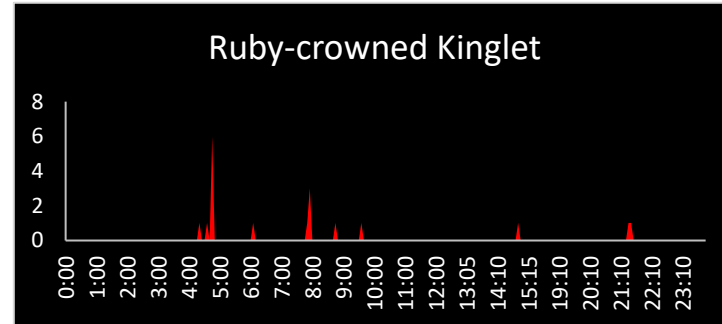
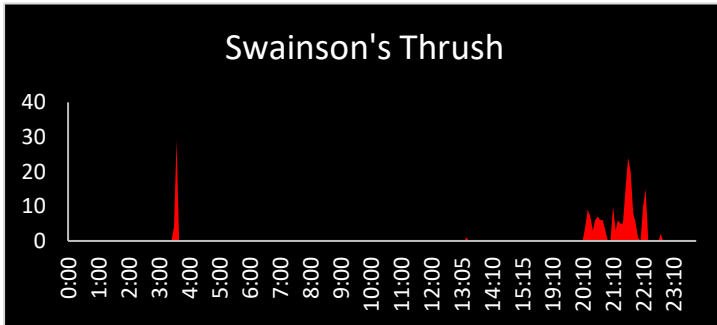
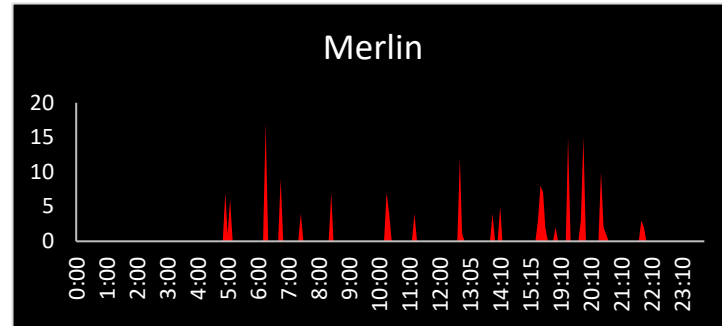
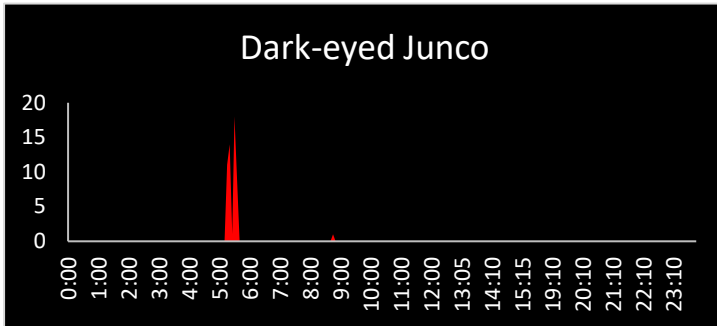
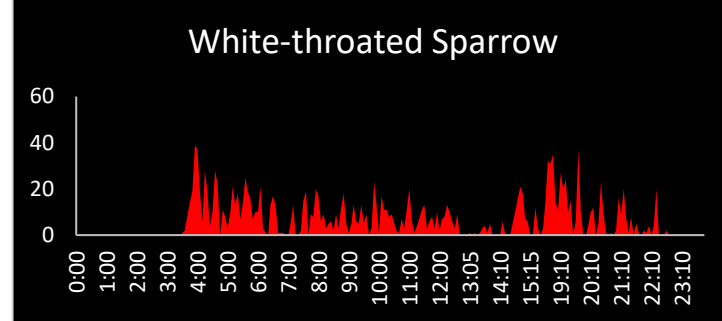
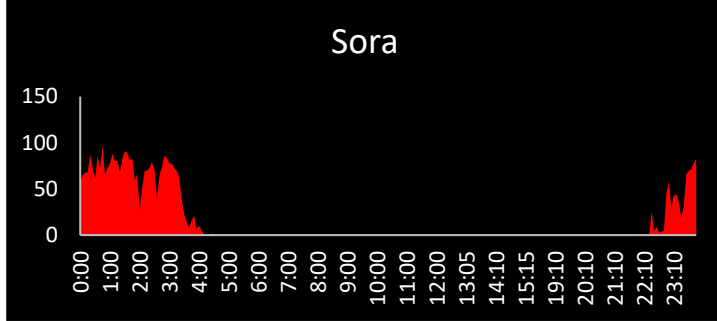
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DAILY SONG CHRONOLOGY

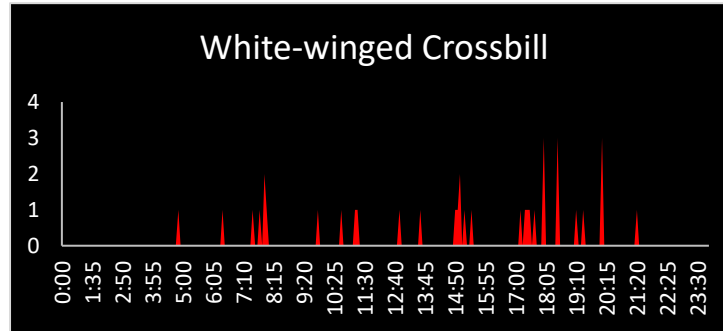
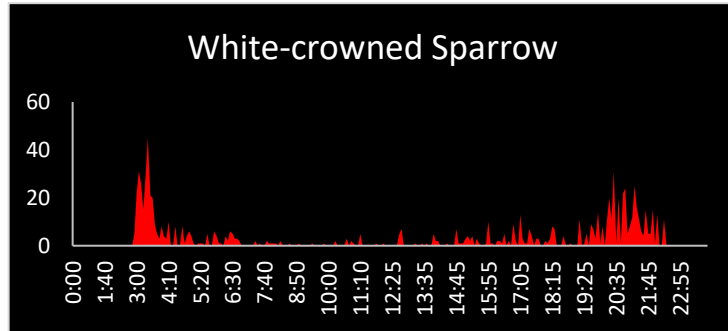
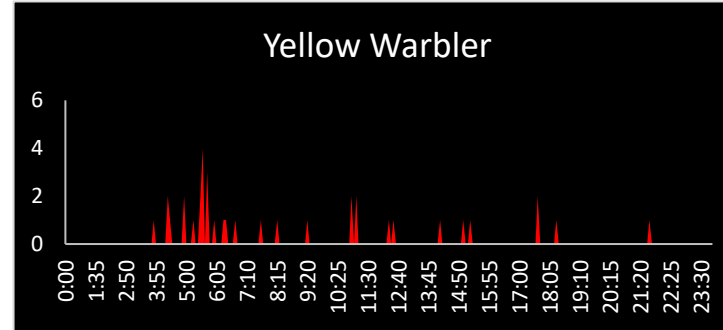
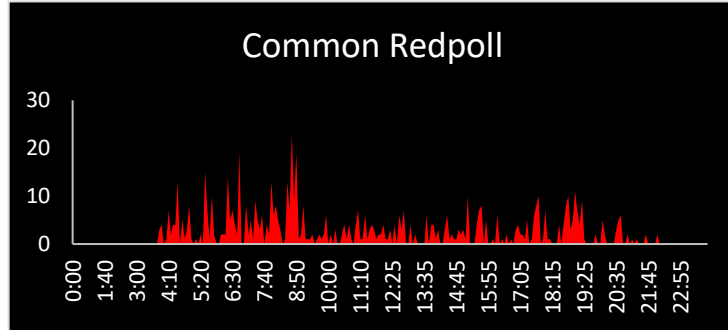
species specific approach



Kuujuarapik



Umiujaq

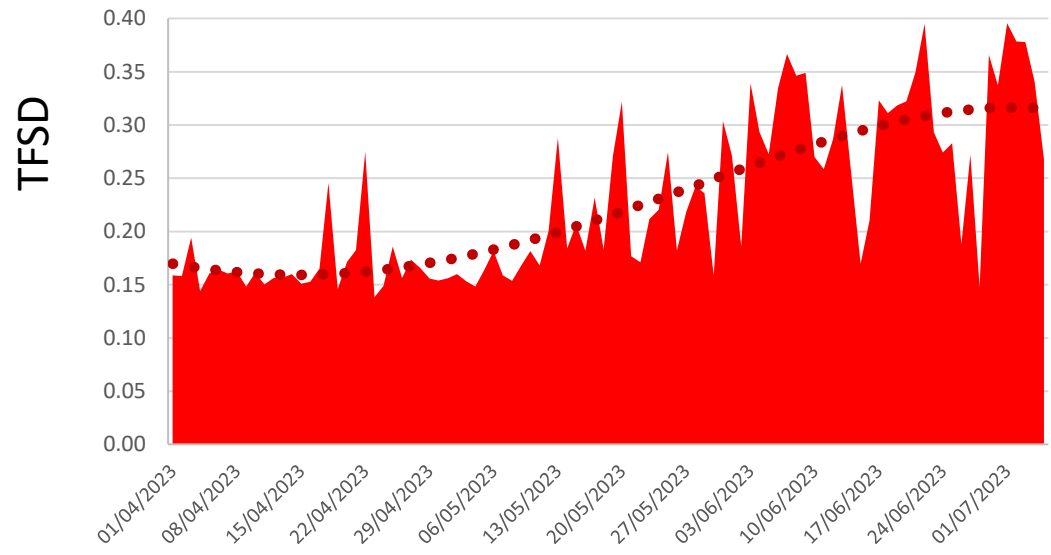


SEASONAL SONG CHRONOLOGY

community approach

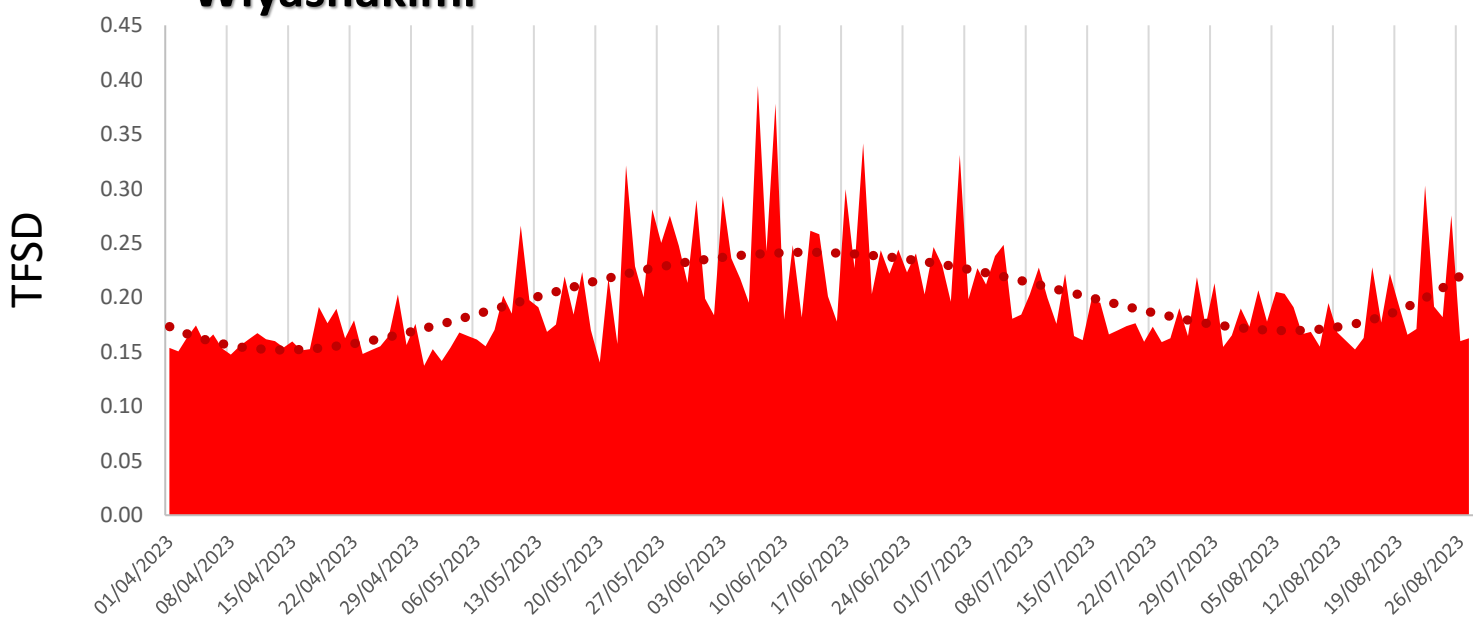
Umiujaq

TFSD



Wiyâshâkimî

TFSD



SEASONAL SONG CHRONOLOGY

species-specific approach

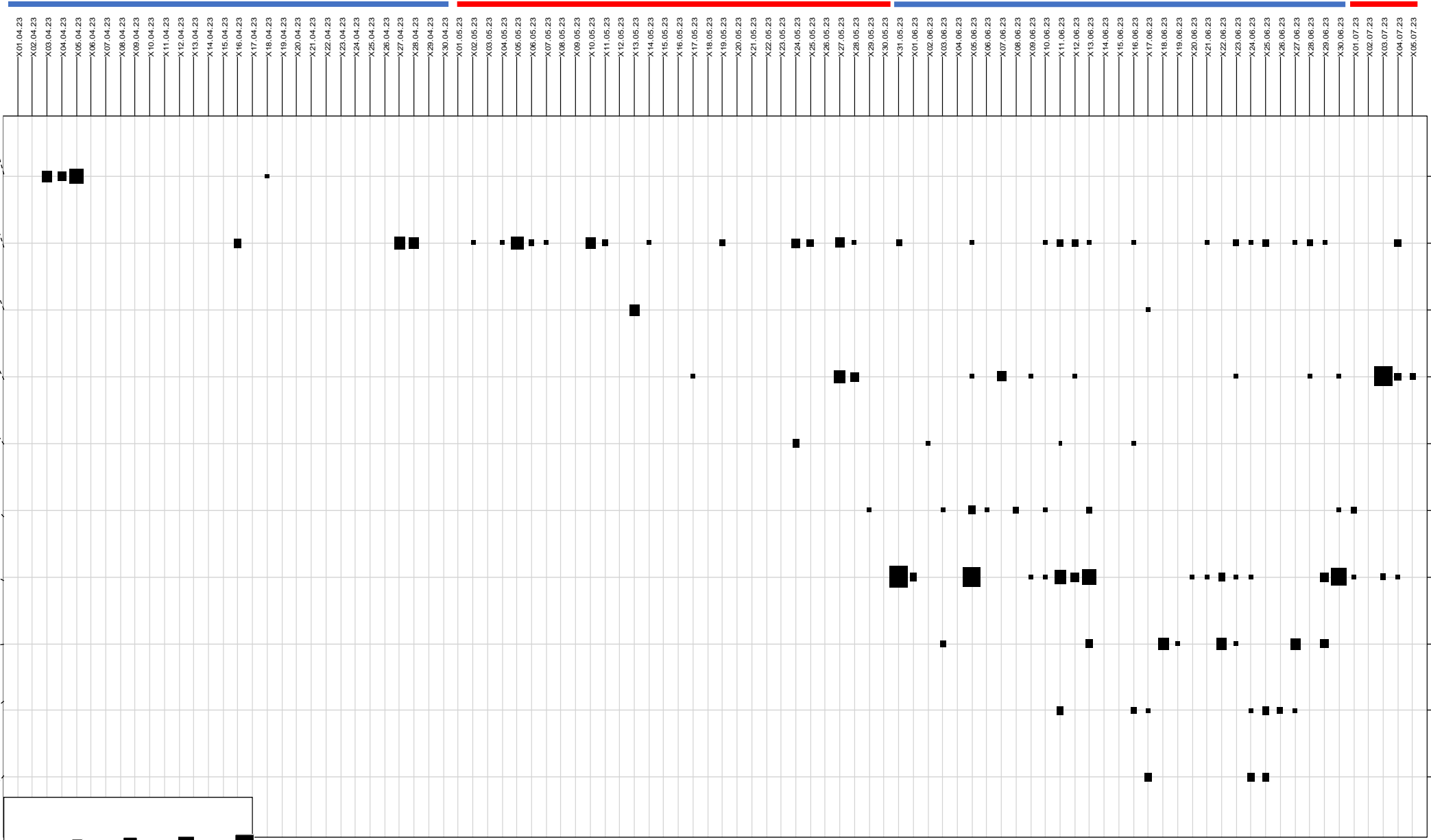
Umiujaq

April

May

June

July



2.5 ■ 7.5 ■ 12.5 ■ 17.5 ■ 22.5 ■

- Willow-Ptarmigan
- Common-Redpoll
- American-Tree-Sparrow
- White-crowned-Sparrow
- American-Pipit
- Northern-Waterthrush
- Blackpoll-Warbler
- Wilson's-Snipe
- Alder-Flycatcher
- Gray-cheeked-Thrush

DISCUSSION



FEASIBILITY

Audio traps and camera traps

- ✓ Batteries
- ✓ Memory cards
- ✓ Data quality

Data processing

- ✓ Photos: pre-treatment of photos via DeepFaune
- ✓ Audio: bioacoustic indices via SeeWave, pre-treatment via BirdNet
- ✓ Photos & Audio: time required for « manual » inspection ok

MAIN RESULTS

MAMMALS

Very low densities of mammals

Need for more camera traps

BIRDS

Surprises: southern species (Occasional / Regular? Fires? Under-prospection?)

Arrival dates of birds = ok! **Assessing impact of potential PRESS on is feasible**

Daily song chronology = ok! **Assessing impacts of potential PULSE on is feasible**

PERSPECTIVES



An audio trap of each CEN station?



2024: Three one-shot surveys

Daily bird song chronology according to press
(light / noise)

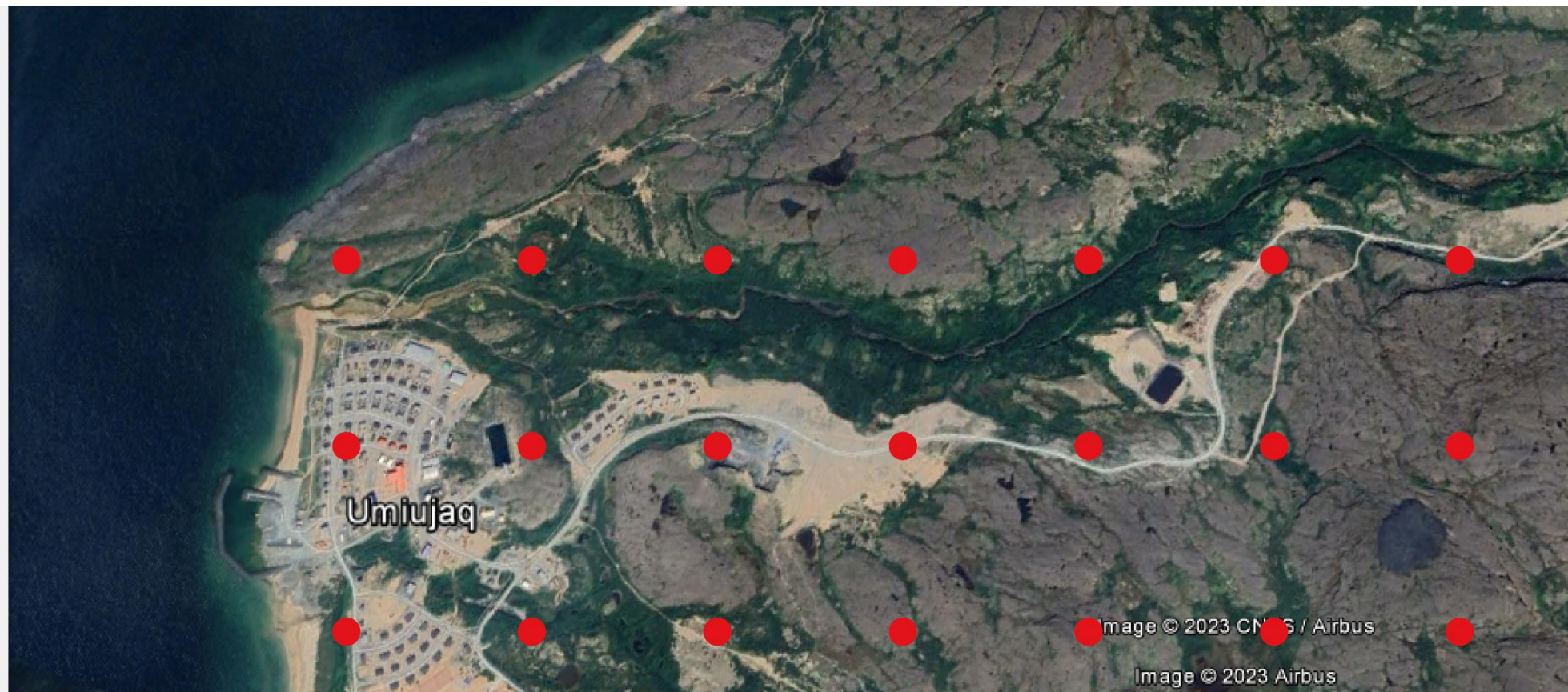


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Image © 2023 Airbus

Special thanks to....



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Isabeau Pratte



Armelle Decaulne



Vincent Filion



Jocelyn Benoit



Najat Bhiry



Pierrick Lefranc



Thank you for your attention!