

Supplementary Material

Spatiotemporal Variability of Fin Whale and Blue Whale Calls Detected by Land Seismometers Along the Lower St. Lawrence Seaway

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Other Supplementary Materials for this manuscript available on Zenodo (<https://doi.org/10.5281/zenodo.10028774>):

Table S2 Center time of fin whale and blue whale detections and calls, from land 6 seismometers (CNQ, ICQ, SMQ, SNFQ, PMAQ, RISQ) in the Lower St-Lawrence Seaway between February 2020 and January 2022:
WhaleDetectionsFeb2020Jan2022LSZ.mat

Table S3 Number of monthly a) fin whale detections and b) blue whale detections from October 2015 to January 2022. Empty cells indicate periods when stations were not operating. Quiet day detections are included here:
MonthlyBlueWhaleDetectionsOct2015Jan2022.csv
MonthlyFinWhaleDetectionsOct2015Jan2022.csv

Movie S1 Audiovisual representation of sample fin whale and blue whale calls recorded from land seismometers:
LSLSWhales.mp4

Folder with scripts used to detect fin whale and blue whale calls in seismic data, based on their characteristic recurrence interval, written by Alexandre Plourde and uploaded with permission:
MATLABWhaleDetectionCode.zip

	Fin whale	Blue whale
Primary spectrogram		
Frequency range (Hz)	12-32	10-32
Window size (s)	1	2
Overlap (s)	0.5	1
Number of frequency bins	48	48
Secondary spectrogram		
Period range (s)	7-35	40-180
Window size (s)	120	720
Overlap (s)	0	0
Number of period bins	128	128
Integration limits		
<u>Frequency (Hz)</u>		
f_1	18	16
f_2	21	18.25
f_3	12	10
f_4	17	14
f_5	23	21
f_6	32	32
<u>Time (s)</u>		
t_1	10	66
t_2	13.75	76
t_3	7	40
t_4	9.5	62
t_5	14.25	80
t_6	35	180
Classification thresholds		
<u>Detection</u>		
Minimum $W(t)$	3	1.5
<u>Active day</u>		
Detections per day	5	3
Minutes per day	10	36
SNR		
<u>Window length (s)</u>		
P_0	0.8-3.8	5-20
P_1	1	4

Table S1 Summary of values used in the detection method for each whale species.

Figure S1 Examples of spectrogram images from the MARS hydrophone that contains a) fin whale calls and b) blue whale calls, which were identified through visual analysis. These spectrograms are computed using a 1 s Hamming window with 50% overlap.

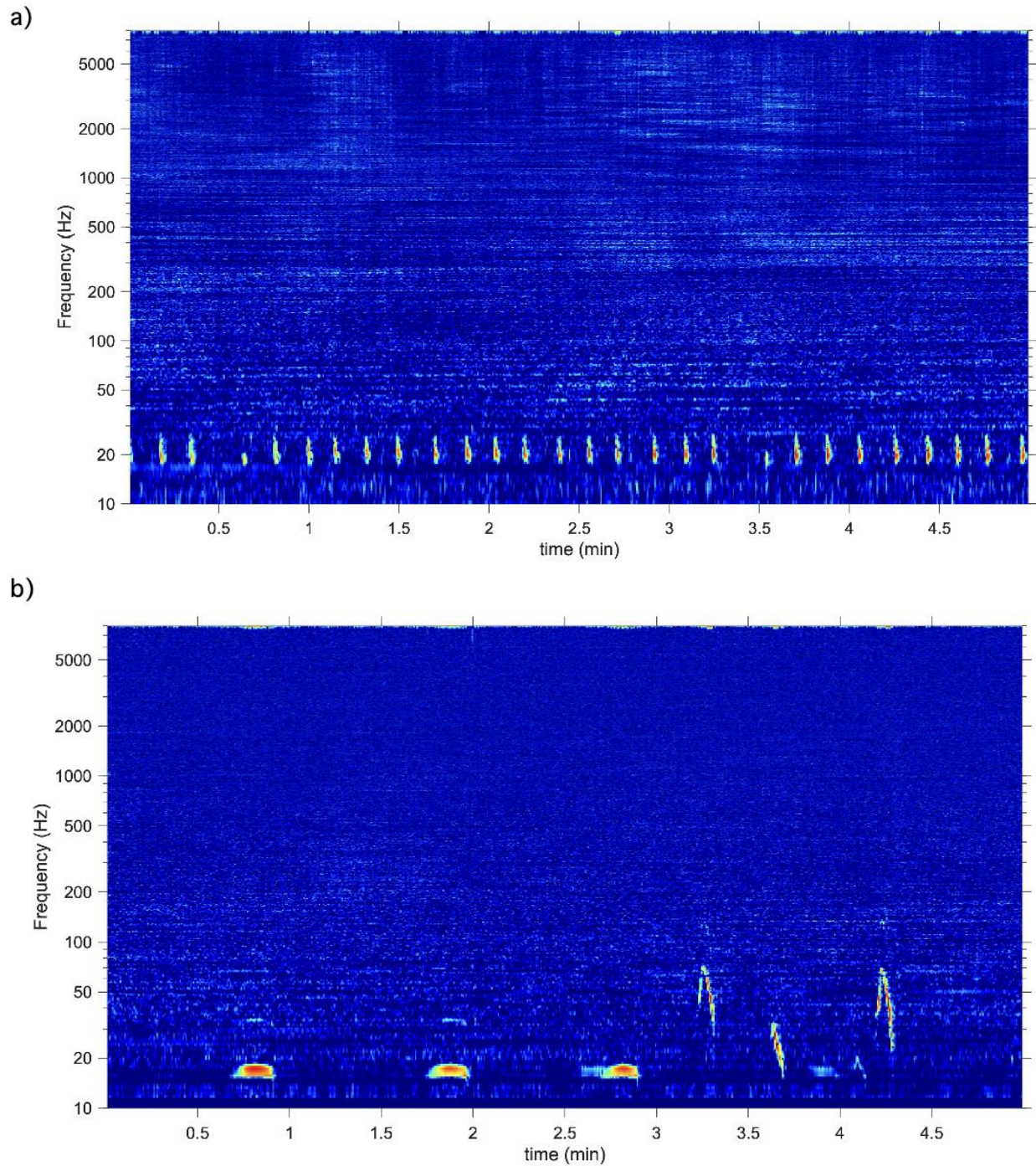


Figure S2 Distribution of a) Whale Call Index (R) and b) Signal-to-noise Ratio (SNR) values for each fin whale and blue whale call.

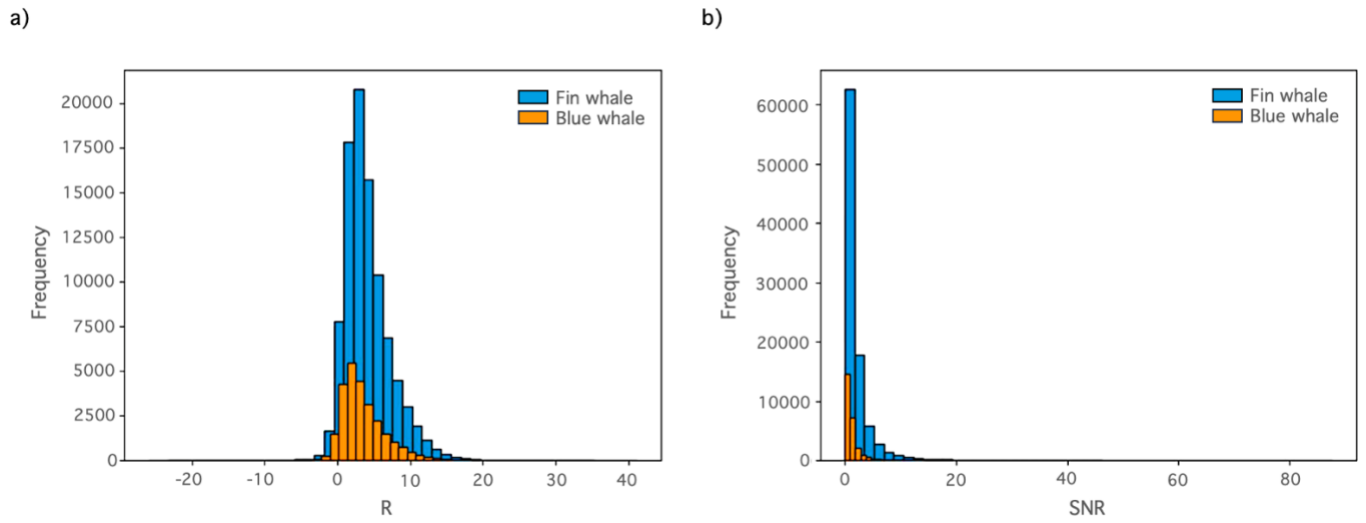
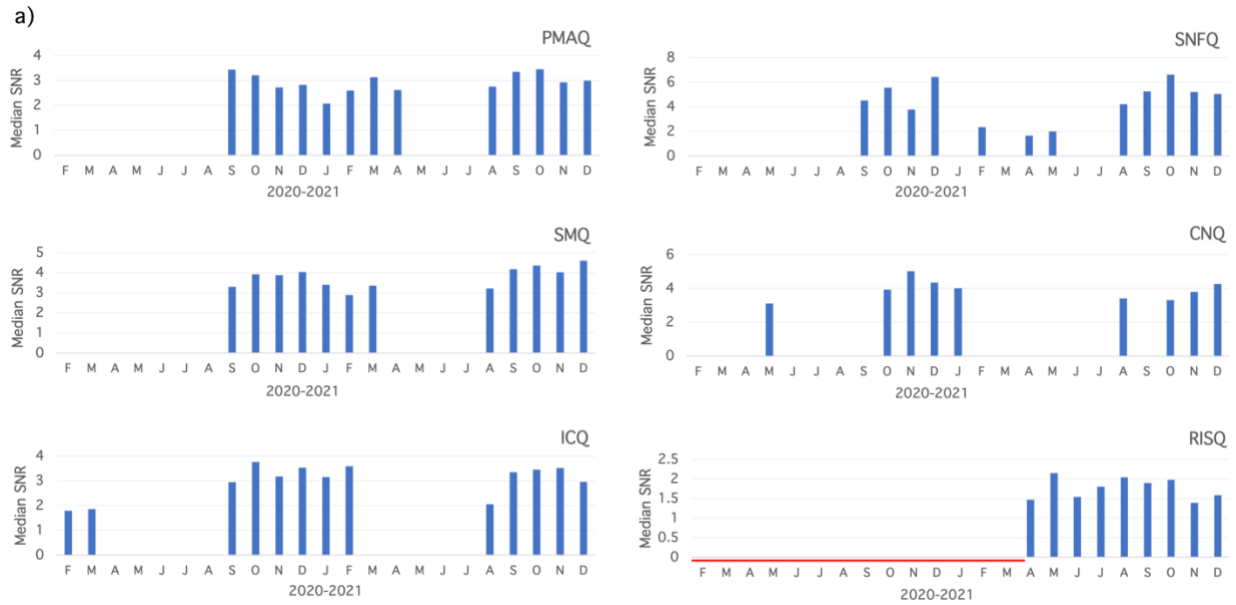


Figure S3 Monthly median SNR values of “active day” a) fin whale calls and b) blue whale calls plotted in Figure 4. Stations located in the Gulf are positioned on the left side and those in the Estuary are on the right. Note RISQ is only active starting in April 2021.



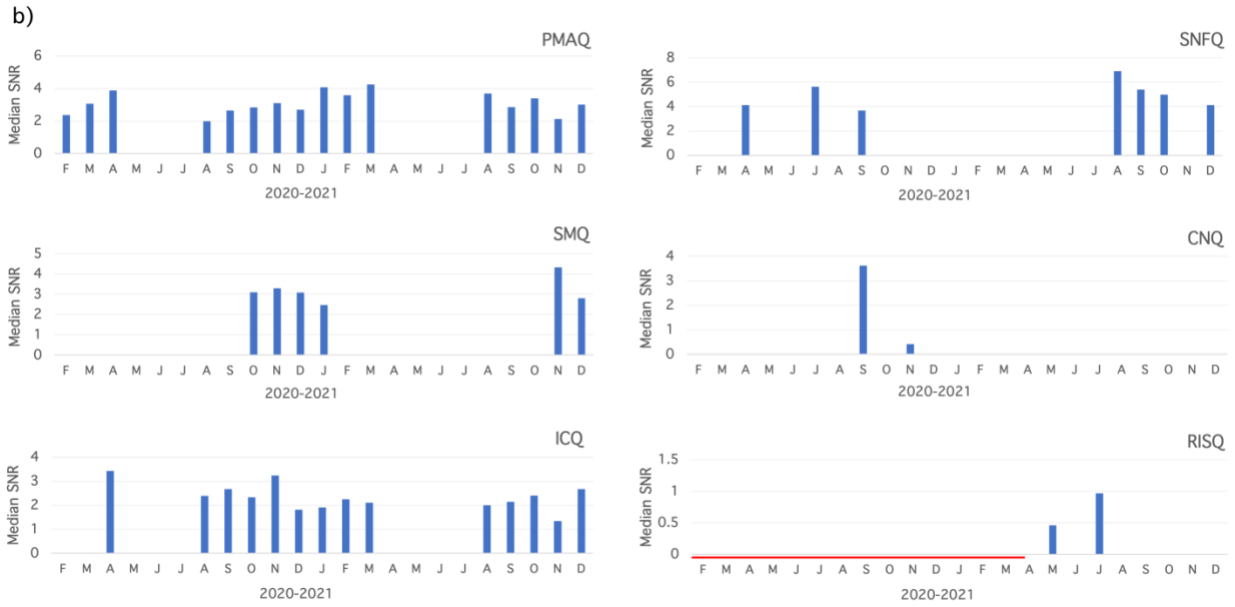
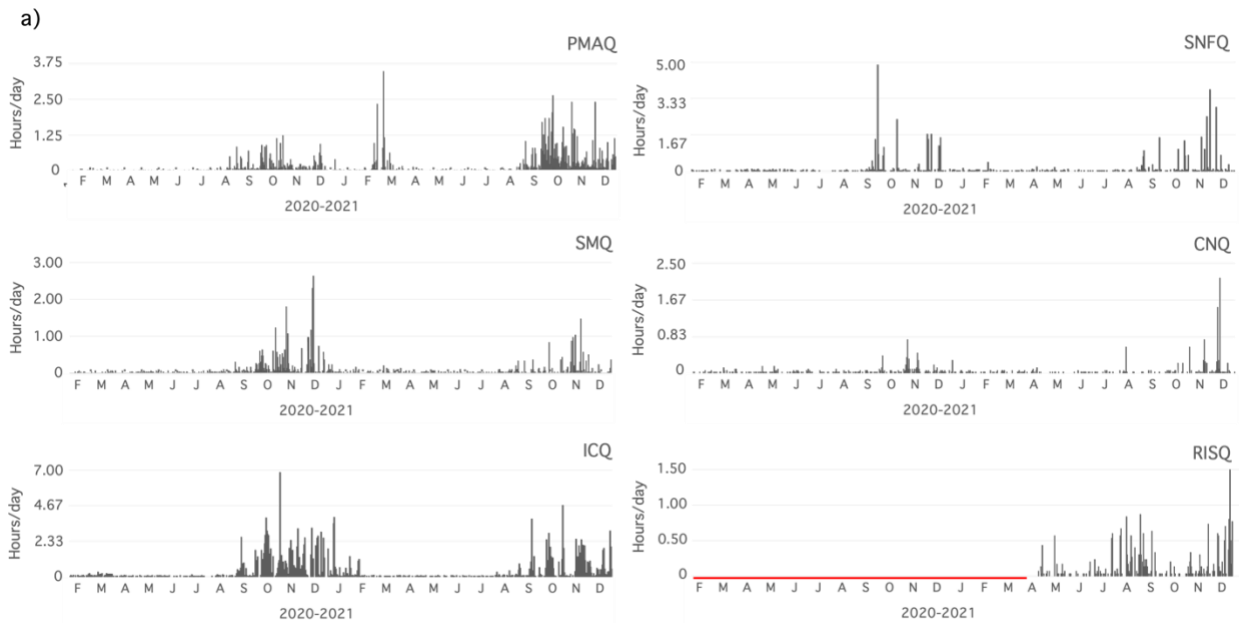


Figure S4 Monthly median SNR values of “active day” a) fin whale calls and b) blue whale calls plotted in Figure 4. Stations located in the Gulf are positioned on the left side and those in the Estuary are on the right. Note RISQ is only active starting in April 2021.



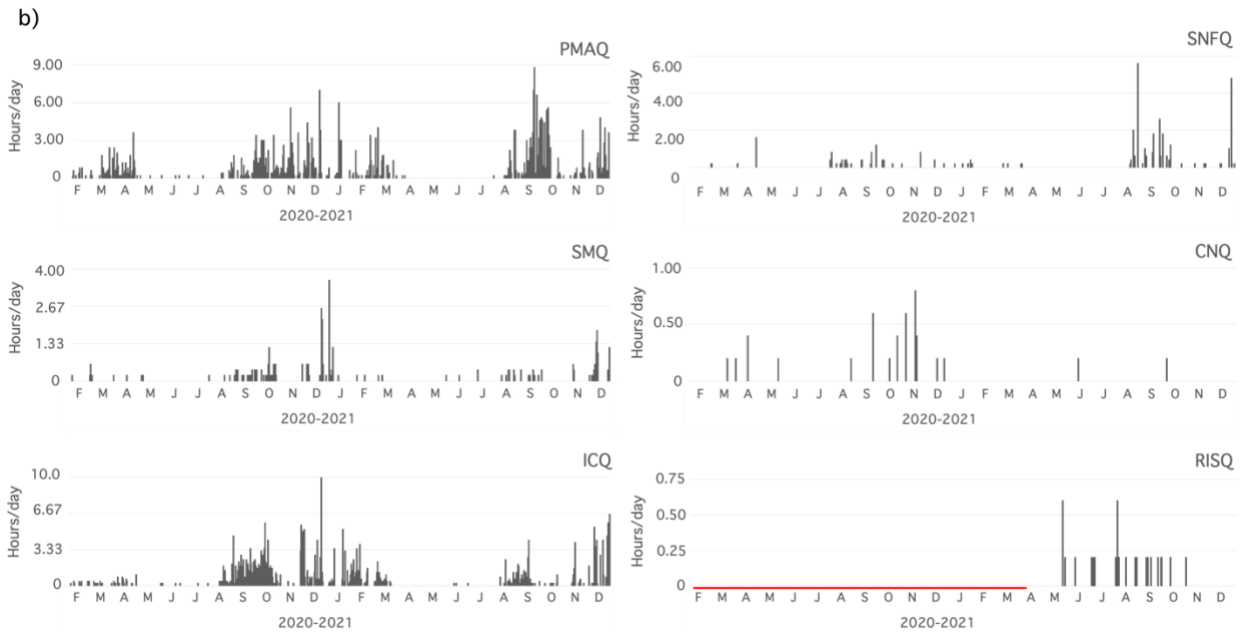


Figure S5 Summary of winter (September-April) and summer (May-August) median detections across all 5 common stations (CNQ, SMQ, ICQ, PMAQ, SNFQ) with continuous data between June 2018 and January 2022 (from Plourde and Nedimović (2022) and this study) for a) fin whales and b) blue whales. The central line on each box refers to the median, and the bottom and top edges of the box indicate the 25th and 75th percentiles, respectively. The whiskers extend to the maximum and minimum data points.

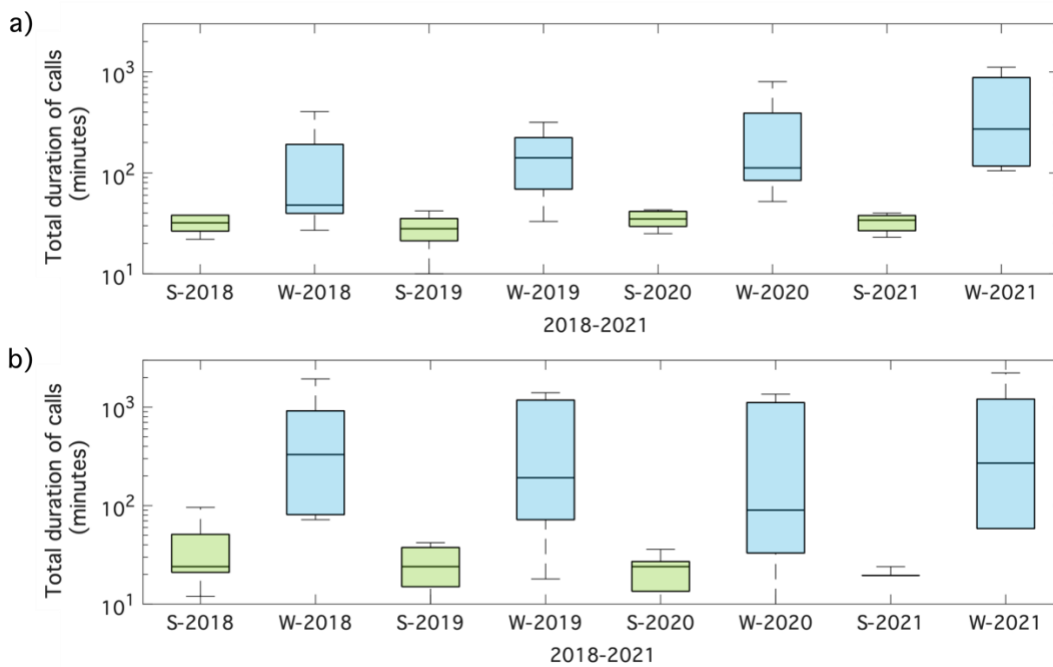


Figure S6 Distribution of blue whale presence and type of vocalization recorded at MARS hydrophone during August and September 2021. Red lines indicate inactive periods of the hydrophone.

