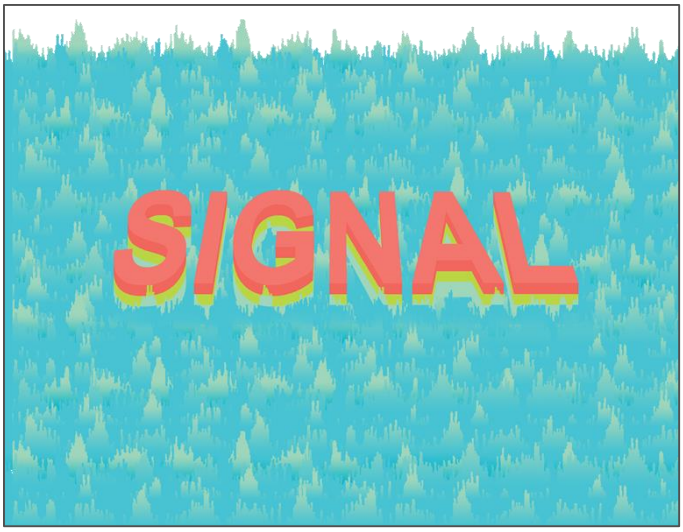
Receiver Noise Measurements

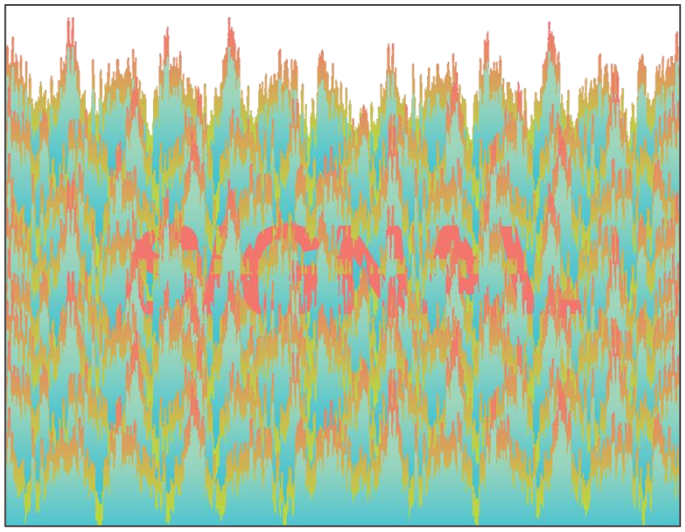
What is a Noise Measurement?

A noise measurement reported by a VR2AR or VR2Tx receiver is an instantaneous measurement of acoustic background noise near the receiver. Background noise has an effect on acoustic communication. Similar to a conversation in a crowded room, it is much harder to hear, or to be heard, when there's noise around you.

Acoustic noise in an area can make it more difficult for a receiver to detect a tag. The difference between the background noise level and the signal level is referred to as the signal-to-noise ratio (SNR). The examples below show how a larger SNR (on left) produces a clearer signal but when the SNR is smaller the signal can be lost (on right).



Large SNR – signal is easily heard over the noise.



Small SNR – signal is almost lost in the noise.

How Can I Use Noise to Help Position my Receivers?

The strength of a received tag signal is affected by a number of factors, for example tag power level (low or high), distance from receiver, interference in the water, and attenuation due to water conditions. For a given tag signal strength, placing a receiver in a location where there is less noise will help to improve the signal-to-noise ratio. VEMCO's new VR2AR and VR2Tx receivers have the ability to record average noise levels as well as min/max noise levels for a specified time period. (See user manuals for instructions on noise logging). If noise logging reveals that a deployment location may be unsuitable, then a comparison of noise levels at other deployment locations can be performed, and the least noisy location can be chosen.

What Causes a Location to be Noisy?

Noise can be caused by many factors in the environment such as tidal events, wind, biological noise (snapping shrimp, for example), boat noise, and construction, for example.

Can I measure noise without having to retrieve my receiver?

The VR100-200 surface unit with a VHTx (Transponding Hydrophone) can be used to request and display noise measurements without having to retrieve your receiver.

Can Noise be used to Determine Detection Range?

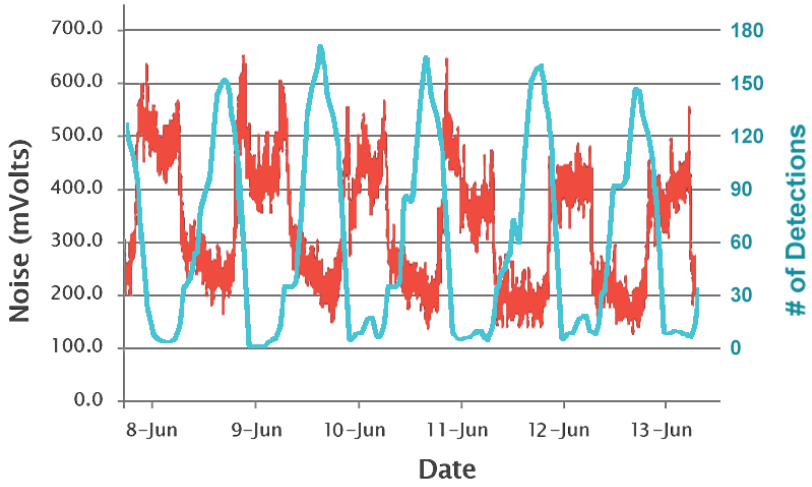
Noise is just one factor in tag detection success, therefore noise levels cannot be used to determine detection range. Knowing the noise level in a study area can help identify relatively quiet deployment locations and can aid in determining if noise in the area impacted the number of recorded detections.

> Noise is just one element in tag detection. Range testing should always be performed prior to starting a study.

How Can Noise Measurements Help with Interpreting Detection Data?

Knowing the noise level in an area can help you interpret your data. In some cases, high noise levels can explain why a lower than expected number of detections were recorded.

In the example shown here, data were collected near a coral reef that had excellent detections during the day and almost no detections at night (blue line). A look at the noise data showed the noise levels rose dramatically at night (caused by snapping shrimp on the reef). In this case, moving the receiver a short distance away from the reef dramatically improved the night-time detection numbers. In other cases, if a receiver can't be moved, just knowing that the noise was there can help to answer the question of why the number of detections were lower than expected.



How Noisy is Too Noisy?

Noise is not the only challenge acoustic signals face. What is considered "too noisy" can vary depending on other factors such as water turbidity, distance from the receiver, and tag power level. A particular noise measurement might be "too noisy" in one location, but the same measurement may not be "too noisy" in a different location. With this in mind, the graph below illustrates some general rules of thumb for predicting how well a receiver will detect tags given different levels of background noise.

Challenging (High Noise): *Very few, if any, detections are expected. Typically 650 – 950 mV.*

Moderate to Challenging: *Detections are expected. Detection range may be reduced. Typically 300 – 650 mV.*

Very Good to Good (low noise): *Many detections are expected. Typically less than 300 mV.*