

## ACOUSTIC THERMOGRAPHIC OFFSHORE MONITORING (ATOM™)

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For more information on how we can help with your next offshore monitoring project, contact:

Julia Robinson Willmott  
352.327.3262  
jwillmott@normandeau.com

[www.normandeau.com](http://www.normandeau.com)

Informed decision-making for offshore projects is constrained by available data on bird and bat activity in the offshore environment. This paucity of data and resulting uncertainty creates challenges for environmental assessment and permitting for offshore wind projects. Acoustic and Thermographic Offshore Monitoring (ATOM™) is designed for offshore studies of birds and bats. It enables species-level identification of detections essential for species-specific regulatory drivers such as the Endangered Species Act and the Migratory Bird Treaty Act. ATOM can be used for preconstruction studies and postconstruction monitoring.

### What is ATOM?

ATOM is a rigorously tested and commercially available monitoring system for birds and bats at offshore project sites. It is designed for remote, self-powered operation on a large marine buoy or on fixed platforms, such as wind turbines or meteorological towers. ATOM collects thermographic, visible light, ultrasonic, acoustic, and VHF data and can be designed to continuously collect data (day and night) in all weather conditions and seasons.

### ATOM Specifications

- **Marine weatherized**—Rugged housing and camera wiper system
- **Multiple sensors**—Two stereoscopic thermal cameras, visible-light camera, acoustic microphone, ultrasonic microphone, dual-band CTT VHF receiver with Yagi and omnidirectional antennas
- **Data storage**—Single solid-state hard drive system with a backup spinning hard drive that can store up to one year of data
- **Data transmission**—Live data streaming is possible with suitable internet connection; straightforward manual data download is possible when sufficient internet speed is unavailable and may be accomplished by O&M staff after brief training
- **System health checks**—Automated status messages on hard drive space, detectors, voltage, and temperature



ATOM on a buoy



ATOM on a turbine platform

- **Remote login**—Enables modification of data collection parameters and checks on system health; done through a satellite modem

## Field of Detection

Originally designed to detect within the rotor swept zone of wind turbines (typically 200 m), ATOM collects acoustic data within that area depending on target vocalizations, ambient noise, and environmental conditions.

Thermographic and visible-light cameras can detect targets at distances within and above the rotor swept zone depending on the size of the targets. VHF receivers with Yagi antennas can detect targets out to ≈15 km, and omni-antennas can typically detect targets out to ≈1.5 km.

## Data Collection and Species Identification

For bats, the species, direction, speed, and altitude can be determined with ATOM's thermographic and acoustic data. For birds, species are identified by sound and measurements taken from the thermographic and visible light data. Each thermographic detection includes the timestamp, altitude, direction, and speed. The thermographic, visible light, and acoustic data together can determine how many birds are in a flock, along with the date, time, and season. The VHF receiver can provide ancillary presence species-specific information on tagged animals in the turbine/tower/buoy vicinity.

## Type of Information Collected by ATOM

	Thermographic (Birds/Bats)	Visible Light	Ultrasonic (Bats)	Audible (Birds)	VHF Receiver
<b>Nightly Passage Rate</b>					
Targets	Yes	No	Yes	Yes	Yes <sup>d</sup>
Species or Taxon	Yes <sup>a</sup>	No	Yes <sup>c</sup>	Yes <sup>c</sup>	Yes <sup>d</sup>
<b>Daily Passage Rate</b>					
Targets	Yes	Yes	Yes	Yes	Yes <sup>d</sup>
Species or Taxon	Yes <sup>a</sup>	Yes <sup>b</sup>	Yes	Yes <sup>c</sup>	Yes <sup>d</sup>
Altitude	Yes	No	No	No	No
Speed	Yes	No	No	No	No
Direction	Yes	Yes	No	No	No
Size	Yes	Yes	No	No	No
Seasonal Variation	Yes	Yes	Yes	Yes	Yes <sup>d</sup>

<sup>a</sup> Species or taxon specific identifications are possible when thermographic, sound timestamps, or visible light camera images overlap or when species or taxa have distinct body forms and sizes.

<sup>b</sup> Species identification varies depending on lighting, visibility, and distance of the camera to the target. Simultaneous acoustic detections improve identification of targets.

<sup>c</sup> Species identification based on acoustics depends on call quality and ability of software or analysts to differentiate between similar calls of different species.

<sup>d</sup> Individuals must be tagged with VHF tags for detections to occur.

