Review of Night Vision Technologies for Detecting Marine Mammals from Vessels at Sea

Program ID 1757

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Introduction

Numerous visual devices are available for nighttime detection but few have been empirically tested at sea with marine mammals and sea turtles. Detection of these animals is critical to their safety and welfare during shipping, vessel transit and exposure to underwater sounds.

Method

We combined a literature review with field data to determine which devices are most effective at detecting species presence to at least 500 m from a vessel at sea during darkness. Consideration was given to device used, species, distance from observer, ambient conditions, relatiave cost, and at-sea effectiveness.

Fifteen *devices* were compared from literature reviews.

Four *methods* were compared using data (*n*=146 detections) collected in 2018-19 by certified Protected Species Observers (PSO) monitoring offshore US Atlantic wind development activities: unaided eye (UE), external deck-mounted Seiche infrared (IR) camera, Scout handheld infrared (HH IR), and Gen III PVS-7 night vision goggles (NVD).

Recommendation

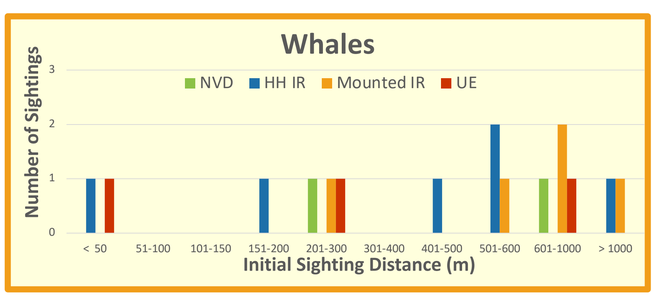
Undertake a controlled test to simultaneously measure detection rates with UE plus multiple IR/NVD devices, under various conditions, in high-density animal areas.

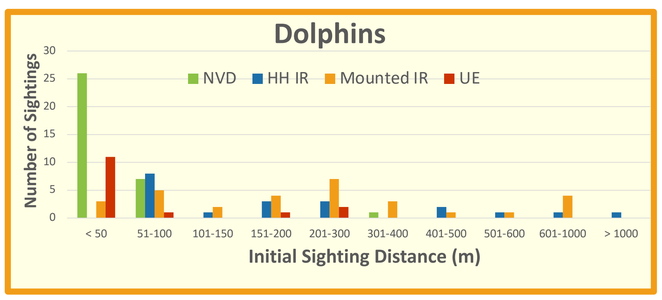
Take Away

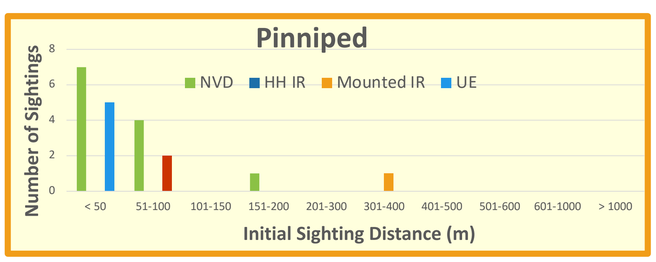
Within 500 m sighting distance, a *combination* of methods is most effective for visually monitoring marine mammals from vessels during DARKNESS.

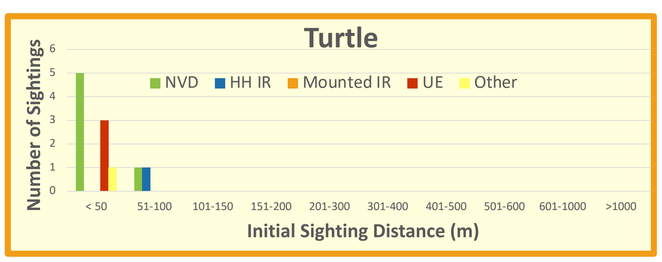
Effectiveness depends upon device, distance, species, and ambient conditions.

DO NOT use - this is a placeholder until we decide whether to use one!









Results – Best Performance

Different methods perform best at different distances. At ≤ 100 m UE detection rates are similar day/night.

During darkness: NVD performs best <200 m, HH IR < 400 m, and mounted IR 200+ m. Baleen whales are detected farther than dolphins, dolphins farther than pinnipeds/sea turtles (the latter detected nearly exclusively ≤100 m).

A combination of methods/devices is recommended, depending on the distance, species, and conditions.

...By Distance

< 100 m	UE (in lights), NVD
100-200 m	NVD, HH IR
200-400 m	Mounted IR, HH IR
400-500 m	Mounted IR

...By Condition

Vessel Lights	UE, HH IR
Bright Moonlight	UE, NVD, HH IR
Very dark	Mounted IR, HH IR
Fog (at dewpoint)	No IR devices work well
Low Beaufort	All
High Beaufort	Mounted IR

...By Species

Whales	< 200 m: UE, HH IR
	> 200 m: Mounted IR
Delphinids	< 200 m: UE, NVD
	> 200 m: Mounted IR
Pinnipeds	UE, NVD (usually < 100 m)
Sea Turtles	UE, NVD (usually < 100 m)

Contact

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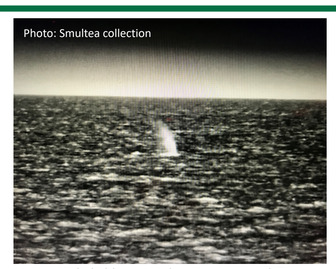
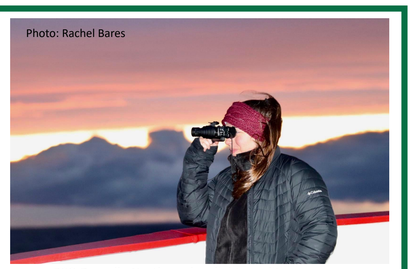
PSO M. Tanski using NVDs on board a vessel.

Mounted IR camera onboard vessel.

PSO L. Burhans detects dolphins at night with deck-mounted IR indoor display.



Whale blow at night using mounted IR.



PSO Danielle Nestler in low light conditions