	Fisheries and Oceans Canada **Central & Arctic Region** **STANDARD OPERATING PROCEDURE** **SOP-FWI-ACC-17**	
TITLE:	**Procedures for use of drones for observation of marine mammals**	
EFFECTIVE DATE: 24 September 2019	REVISION DATE: NOV 2021	
APPROVED BY:	**Freshwater Institute Animal Care Committee**	

PURPOSE: **To provide instructions for the efficient and safe use of drones for observation of marine mammals**

POLICY: **To meet or exceed the standards as set out in the CCAC Guide on the Care and Fish in Research, Teaching and Testing**

SCOPE

This procedure applies to all scientists, technicians, students, animal care and veterinary staff at the DFO Central & Arctic Region Freshwater Institute. Visitors to the laboratory facilities must follow the biosecurity protocols.

Responsibilities

Animal Care Committee is responsible for:

- Review and approval of FWI Animal Use Protocols and Management Procedures for animal use (FWI-ACC Chair: Michelle Wetton-Salo)
- Taking action if procedures are misused. (See Section 3.0, FWI-ACC Terms of Reference)

DFO Central & Arctic Region FWI-ACC Veterinarian is responsible for:

- Support in the review process of Animal Use Protocols.
- Advice on health and disease management for research fish.
- Provision of training and advice on use of anaesthetic drugs and prescriptions as required.
- Use of professional judgement in determining if research users of animals demonstrate competency to perform procedures; taking action to address unnecessary pain or distress of animals.

Division or Responsible Managers have overall responsibility for:

- Ensuring that personnel are aware of and understand the policy/procedure.

All FWI Personnel that use drones for study of marine mammals are responsible for:

- Familiarizing themselves with this policy/procedure;
- Obtaining training for this procedure prior to conducting it unsupervised.

Use of drones for observation of marine mammals

Background

The increasing use of drones for field research on marine mammals has resulted in the need for the development of standard operating procedures, or a set of guidelines, to minimize disturbance to animals. The response of marine mammals to the presence of a drone is dependant on a number of factors, including the size and type of drone, the operating altitude, the method of operation, and the species of marine mammal. Even within a species, different populations or individual animals may exhibit different levels of tolerance dependent on past experiences. For example, a population that has historically been subject to intense hunting pressure may be more easily disturbed than another population. Given the wide range of factors that influence animal response to drones, defining acceptable operating procedures is challenging. Ultimately the onus is on the field researchers to recognize excessive levels of disturbance and to cease or modify their drone operations accordingly.

UAS Systems

The disturbance from drones on marine mammals comes from two main effects: noise and visual cues (Smith et al. 2016). The different types of drones can be broadly classified into two categories: fixed-wing (FW) and vertical takeoff and landing (VTOL) systems. Fixed-wing systems can be categorized as either long endurance or short endurance fixed-wings, where long endurance systems are used for aerial surveys over large areas while short endurance systems are limited to smaller survey areas (Fiori et al 2017). In general, fixed-wing systems are larger than VTOL systems though they are generally flown at higher altitudes and faster speeds. VTOL systems have the ability to hover at low altitude over a fixed position, making them ideal for photo-id and photogrammetry applications, though likely increasing the potential for animal disturbance through prolonged exposure and close-proximity.

Observed Behavioural Response

Studies that have systematically documented the effects of drones on marine mammals are relatively uncommon and much of the available information is reported anecdotally, observed while carrying out other research objectives (Smith et al. 2016). With so little information available, researchers are encouraged to take a precautionary approach, especially for objectives that require operations at lower altitudes (Fettermann et al. 2019, Hodgson and Koh 2016).

Fixed wing systems are generally reported to be flown at altitudes between 100 and 300 m with no obvious disturbance to marine mammals (Smith et al. 2016). One study reported a FW operating altitude of 60 m with no behavioural responses from Stellar sea lions (Fritz 2012).

Large whales (such as humpbacks, bowheads, blue whales, gray whales, sperm whales) are generally undisturbed by the presence of drones at low altitudes, showing no behavioural responses at altitudes as low as about 10 m (see Smith et al. 2016). No behavioural responses were shown from killer whales with a VTOL system operating at 30-35 m (Durban et al. 2015) and bottlenose dolphins showed minimal response at altitudes greater than 30 m (Ramos et al. 2018). VTOL systems have been regularly used on beluga whales in Cook Inlet, Alaska at approximately 22-23 m (NOAA) and have also been used on narwhal at 10-15 m altitude with no obvious reaction (DFO unpublished). Studies reporting VTOL drone operations on pinnipeds covered a wide range of altitudes (5-50 m) with varying levels of behavioural response (see Smith et al 2016). Manatees are more sensitive to drone presence and "exhibit[ed] strong disturbance in response to the aircraft from 6 to 104 m" (Ramos et al. 2018). Overall behavioural responses may fall into a number of broad categories provided in Table 1.

Table 1. Response level category and resulting animal behaviour. Researchers should be vigilant in recording responses to drones, and adjusting altitude to limit behavioural responses.

Response level	**Animal behaviour**
None	No change in behaviour
Low	Animal may notice drone and turn to look at it, but no change in speed of movement or direction of travel
Medium	Animal reacts to drone by increasing speed or changing direction of travel
High	Animal reacts to drone by fleeing which is indicated by a sharp increase in speed or change in direction of travel, or repeated deep-diving events that do not appear to relate to foraging.

Altitude Guidelines

Given the wide range of factors that influence animal response to drones, defining altitude limits is challenging. It is the responsibility of the researchers to recognize excessive levels of disturbance and to cease or modify their drone operations accordingly. Conversely, if animals are showing a high level of tolerance to operations at the altitude levels presented here, it may be acceptable to operate at lower altitudes in order to achieve certain project objectives. However, efforts should be made to use drone systems that can collect the required data with minimal disturbance. For example, using higher resolution cameras to capture the necessary detail from higher altitudes.

Table 2. Guidelines for operation of vertical take off and landing (VTOL) drones for observation of marine mammals. Recommended lowest altitude limits are based on a limited number of published studies as well as unpublished accounts from field researchers. As more data becomes available, altitude guidelines will be updated accordingly.

Species/Group	**VTOL Lowest Altitude**
Bowhead, Humpback, Sperm, other large whales	10 m
Killer whale, Beluga, Narwhal	20 m
Pinnipeds	30 m

If researchers are flying their drone at the lowest recommended altitude and the animals response level is medium or high, we recommend that researchers increase the altitude of the drone. If high levels of disturbance are still noted after increasing altitude, we recommend ceasing work with that animal.

Transport Canada Regulations

As of November 2021, for the operation of drones greater than 250 grams, the minimum requirements include completion of an online exam to obtain a drone pilot certificate for either basic or advanced operations and registration of the drone with Transport Canada. For basic operations, drone pilots must maintain visual line of sight (VLOS) at all times, must only fly within uncontrolled air space, must stay greater than 5.6 km away from airports and 1.9 km from heliports, and must fly at altitudes lower than 122 m (400 ft). For operations within controlled airspace, in close proximity to airports or heliports, beyond VLOS, at altitudes greater than 400 ft, or for operation of drones greater than 25 kg, pilot certification for advanced operations is required and a Special Flight Operations Certificate may also be needed.

For the complete and current regulations and legal requirements refer to the Transport Canada *Canadian Aviation Regulations* (CARs) and the Transport Canada Drone safety information page:

https://tc.canada.ca/en/aviation/drone-safety/learn-rules-you-fly-your-drone/flying-your-drone-safely-legally

Additional Approvals

For drone operations that take place in or over National Parks or historic sites, permission from Parks Canada is required. For research projects that require approval from local wildlife management boards or Hunters and Trappers Organizations/Associations, the proposed drone operations should be included in the project proposal.

References

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