

# From Supermarkets to Sea Ice: RFID Tags for Bear Management

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Polar bears (*Ursus maritimus*) and grizzly bears (*U. arctos*) are important components of the Arctic ecosystem in northern Alaska. Management of bears requires identification of individuals. While females and subadults can be followed with conventional telemetric methods, the neck configuration of adult males, especially polar bears, requires special consideration because collars are poorly retained. In this proof-of-concept study we tested the efficacy of Radio-Frequency Identification (RFID) tags to provide identification of individual polar bears and radio-collared grizzly bears from over-flying aircraft. RFID tags are used commonly for inventorying commercial and military products, livestock and personal identification tags.

## The System

Most commonly RFID tags are Passive Transponders (“pit” tags) such as used on pets. However, we tested Active RFID tags that emitted a beacon at 303.8 mHz every 2 seconds. Together with IntegralRFID (Richland, WA) and Arctic Air Alaska (Fairbanks, AK) we developed and tested a system that consisted of the tags, receiving antenna, reader, and display for aircraft and ground vehicles. The tags consisted of a battery and chipset encased in High-Density Polyethylene. The signal was recorded through the antenna system and decoded by a Mantis II™ decoder, which displayed the tag(s) on a laptop or PDA. All tags within range were displayed concurrently. This system did not convert the tag signal to audio.



## Conclusions

- **Signal range:** better than expected and suitable where aerial or ground detection of individuals encountered randomly is important; no application for aerial tracking
- **Tag retention:** a major obstacle for females with cubs at the time of deployment, or for adult males; retention on grizzly bears may be less than on polar bears;
- **System performance:**
  - The antenna system, although modified for use alongside conventional VHF tracking, was less durable under the extreme arctic conditions encountered
  - The visual display requires constant monitoring but allows concurrent monitoring of all tags

## Results

### Tag Retention:

- **Grizzly bears:** of 18 females and 4 males, only 6 of 20 tags were retained >1 yr; no tags on females with cubs or adult males were retained,
- **Polar bears:** of 72 bears with tags, only 6 were relocated after 1 yr and of these 3 had functioning tags

### Signal Reception:

- **Grizzly bears:** reception ranged from 10-1750m on active bears; denning bears could be detected at >=1520 AGL
- **Polar bears:** reception range was only 10m horizontal from altitudes of 330-1300m

## Potential Improvements

- **Implant tags:** although invasive, with the signal range of active RFID, implants would improve tag retention
- **Conversion to audio:** coupling an audio display with a signal strength detector would allow radio-tracking
- **Remote monitoring:** ground-based remote monitoring of individuals passing an antenna (e.g., at a work site) coupled with a memory system could be used to identify individuals frequenting an area

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