Marine nature conservation in Lithuania

Surgical and husbandry techniques for Red-throated divers marked with implantable transmitters and example of surgeries performed in Lithuania

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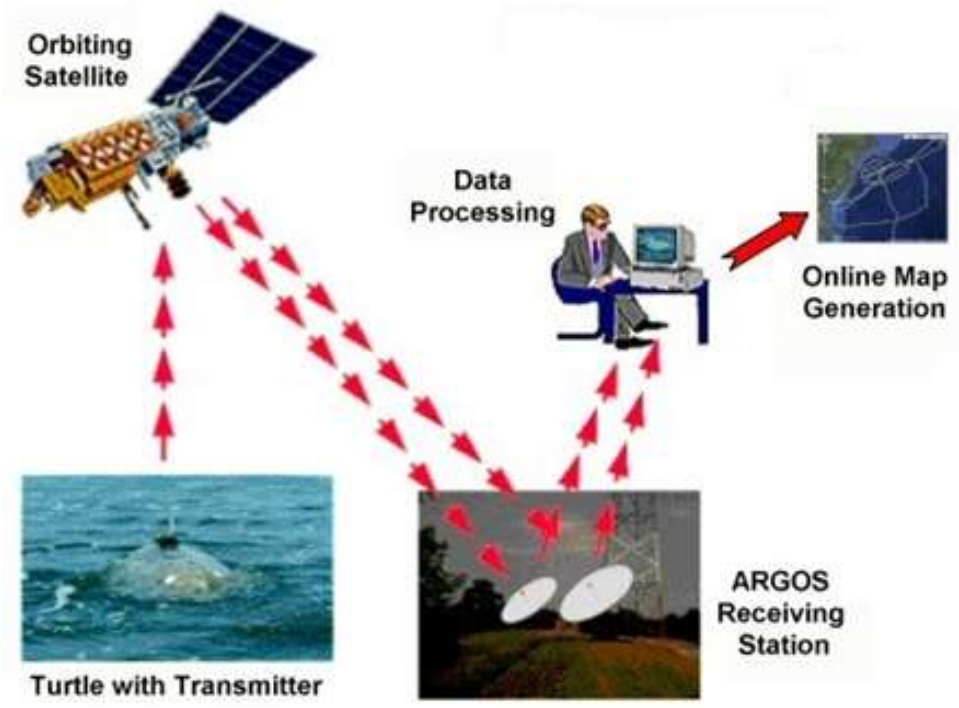
Satellite telemetry

- Satellite telemetry has been used in many studies around the world to learn more about breeding, molting and wintering areas of diving birds
- During these projects ~ 1820 diving birds of at least 13 species were implanted with the transmitters

How does it work?

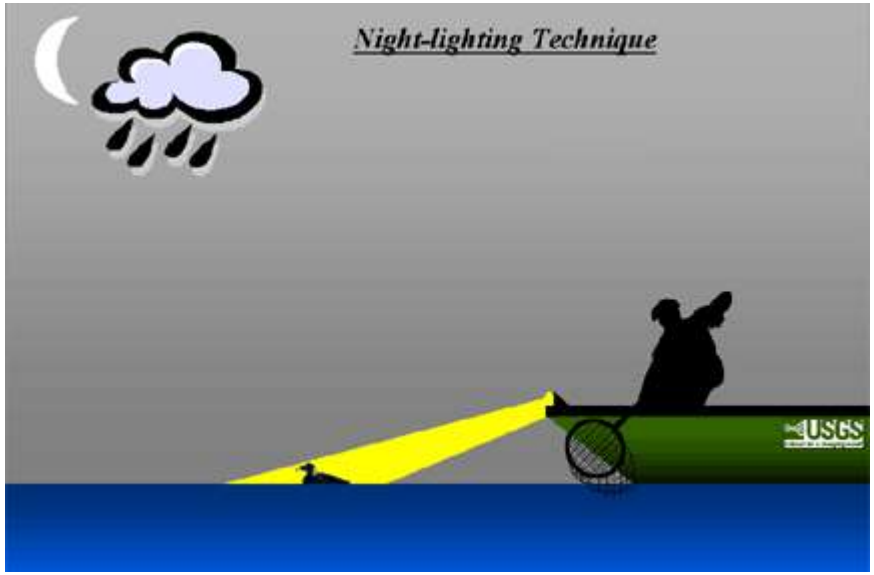
- Transmitters are programmed to send signals to satellites at periodic intervals
- Polar orbiting satellites flying at an orbit of 850 km above the earth pick up the signals
- Receiving stations in USA and France relay data from satellites to processing centers
- Processing centers collect all incoming data, process them and distribute them to users
- Argos users around the world receive data directly in their office or on-site



Studied birds

- Red-throated Divers were studied along with Velvet Scoters and Long-tailed Ducks as a part of the EU LIFE+ funded DENOFLIT project “Marine nature conservation in Lithuania”
- All needed permissions from the authorities of Lithuania were obtained to perform catching and surgeries
- Birds were captured using night lighting technique on wintering grounds 0.5-2 km off the coast of Lithuania

Night lighting technique



- Weather conditions for captures should be calm, no strong wind
- Slight snow, drizzle and light fog are desirable
- No moon should be present during bird captures
- Boat with open front is used
- It is important to maintain constant speed, minimizing changes in motor sound volume during catching
- Artificial lighting from Klaipeda city and port affected bird captures, particularly on overcast nights


V-7542

Night lighting catch

A total of 39 birds of 7 species were captured during two winters (2011-2012 and 2012-2013):

- **11 Velvet Scoters**
- **9 Red-throated Divers**
- **3 Long-tailed Ducks**
- *10 Great Crested Grebes*
- *3 Common Guillemots*
- *2 Black-throated Divers*
- *1 Razorbill*

Handling the birds

- Captured divers were held in holding crates with bedding material or additional net bottom to keep them dry and clean
- We found a problem holding divers in pet transporting cannels, because they become stressful and tried to get out of carrier by pushing beak through grid
- After surgery divers were kept in a carton box with lots of bedding material
- Captured divers were transported ~20 km for surgery to a veterinary clinic
- Divers were kept until surgery for 5-7 hours in 0 – -5 C temperature

Satellite transmitters

- PTT100 transmitter manufactured by Microwave Telemetry, Inc. (Columbia, MD, USA)
- Two types of transmitters:
  - larger – 6.0×3.5×1.5 cm, 46 g
  - smaller - 4.5×2.0×2.5 cm, 31 g
- Transmitters were made to withstand pressure at depths of up to 30 m
- Transmitters were with no abrupt edges and were additionally dressed with nylon mesh

Implantation of transmitters (1)

- Only sterile transmitters were used for implantation
- Birds were put to general anesthesia with isoflurane for both induction and maintenance
- Incision place was prepared without plucking feathers
- Sometimes additional anesthesia with injectible agents was administrated for divers because they are more resistant to isoflurane gas than other diving bird species

Implantation of transmitters (2)

- Small incision ~3 cm is made on central linea alba
- Transmitter is surgically implanted into abdominal cavity, in place of right abdominal air sac
- The transmitter's 20 cm antenna exited the skin laterally to the sacral vertebrae

Implantation of transmitters (3)

- After the surgery incision place was sprayed with bupivacaine (analgesic) and antibiotic
- Incision place and surrounding feathers were cleaned with warm water, washed several times to remove all stains of blood
- While birds were under anesthesia, samples of blood and feathers were taken for stabile isotope and mtDNA analysis, bird was banded with metal ring
- All divers received an injection of fluids to replace fluids lost in surgery

Post surgical care of divers (1)

- Until and after recovery Red-throated Divers were kept in the same cleaned crates or cardboard boxes they arrived
- After full recovery bird belles were cleaned one more time with cold water and paper towel, also they could be washed under running tap water or put to bath for short swim

Post surgical care of divers (2)

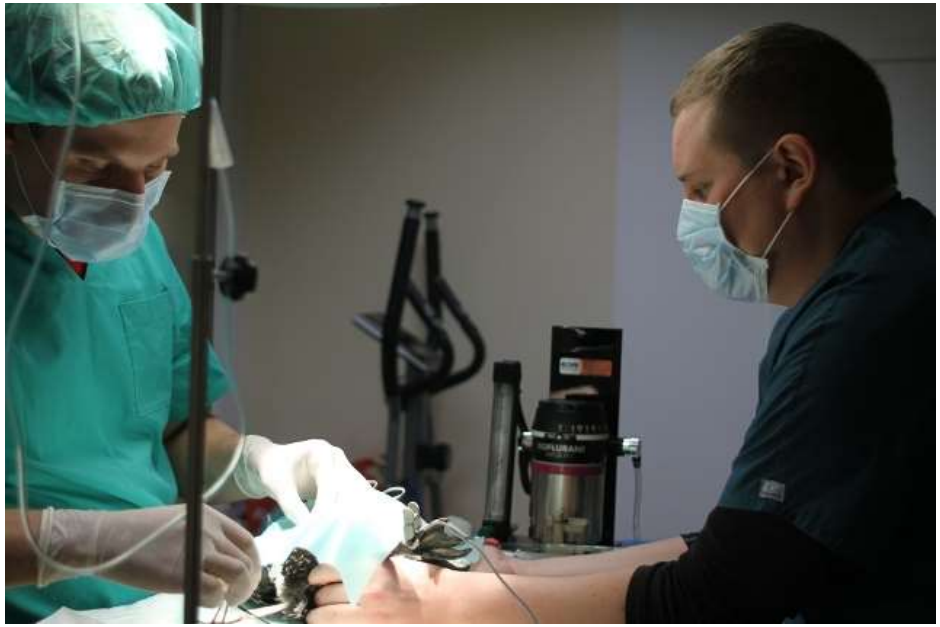
- Until release in the evening, divers were kept for 4-7 hours at a temperature of +1 - -5 °C
- Birds preened themselves and waterproofed their feathers

Release

- In the same evening divers were transported close to the capture place
- Birds were released after sunset minimizing the possibility of gull predation and prosecution
- Before release divers were force fed with European smelts or Baltic herrings

Numbers

- Weight (n=8): Females – 1632g, Males - 2100g
- Average time (n=9):
  - Total surgery timing from cage back to cage – 1 h 24 min
  - Anesthesia and preparation till incision - 28 min
  - Implantation procedure from incision to skin close - 32 min
  - Time to release after surgery – 6 h 13 min

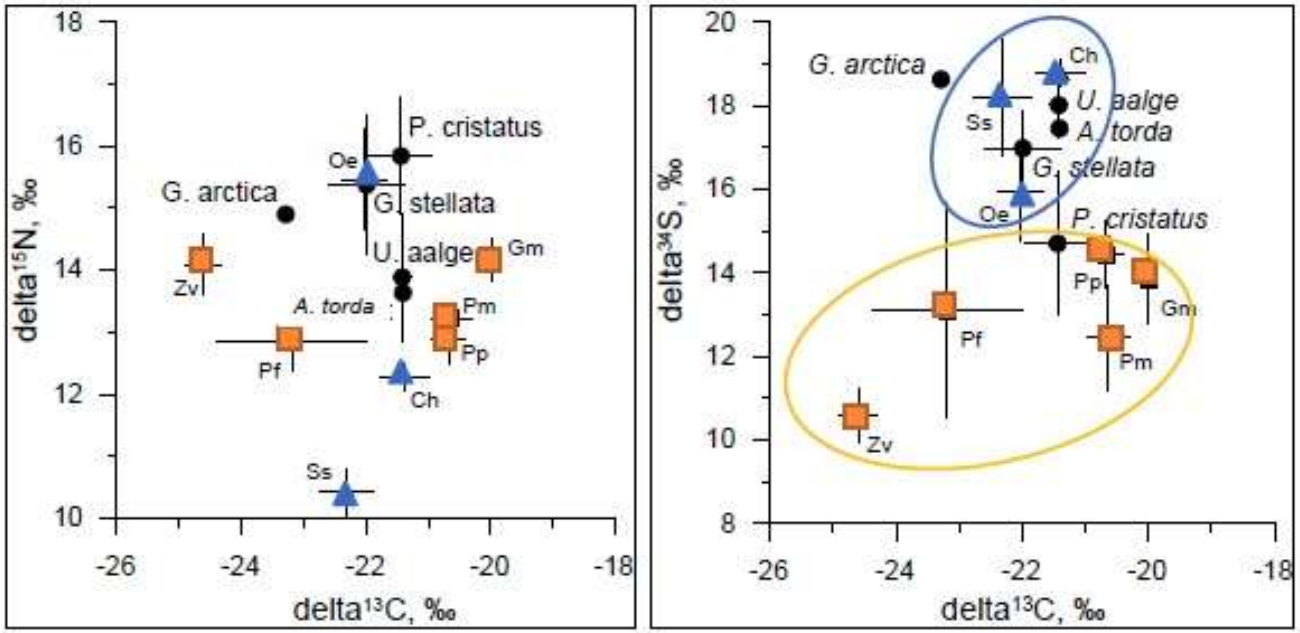


Results

- In 2011-2013 transmitters were implanted to 9 divers:
  - 6 survived longer than 1 month
  - 1 bird survived about 10 days
  - 2 divers produced no signals
- Five divers were successfully tracked for over 8 months from the wintering areas to the breeding grounds

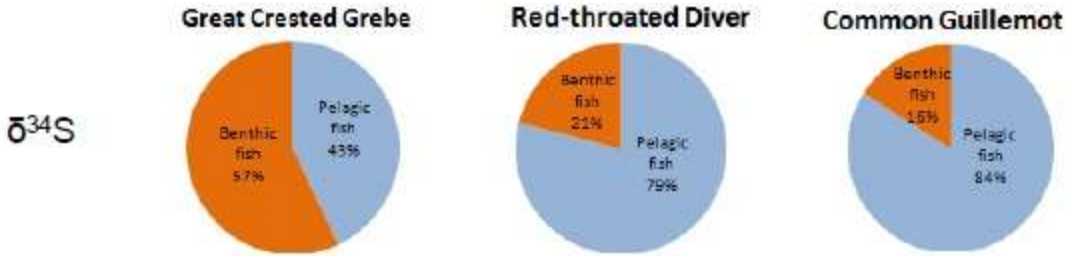
Additional results

Isotopic signatures of fish and piscivorous birds



● Birds: *Alca torda*, *Gavia arctica*, *G. stellata*, *P. cristatus*, Ua – *Uria aalge*
▲ Pelagic fish: Ch – *Clupea harengus*, Oe – *Osmerus eperlanus*, Ss – *Sprattus sprattus*
■ Benthic fish: Gm – *Gadus morhua*, Pf – *Platichthys flesus*, Pp – *Pleuronectes platessa*, Pm – *Potamoschistus minutus*, Zv – *Zoarces viviparus*

Results of Mixing Models for the Piscivorous Birds

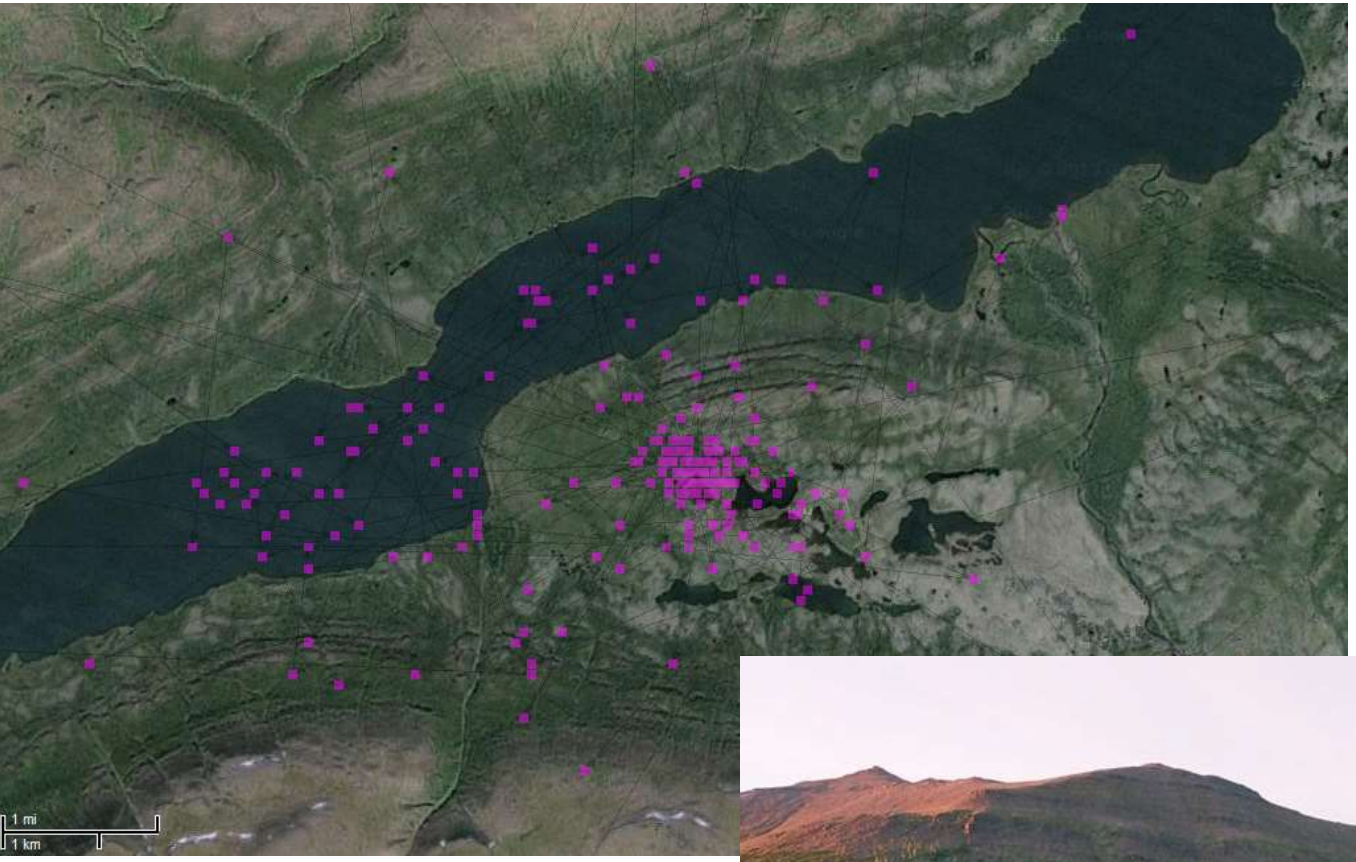


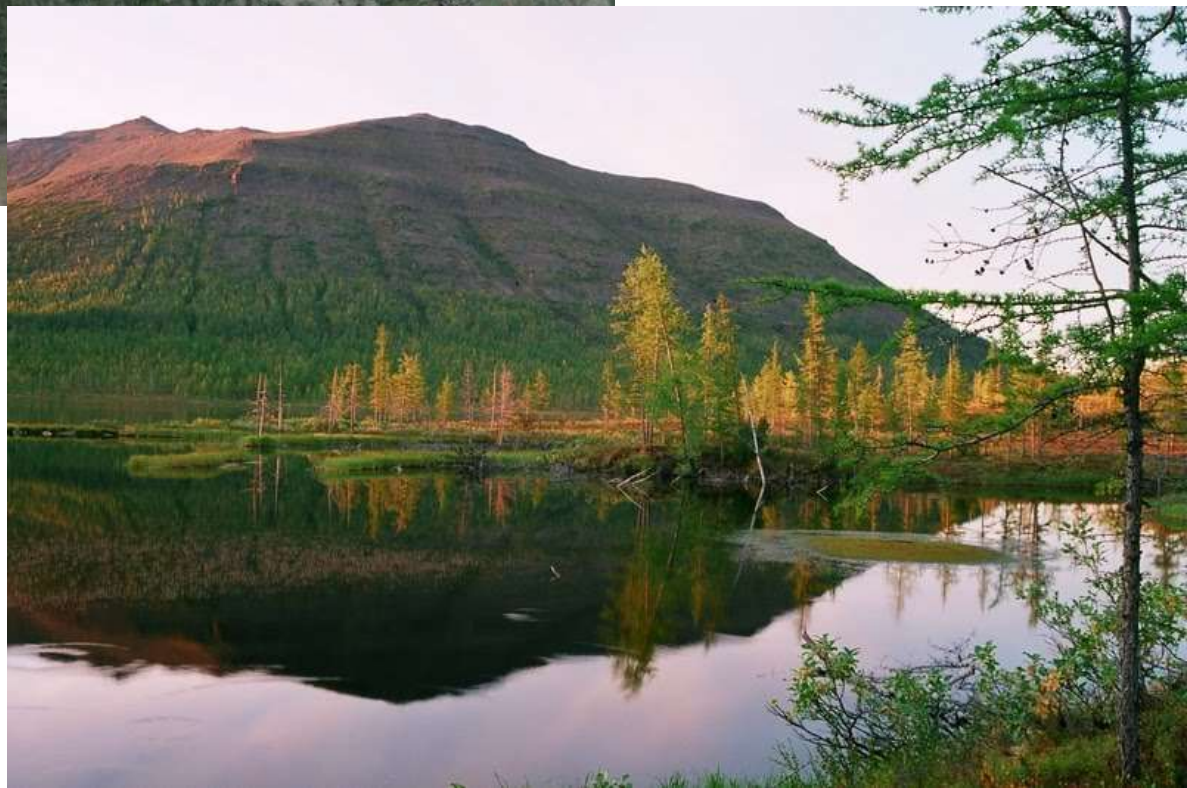
Lessons learned

- For transporting and holding divers, it is better to use cardboard box
- Clinical examination is of key importance for choosing right candidates for the implantation
- The anesthesia procedure goes smoother when used in combination with injectible drugs
- Additional force feeding gives extra energy for birds during the most critical first days after surgery
- Divers are more sensitive to surgery than other diving birds

Red-throated Diver PTT 112117 , F, ~2y+, track marked blue line

Red-throated Diver
PTT 112117





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Thank you

Red-throated Diver PTT 112113 , M, 3y+