

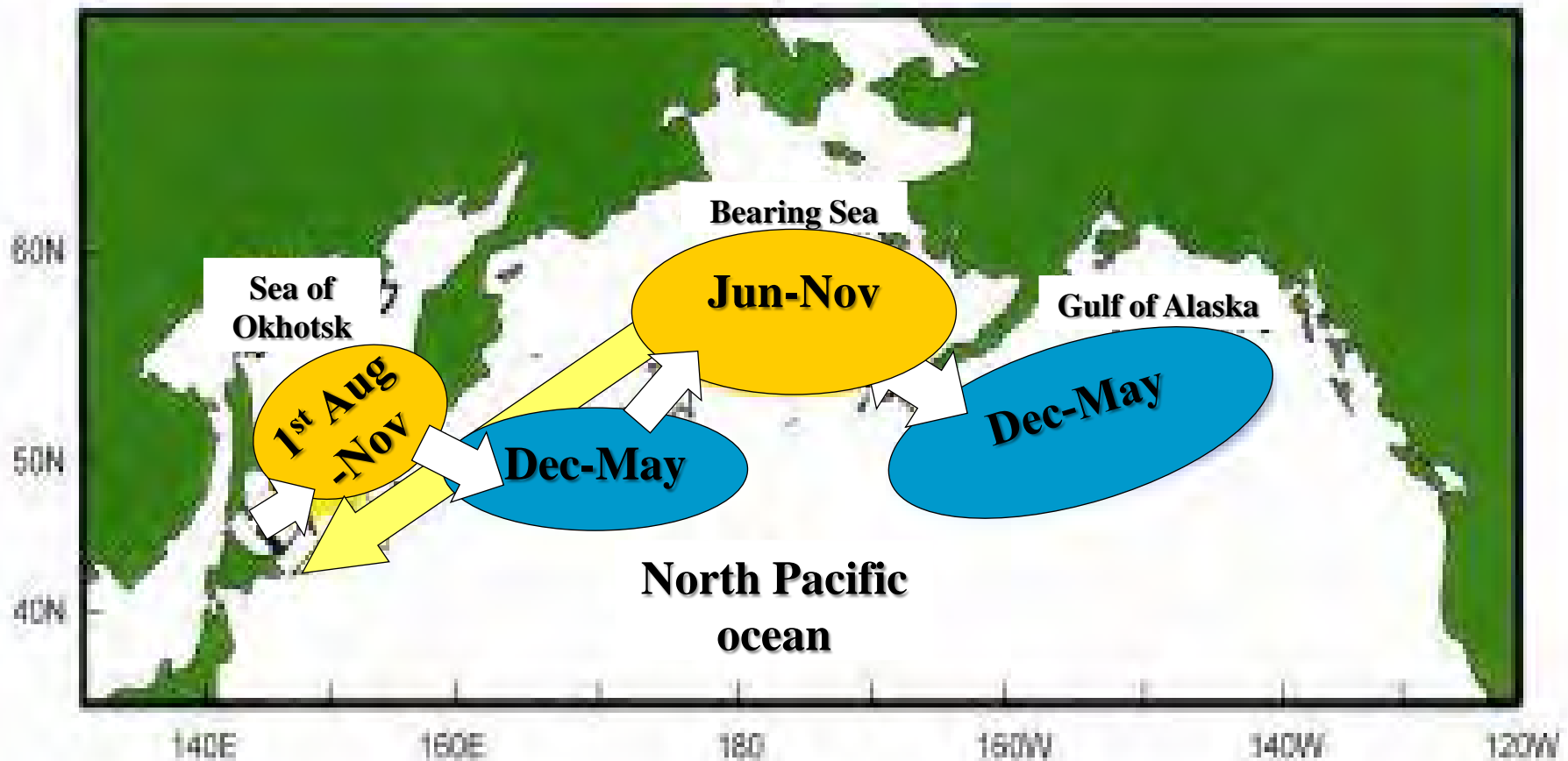
# The records of Chum salmon fingerling predation by avian predators at the coastal area of Otsuchi, Japan

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# Migration and depletion of Cham salmon



Salmon fingerlings will deplete before 1<sup>st</sup> wintering at the sea of Okhotsk.

**One of the major cause of depletion might be predation.**



# Birds might be one of the most important predators for salmon



<http://www.birdsasart.com/bn251.htm>



Consume 1.1 – 2.4% of salmon fingerling stocks



Consume 17% of salmon fingerling stocks

Scheel and Hough 1997, Roby et al. 2003, Good et al. 2007 etc.

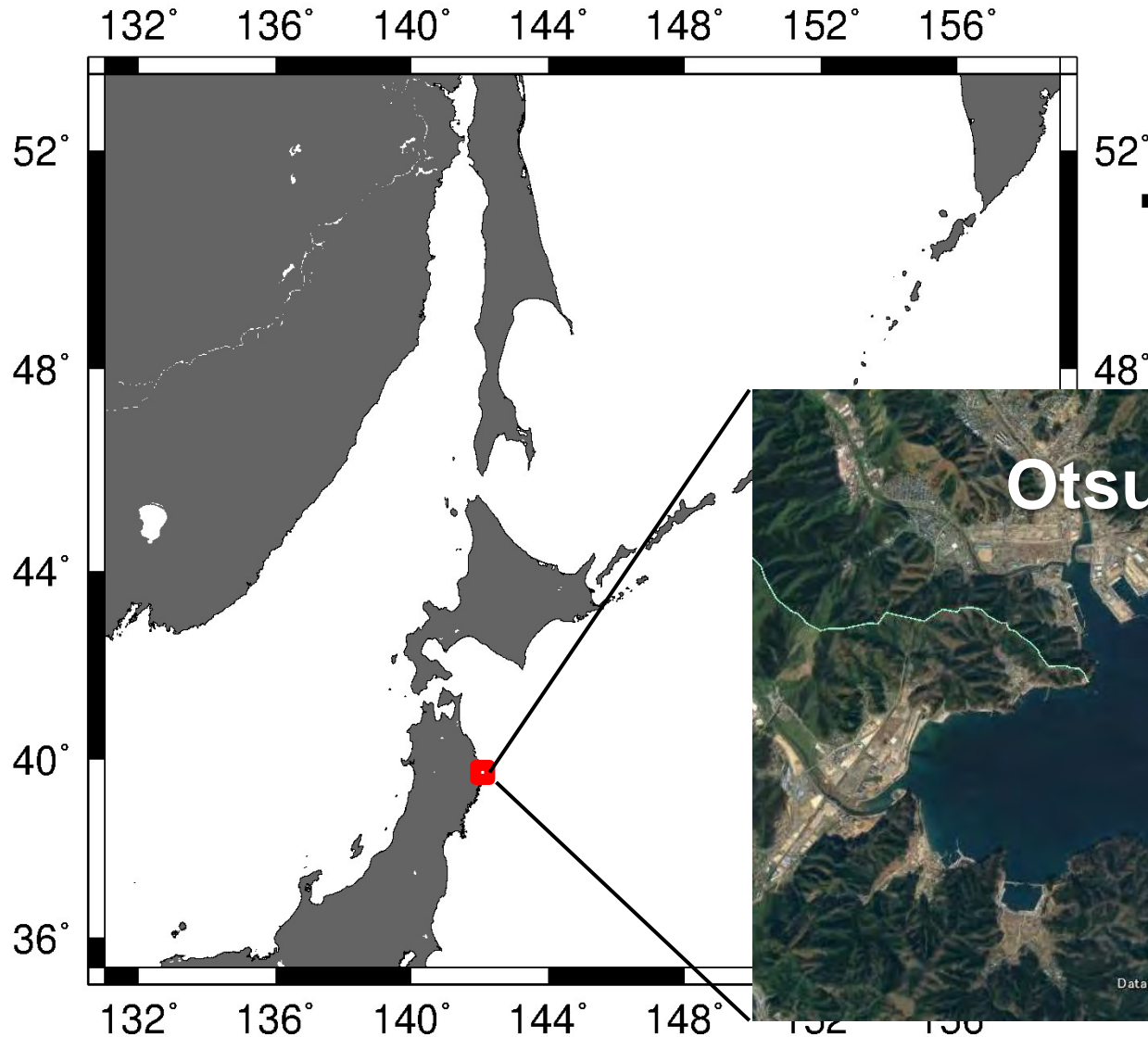
# Objectives

1. Determine the potential avian predator for Chum salmon fingerling around Otsuchi-Bay and -River, Iwate, Japan.
2. Estimate predation rate of Chum salmon fingerling by avian predators around Otsuchi-Bay and -River.

# Study Site

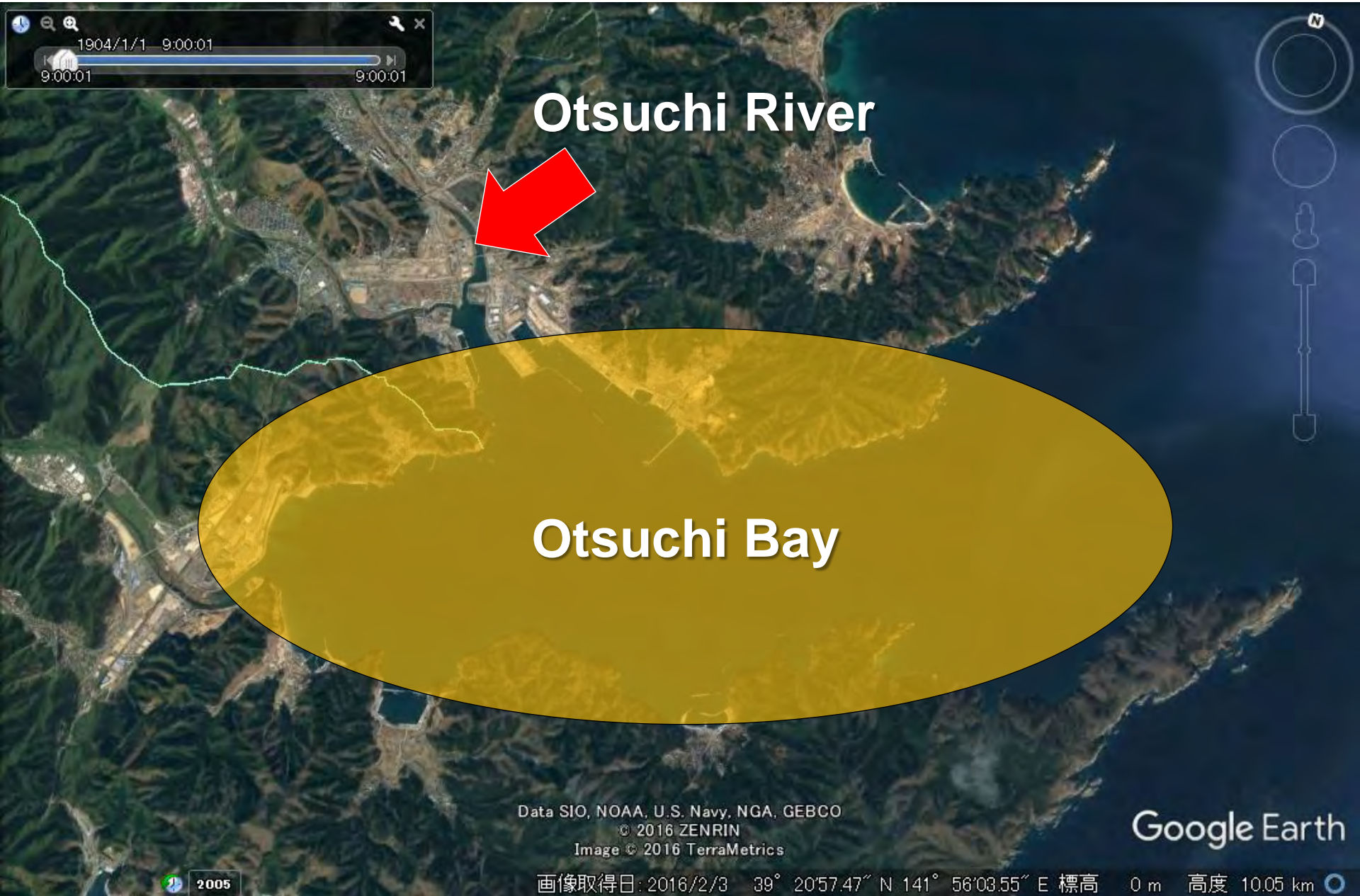
▪ **Otsuchi, Iwate, Japan**

▪ **20 million salmon release per year**





# Surveys



Otsuchi River

Otsuchi Bay

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
© 2016 ZENRIN  
Image © 2016 TerraMetrics

Google Earth

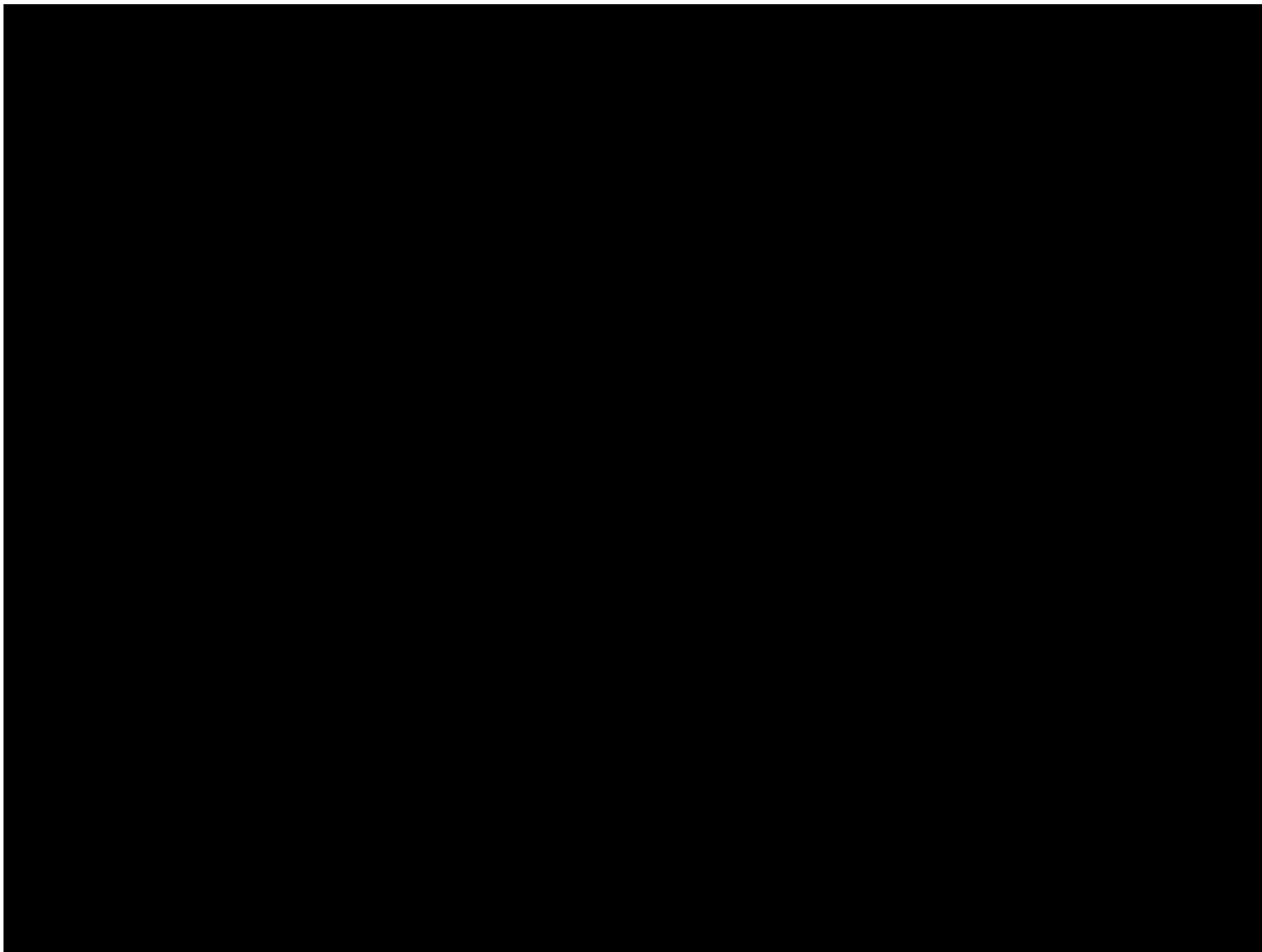
画像取得日: 2016/2/3 39° 20'57.47" N 141° 56'03.55" E 標高 0 m 高度 10.05 km

2005



# Black-tailed gull











# Great egret





































# Cham salmon, EXACTLY!



# We observed 7 families, 15 species of birds feed on salmon fingerling

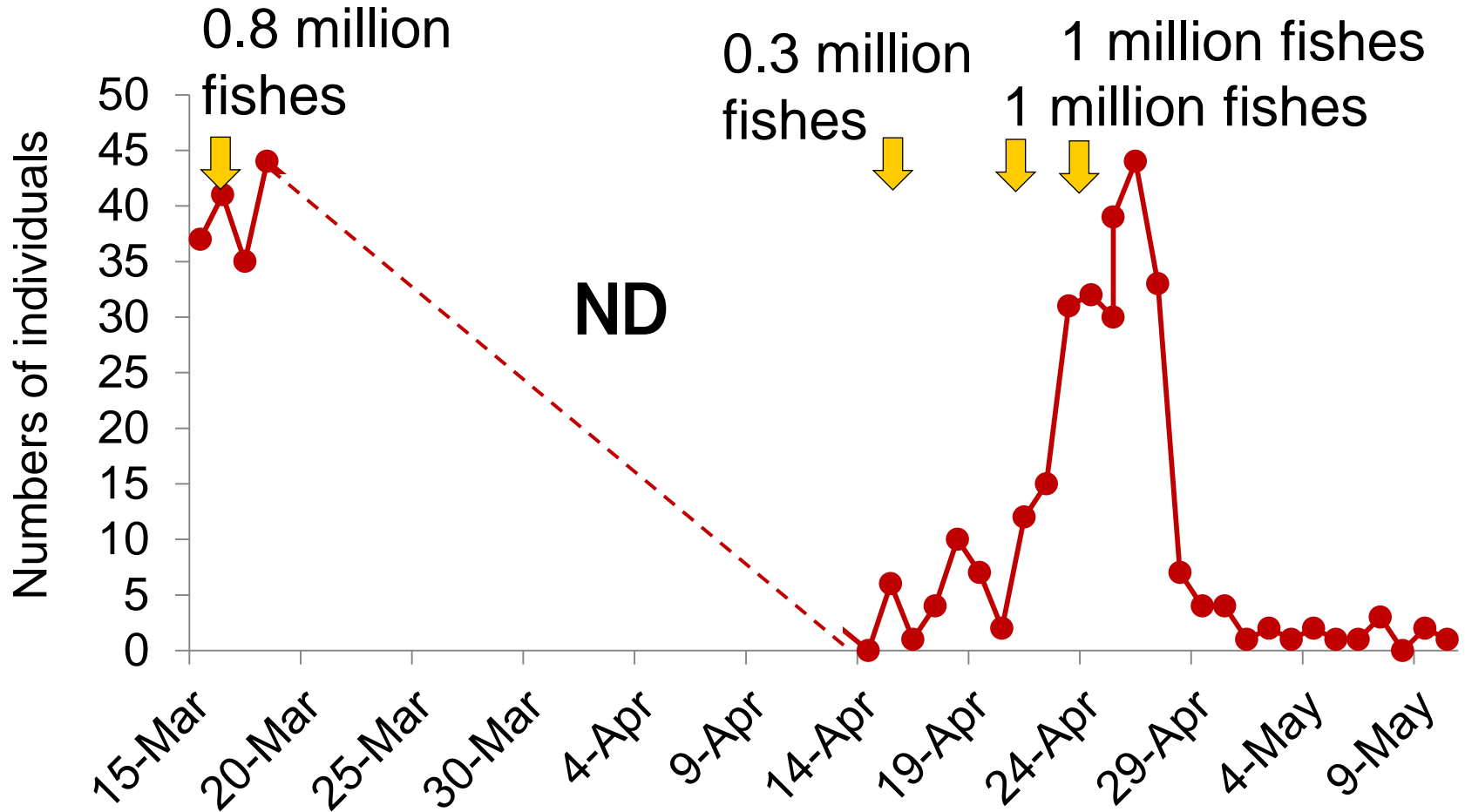
Species	Diet	Salmon	Species	Diet	Salmon
Black-tailed gull	P	◎	Ancient murrelet	P	◎
Slaty-backed gull	P	◎	Thick-billed murre	P	○
Common gull	P	○	Common kingfisher	P	○
Great cormorant	P	◎	Common murre	P	▲
Japanese cormorant	P	◎	Rhinoceros Auklet	P	▲
Great egret	P	◎	Little egret	P	▲
Grey heron	P	◎	Eared Grebe	P	▲
Common Merganser	P	○	Pelagic cormorant	P	▲
Red-breasted Merganser	P	◎	8 species of Anatidae	N	×
Little grebe	P	◎	Other terrestrial birds	N	×
Red-necked grebe	P	◎	*P: piscivorous, N: non-piscivorous		
Eared Grebe	P	○	*◎:>4 observed, ○:1-2 observed △:potential forager, ×:not-observed		



# Fixed point observation at the Otsuchi river

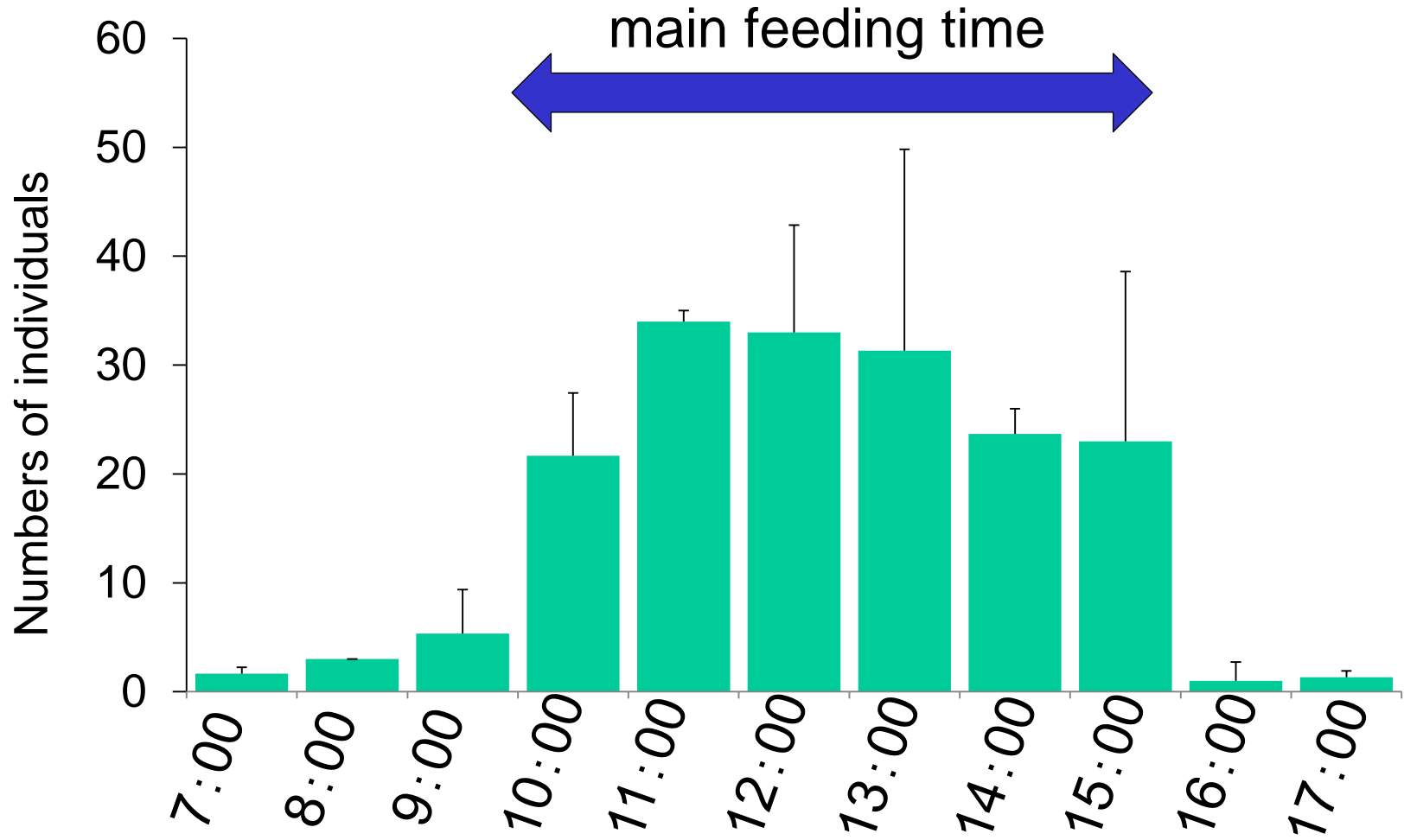


# Timing of salmon release and numbers of gulls at the Otsuchi river





# Daily change of the numbers of Gulls at the Otsuchi River



# Estimation of avian predation rate

(Late April)

- Duration of feeding events (days) per release

**3days / 1 salmon release**

**(1 million salmon/ 1 release)**

- Duration of feeding events (hours) per day

**10:30 – 15:00 (4.5 hours)**



- Maximum Feeding rate

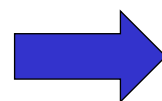
**Gulls: 230fishes / 1 hour / 44 birds**

**Egrets: 10fishes / 1 hour / 1 bird**

- Maximum numbers of birds

**Gulls: 44 birds Egret: 2 birds**

**Cormorants: 2 birds**



**Predation Rate: 0.52%**  
**(5157 / 1 million)**



# Conclusion

1. We confirmed that 7 families, 15 species of birds feed on salmon fingerling.
2. Main predators were Black-tailed gulls breeding 5km apart from the salmon hatchery.
3. Chum salmon fingerlings might be the important prey resources for avian predators during early spring, predation rate might not be very high (less than 1%) in the Otsuchi area.

# Then, who would be the main cause of natural depletion of salmon?



**We need to investigate effects of more broader predators on salmon resources.**



