

Case study – effect of cormorant predation on perch stocks in a shallow coastal area

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Cormorant (Phalacrocorax carbo) predation on a coastal perch (Perca fluviatilis) population: estimated effects based on PIT tag mark-recapture experiment

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The number of commorants has rapidly increased in the northermost baloic Sea in 2018, 50 km × 50 km KES catch neckangle SSH1 had \$140. The number of commercest, has rapidly increased in the northermonic Baltic See. In 2018, 50km × 50km KES carch necturing SSH1 had \$1400 increased pairs. To estimate the prediction effect of commerciate on perch populations, we Passive integrated Tap (1896) 1977 perchand 1400 increased. breeding pairs. To estimate the prediction effect of commonants on perch populations, we Passive Integrated Tags Lagard 1977 parch and 97% of 1879 were found. The median instruments commonant induced mortality during the breeding time, with consumption by son-breeding time. of tags were found. The median instantaneous commonant-induced mortality during the breeding stine, with consumption by each breeding included and the standard of the standar individuals, was estimated at 0.33 and at 0.35 during the whole residing period. We estimated with a yield-per-escript model that the kings-term maximum loss of perch yield of tagging sub-population would be at grin, probability interval 3.3-67%, and when extended to the class 49-64%. term maximum loss or perch yield of sagged sub-population would be at gots, prosphiltry interval 31-67% and when extended to the entire 55H1, 10-33%, respectively. The commonant's share of the >2-year-old perch biomass and production would be 8%, while that of other percentages of the same of 56H1, 10-33% respectively. The commonants' share of the >2 year-old perch biomass and groduction would be 8%, while that of other natural percentage would be 85% and that of fishing 29% in 56H1. The yield-per recruit results should be interpreted as an estimated of manifest and the state of the percentage of the perc relementabley would be 63% and that of folying 22% in 5501. The yield-per-recruit results should be interpreted as an estimate of manning and compared to the per-recruit results should be interpreted as an estimate of manning and compared to the per-recruit results should be interpreted as an estimate of manning and compared to the per-recruit results and the per-recruit results are per-recruit results and the per-recr commonant effect because the dependence of predaction rate on prey density was not accounted for, and density-dependence of growth, mor-tality, and reproduction of prots could partly compensate the loss. The results indicate that high density of commonants can reduce the perch

Keywords: comorant, fishery, perch, predator-prey interaction, yield

The history of great commorant (Phalacrocorax carbo) occurrence in Finnish contail area is short. The first breeding was observed in IN FIRMAN COASSA area to strort. The tirst neceding was concerved in 1996 and increasing up to 27 600 breeding pairs in 2018. The in-1990 and increasing up to 21 to 33 receining pairs in 2018. Fire increase follows the European level stock, development (Hermann crease someway are eneropean even many average of al., 2019). In the northern Baltic Sea, a strong debate has been going on about the role of cormocant in the coastal ecosystem. and especially about its potential effects on fish stocks (e.g. Salmi and especially about us potential energy on this stocks (c.), et al., 2015; Lehkoinen et al., 2017; Hartsson et al., 2018).

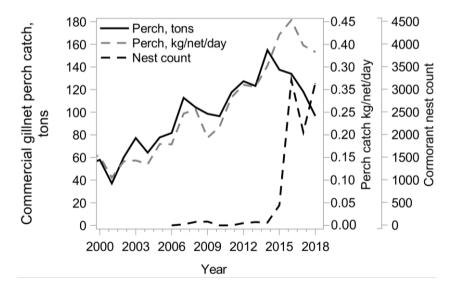
The commonant population growth has levelled off in Finland the cormorane population gruent has sevened out in reseases in recent years, but location of colonies and thus the local

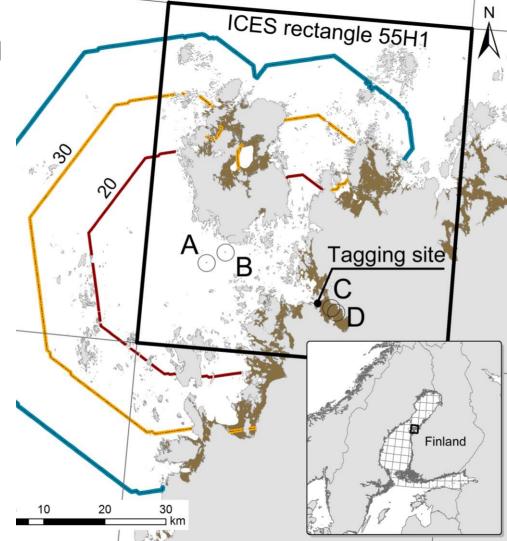
number of birds vary from year to year (Anonymous, 2018). The number of nothing pairs in the Quark, central Gulf of Bothnia, exnumner or neuring pairs in the Searce, scenies sain or nonima, ser-ploded in spring 2016. After a long positive catch development of perch (Print Bevistili) and peak year in 2014, the commercial peren (revoa jinvienni) and peas year in 2014, the commercial catches have decreased and the fishermen consider cormorants to be the cause of the negative trend (Seels et al., 2019). Perch is a pe une cause or trie megarive tresia times et ali, 2019;. Fecus o a focal species of coastal fishery in the Quark and, thus, commercial and recreational fisheries and cormorants are partly exploiting and recreational tunseries and cormorants are purity expositing the same resources. Many studies have identified periods (Peria spp.) as particularly important in cormorant diet (e.g. Emunich syp.) as particularly important in commonant and (e.g. anial and Duttmann, 2011; Ostman et al., 2012; Skov et al., 2014).

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Study area, catch rectangle 55H1

- Important perch fishing area
- Perch reproduction areas, brown
- Colonies A-D
- Nest count 3140 in 2018
- Predation range 20-40 km at maximum

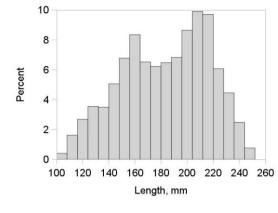






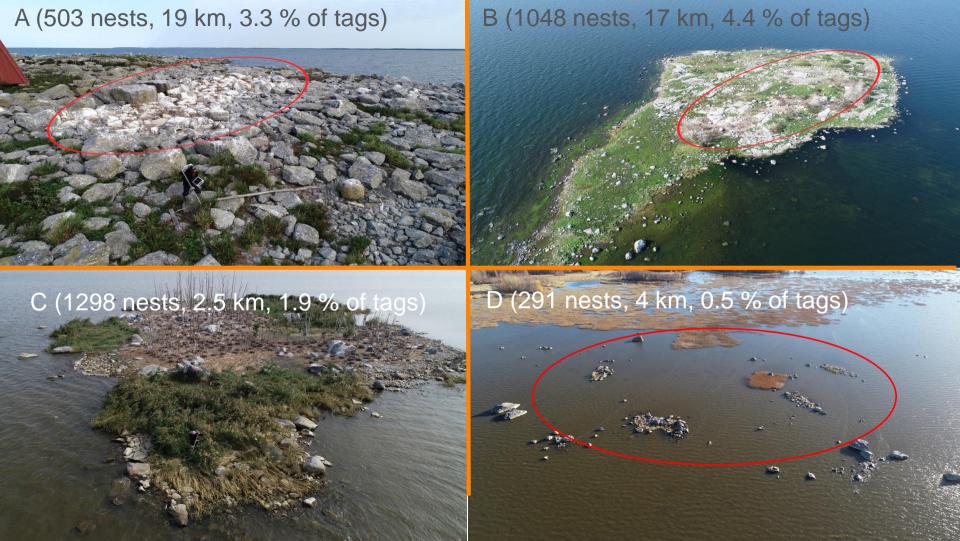


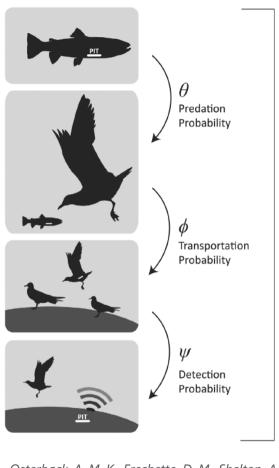
PIT tagging of perch



- Perch were sampled with a fyke net and wire traps
- In total 1977 individuals were tagged
- 12 mm PIT tag in the muscle under dorsal fin
- Tagging mortality 2 %
- Lenght distribution follows the diet length distribution reported in Salmi et al. 2015







Factors affecting to the PIT recovery

 $\theta\phi\psi$ Recapture

Probability

- Literature derived deposition values x = 0.51 (CRI 0.34 - 0.7) (Hostetter et al. 2015)
- Detection values tested in field x=0.93 (min 0.76- max 1.0)

Osterback, A. M. K., Frechette, D. M., Shelton, A. O., Hayes, S. A., Bond, M. H., Shaffer, S. A., & Moore, J. W. (2013). High predation on small populations: avian predation on imperiled salmonids. Ecosphere, 4(9), 1-21.

Tagged perch were vulnerable for predation

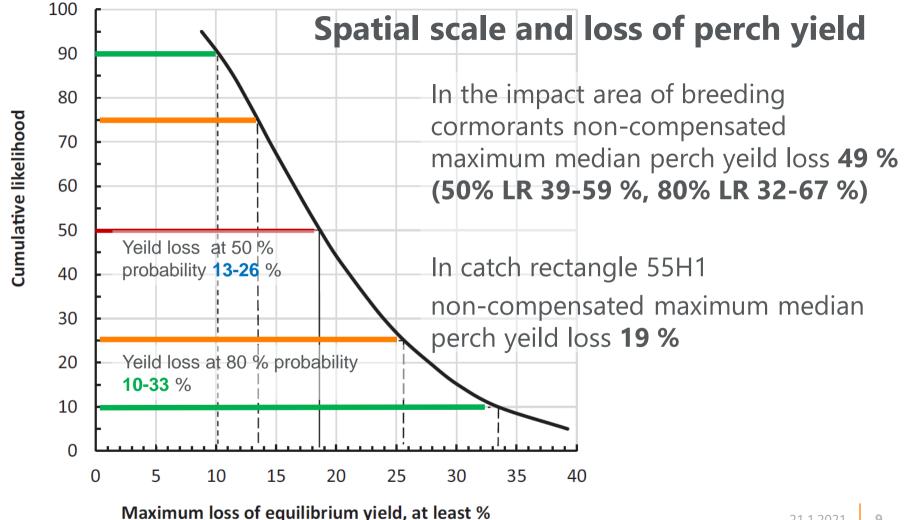
- 9.2 % of tags recovered
- With detection correction, 9.9 % of tags found in breeding colonies
 - Minimum estimate of consumption
- Considering tag detection and deposition, 16-26 % of tagged perchare consumed by breeding population
- With non-breeding population, 20-33 % of tagged perch are consumed
- Cormorants breeding in the northern Gulf of Bothnia (>3000 pairs) were not taken into account

Perch consumption – yeild model assumptions

- Cormorant population and abundance of 2-year old perch are constant
- Both, fast and slow growing part of perch population included
- Breeding period, migration periods and period without cormorants noted
- Instantaneous predation mortality esteimated with Baranov's catch equation
- Effect of cormorant predation on the fishing yield assessed with Ricker's Y/R model
- The results were extrapolated to catch rectangle 55H1 with catch statistics data



21.1.2021



Cormorant perch consumption based on biomass

Based on catch statistics, perch size age-samples and tagging data, **in 55H1** cormorants eat 8% of ≥2 year perch biomass, share of natural mortality 63 % and fishery 29 %

- The biomass of ≥2 year perch could decrease up to 17 % based on median results in the 55H1
- If calculated in situation without cormorants, the perch catches could be 27 % higher

NOTE! Close to colonies the effects would likely be stronger



1.1.2021

Possible causes of uncertainty

Calculations are affected by literature derived values

- Deposition propability
- Level of natural mortality
- Catch statistics, feeding ranges, extension of results to 55H1

Possible problems in calculations

- Perch density effect on predation efficiency
- Perch density effect on growth of perch, reproduction or mortality

Perch biomass estimation is based on statistics – recreational data inaccurate

The effect of cormorants breeding in north and migrating trough 55H1 (?)



021 '

Cormorants can have negative impact on perch stocks and fishery

Perch is considered particulary vulnerable species

 Several sub-populations, feeding area in 10 km range from reproduction area

High density of cormorants can cause yield losses in perch fishery Other factors, like year-class fluctuations, density dependence of growth and mortality may counteract the cormorant predation – not well known

Depends on spatial scale, distance from colonies decreases the potential impact

Problems close to large colonies!



Thank you!



