

Cormorants and fish populations

DOCUMENTATION OF EFFECTS

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Main points:

1. Short overview of the development of the cormorant conflict
2. Predation studies, coast, lakes, rivers – what have we learned?
3. Briefly on Danish cormorant management plan

Documenting the impact of predation:

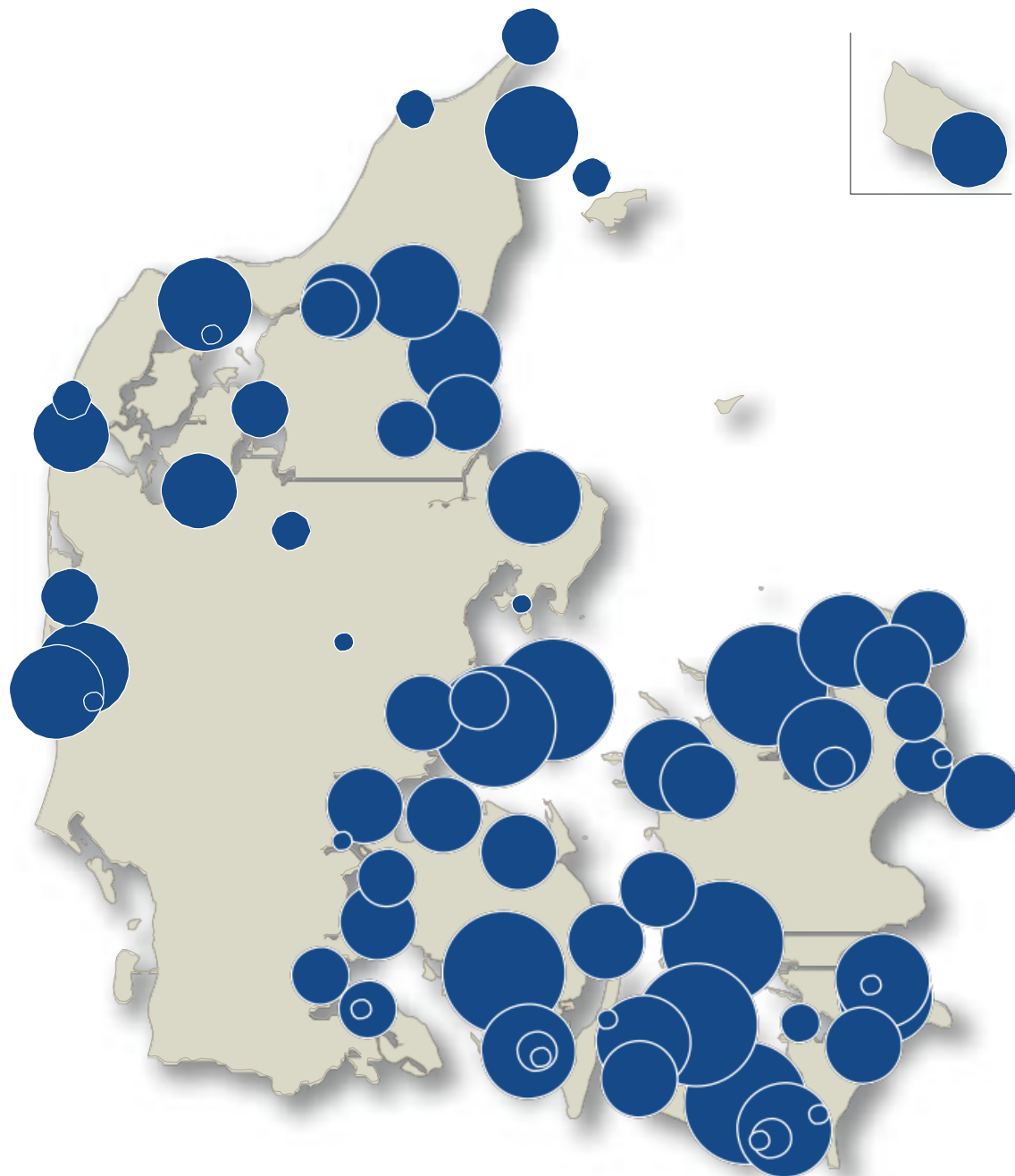
- Proving things that have happened
- Lack of fish to study
- High variation from year to year
- Effect of capture, handling and tagging
- Statistical confidence in estimates

Funding for studies ??

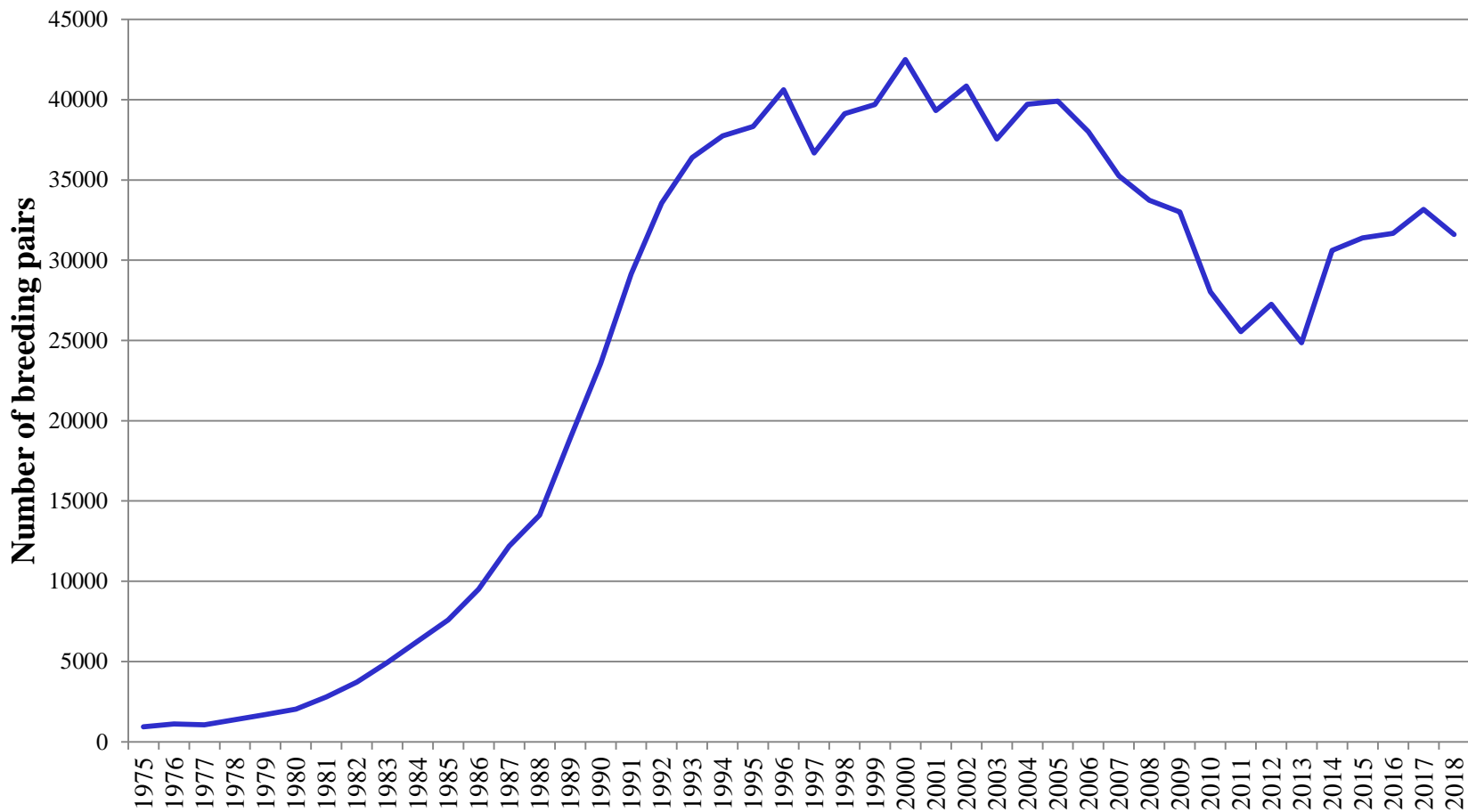
Colonies 2016

Current max number
of birds: 250.000

Current min number
of birds: 15.000

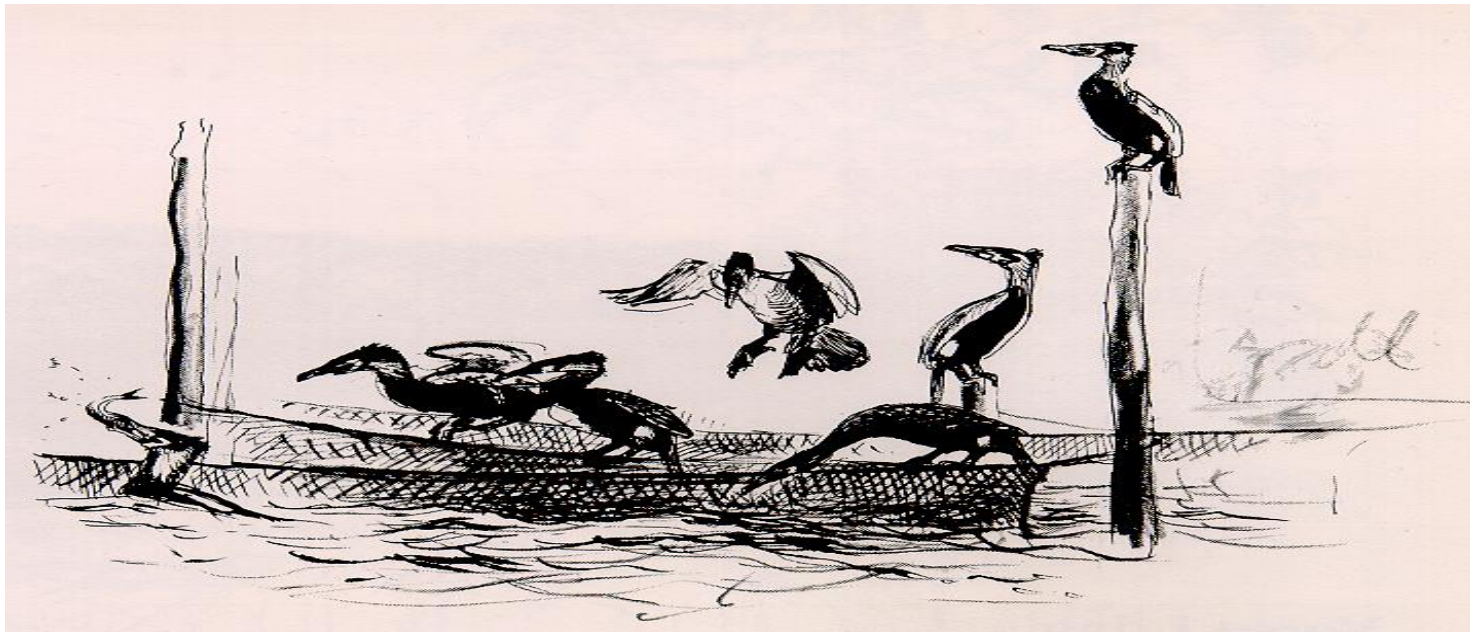


Development in breeding stock (pairs) in Denmark 1975-2018



Who has the problems?

- Pound-net fishers
- Recreational net fishers
- Anglers
- Biodiversity?



Coast:

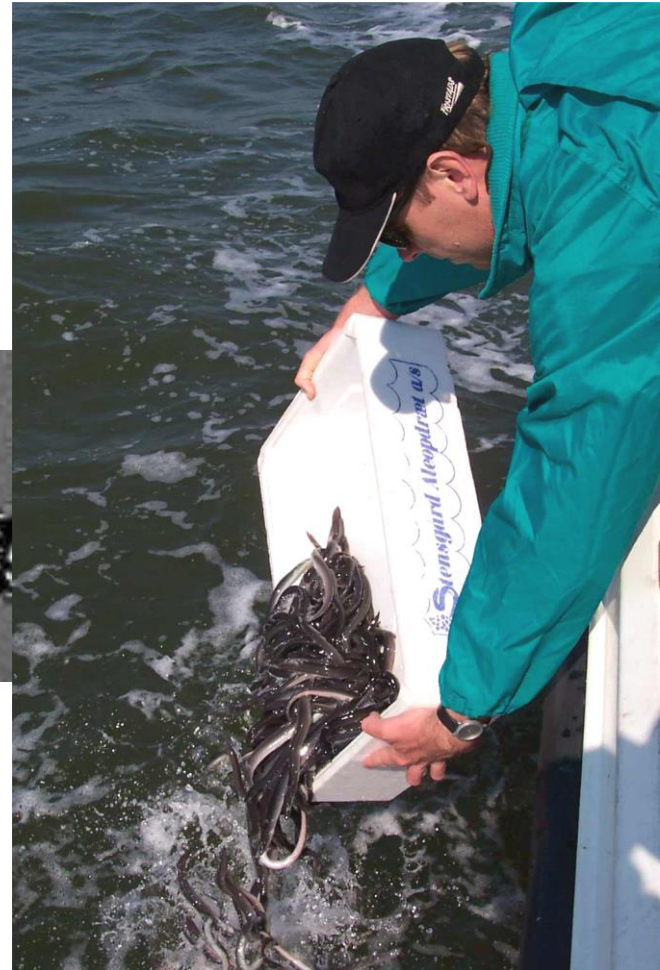
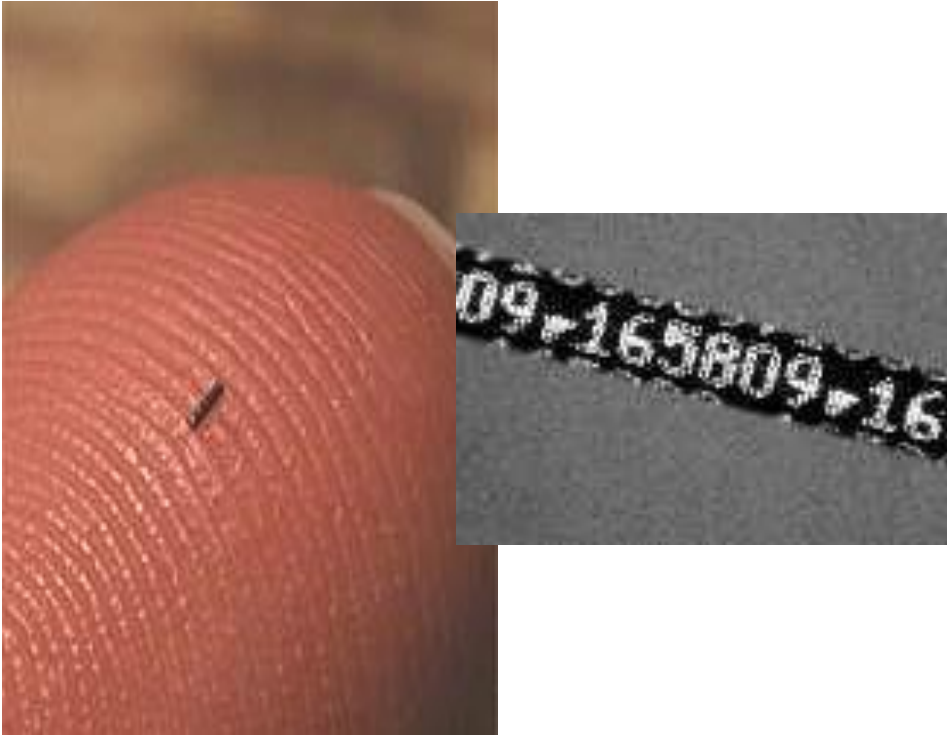
Eelpout and cod largely disappeared

Documented impact on flounders

Documented impact on eel

Documented impact on salmon

Ringkøbing Fjord



10,000 eel were cw-tagged and released in 2003
and 64.000 CW tagged 1-year salmon were released in Skjern
River

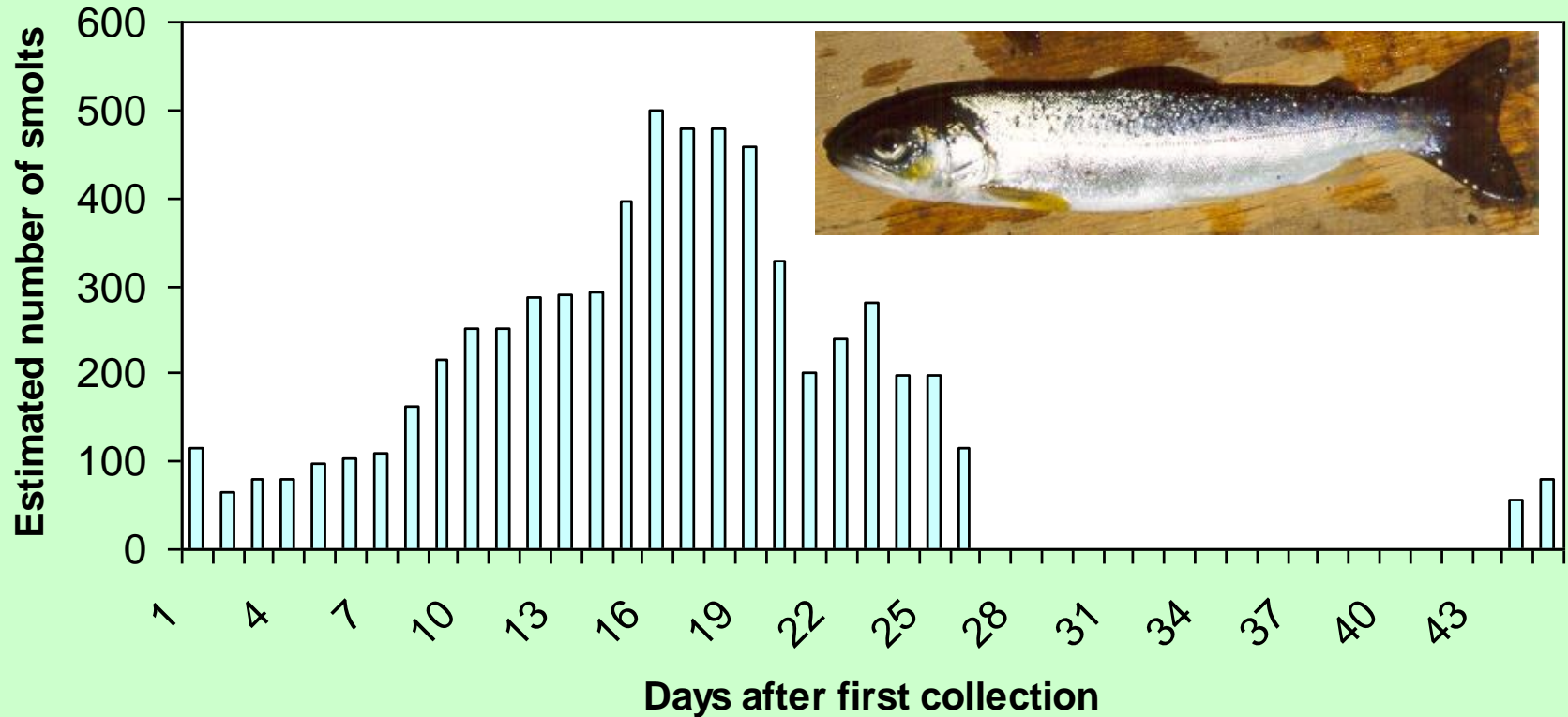


4,000 flounders (7 – 20 cm) were caught and cw-tagged in 2004



Pellet collection

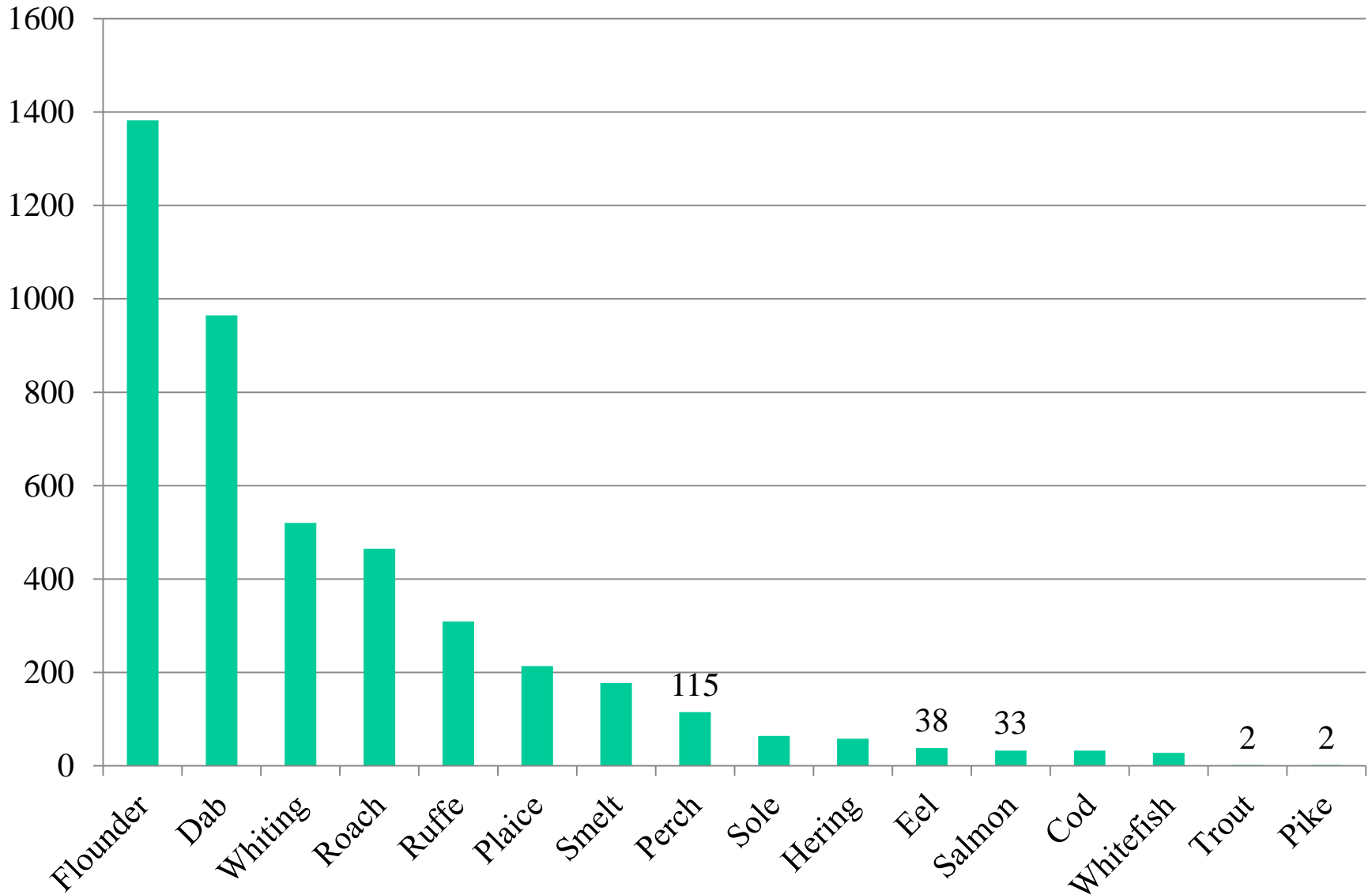
Predation of salmon smolts 2003



Recovery of cw tags from salmon smolts from cormorant pellets collected April through June 2003

Otolith analyses from pellets

x 1000



Results from Ringkøbing Fjord 2000 – 2004

Telemetry (2000, 2002): Salmon smolts, 40 – 50 % of tags were recovered from one colony.

CW-tagging (2003, 2004): 25 % of tagged salmon smolts were eaten during the 3-weeks smolt migration period.

40 – 50 % of tagged eel were eaten in one year.

All (100%) of tagged flounders eaten in 15 days

Pellet analyses: 30,000 salmon smolts, 1.4 million flounders, 38,000 eel were eaten.

Smolt predation by cormorants *from Jepsen et al. (in press)*

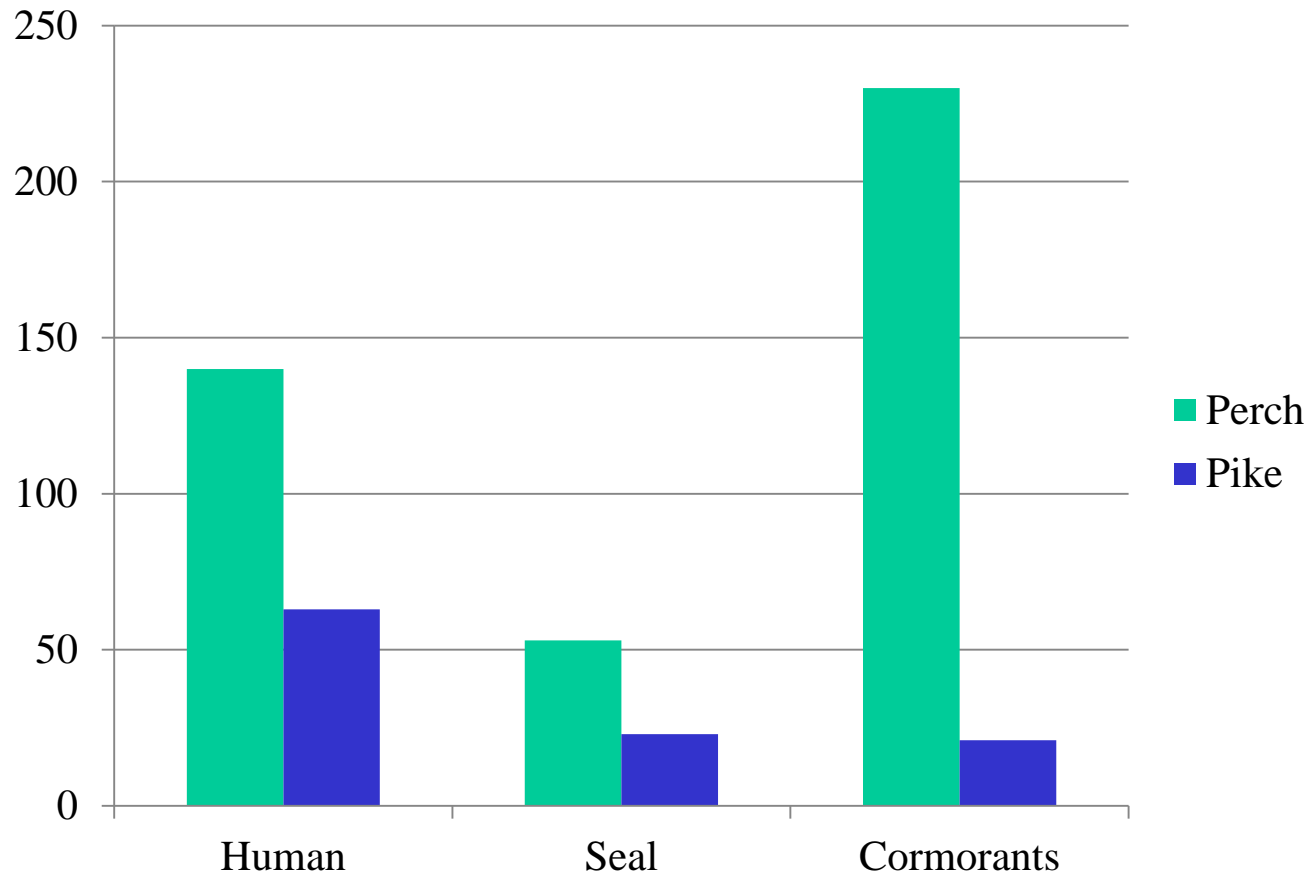
Year	Number tagged	Species	Mortality by cormorants (%)	Method	Source
1997	50	Wild trout	55	Radio-telemetry	Dieprink et al. 2001
1997	50	Hatchery trout	67	Radio-telemetry	Dieprink et al. 2001
2000	17	Wild trout	24	Radio-telemetry	Dieprink et al. 2002
2000	51	Wild salmon	48	Radio-telemetry	Dieprink et al. 2002
2002	51	Salmon (mix)	40	Radio-telemetry	Baktoft 2003
2001					
2003	64,500	Hatchery salmon	23	CW-tagging	Jepsen et al 2010
2003	-	Salmon (mix)	> 60*	Pellet analyses	Sonnesen 2007
2005	10,000	Hatchery salmon	31	CW-tagging	Jepsen et al 2010
2005	58	Salmon (mix)	53**	Acoustic telemetry	Koed 2006
2005	42	Trout (mix)	88**	Acoustic telemetry	Koed 2006
2008	4363	Wild trout	45***	PIT-tagging	Jepsen et al. 2014
2008	5009	Wild trout	42***	PIT-tagging	Jepsen et al. 2014
2010	5900	Hatchery trout	72***	PIT-tagging	Thomsen 2013
2014	1400	Wild trout	22***	PIT-tagging	Jepsen et al. 2014
2016	74	Salmon (mix)	42	Radio-telemetry	Unpublished
Mean			47		

47% fewer smolts = 47% fewer salmon coming back!

Not many salmon survive to this size!



Consumption of fish from the Baltic Sea – kg/km²/year



From *Hansson et al. 2017*

Cormorants in rivers – a new phenomenon in DK



Foto: Allan Guido Nielsen



Two cold winters
2009-10
2010-11



Foto: Michael Holm

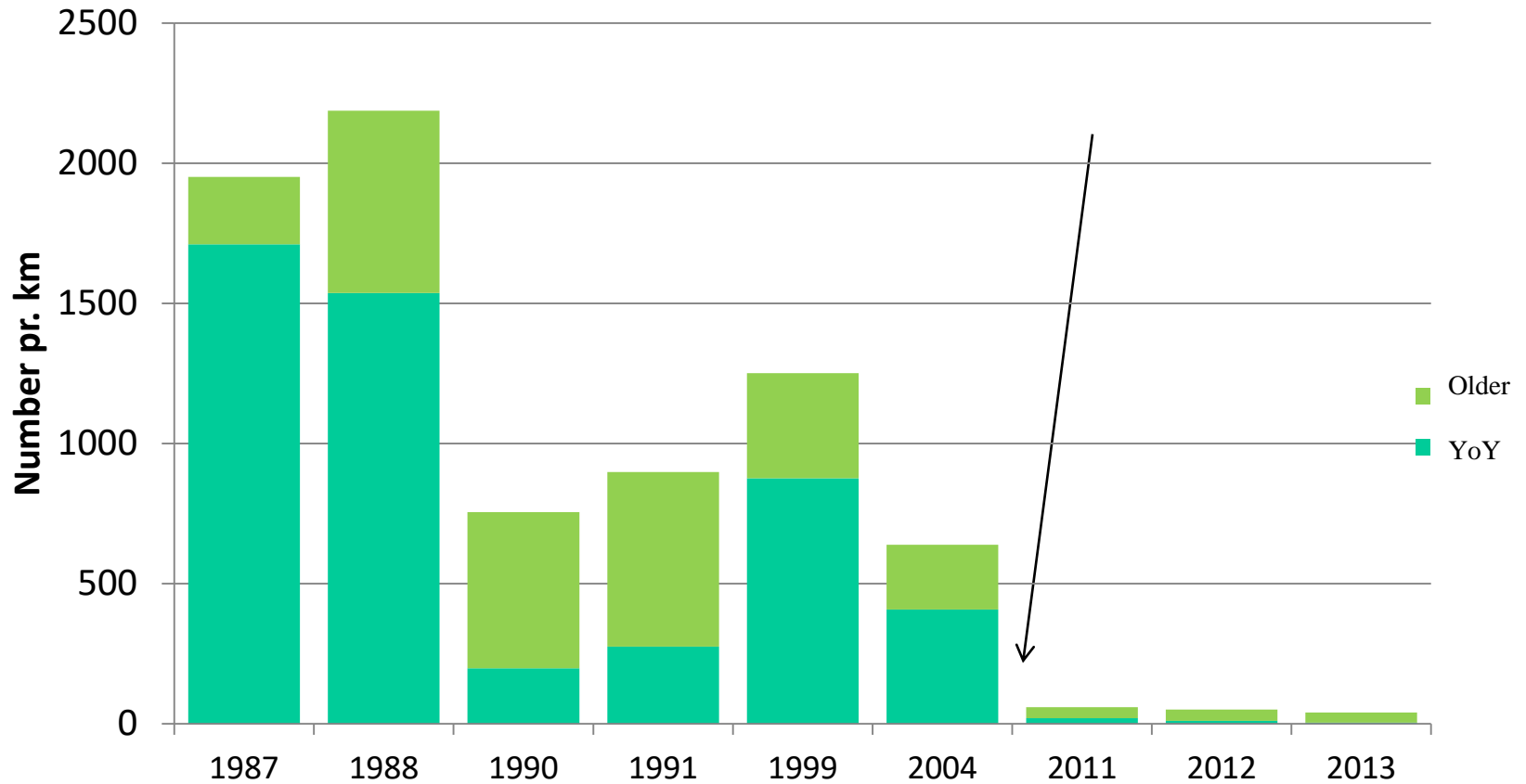
Grayling



Grayling – Omme Å	2009	2010
Number pr. km		
Fry	147	0
1+	250	5
Larger	15	1
Total	412	6

Catch of Grayling by electrofishing a 2 km stretch in 2009 og 2010 (Iversen 2010).

Grayling



Grayling density in 1,5 km stream.

25 grayling (32-36 cm) were radiotagged in October.

River with very few cormorants

Only two tagged grayling survived

A loss of 80% of total fish biomass was estimated



Video-clip

Trout



Year	PIT-tagged (N)	Recovered (%)
2010	650	8.5
2011	1038	12.2
2012	937	14.6

PIT-tags from brown trout, recovered at a cormorant roosting site.
Jepsen et al. 2018



Predation on lake fish?



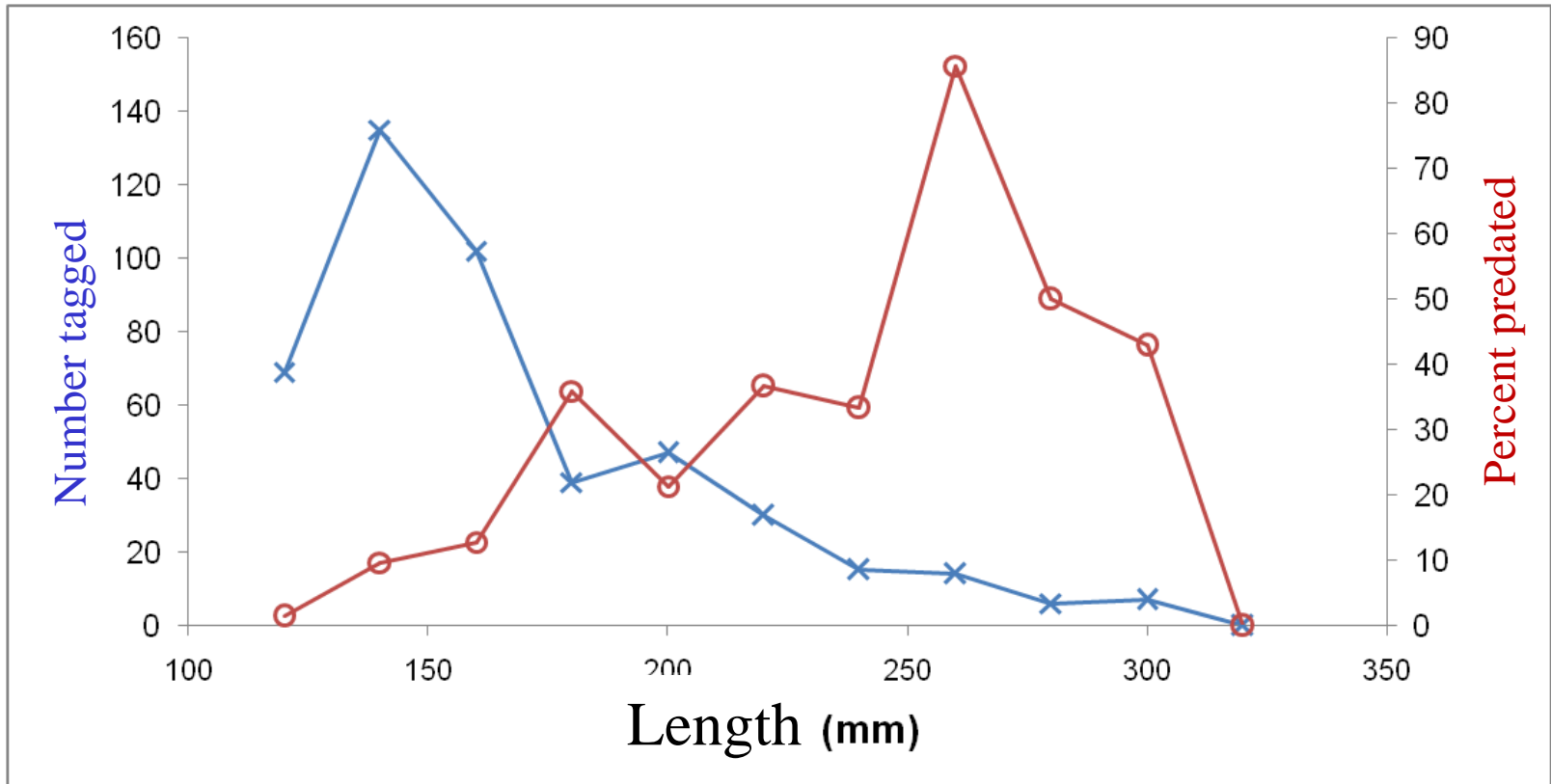
PIT studies of lake fish

More than 1000 PIT tags were found in one colony 13-20 km away

	Loldrup Lake				Viborg Lakes	
	2005	2007	2008	2009	2008	2009
Roach	19%	32%		17%	30%	24%
Bream	11%				33%	33%
Perch	41%			46%	70%	45%
Pike			33%	30%		

Minimum estimates (*Skov et al. 2014*)

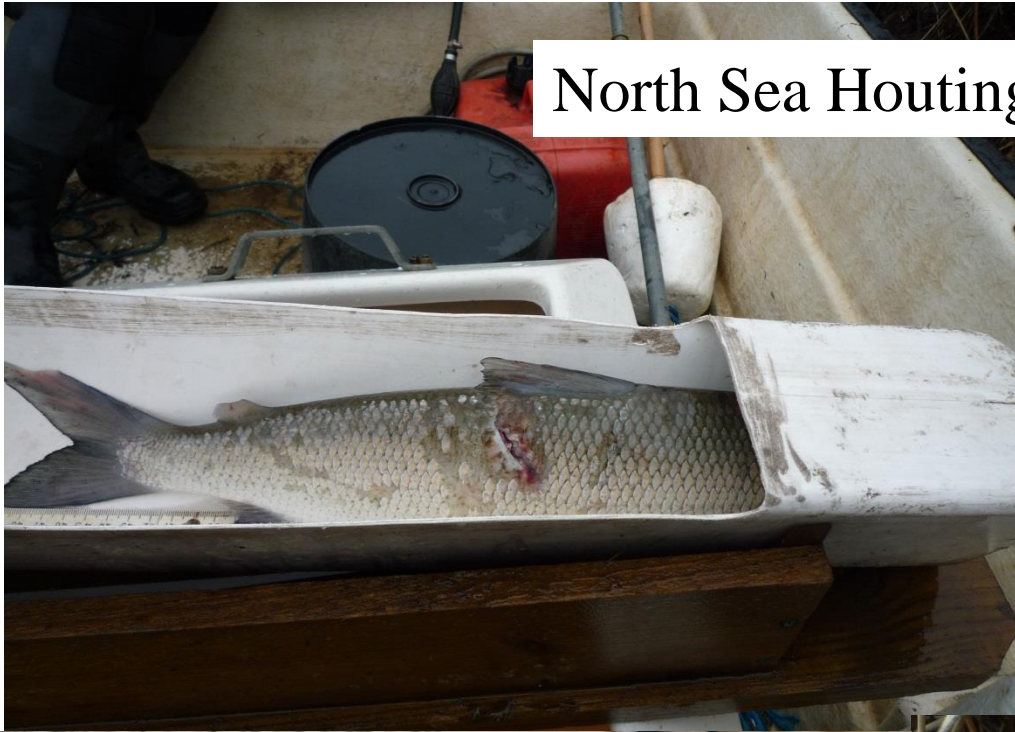
Perch



Larger perch are more vulnerable



North Sea Houting



Conclusion:

Impact on fish populations in Rivers, Lakes and coast.

Documentation (by different methods) that predation from cormorants is now the *main regulating factor* for many fish stocks.

Effects include:

- Economic loss (commercial and recreational fishing)
- Cultural loss
- Biodiversity loss
- Problems in reaching WFD requirements

Management

Ministry of Environment

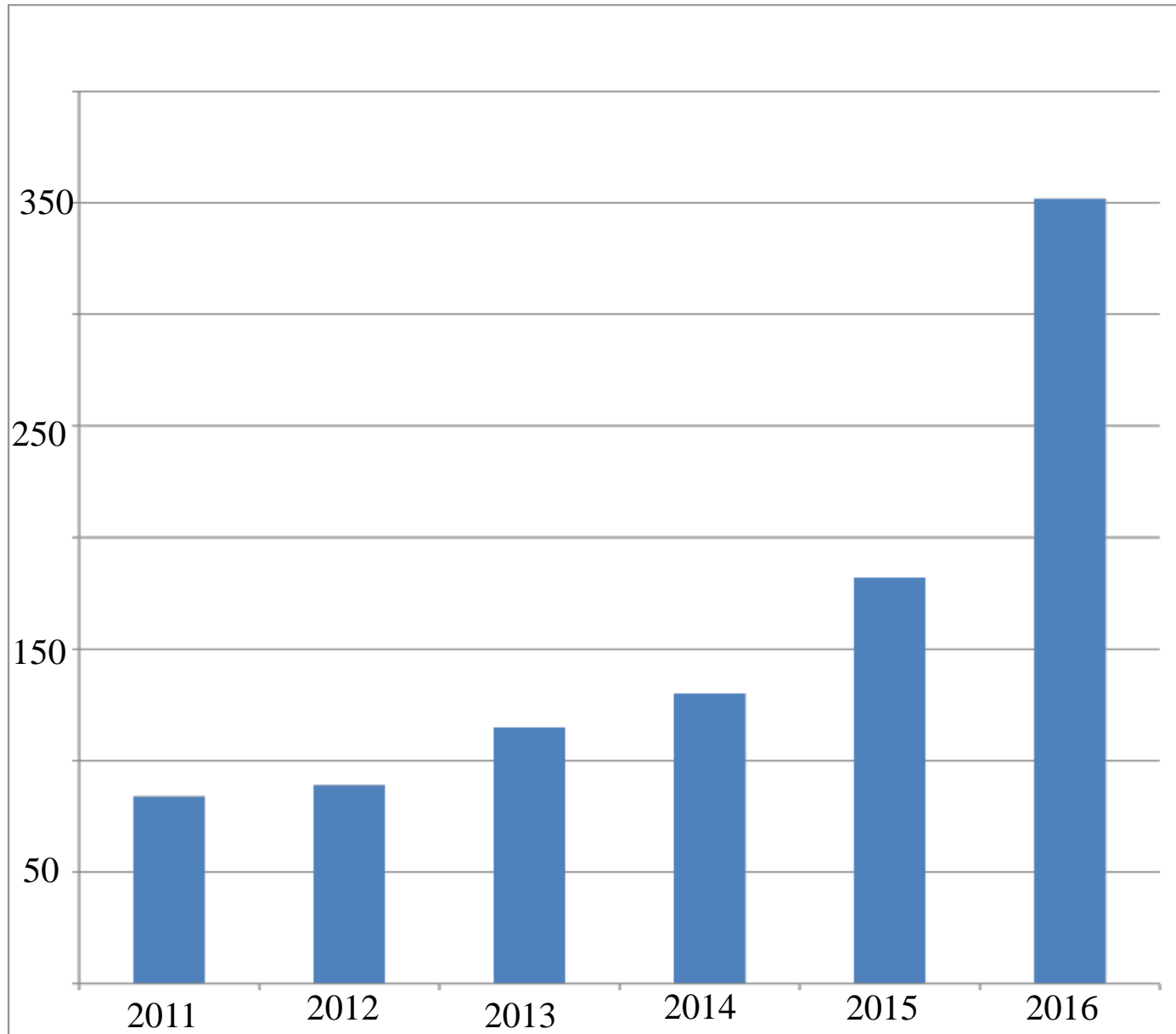
Cormorant-group: Stakeholders, managers, experts

National cormorant management-plan since 1997:

- Egg oiling
- Prevention of new settlements
- Protective Shooting (fishers and hunters)
- Regulation outside breeding season in rivers

Adaptive management

- MP provides the framework
- Loss in poundnets – fishermen were permitted to shoot cormorants at nets (1000 m)
- Loss of smolts – anglers were permitted to shoot cormorants during smolt migration
- Cormorants foraging in the rivers – protective shooting was initiated
- Continued problems in rivers - permission to shoot at night roosting sites

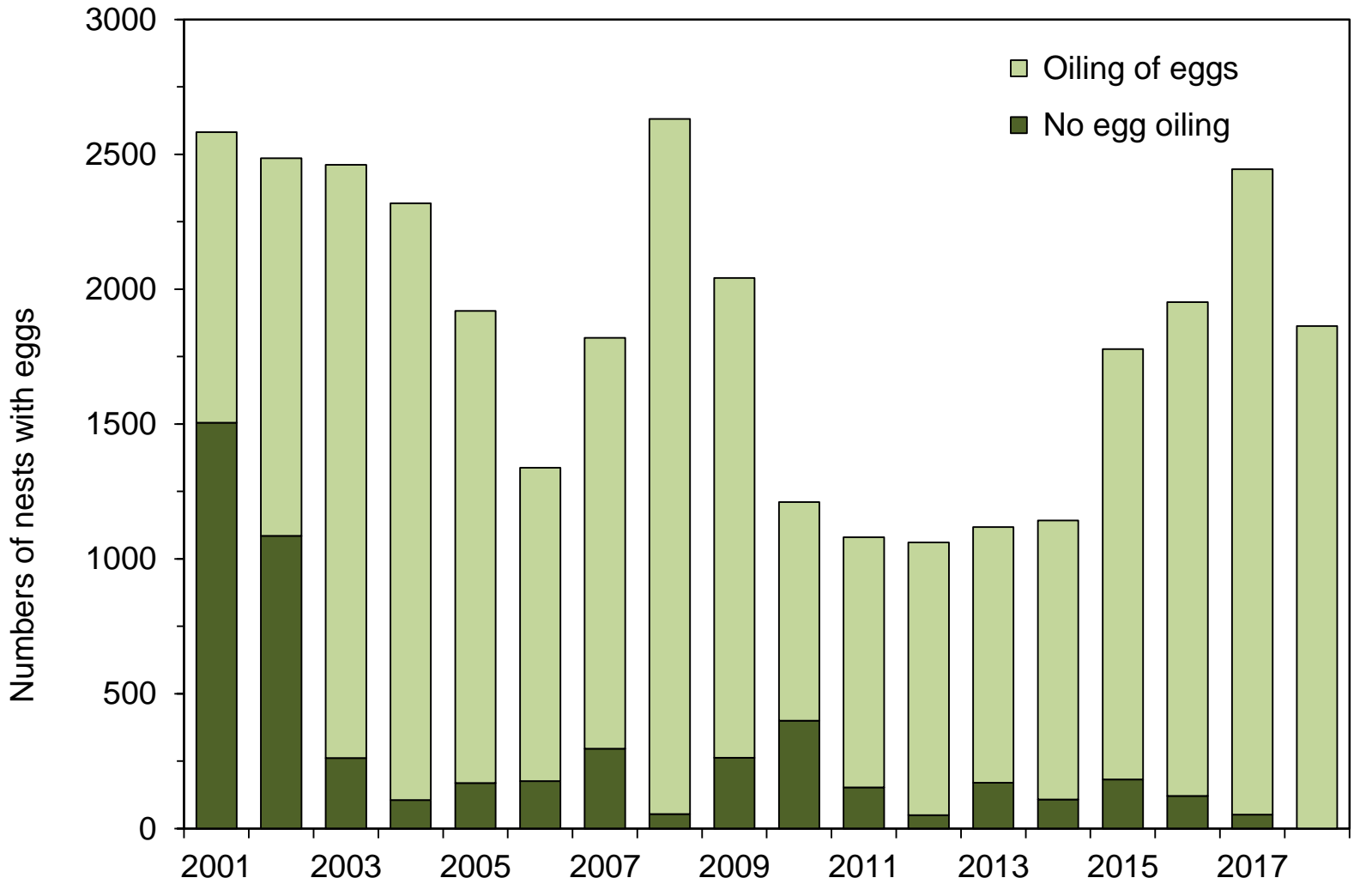


Permissions granted to regulate (shoot) in rivers

Oiling off eggs







Thomas Bregnballe, AaU

17 years after start, we have app. 2000 nests in 2018

- Despite much effort – conflicts still remain high
- No clear effects of regulation
- High immigration rate
- A common EU plan would help management



Thank you

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Human - Wildlife Conflicts in Europe

Fisheries and Fish-eating Vertebrates as a Model Case

Series: Environmental Science and Engineering

Klenke, R.A.; Ring, I.; Kranz, A.; Jepsen, N.; Rauschmayer, F.;

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