



Assessing the causes and developing measures to prevent the escape of fish from sea-cage aquaculture

**Scientific Co-ordinator:
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SINTEF Fisheries and Aquaculture**

**PREVENT ESCAPE is financially supported by
the Commission of the European Communities
under the 7th Research Framework Program**





Prevent Escape



*Assessing the causes and developing measures
to prevent the escape of fish from sea-cage aquaculture*

Co-ordinator

SINTEF Fisheries and Aquaculture, Norway

Participants

Hellenic Centre of Marine Research, Greece

University of Alicante, Spain

Association of Marine Science, Scotland

Institute for Nature Research, Norway

Nofima Marin, Norway

University of Crete, Greece

Marine Institute, Ireland

University of Malta, Malta

Tecnalia-AIE, Spain

University of Las Palmas de Gran Canaria, Spain

Memorial University of Newfoundland, Canada



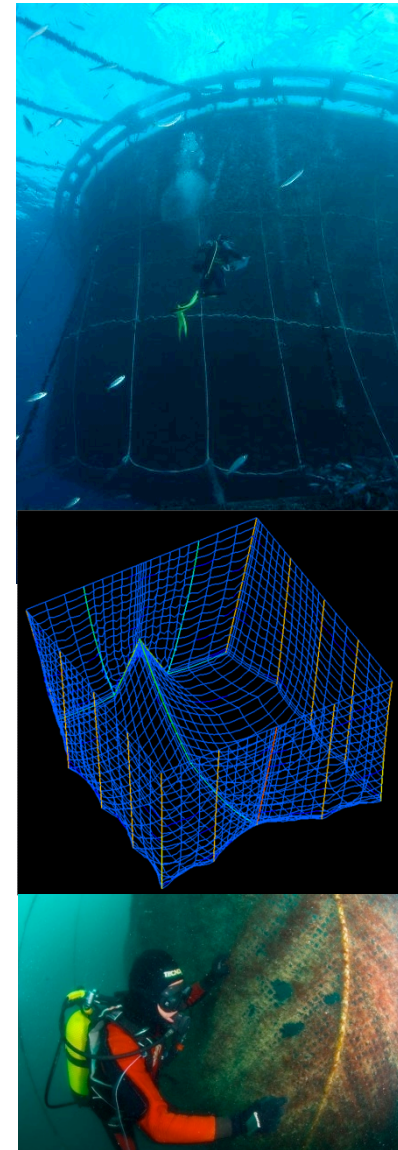
Prevent Escape Industry Workshop

Prevent Escape is a European Union research project that seeks to reduce the number of fish that escape from European aquaculture through research to improve fish farming techniques and technologies.

- Agenda -

- 09:45 Welcome and workshop introduction**
Javier Remiro – FOESA
- 10:00 The problem, extent and causes of escapes in the Mediterranean, and possible solutions.**
Tim Dempster – SINTEF, Norway
- 10:20 Tracing escapees in the Mediterranean**
Pablo Arechavala – Universidad de Alicante
- 10:40 Coffee break**
- 11:00 Escaped sea bream and sea bass – where do they go and can we recapture them?**
Pablo Sánchez – Universidad de Alicante
- 11:20 Meagre – a new species and a new escapee**
Ricardo Haroun – Universidad de Las Palmas de Gran Canaria
- 11:40 Properties of Mediterranean nets and ropes**
Diego Mendiola – AZTI Tecnalia
- 12:10 Current research on containment issues and how it might help prevent escapes**
Osten Jensen – SINTEF, Norway
- 12:40 Industry perspectives and open workshop discussion**
Javier Ojeda – APROMAR

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The problem, extent and causes of escapes in the Mediterranean, and possible solutions.



- Little known about the extent, causes and effects of escapes of sea bream, sea bass and meagre



- Potential for genetic and ecological effects
- Potential for disease transmission to other farms and to wild fish
- Possible that escapes are costly to the industry



Map Escape – aims and methodology

- Document **extent** escape incidents
- Assess **causes** of known escapes
- Evaluate **cost** of escape events

- Collate existing information and gather original data by means of:
 - Questionnaire/interview process
 - Follow up visits with sub-sample





Map Escape

**David Jackson ^{1*}, Alan Drumm ¹, Osten Jensen ², Diego Mendiola ³,
Joseph A Borg ⁴, Kenny Black ⁵, Nafsika Papageorgiou ⁶ &
Ricardo Haroun Tabraue ⁷**

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2 SINTEF Fisheries and Aquaculture, Norway

3 Tecnalia AIE, Spain

4 University of Malta, Malta

5 Scottish Association for Marine Science, UK.

6 University of Crete, Greece

7 Universidad de Las Palmas de Gran Canaria, Spain



Questionnaire Returns

- Number of questionnaires returned per country variable.
- In general good data in questionnaires.
- Difficult to access data from some countries.
- Difficulties addressed by sourcing data from elsewhere – e.g. national reports





Questionnaire Returns

Country	No. returned	No. of escape incidents	Bream	Bass	Meagre	Salmon	Cod
Ireland	16	1				1	
Greece	4	11	4	3			
Norway	26	3				1	2
UK	2	2				2	
Spain	11	17	14	2	1		
Malta	3	26	22	4			



Follow up visits to sub-sample of respondents

- Two companies were visited on mainland Spain covering 7 sites & two companies in Islas Canarias.
- Two companies were visited in Greece covering 3 sites
- One company in Malta covering 4 sites
- One company in UK covering 25 sites
- Five cod and five salmon sites in Norway



Causes and number of fish escaped

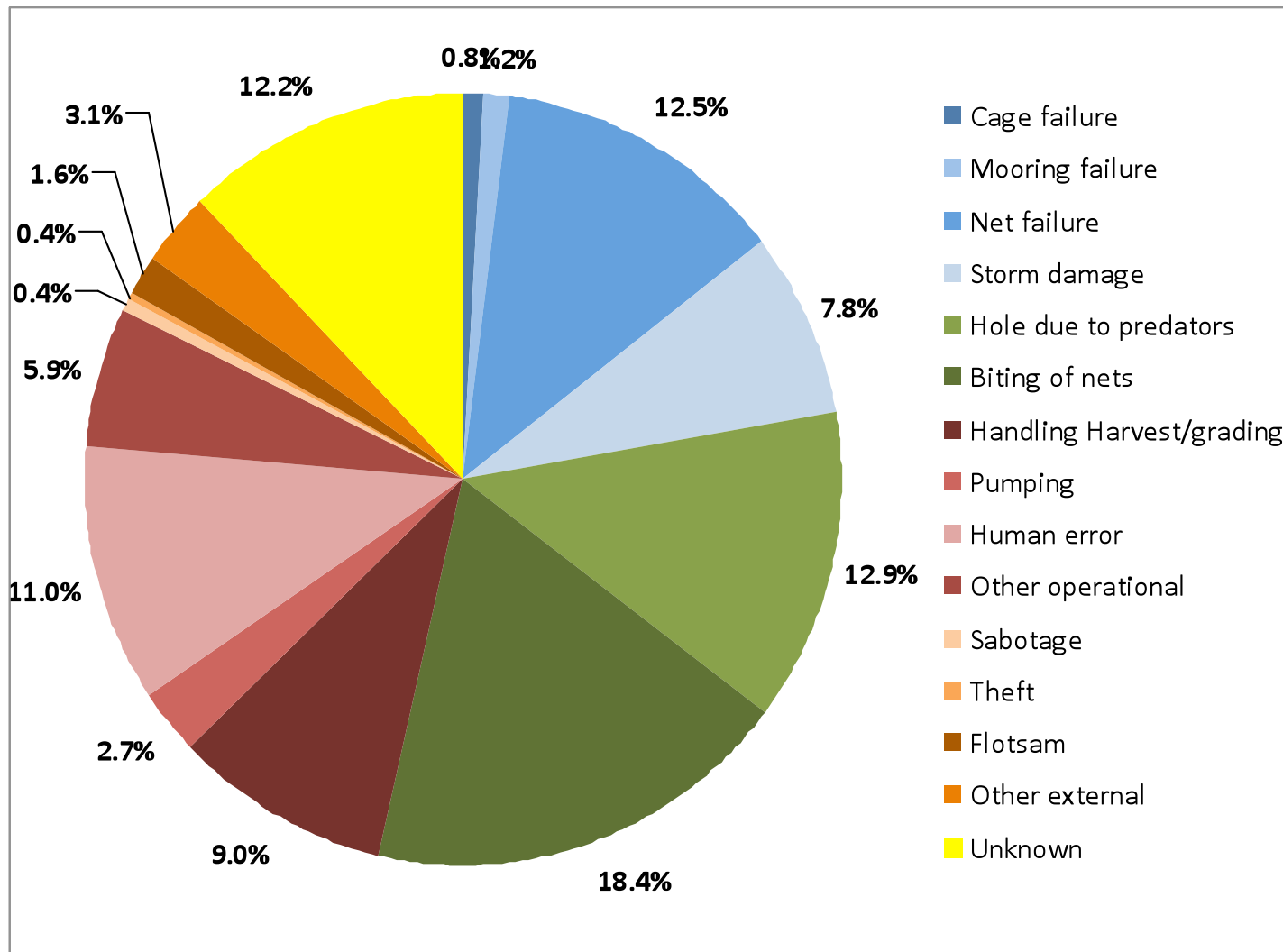


Summary of all 242 escape incidents

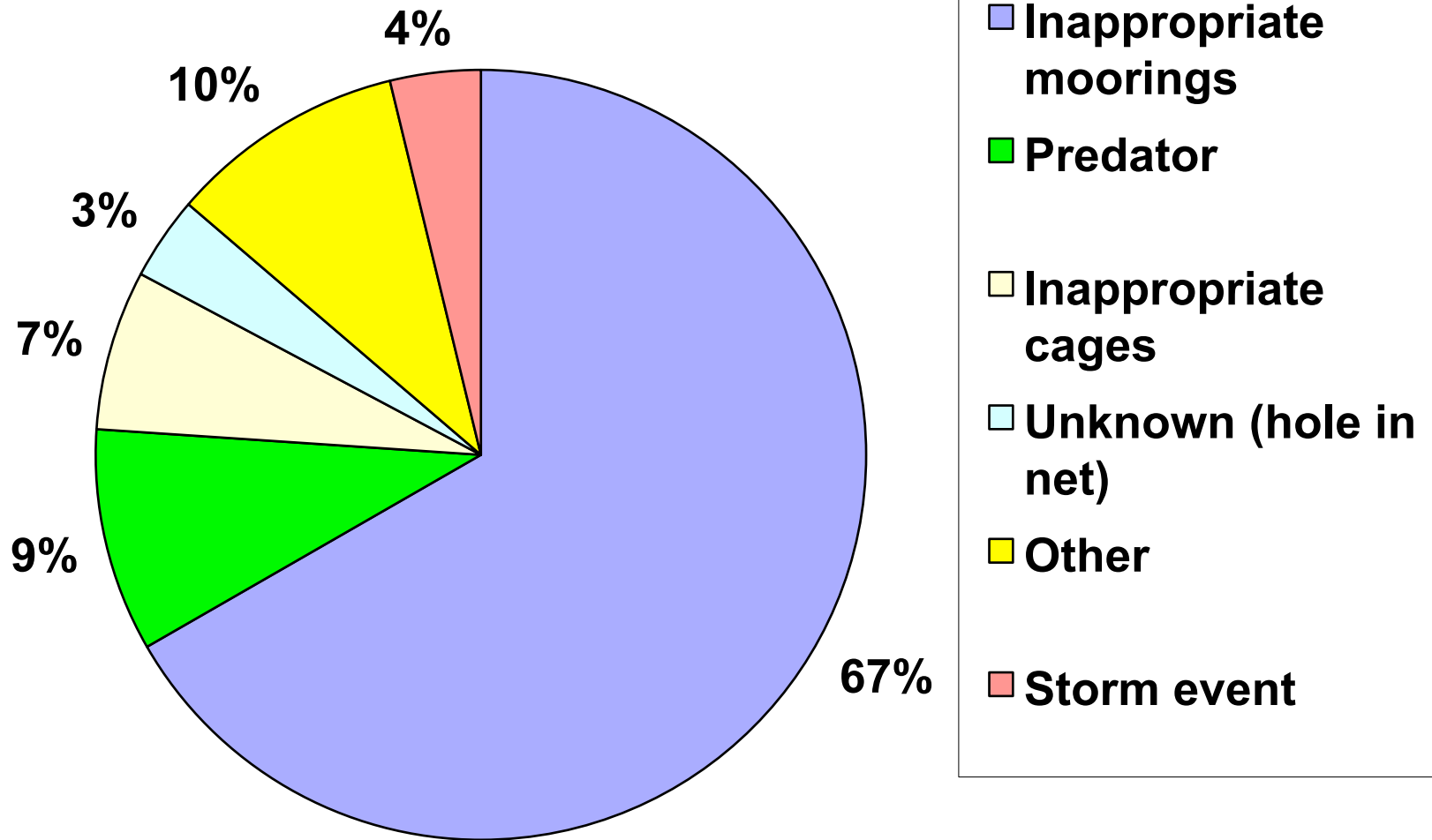
Species	Total		Structural		Biological		Operational		External		Unknown	
	No. incidents	No. escapes	No. incidents	No. escapes	No. incidents	No. escapes	No. incidents	No. escapes	No. incidents	No. escapes	No. incidents	No. escapes
Atlantic Salmon	113	820158	40	678279	5	6758	47	88065	3	13194	18	33862
Cod	61	457005	6	16466	38	118974	6	11839	3	180717	8	129009
Sea bass	15	599600	9	540000	5	52100			1	7500		
Sea bream	52	6846100	22	6181900	25	604000	1	20000	2	25200	2	15000
Meagre	1	200000	1	200000								
TOTAL	242	8922863	78	7616645	73	781832	54	119904	9	226611	28	177871



Causes of escapes by no. of fish escaped

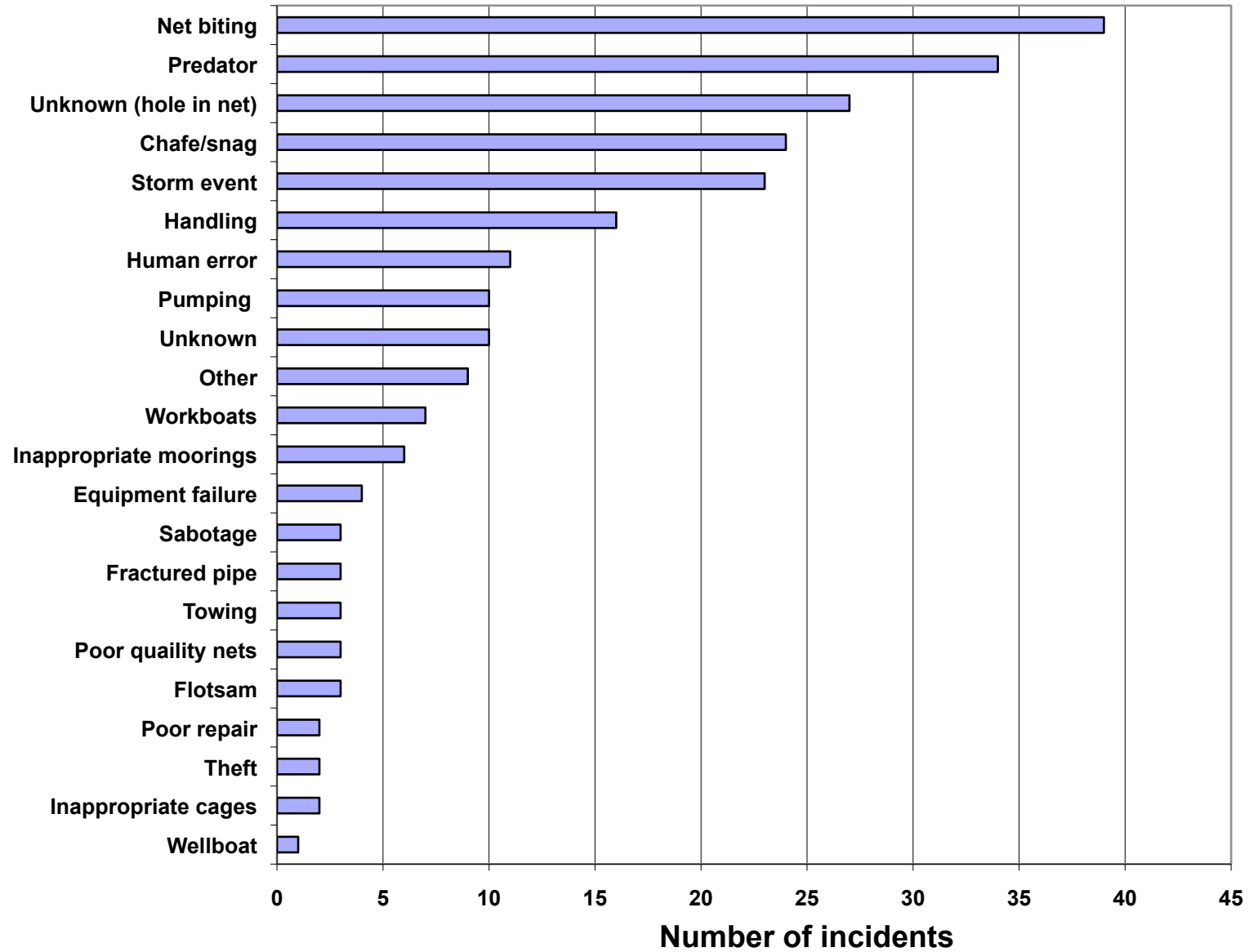


Causes of escapes by no. of fish escaped

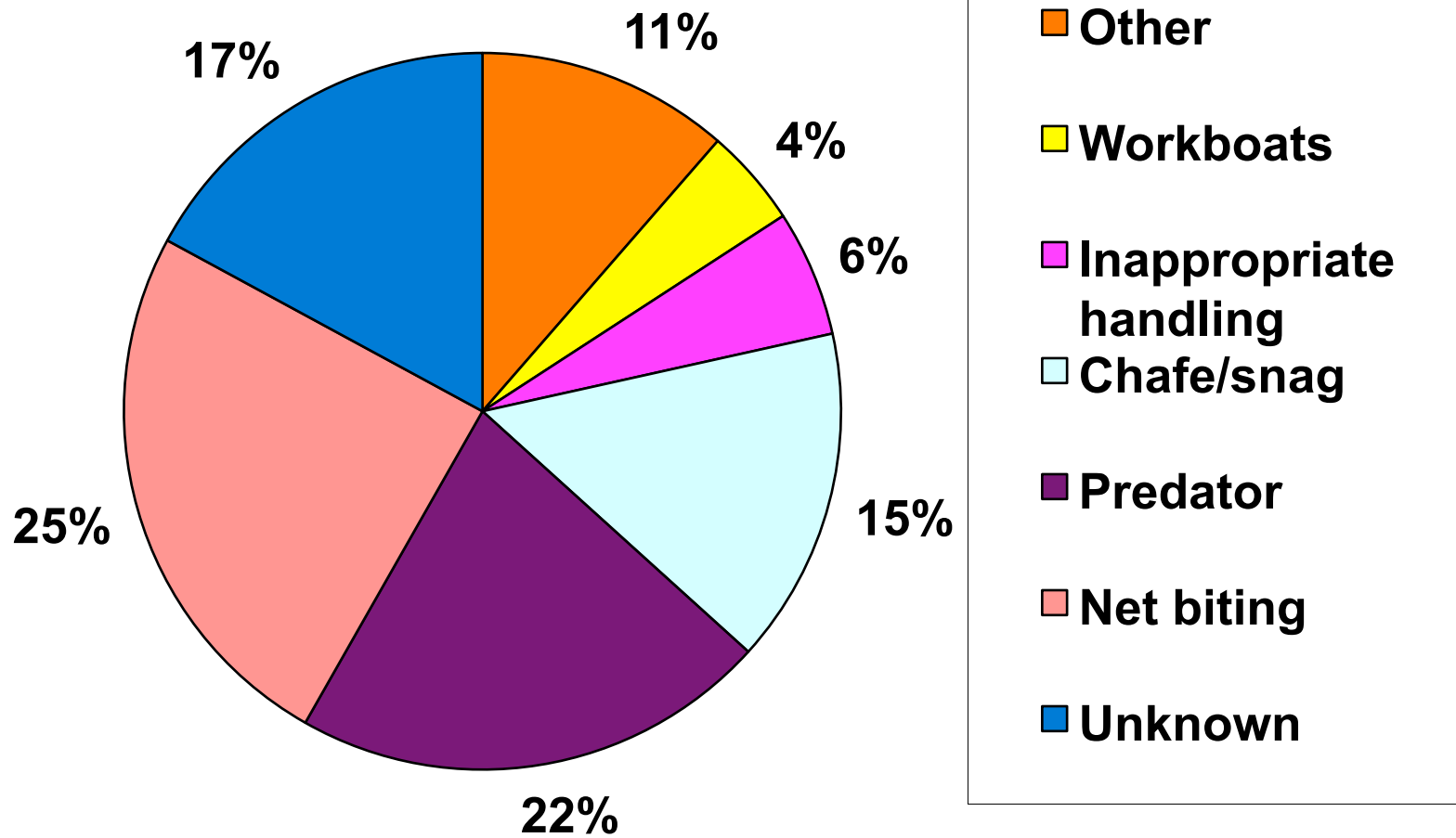




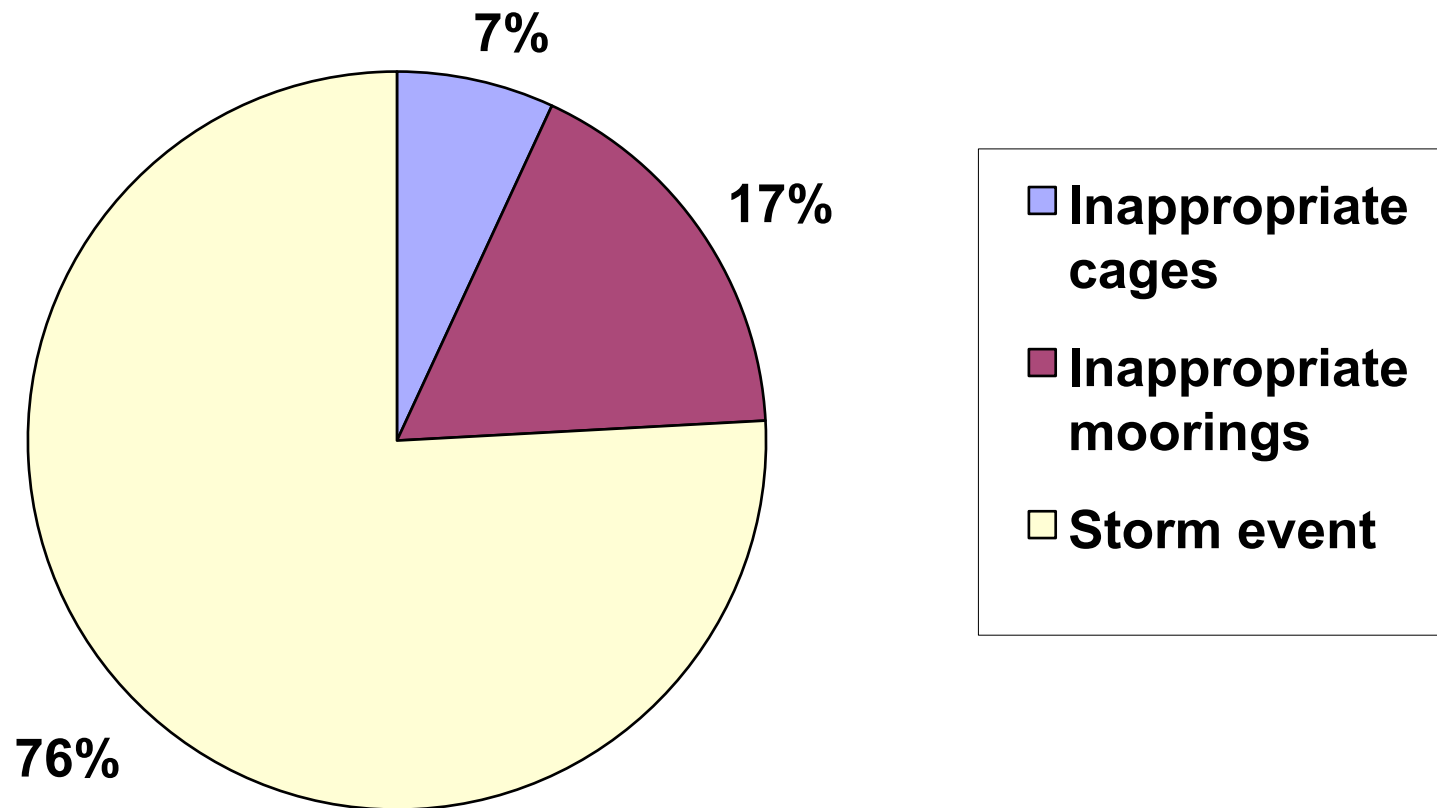
Causes of escapes by no. of incidents



Causes of escapes by no. of incidents



Escape incidents by structural failure



Causes of structural failure

- Progressive collapse of mooring lines
- Collapse of floating collar
- Hole in the net





Summary

- We catalogued 242 escape incidents across 6 countries over 3 years.
- The total number of fish escaping was almost 9 million.
- The most common cause of escape incidents related to a hole in the net.
- **The largest escape incidents were related to structural failures.**





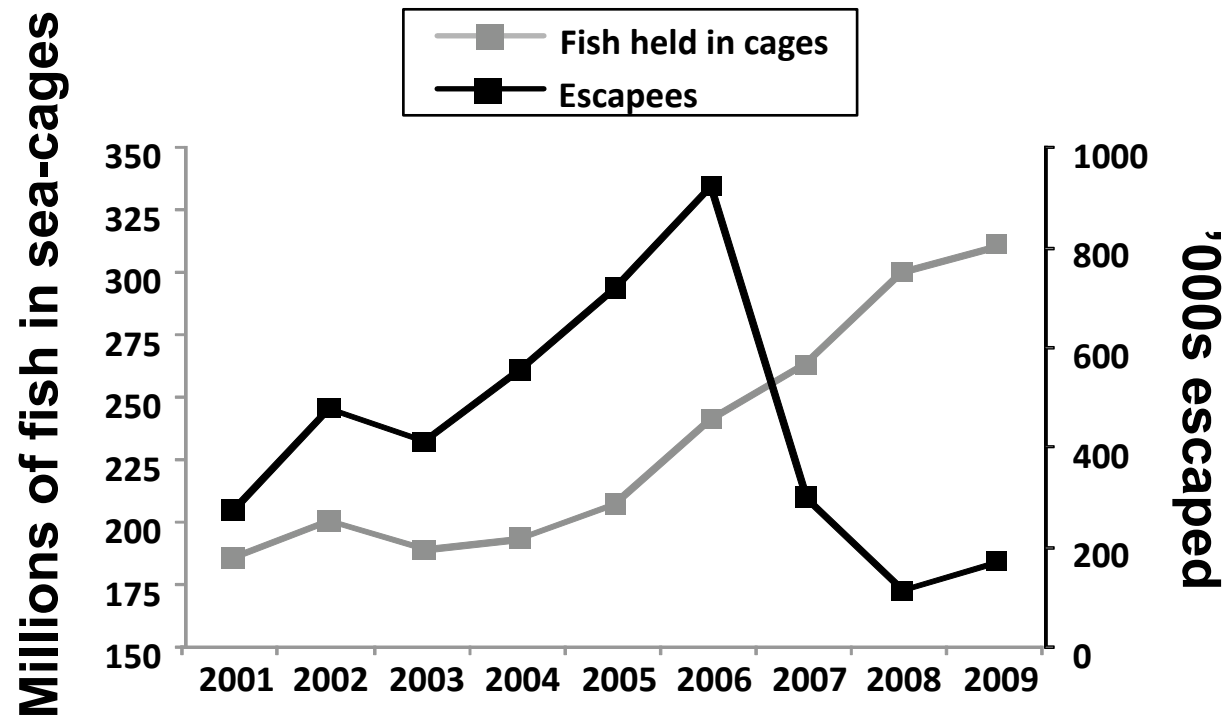
What can we do to prevent escapes??

The Norwegian salmon industry as an example



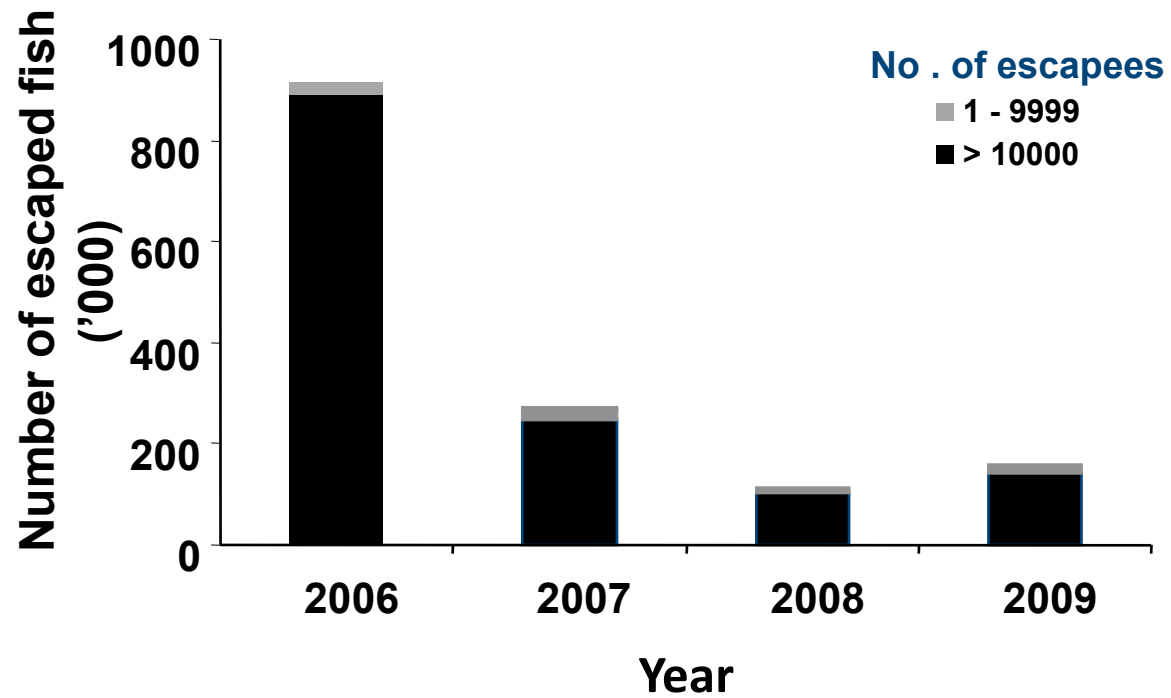


Norway as an example – salmon escapes



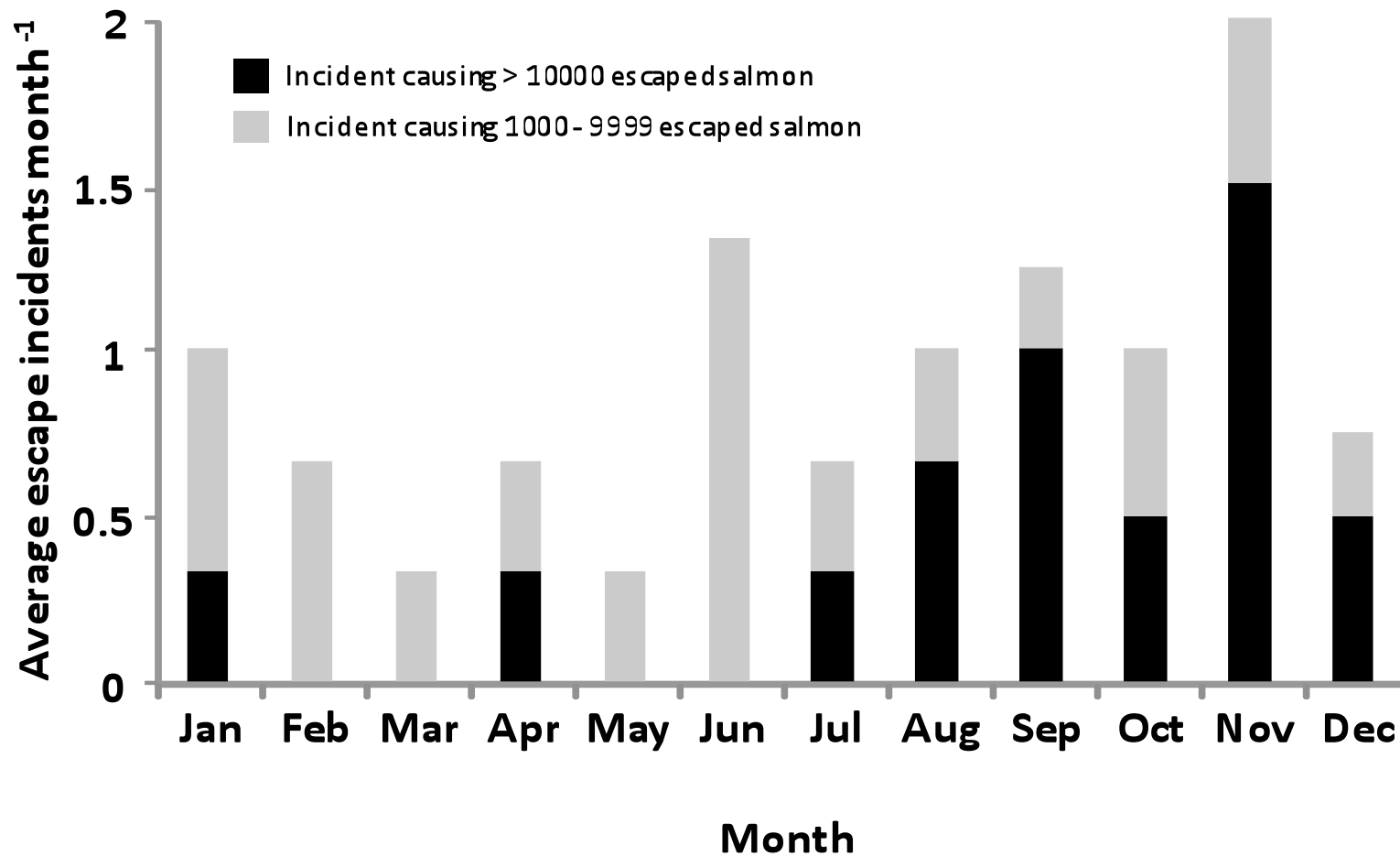


Large escape events are responsible for almost all escaped fish



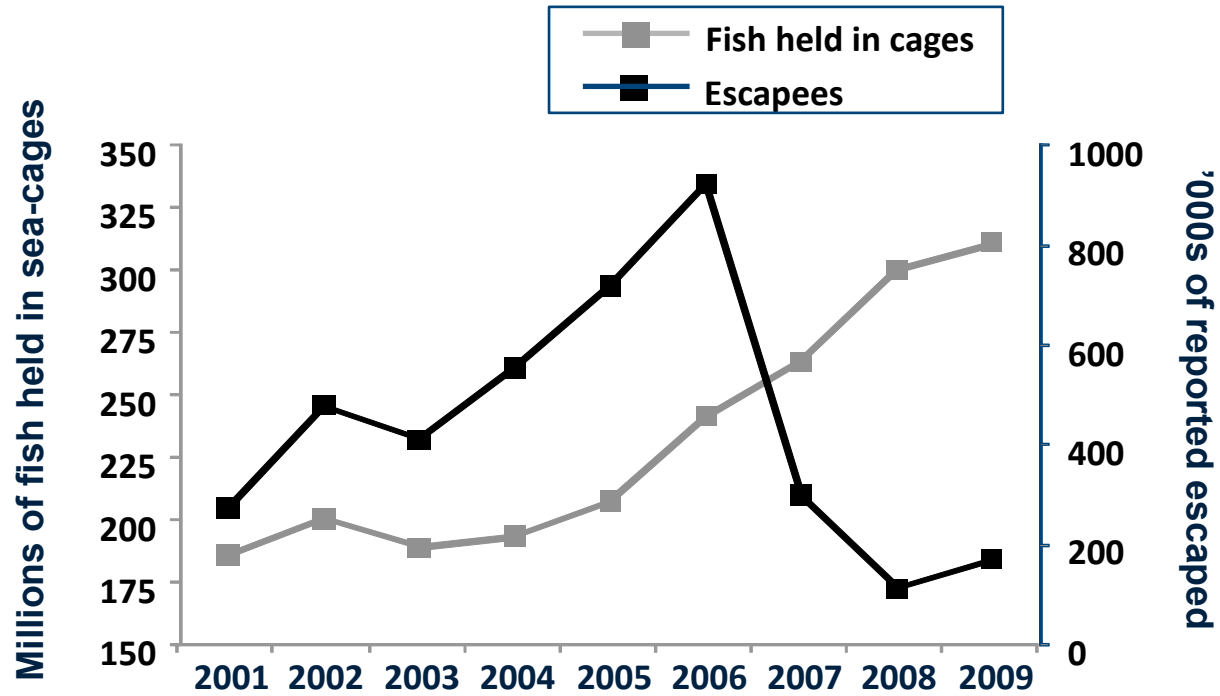


Escapes are highly seasonal – coincide with stormy season





Norway as an example – Salmon escapes



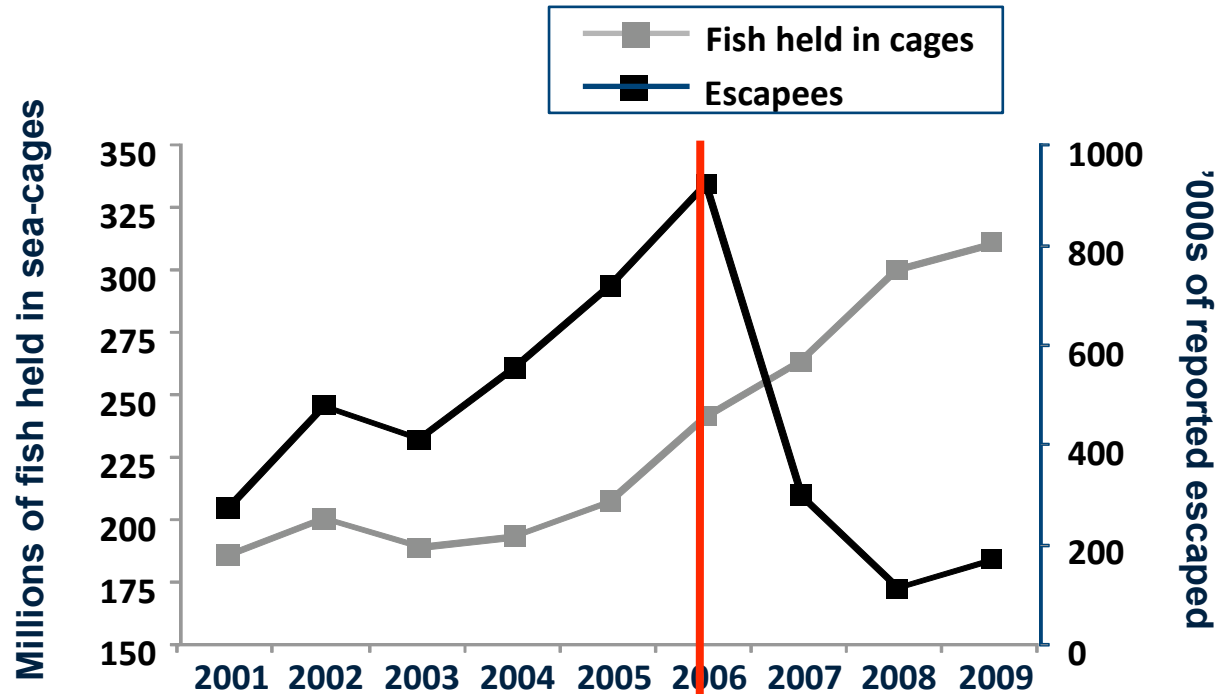


Introduction of a Technical Standard

- NS9415 - Marine fish farms: requirements for design, dimensioning, production, installation and operation
- Requirements for all key equipment – moorings, nets, floaters
- Fish farms should be able to withstand a ‘once in 50 years’ storm
- Standard became effective on 1.1.2006



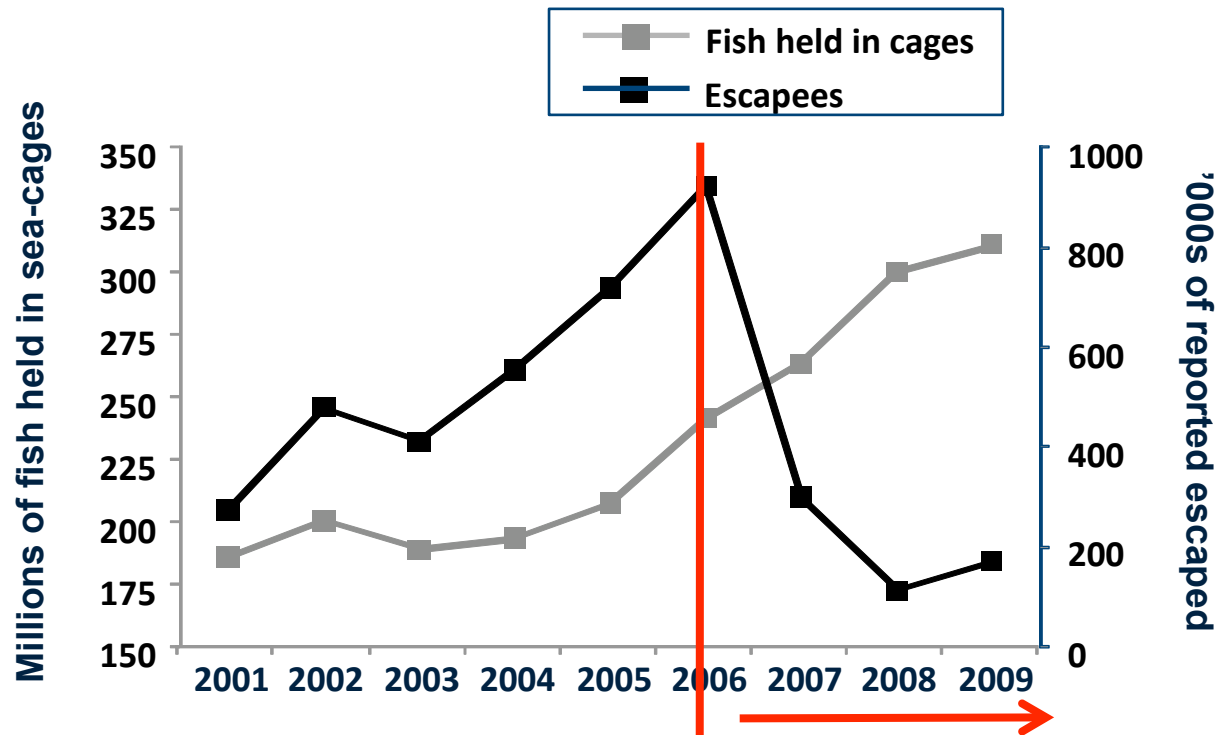
Norway as an example – Salmon escapes



Technical Standard
NS 9415 introduced



Norway as an example – Salmon escapes



Technical Standard
NS 9415 introduced

Escapes decline as standard
is phased in over several years



Causes of structural failure

- Progressive collapse of mooring lines (REDUCED)
- Collapse of floating collar (REDUCED)
- Hole in the net (PROBLEM)





**More information:
www.preventescape.eu**

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