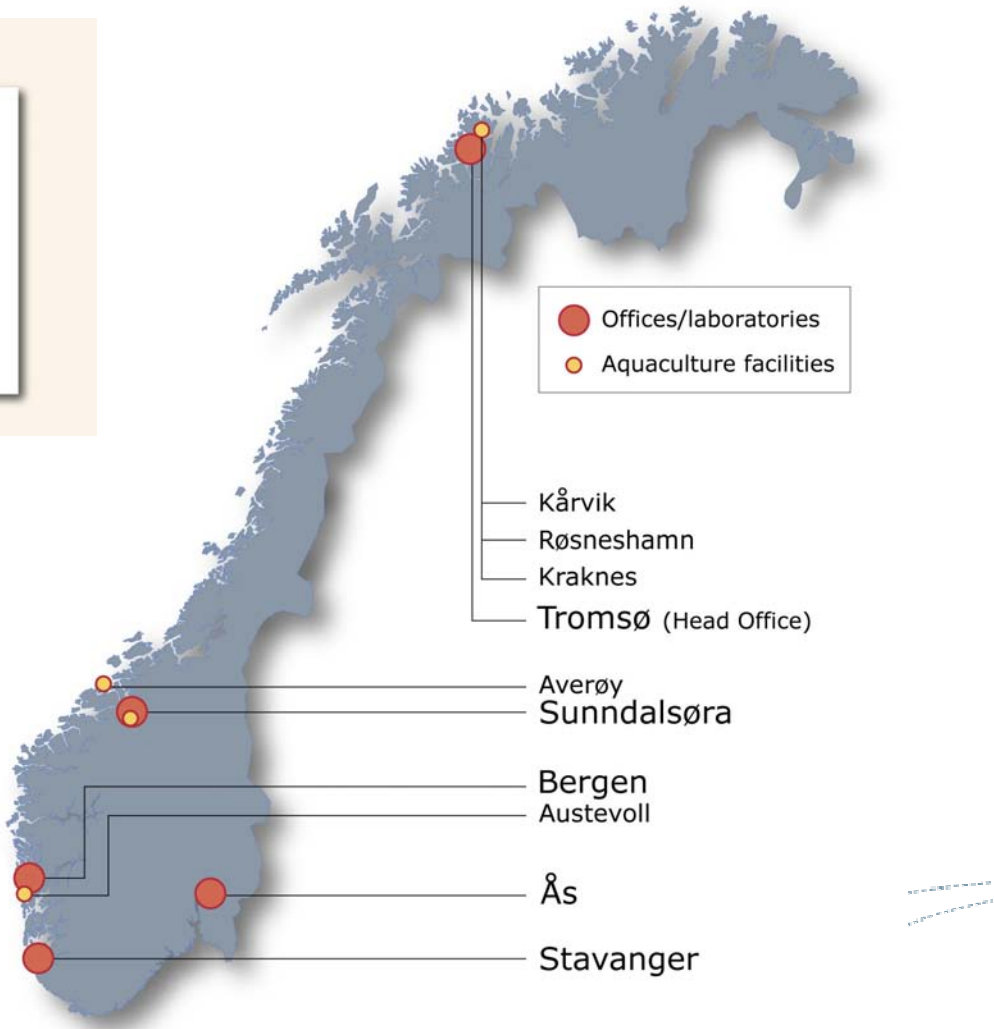


Field work and lab studies: Two sets of standards?

Grete Bæverfjord
Nofima Marin
Sunndalsøra, Norway



From NARAs annual report for 2008:

- In 2008, a total of 1 336 340 experimental animals were used in field studies (outside licensed experimental facilities)
 - 1 332 422 fish
 - 2 655 mammals
 - 1 253 birds
- ~70% of all animals reported to NARA in 2008 were fish used in field trials
- Nearly all of these fish were part of vaccine trials

Why do field work?

- Two sorts of "fields"
 - Ecobiological studies
 - Motivation: To study fish responses in their natural environment
 - No alternative to using the natural habitat
 - Aquaculture related studies
 - Motivation: To study fish responses to human and environmental impact in aquaculture
 - The "field" is a fish farm

Norway: Regulation on Animal Experimentation

§10 Permission for **field experimentation**

Upon receipt of an application, permission to conduct a field experiment, or other experiments not conducted in an approved laboratory animal facility, may be given to an institution, company or an individual. The National Animal Research Authority may require that a person other than the person receiving the permission is to take part in or supervise the experiment.

The applicant must document the goals, type of experiment, size of the experiment including the species and numbers of individuals of each species, the duration of the planned experiment, and where the field experiment will take place. In addition, the applicant must at any given time provide any information the Authority may require.

Permission may be given for up to two years at a time and may be withdrawn with immediate effect should the conditions for approval be altered or no longer exist.

Animal welfare act (old)

Section 21 Use of animals in research, etc.

No person may carry out biological research on animals without a special licence. A licence may be given if the aim is to find out what kind of disease animals or people suffer from, or if the purpose is to prevent or eradicate disease. A licence may also be granted if the purpose concerns research, preparation or testing of a medicine , drug, poison, etc. for use in people, animals or plants.

Such research must be carried out in such a manner that the animal is not exposed to the risk of suffering more than is strictly necessary for the purpose.

Ecobiological studies on fish

- Wild fish
 - Catch – tag - release – recatch
 - Catch – tag – release – trace
 - How will the catch and release affect the fish?
 - What are the effects of tagging?
 - Methods and procedures
- Hatchery-reared fish
 - Most often from wild origin
 - (Treatment) – tagging – release – recatch
 - Are these fish sufficiently comparable to wild?
 - What about their capabilities to survive in the wild?
 - Tagging methods

Tagging of fish for release in the wild

- Fin clipping
- Colours and dyes
- External tags (e.g. Carlin, Floy-tags)
- Passive ID tags
 - PIT-tags
 - Coded wire tags (CWT)
- Telemetry (logging and/or transmission of data)
- ...



Tagging of fish for release: Coded wire tags (CWT)

- Common in US, also used in Norway (and other countries)
- Small stainless steel implant, typically placed in the snout of the fish, with unique ID code
- The producer says "minimal biological impact"
- Are these tags really of no consequence to the fish ?

ELSEVIER

Fisheries Research 59 (2002) 209–215

www.elsevier.com/locate/fishres

Impact of tagging with coded wire tags on marine survival of
wild Atlantic salmon (*Salmo salar* L.) migrating from the
R. Bush, Northern Ireland

W.W. Crozier*, G.J.A. Kennedy

*Department of Agriculture and Rural Development for Northern Ireland, Agricultural and Environmental Sciences Division,
Newforge Lane, Belfast BT9 5PX, UK*

Crozier and Kennedy (2002):

River Bush, return rate (mean of 10 years):

- Tagged fish 5.5%
- Untagged fish 10.7%

Table 3

Comparison of the ratios of returns of CWT tagged:control wild R. Bush smolts with literature reported values for wild and hatchery origin salmon handled/tagged using various methods^a

Study	Origin of fish	Comparison	Return ratio, tagged:control
This study	R. Bush (W)	CWT/AFC:control	0.33:1–0.84:1
Moffett et al. (1997)	R. Bush (H)	Ventral pan-jet:control	0.47:1
Moffett et al. (1997)	R. Bush (H)	Hot brand:control	0.77:1
Moffett et al. (1997)	R. Bush (H)	Anal fin clip:control	0.69:1
Moffett et al. (1997)	R. Bush (H)	Fluorescent pigment:control	0.69:1
Hansen (1988)	R. Imsa (W)	Carlin tagged:control	0.35:1
Hansen (1988)	R. Imsa (W)	AFC:control	0.53:1
Hansen and Jonsson (1988)	R. Imsa/R. Sandvik (H)	Dip netted:control	0.98:1
Hansen and Jonsson (1988)	R. Imsa/R. Lone (W)	Dip netted + anaesthesia:control	0.28:1
Isaksson and Bergman (1978)	Kollafjordur (H)	Carlin tagged:CWT	0.62:1
Isaksson and Bergman (1978)	Kollafjordur (H)	Carlin tagged:control	0.67:1–0.50:1
Saunders and Allen (1967)	N.W. Miramichi	Carlin tagged:AFC	0.60:1

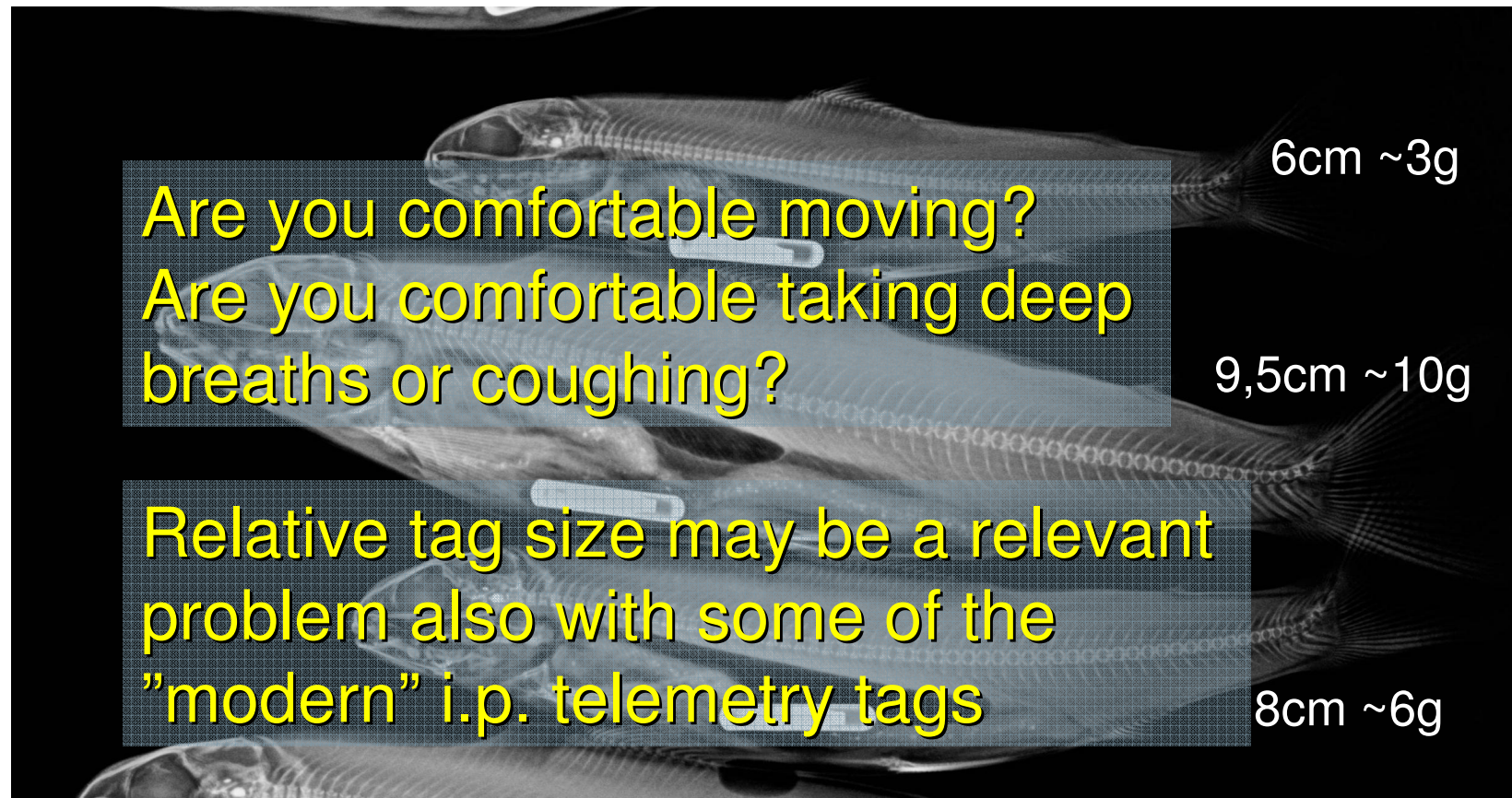
^a Average values used where a range is not given. W: wild; H: hatchery; CWT: coded wire tagged; AFC: adipose fin-clipped.



Tagging of fish for release: Effect of tag size

- Field study application (NARA): Use of PIT-tags in small salmonids for release in river
 - Hatchery reared fish
 - Mean weight at tagging 4-6g
 - Release in river following recovery
- PIT-tags: Passive transponders i.p., glass encapsulated, length 12 mm
- Reports in the literature: Good results when tagging fish <2g (perch)
- Reference to tagging down to 3g in salmonids (from applicant)
- Experience from Nofima Sunndalsøra: 5g fish have problems in recovering balance after tagging, and may sink to the bottom

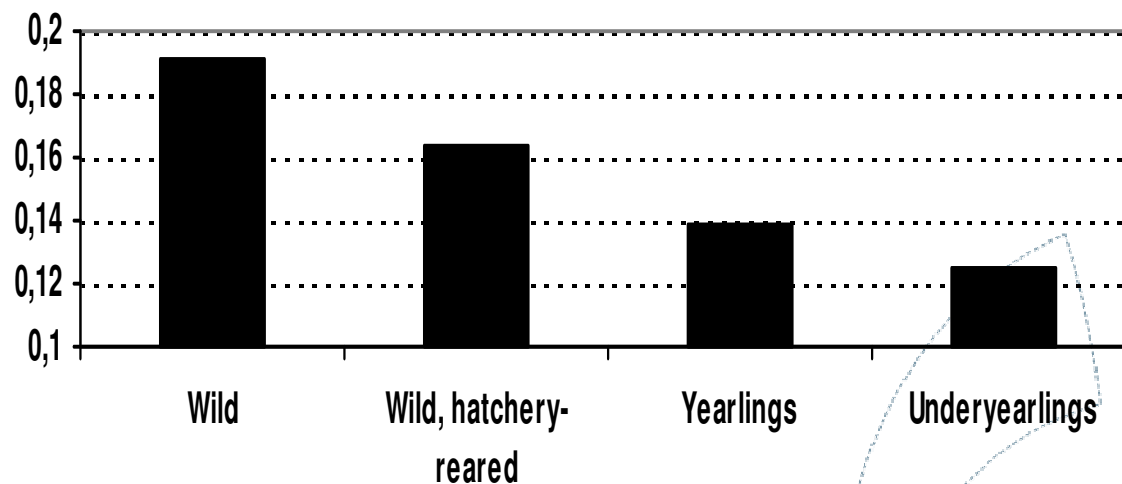
Tagging of fish for release: Effect of tag size



Ecobiological studies using hatchery-reared fish

- Even if being of wild origin (offspring of wild broodstock), how fit are these fish for release in the wild?
- Are they valid as models for "true" wild fish populations?

Cardiac- somatic index (CSI)



Hillestad and Tørud (2004)

Ecobiological studies, food for thought:

- "...research must be carried out in such a manner that the animal is not exposed to the risk of suffering more than is strictly necessary for the purpose."
- No specific guidelines for field trials, so same rules should apply
- Standard procedures and methods are even more absent than in laboratory settings
- Researchers, when challenged, will fight for their choice of method, and it is generally difficult to dispute their choices
- Daily inspection?
- Humane endpoints?
- Who knows what these fish experience after release: In too many experiments, most of the fish disappear without trace
- It may be justified to advice use of fewer animals: More information per animal through more refined techniques, e.g. telemetry, even if this means more impact per fish

Why field studies in aquaculture related research?

- Relevance:
 - Results from small scale experimental units may not be accepted by the industry (and authorities) unless it can be demonstrated that they can be reproduced in a farming environment
 - Some things just cannot be modelled in small scale
- Cost:
 - Although costs may vary, use of experimental facilities is expensive
- Funding:
 - Many research funding systems require extensive contributions from industry
 - Field studies are the most common choice!

Field studies in aquaculture: Relevance for commercial production

- Scale, scale, scale
- Continuous increase in size of commercial units: How well can rearing conditions be modelled in smaller scale
- Are we able to reproduce the "superior" rearing conditions in large units in experimental scale
- Vaccine trials: Post-license test in commercial cages
 - Should they be classified as experiments?
 - No "real" experimentation done

Funding of research, general considerations

- Research policy and practices:
 - Research funding from public budgets must be matched by own funding from industry to reach the goal of 3% of gross national product
 - The more applied the research is, the more own funding is requested
 - With increasing "solidity" of the industry, a higher level of own funding is expected

Aquaculture research funding, Norway

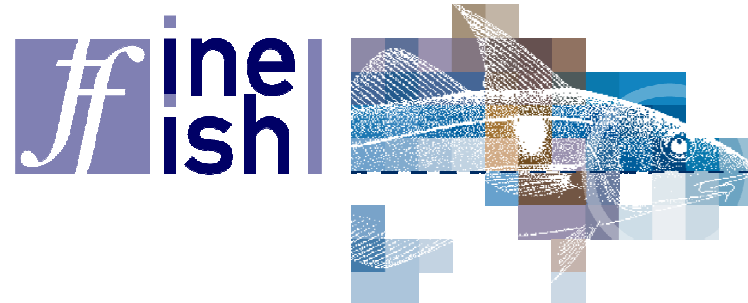
- The Norwegian Research Council (R&D)
 - Researcher initiated project 100-0
 - "Competence development project with user contribution" 75-25
 - 25% of budget in cash from industry
 - User-initiated project 50-50
 - 50% from industry, in kind contributions are accepted
- Innovation Norway (R&D)
 - Industry driven
 - Variable public funding, but commonly 20-30% of total budget, for reimbursement of RTD.
 - The rest is own funding from industry, mainly in kind contributions
 - SkatteFunn: System of tax deduction for money used for R&D, 20%
- Regional funding sources
 - Requires high level of own funding from industry

Aquaculture research funding, EU

- Large research projects for basic science exist!
- Smaller, SME-related projects
(SME: Small and medium-sized enterprises)
- For applied aquaculture research, the SME-related funding is the most likely option
- In FP6: SME projects required 50% own funding from industry
- In FP7: SME projects may get more than 50%, but financial models are very complicated
- The EU grant is mainly intended to cover RTD-partner expenses

Own contributions from industry

- Financial state of aquaculture is highly variable
- Large, profitable companies do their own research, generally of a high standard
- The SMEs need public support to do R&D
- The SMEs don't have any cash to spare!
- "Own funding" in aquaculture SMEs in practice limited to
 - Time
 - Use of fish and facilities



The FINE FISH project: Improving sustainability of European fish aquaculture by control of malformations (2005-09)

Coordinator: Mr. Courtney Hough, Federation of European
Aquaculture Producers (FEAP)

Technical manager: Dr. Grete Baeverfjord, Nofima Marin

www.finefish.info

Total budget ~5 mill €

EU grant ~3 mill €

Industry contribution required ~2 mill €



FINE FISH partners:

FEAP

Profunda	NO
Ferme Marine de Douhet	FR
AquaSearch ova	DK
Tinamenor	ES
Bolaks	NO
Viviers de France	FR
Brow Well Fisheries	GB
Andromeda	GR
Panittica Pugliese	IT
Pepite	BE
Royal Veterinary College	GB
UMR NuAGe (INRA)	FR
CCMAR	PT
NCM	IL
HCMR	GR
IFREMER	FR
University of Patras	GR
Nofima Marin	NO



- Personal observations:
 - Few, if any, successful experiments in fish farms
 - Plenty of horrible experiences
 - Bad luck
 - Lack of understanding
 - Lack of skills
 - Lack of technical facilities
 - Commercial interests will always win!
- Basic principle:
 - Experiments with expected negative impact on fish welfare must be done in designated facilities
- The FINE FISH positions
 - No "experiments" aimed at inducing malformations in SMEs
 - SMEs were encouraged to test **improved** procedures as field trials
 - SMEs to make their own decisions on topics for field trials, with full respect for commercial considerations
- EU restriction (during negotiation)
 - Value of fish and use of facilities could not be counted
 - Only value of time efforts accepted

Reflections

- All these efforts, so little results!
- Highly skilled and motivated personnel, own choice of topics
- "Low impact" studies, so probably little harm done to fish
- No expectations from project management
- The field experiments were forced upon the SMEs for funding purposes only, as a consequence of current funding policies
- More, rather than less, own funding expected from aquaculture producers in future
- To researchers, this is a fundamental dilemma: **More efforts must be put into doing low quality research with less control of fish welfare, to satisfy funding agencies**

Summary

- Field and laboratory: Two sets of standards? Yes, no doubt.
- In ecobiological research, field work is the only option, but some of the common approaches are due for revision
 - Not acceptable to do experiments where the majority of animals are lost without trace
 - How can we obtain better control? Is it possible?
 - Relevance and validity of models must be discussed
- In aquaculture related research, main priority should be to challenge the funding agencies
 - How can producers contribute to research without being required to waste time and efforts on bad experiments