A strategic review of UK and EU funded Aquaculture R&D – 1999 - 2009+

Marine Scotland Aquaculture Research Workshop - 20/10/09

Mark James

Scottish Aquaculture Research Forum

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Structure

- Where does support for UK aquaculture R&D come from and associated structural issues!
- Breakdown of UK and EU expenditure
- Key drivers for future aquaculture R&D

THIS PRESENTATION MAY SERIOUSLY DAMAGE MY HEALTH!

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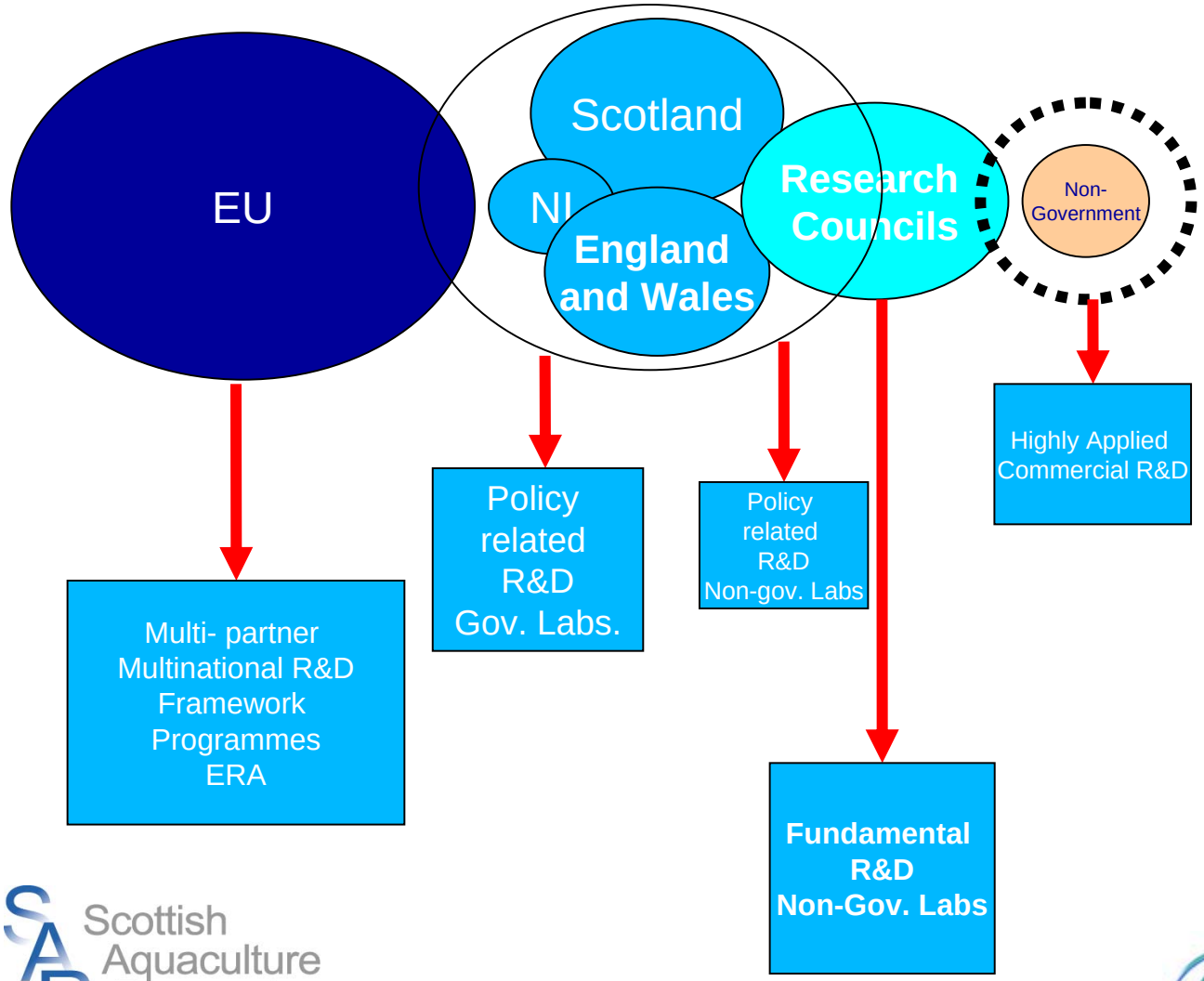
Funding jigsaw!



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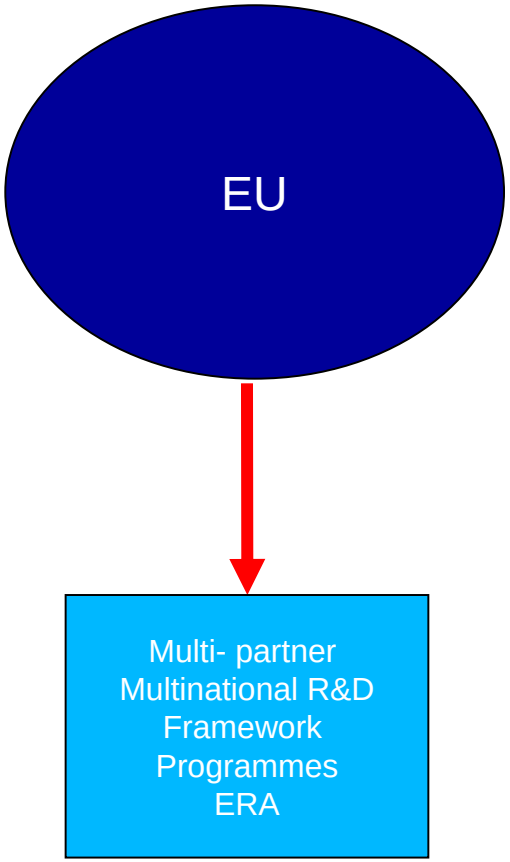
Structural Issues – to consider in the context of an R&D strategy!



- Driven by the Framework Programmes (FP)
- Large multi-partner projects costly to administer and difficult manage
- Often not co-hesive – and can duplicate national R&D efforts
- Many of the larger projects lack commercial focus
- Major source of funding for many GB research providers
- Potential to reduce duplication through ERAnets
- Potential to improve relevance and focus of through Technology Platforms

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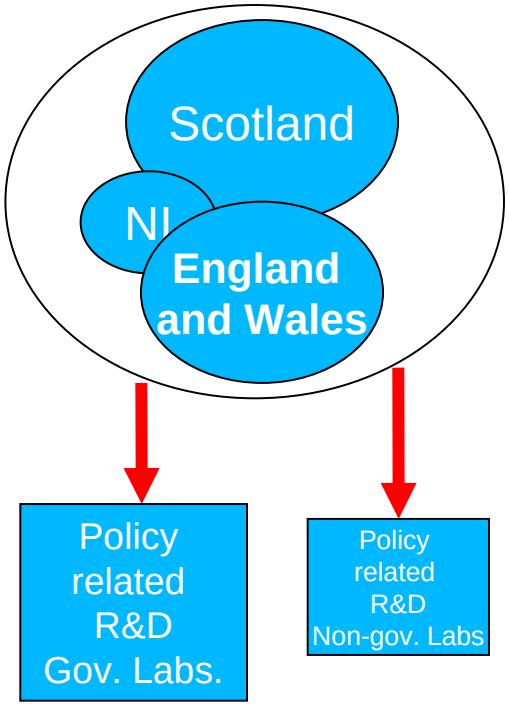
Structural Issues



- Majority of Gov. funding goes directly to three Gov. Labs. – significant fixed costs and staff complement
- Relatively small proportion available as flexible allocation for R&D in non-Gov. Labs.
- Nature of "Policy" related R&D is often driven by Gov. Labs as Policy divisions may lack independent scientific input
- Historic competition between Gov. Labs – and non-Government labs has been a problem
- Devolution has resulted in divergent Policy priorities for R&D
- Need to combine forces to support R&D of mutual interest – cut costs!

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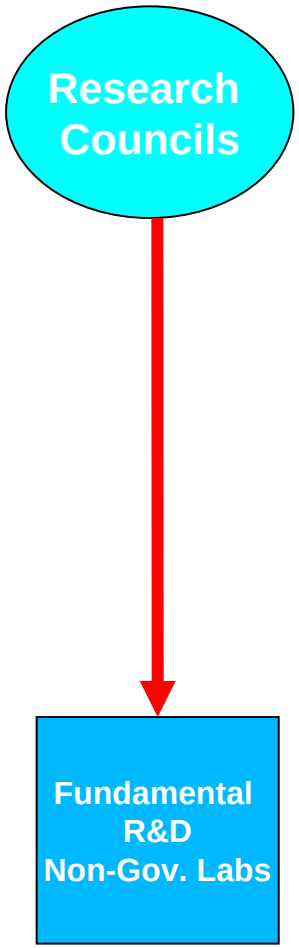
Structural Issues



- BBSRC is the only major Research Council sponsor of R&D in aquaculture sector
- Principal focus – fundamental R&D
- "Applied" R&D supported, but only if "scientifically excellent"!
- Major source of funding for non-Gov. Labs
- Main metric of "success" – Research Assessment Exercise (RAE) soon to be – Research Excellence Framework (REF)
- Focus on publications in high impact journals/PHD students etc….
- Very little credit given for industry driven/relevant applied problem solving R&D

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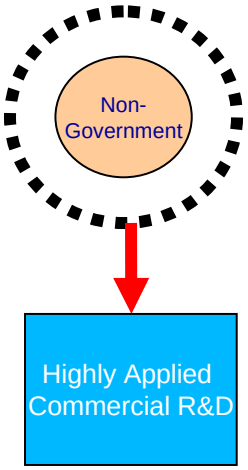
Structural Issues



- Non-Gov – Private/Industry/Charitable etc…- size and scale unknown!
- Little or no co-ordination at this level
- Probably <5% of available funding
- Often not in the public domain – no published record
- Highly applied
- Quality control - variable

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The UK Aquaculture R&D database – what is it?

- Sponsored by Defra – compiled annually by FRM Ltd
- An Excel file download and summary http://www.frmltd.com/ and http://www.sarf.org.uk/

- **Sponsors approached for data:**
- Defra (Department for the Environment Food and Rural Affairs);The Scottish Government; Aquaculture Wales; DARDNI (Department for Agriculture and Rural Development, Northern Ireland); NERC (Natural Environment Research Council); BBSRC (Biotechnology and Biological Research Council); FSA (Food Standards Agency); ASSG (Association of Scottish Shellfish Growers); SAGB (Shellfish Association of Great Britain); SFIA (Seafish Industry Authority); BMFA (British Marine Finfish Association); SSPO (Scottish Salmon Producers Organisation); BTA (British Trout Association); OATA (Ornamental Aquatics Trade Association); SARF (Scottish Aquaculture Research Forum); HIE (Highlands and Islands Enterprise); The Highland Council; SEPA (Scottish Environment Protection Agency); EA (Environment Agency); SNH (Scottish Natural Heritage); The Crown Estate.

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The UK Aquaculture R&D database – what is it?

- Data limitations – poor quality data <1999; incomplete data from some sponsors; little data from industry.
- Data Description - Project Code; Title; Start Date; End Date; Project Summary; Project Cost to Sponsor; Total Project Cost; Main Sponsor; Sponsor contact; Main contractor
- *Main categories (sectoral) – Sub Categories (subjects)*
- RELEVANCE!

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The UK Aquaculture R&D database – what is it?

Total number of projects – 589 (including duplicate records for co-sponsored projects)

Total number of "relevant" records–

- **Directly related applied R&D – 357**
- **Related applied R&D – 50**
- **Related fundamental R&D – 67**
- **Not related – 73**
- **Not R&D – 16**
- **Unknown - 26**

Total number of "relevant" related records analysed - 431

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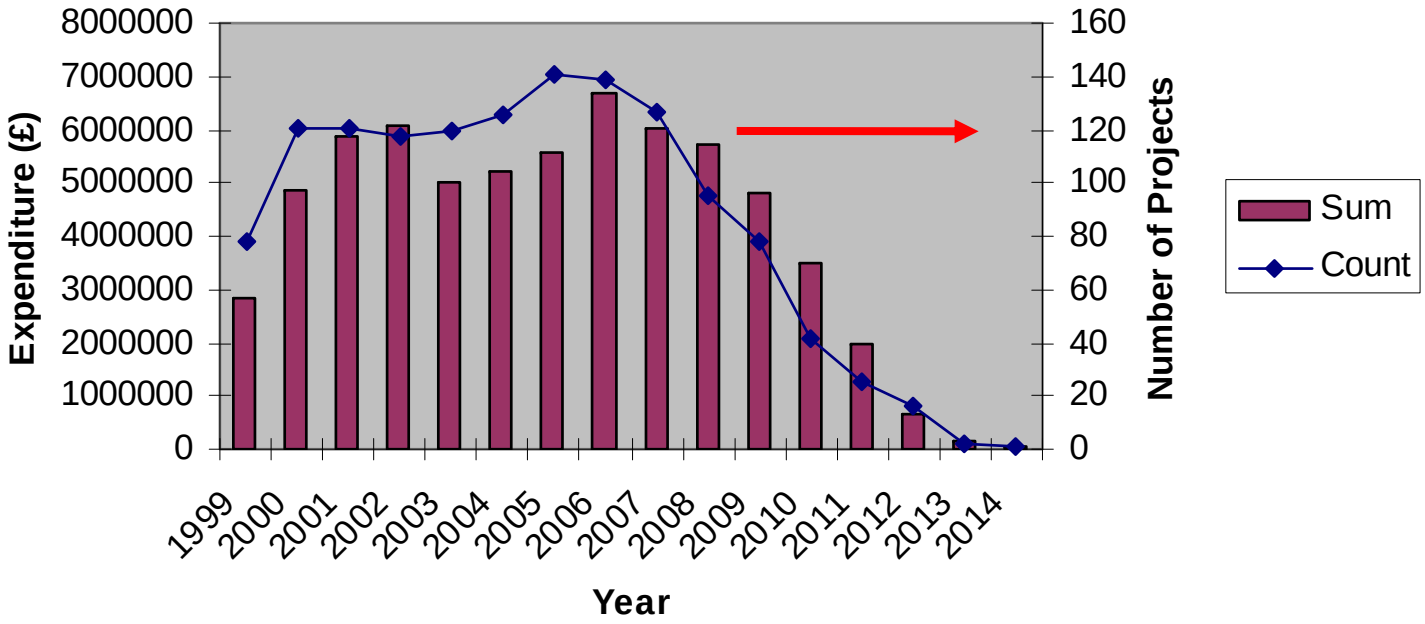
General trends



Cumulative cost 1999 – 2014 = £64.95 million

2008 – estimated expenditure £5.71 million

2008 possibly 8.6% lower expenditure than 2007

General trends

- **Mean annual project cost 2008 - £58,211 (SE £8,238) ~ average annual increase of 1.76%**
- **Project costs may have fallen behind underlying inflation by approximately 7.5% between 2000 and 2008**
- **Number of projects has fallen from around 120 to 84 in 2008**
- **In real terms the amount of R&D funding in the UK has declined over the last decade**

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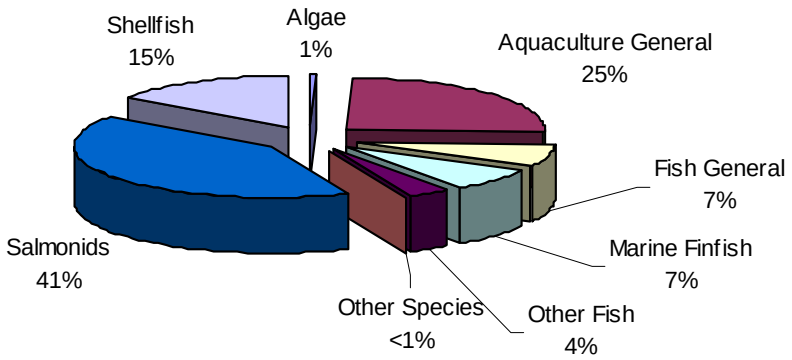
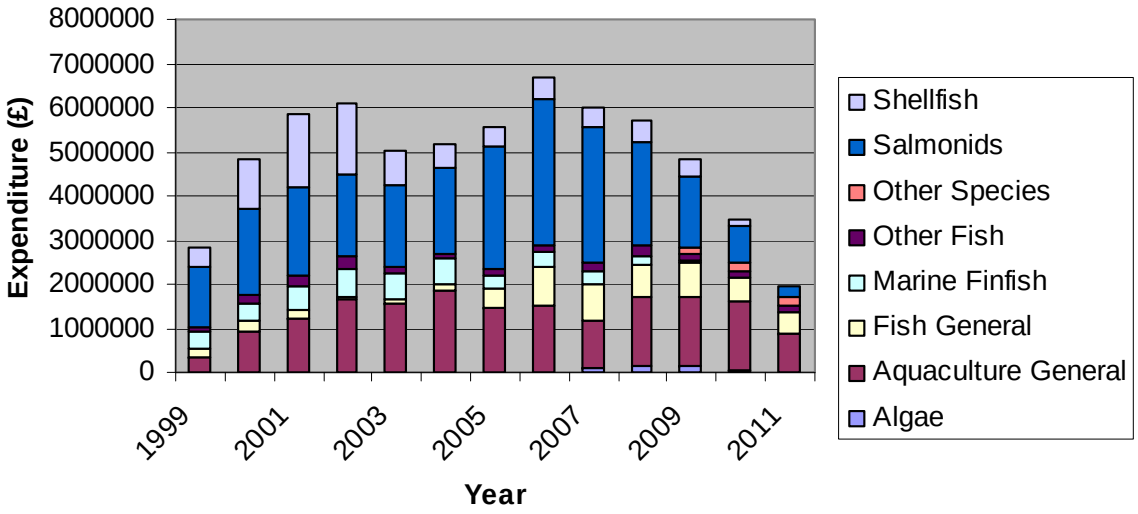
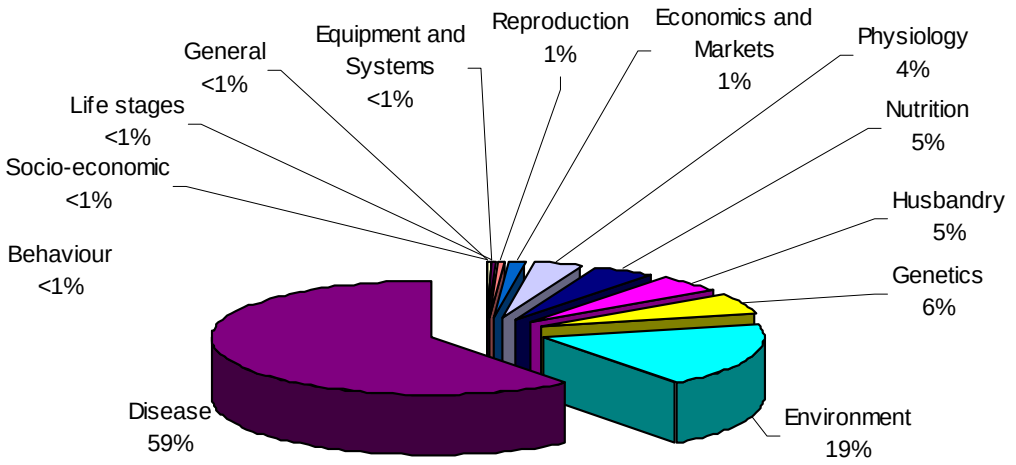
Main Species Proportion of Expenditure 2000-2008



Major R&D Categories - 99-11

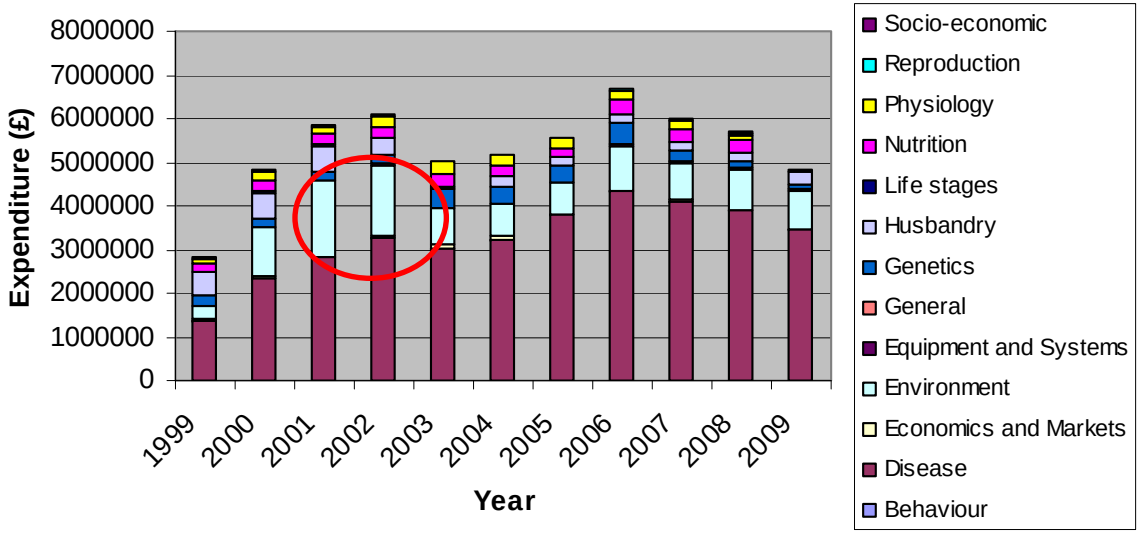


Subject Area Expenditure 2000-2008

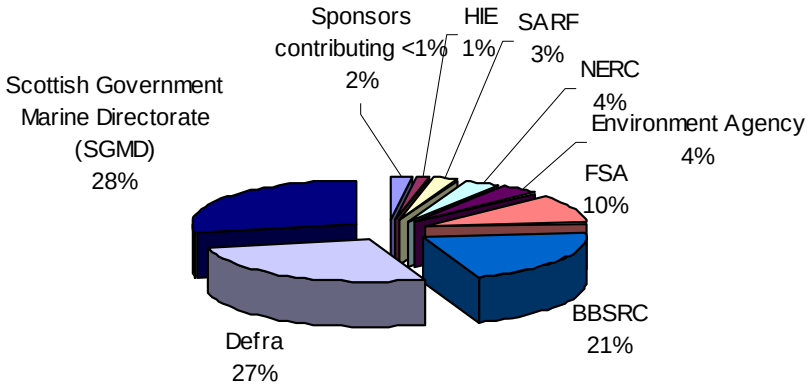


Technology development?

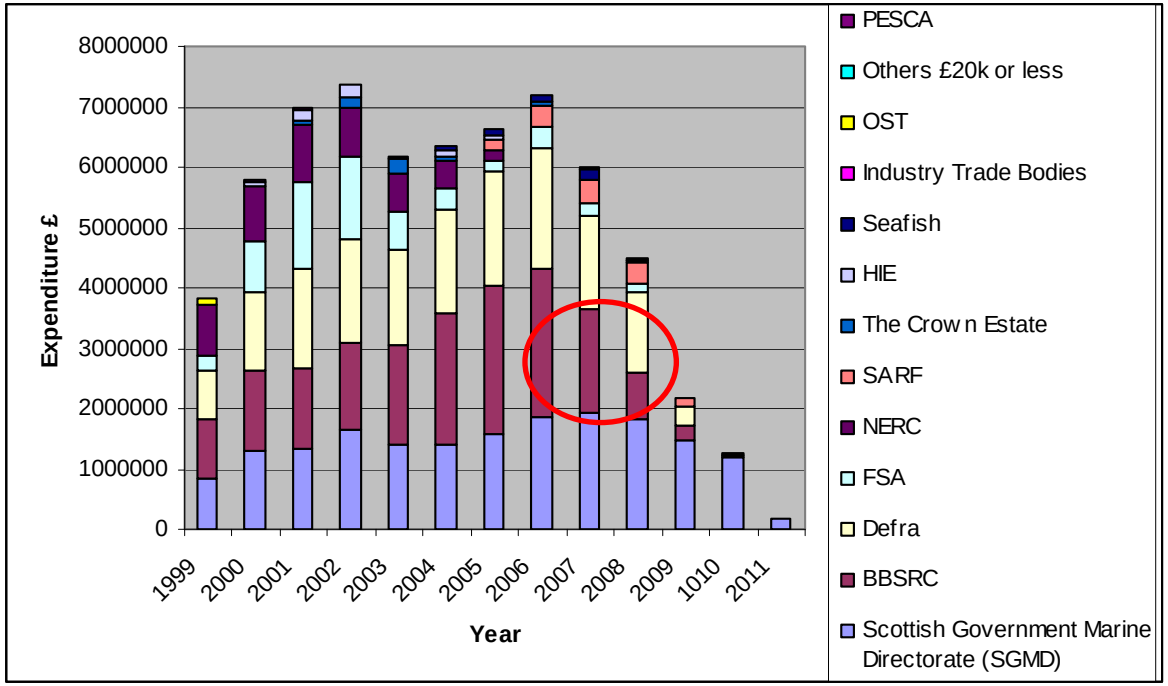
Subject Area Expenditure 1999-2009



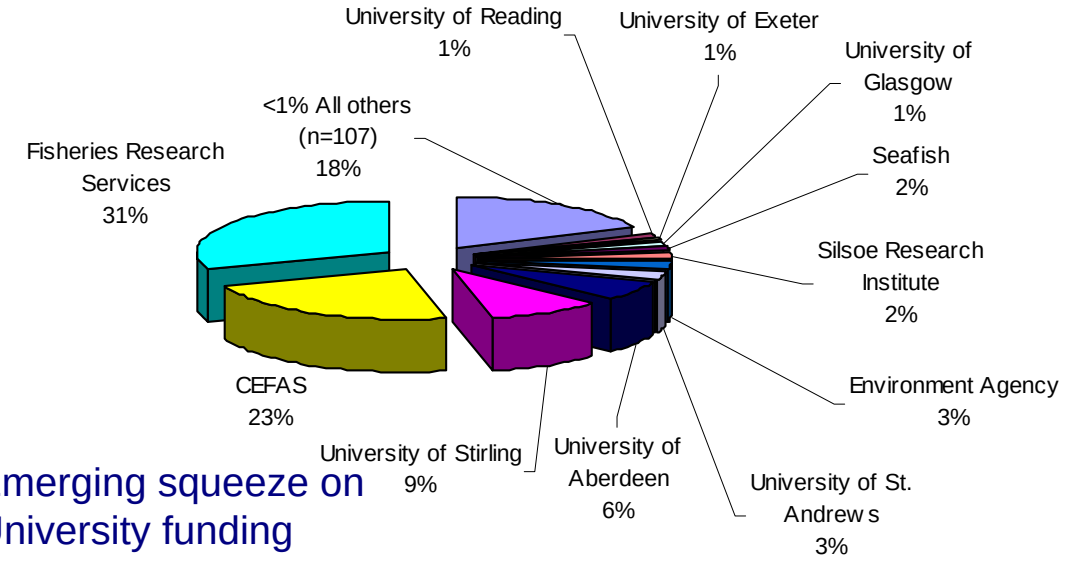
Proportion of Expenditure by Sponsor 2000-2008



Possible decline in BBSRC funding?

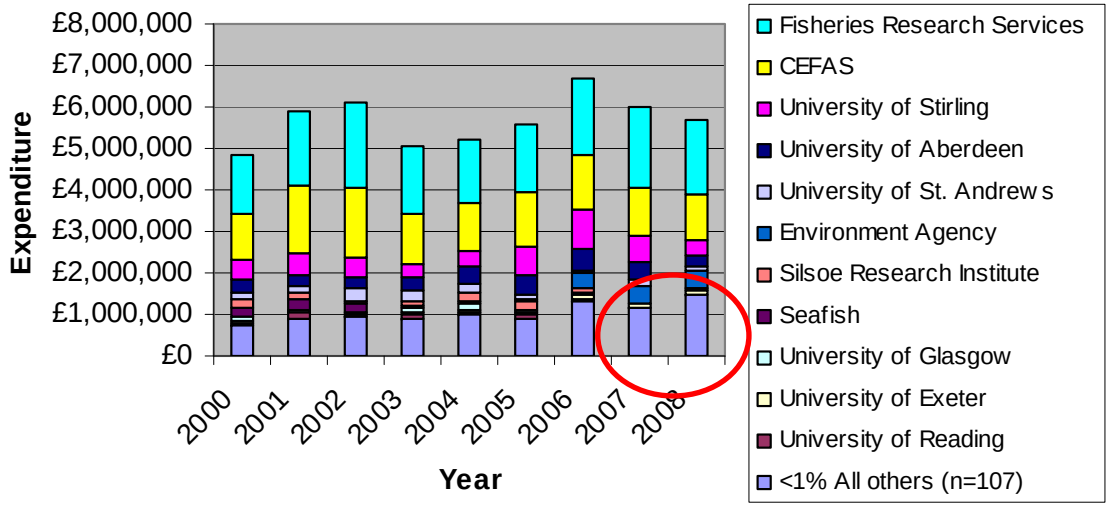


Proportion of Expenditure by Main Contractor 2000-2008



Emerging squeeze on University funding

Expenditure by Main Contractor 2000-2008



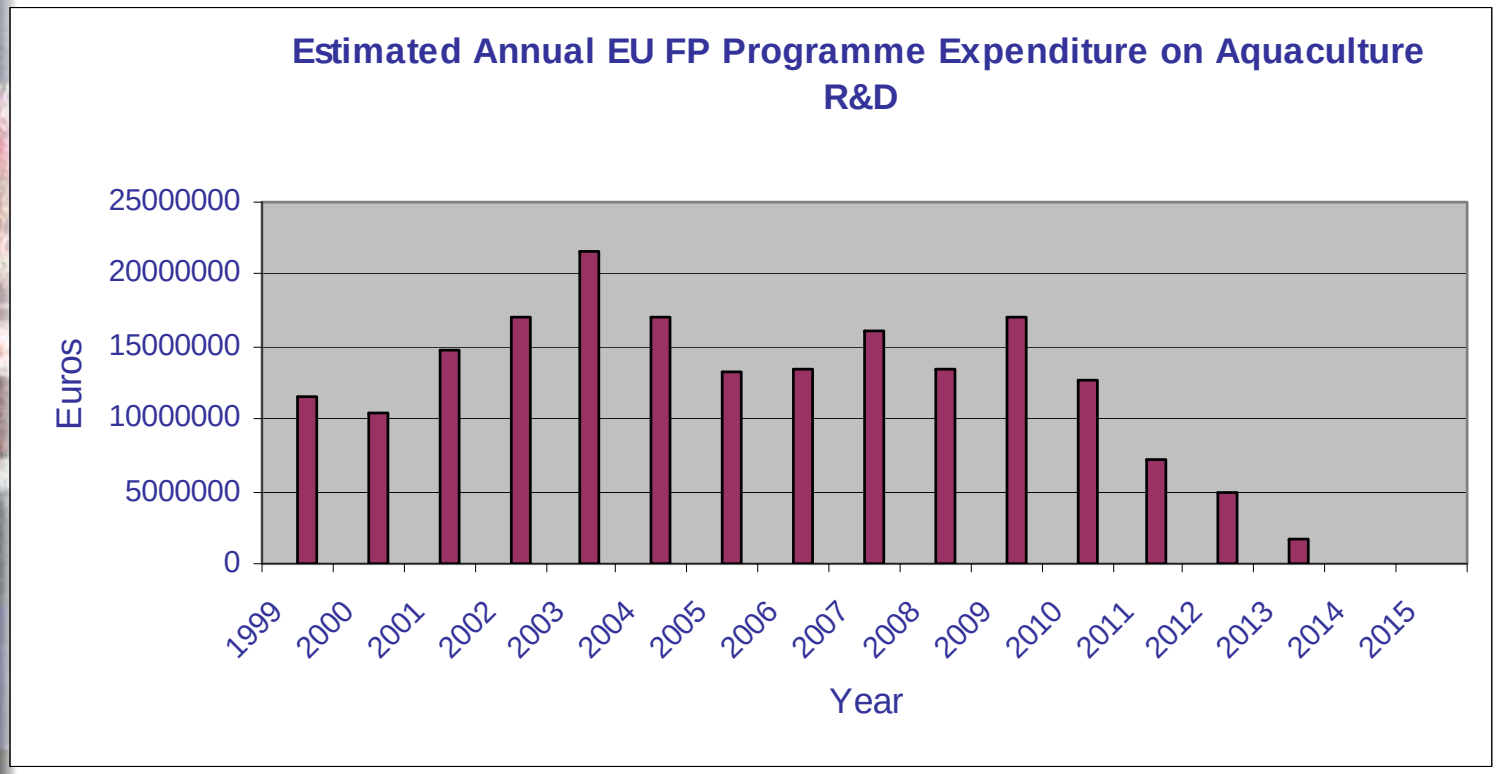
Summary of the story so far!

- UK spend on aquaculture R&D ~ £6 million
- Probably > 90% from public purse – MS + Defra + BBSRC
- Salmonid disease > 50% of all expenditure
- Marine Science Scotland and CEFAS receive > 50% of all funding. Stirling and Aberdeen ~ 15%. Remaining 35% spread over 131 “others”!
- Most R&D reflects focus on regulation with respect to the environment and disease detection and management.

Analysis – reflects historic drivers and structures – are these adequate/relevant for the future?

DEVILS ADVOCATE! – Does the allocation of expenditure reflect the needs of the main contractors – rather than their customers?

EU Cordis R&D – FP4/5/6/7 Analysis



Cumulative cost 1999 – 2015 = €192 million

2008 – estimated expenditure €13.4 million

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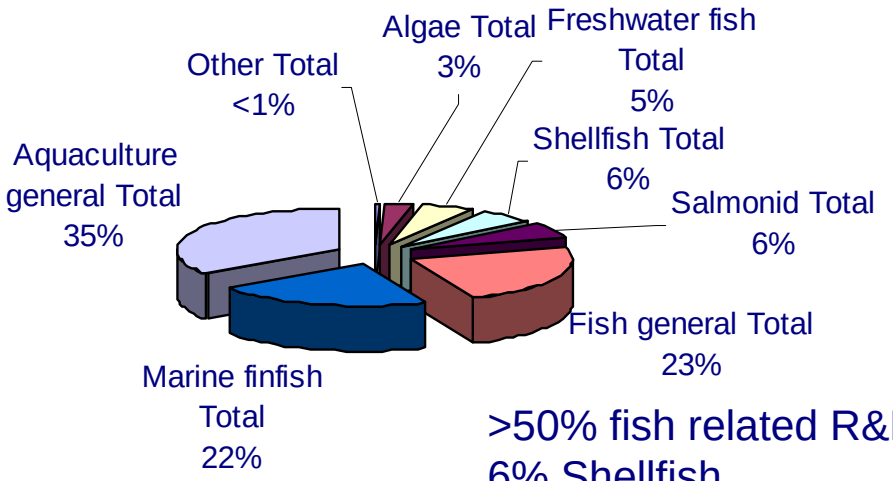
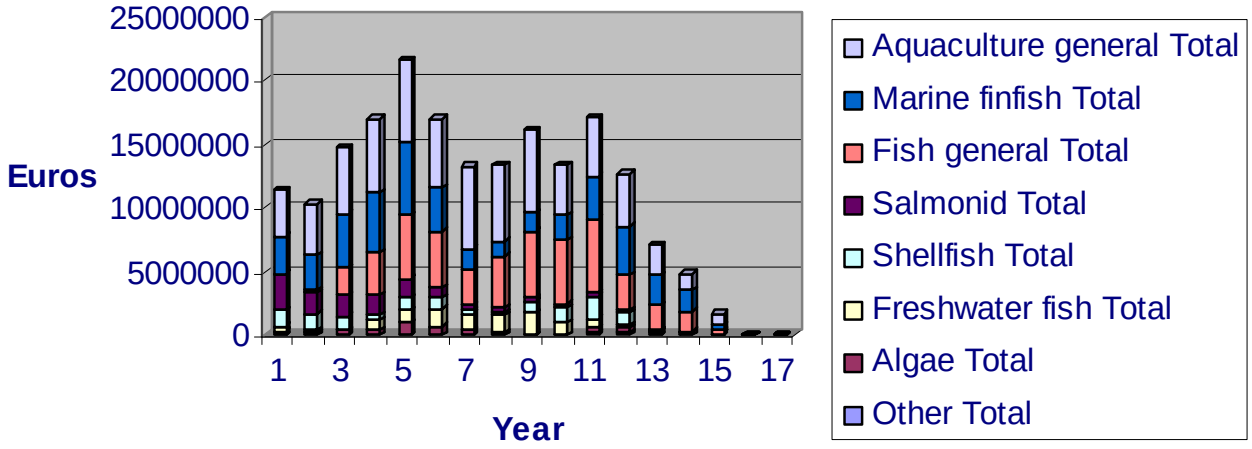
Percentage EU FP Expenditure by Sector 1999-2015

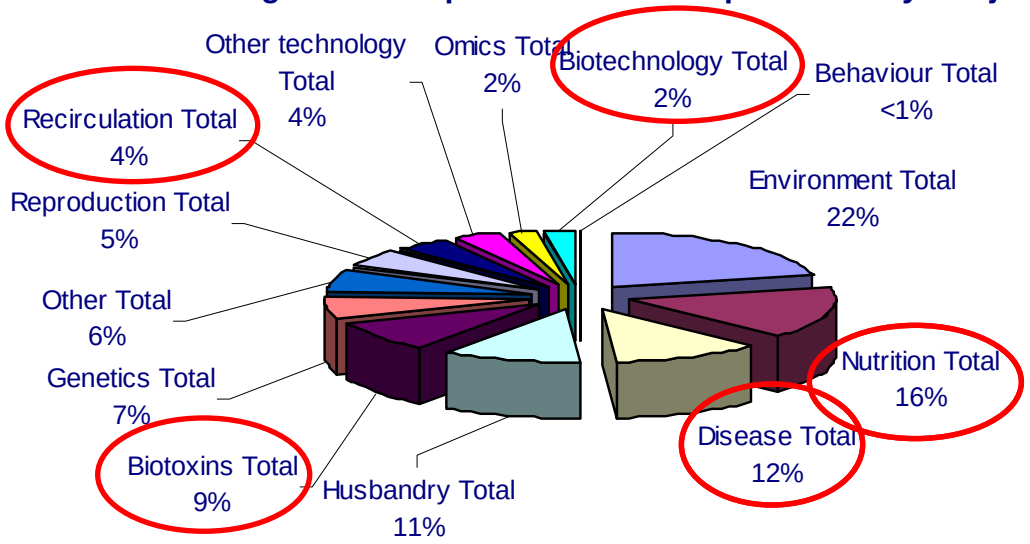


>50% fish related R&D
6% Shellfish
3% Algae

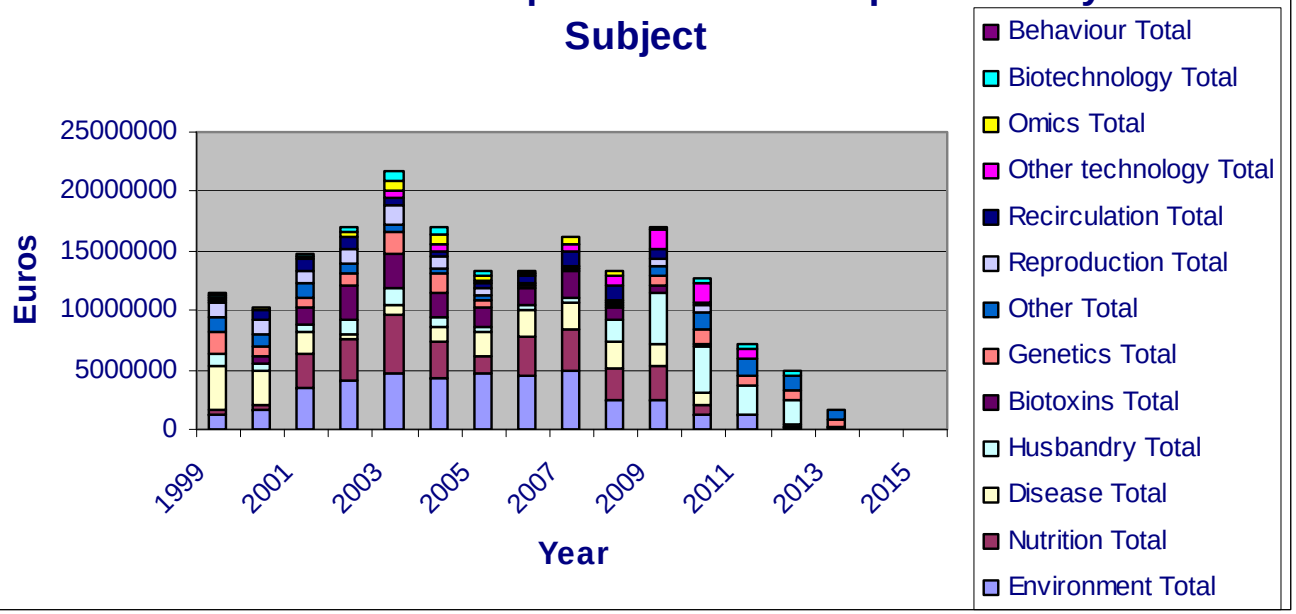
Estimated EU FP Aquaculture R&D Expenditure by Sector



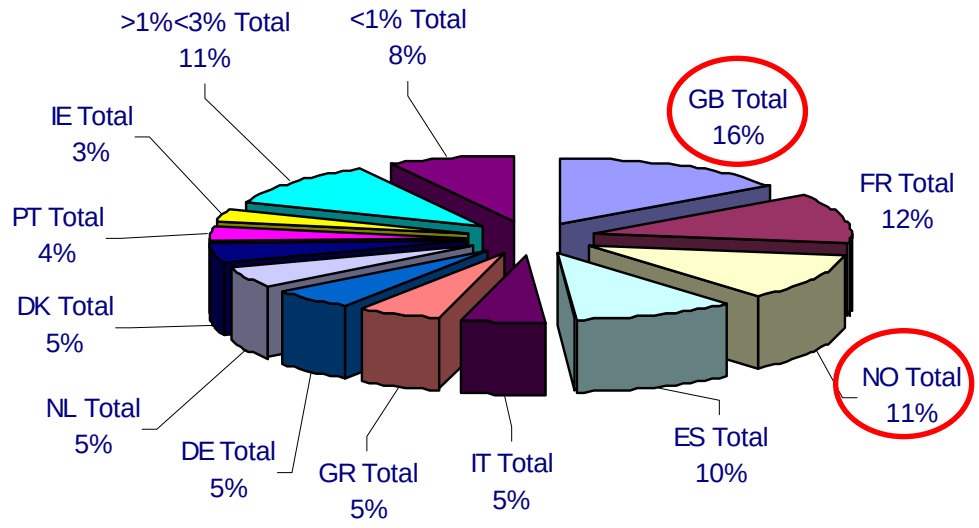
Percentage EU FP Aquaculture R&D Expenditure by Subject



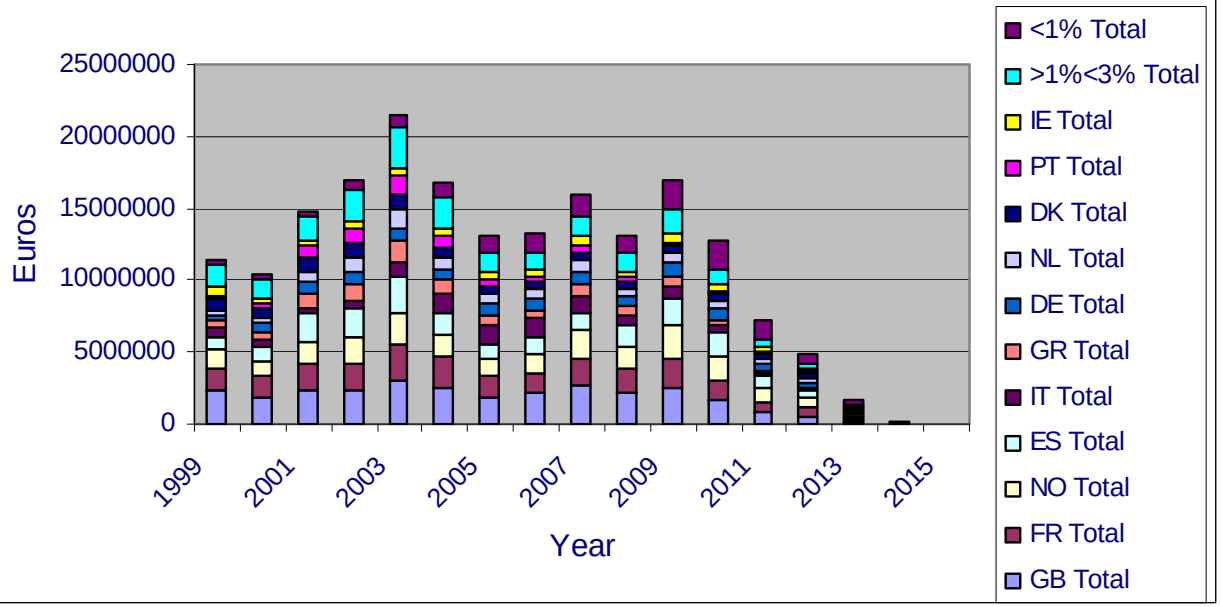
Estimated EU FP Aquaculture R&D Expenditure by Subject



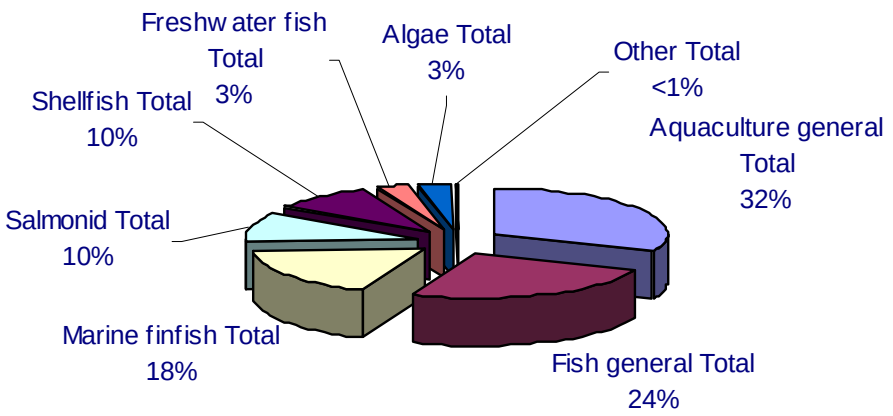
Estimated EU FP Aquaculture R&D Expenditure by Country



Estimated EU FP Aquaculture R&D Expenditure by Country



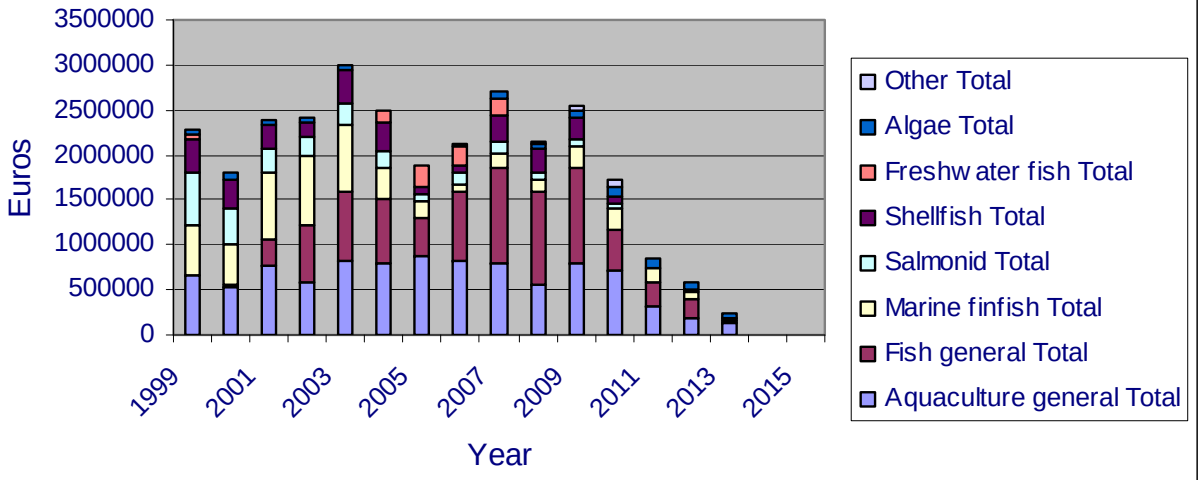
Estimated Percentage EU FP Aquaculture R&D Expenditure on GB led projects by Sector

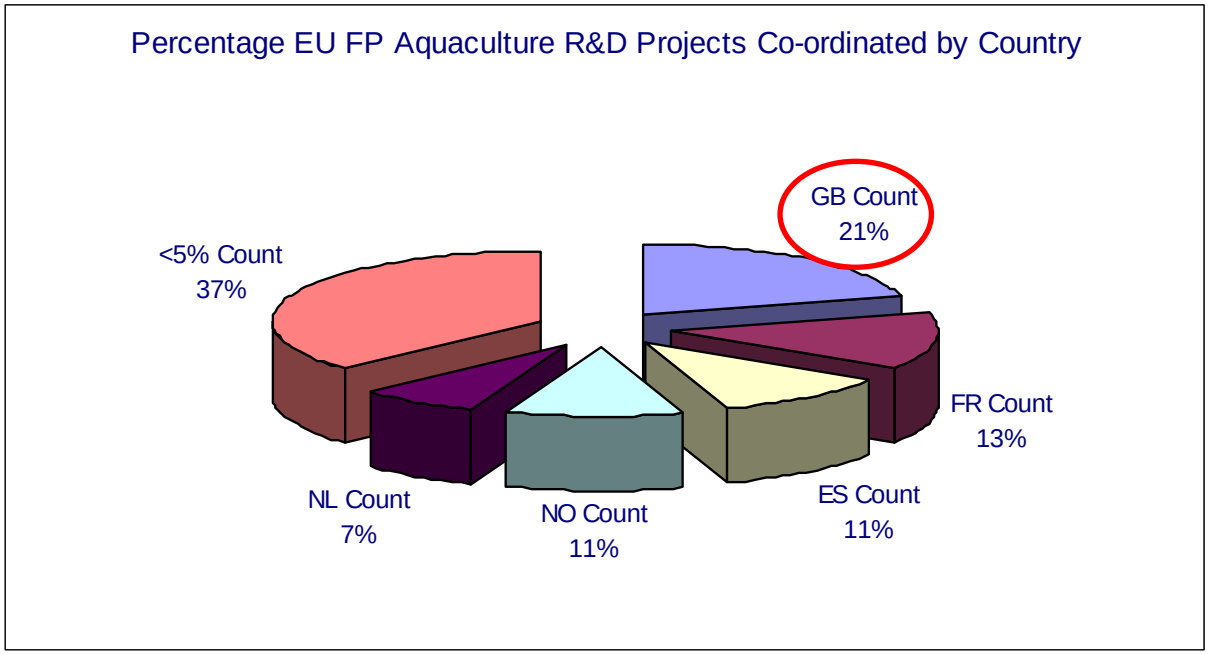


GB R&D sector contributing to a wider range of subject areas at EU level than domestically

Estimated EU FP Aquaculture Expenditure - GB led projects by Sector

Trend towards generic R&D?





Take home messages:

- GB is a dominant force in EU FP aquaculture related R&D – leading >20% of projects
- Probably securing > € 30 million over the last decade
- Majority of disease related expenditure is national – not EU!
- Majority of environment related expenditure is EU
- EU R&D aquaculture budgets for most EU27 – very low – but competition likely to increase
- GB is probably a significant net exporter of aquaculture R&D expertise/knowledge – i.e. a lot of potentially unused capacity in some areas – if funding continues to decline

Future research drivers – chronic and acute!

**Based on Defra report by James and Slaski, 2009*

http://www.defra.gov.uk/marine/pdf/aquaculture-report0904.pdf

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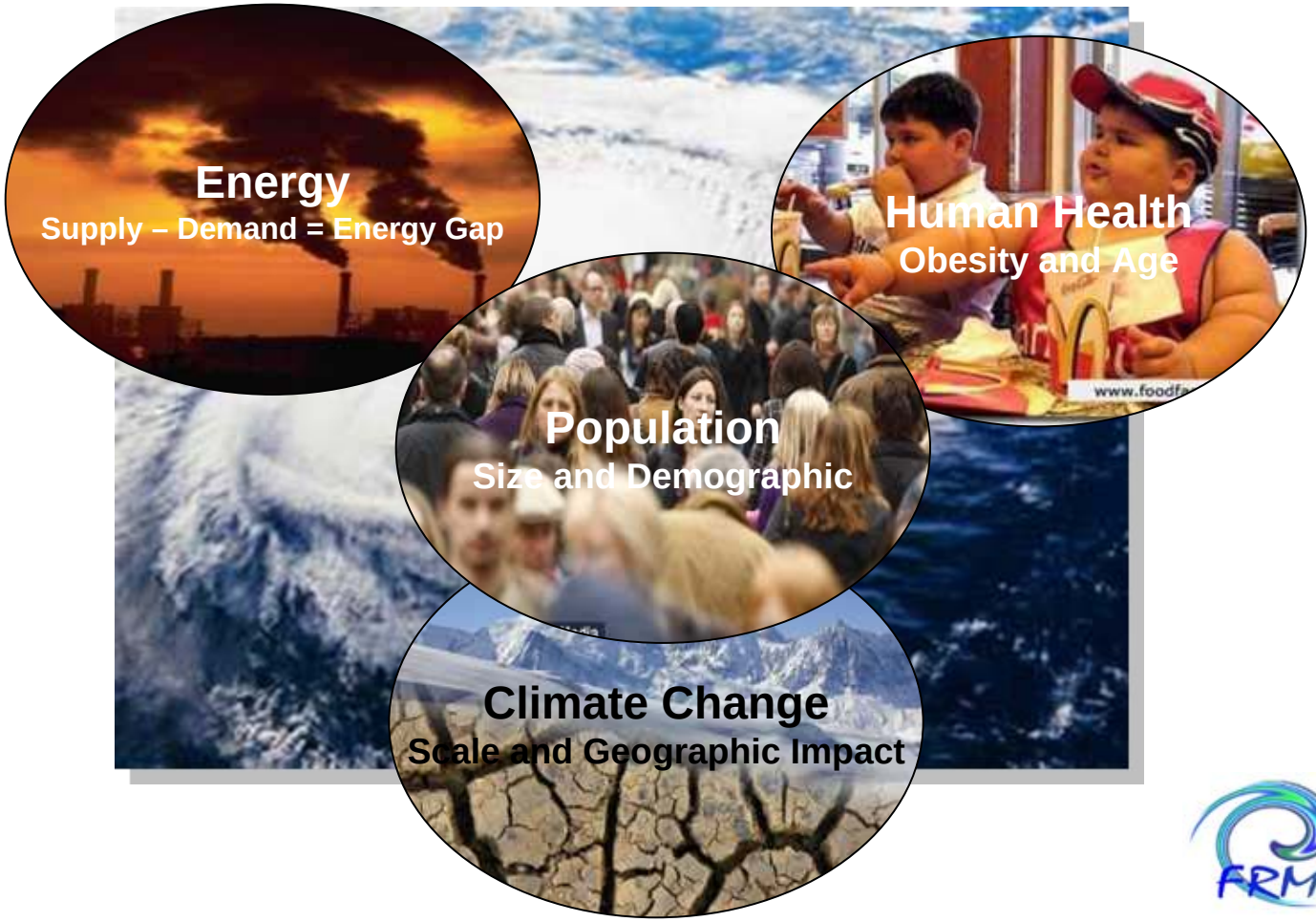
Strategic Drivers – “The Perfect Storm”

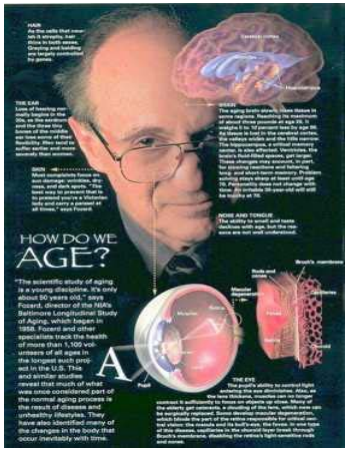
To accommodate these changes that will take place within a generation we must take bold strategic decisions to secure sustainable food and non-food resources at national and regional level



Population

Size

- World – 2009 - 6.7 billion – 9.2 billion (27% increase) by 2050
- EU – 2009 - 495 million – 521 million by 2035
- UK – 2008 – 61 million - 77 million by 2060



Age

- World - People over the age of 65 expected to more than double over the 50 years, increasing from 7% to 16%

Health

- 2007/08 healthcare cost an estimated £90.4 billion and accounted for 9.4% of UK GDP
- Obesity - £50 billion per year by 2050
- Food-related ill health costs the NHS £6 billion each year

- Population growth coupled to aging and obesity = additional health burdens and costs association with chronic conditions
- Public engagement in health will need to increase significantly in the future and there are likely to be strong incentives for individuals to adopt healthier lifestyle choices

Energy

Declining use of fossil fuels

- **increasing cost of extracting diminishing available reserves**
- **Over ridding need to curb CO2 emissions to reduce the impacts of climate change**

+

Lack of strategic investment in electrical generation capacity

+

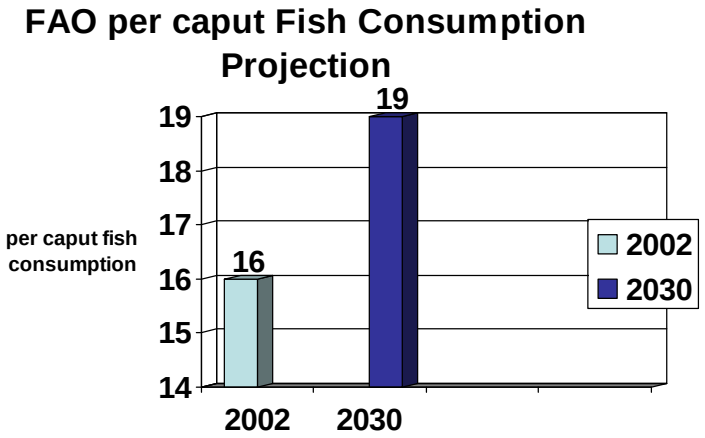
Increasing reliance on imports and related energy security issues

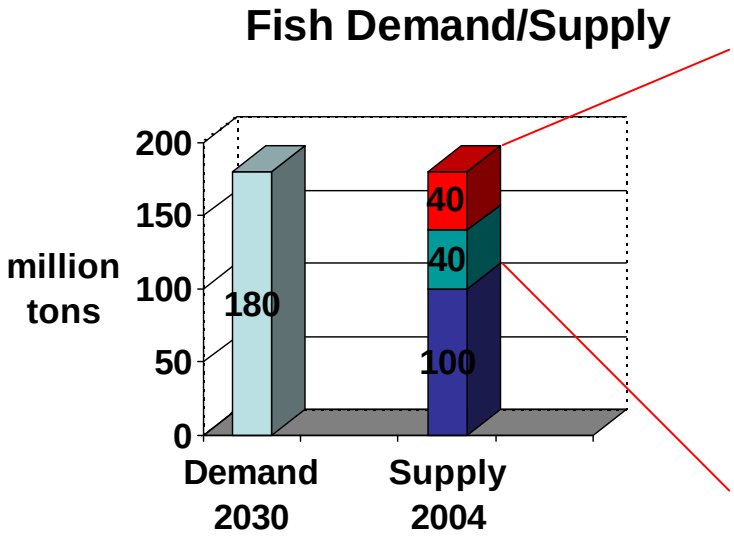
=

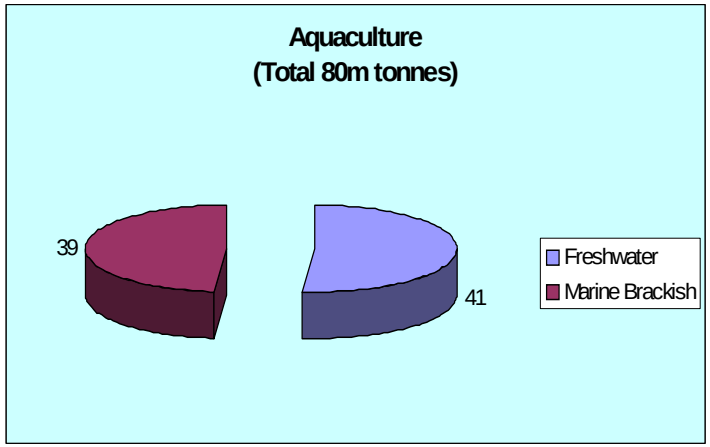
Growing gap between energy demand and (“clean”/”sustainable”) supply

What does this mean for aquaculture?

- Fish and shellfish consumption likely to increase as a function of increasing population and increased *per capita* consumption
- The increase in demand must be supplied from aquaculture







What does this mean for aquaculture?

- **An increasing proportion of non-food commodities will need to come from aquaculture**
- **Marifuels and biopolymers from algae**
- **Increasing aquaculture activity and infrastructure in exposed and ultimately offshore locations**
- **Co-development alongside and in collaboration with offshore renewables development**

Marine Harvest - £40m – developing more exposed sites

Biomass for Anaerobic Digestion and Bioethanol production

Led by CREDIT with SAMS and IT Sligo

Sub-project 1 - Seaweed (Macro-algae) culture
Culture seaweeds, EIA assessment, and polyphenol analysis

Sub-project 2 - Anaerobic Digestion (AD)
Establish operational bench digesters; estimates of methane production potential; maximizing methane yield through nutrient content; and semi-commercial scale trials.

Sub-project 3 Bioethanol Production
New bacterial isolates, chemical mutagenesis, small batch scale, bench top fermentation and large -scale fermentation.

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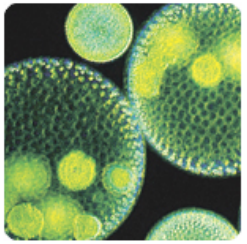
- the energy imperative
- climate and emissions
  - our views
  - our operations
- consumer energy
  - vehicle technology
  - GCEP
  - reporting emissions
- energy technology
- pricing and earnings
- biodiversity conservation
- environmental performance
- project profiles

Algae biofuels



ExxonMobil is launching a significant new program to research and develop next-generation biofuels from photosynthetic algae. This is part of our ongoing commitment to advance breakthrough energy technologies to help address the world's long term energy challenges.

Meeting the world's growing energy demands will require a multitude of sources. Biofuel from algae could be a meaningful part of the solution in the future because of its potential as an economically viable, low emissions transportation fuel.

As part of the program, ExxonMobil Research and Engineering Company is joining with Synthetic Genomics, Inc (SGI) to develop, test, and produce biofuels from photosynthetic algae. Algae produce bio-oil that can be processed into biofuels similar in structure to today's gasoline and diesel fuels. This helps ensure the fuels are compatible with existing transportation technology and infrastructure.

Listen to the algae press conference (July 14, 2009)
Dr. Emil Jacobs and Dr. J. Craig Venter

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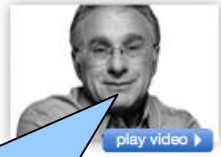

based biofuels
ssman

- *ExxonMobile – recently announced $600million investment in development of biofuel from microalgae – a fraction of the cost of finding and exploiting a new oil field!*

REMEMBER –
EU aquaculture
R&D expenditure for the
last decade <€200 million

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Other non-food aquaculture futures !

The Kelp Car

Toyota is looking to a greener future — literally — with dreams of an ultralight, superefficient plug-in hybrid with a bioplastic body made of seaweed that could be in showrooms within 15 years.
The kelp car would build upon the already hypergreen 1/X plug-in hybrid concept, which weighs 926 pounds, by replacing its carbon-fiber body with plastic derived from seaweed. As wild as it might sound, bioplastics are becoming increasingly common and Toyota thinks it's only a matter of time before automakers use them to build cars.

SUMMARY REMARKS

- The current structure and resource allocation for aquaculture R&D provision will need to change if we are to meet the challenges that will face us nationally and internationally within the space of a generation

- Increased international collaboration is inevitable as no one country has sufficient resources – this process needs to be properly managed/co-ordinated

- The R&D industry will need to focus on more applied problem solving R&D and be suitably rewarded for doing so

- With diminishing access to public resources hard choices will be required to ensure that strategically important R&D and its practitioners are supported – this should not be an “organic” process

- The need to engage and inform stakeholders will be a key – if painful feature of the future sustainable development of aquaculture and the R&D that will underpins it

SUMMARY REMARKS

- Future aquaculture R&D will need to reflect strategic requirements for the provision of food and non-food goods and services

- Food and energy security are likely to become important drivers – NOT TO BE UNDER ESTIMATED!

- Aquaculture is likely to play an important role in helping to meet food and energy security issues – given appropriate resources, support, focus and expertise!

Thank you for your attention

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