

10th Asian Fisheries and Aquaculture Forum
4th International Symposium on Cage
Aquaculture in Asia



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The presentation

- **History of cage culture**
- **World fish production – drivers and supply/demand gap**
- **Cage technologies – setting the scene**
- **Siting aspects**
- **Species selection – finding the right one**
- **Aquafeeds - environmental considerations**
- **Conducive policy and governance**
- **The way forward**

April 30-May 4 2013
The Ocean Resort Hotel
Yeosu, Republic of Korea



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History of cage culture

- **Origins trace back two centuries ago, possibly earlier, to the Asian region**
- **Relatively recent aquaculture innovation**
- **Commercial cage culture pioneered in Norway in the 1970s**
- **Sector has grown rapidly in the past 25 years**



The presentation

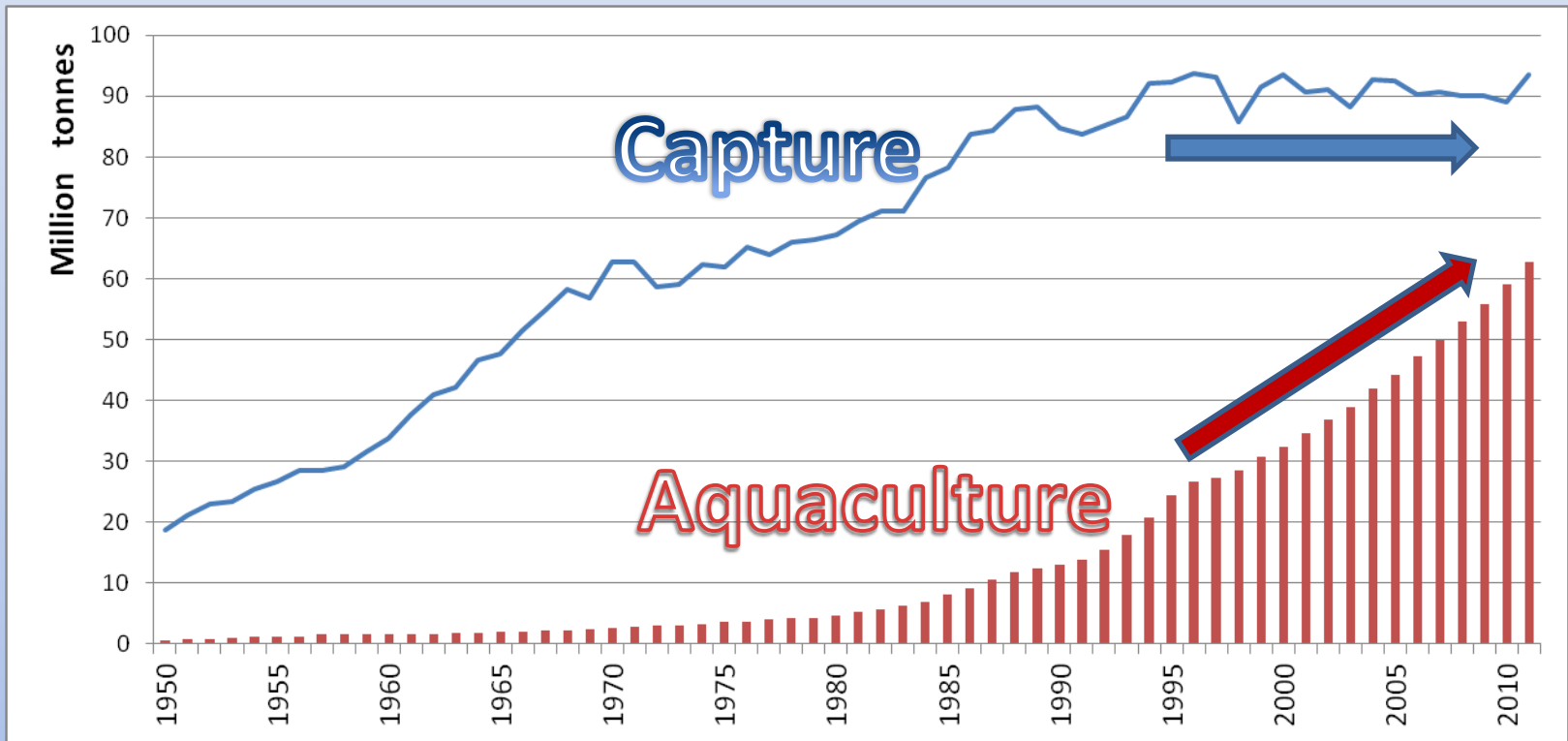
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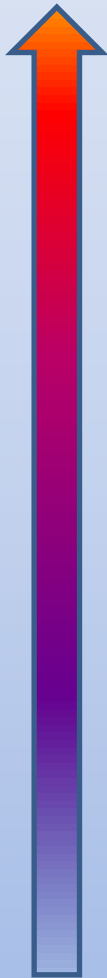
World Fish Production



2012 Aquaculture: 66.5 million tonnes (estimate)

What is our FUTURE?

WORLD POPULATION



World's 'seven billionth baby' is born | Environment | The Guardian - Windows Internet Explorer

http://www.guardian.co.uk/world/2011/oct/31/seven-billionth-baby-born-philippines

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Crowded planet: Global population hits 7 billion



World's 'seven billionth baby' is born

Denica May Camacho, a girl born in Philippine capital Manila, is chosen by UN to symbolically mark global population milestone

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Jasmine Coleman
The Guardian, Monday 31 October 2011
Article history



World population boom likely by 2050 - World news - msnbc.com - Windows Internet Explorer

http://www.msnbc.msn.com/id/17605185/ns/world_news-ft/world-population-may-reach-billion/

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World news msnbc.com

World population may reach 9.2 billion by 2050

Biggest boom expected in developing countries, U.N. report says

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Ap Associated Press
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UNITED NATIONS — The world's population will likely reach 9.2 billion in 2050, with virtually all new growth occurring in the developing world, a U.N. report said Tuesday.

According to the U.N. Population Division's 2006 estimate, the world's population will likely increase by 2.5 billion people over the next 43 years from the current 6.7

Only on msnbc.com
Some see Twin Tower

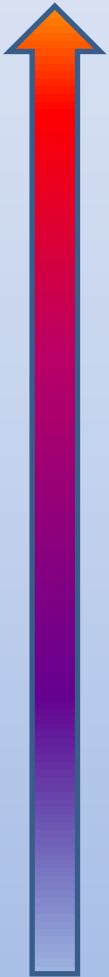
What is our FUTURE?

The screenshot shows the WFP Hunger Stats website with the following content:

- Hunger is the world's No.1 health risk.** It kills more people every year than AIDS, malaria and tuberculosis combined. (This section is circled in red in the image)
- One in seven people in the world will go to bed hungry tonight** (Illustrated with 7 human icons, 6 blue and 1 red)
- One out of four children in developing countries are underweight** (Illustrated with 4 child icons, 3 blue and 1 red)
- There are more hungry people in the world than the combined populations of USA, Canada and the European Union** (Illustrated with a bar chart comparing 925,000,000 Hungry Worldwide to 841,000,000 Population US, Canada, EU)

Additional elements include a balance scale comparing HUNGER to AIDS, MALARIA AND TB, a photo of a woman, and the WFP logo with the tagline 'Fighting'.

HUNGER INCREASE?



What is our FUTURE?

UN: farmers must produce 70% more food by 2050 to feed population | Environment | guardian.co.uk

http://www.guardian.co.uk/environment/2011/nov/28/un-farmers-produce-food-population

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BBC News - Asia UN: farmers must pr... Google

theguardian


News Sport Comment Culture Business Money Life & style Travel Environment TV Data Video Mobile

Environment > Farming

UN: farmers must produce 70% more food by 2050 to feed population

A quarter of farmland is highly degraded, according to the first report into the state of the world's land resources

Associated Press
guardian.co.uk, Monday 28 November 2011 09.42 GMT
Article history




Environment Farming · Food

World news
United Nations · Population

More news


More on this story



On Environment

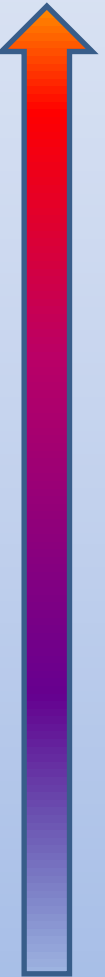
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MORE FOOD NEEDED



Where do we stand TODAY

BBC News - Global fish consumption hits record high - Windows Internet Explorer

http://www.bbc.co.uk/news/science-environment-12334859

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1 February 2011 Last updated at 16:02 GMT

Global fish consumption hits record high

By Mark Kinver
Science and environment reporter, BBC News

The global consumption of fish has hit a record high, reaching an average of 17kg per person, a UN report has shown.

Fisheries and aquaculture supplied the world with about 145m tonnes in 2009, providing about 16% of the population's animal protein intake.

The findings published by the Food and Agriculture Organization (FAO) also stressed that the status of global fish stocks had not improved.

It said that about 32% were overexploited, depleted or recovering.



Top Stories



Time runs short for climate

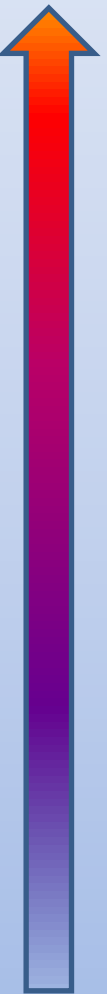
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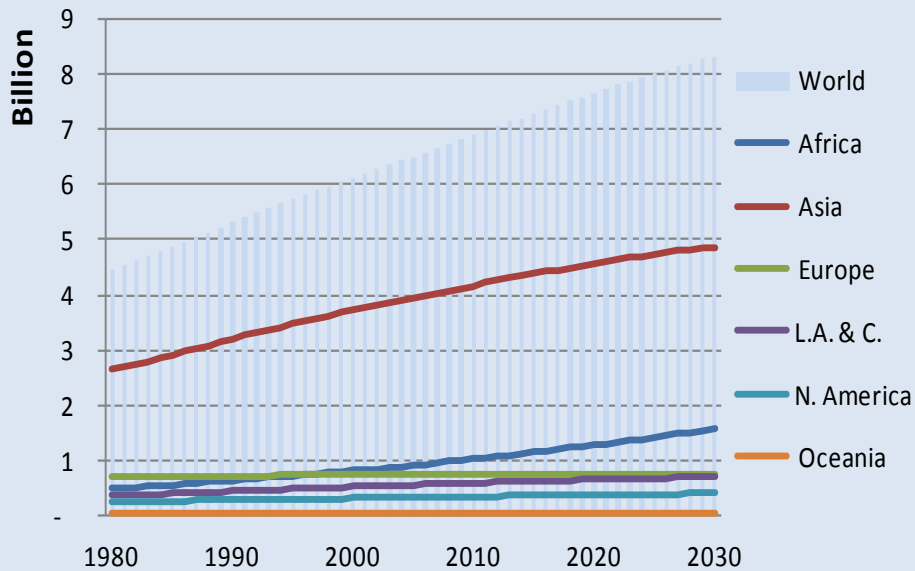
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RECORD FISH AS FOOD

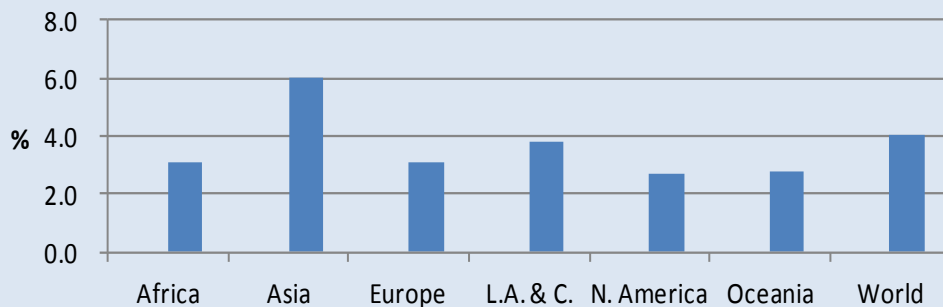


Demand (population & income growth)

Population growth



Growth of GDP per capita: 2010-2020



Fish Demand (mio mt)	2007 (baseline)	2030 (projection)
Africa	9.0	18.7
Asia	86.4	186.3
Europe	19.4	23.4
L.A. & C.	15.2	18.3
Northern America	9.1	12.9
Oceania	1.1	1.8
World	140.3	261.2

Source: FAO/FI Department estimate (preliminary)

Fish supply-demand gap

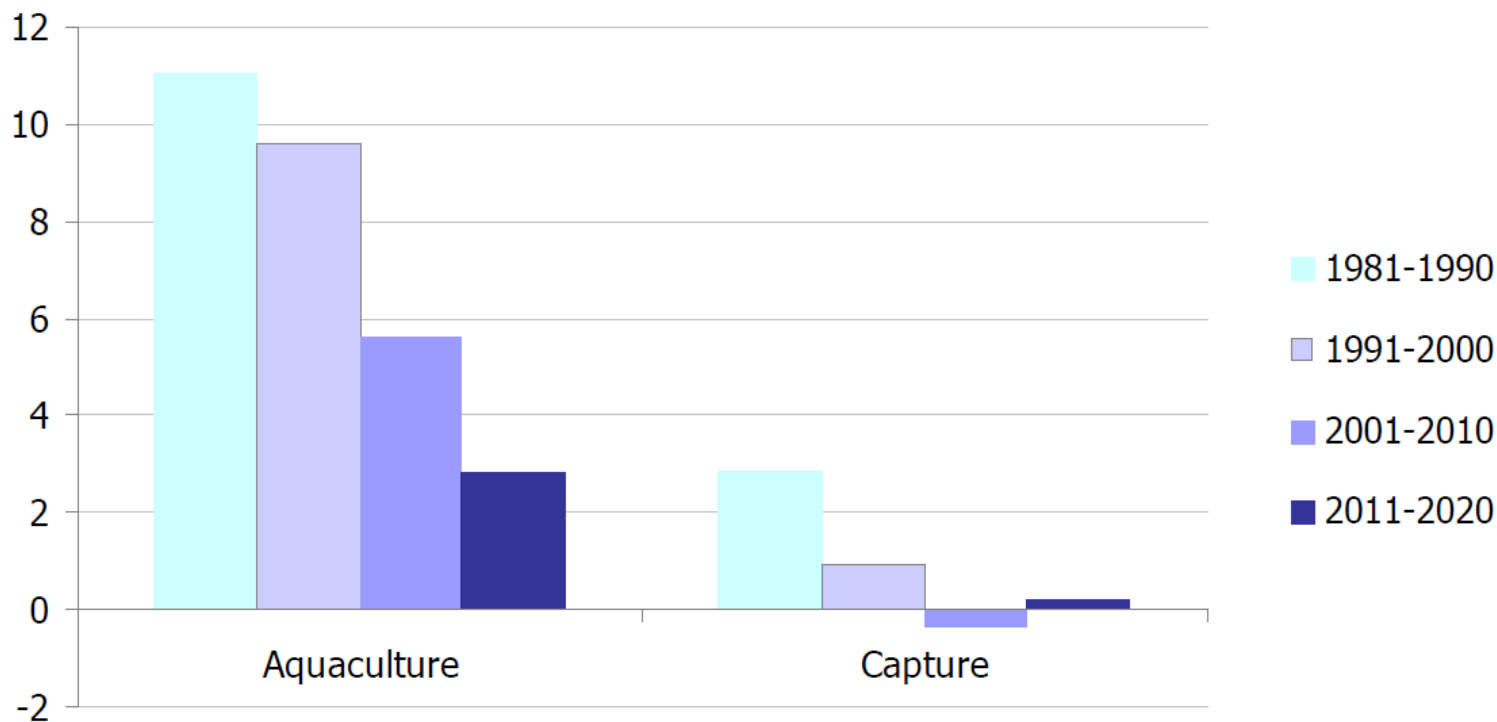
S-D gap (mio mt)	Supply 2030	Demand 2030	S-D gap 2030
Africa	11.7	18.7	-7.0
Asia	156.5	186.3	-29.8
Europe	18.6	23.4	-4.8
L.A. & C.	16.2	18.3	-2.1
Northern A.	6.2	12.9	-6.6
Oceania	1.5	1.8	-0.3
World	210.7	261.2	-50.6

Source: FAO/FI Department estimate (preliminary)

- Per capita fish demand in 2020 estimated based on assumptions:
 - GDP per capita projection by IMF
 - Prices unchanged
 - Preference unchanged
- Total fish demand in 2030 estimated based on:
 - Estimated per capita demand in 2020.
 - UN population projection in 2030.
 - Non-food fish demand unchanged
- Results:
 - Supply < Demand
 - 51 mt shortage
 - S-D gaps decline in all regions
 - Largest insufficiency in Asia

Growth rate of aquaculture and capture fisheries

Least-squares growth rate (%)



Source: FAO



Bridge the supply-demand from

Cage Culture?



SPACE

Mariculture potential ..

- Offshore areas are largely unused for mariculture
- 44% of maritime nations and territories are not yet practicing mariculture
- 0.3 million km of coastline along which mariculture is not yet practiced
- Much inshore mariculture production is plants, but there is as yet little attention to the production of plants (or fish or shellfish) offshore



Main challenges

- Technology and knowledge
- Land and water – availability and access
- Finance and investment
- Cost and energy efficient productivity
- Feeds - fishmeal and fish oil and ecosystem impacts
- Social concerns



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TECHNOLOGY

Cage models

Different cage models exist and several factors determine the choice:

- Site characteristics (exposure, depth, human interaction)
- Cost of cages, mooring system and installation
- Production plans



WORKING BOATS



1



3



2

- 1 - Main work boat
- 2 - Feeding boat
- 3 - Auxiliary service boat

LAND FACILITIES



- 1 - A packaging / processing area
- 2 - A feed warehouse (or a silos storage system)
- 3 - Area where the nets are stored and maintenance is carried out

4 - Offices and laboratory

Distance from shore is a factor

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Choice based on:

THE FARM SITE



The technology factors

To avoid all sorts of negative impacts to the farming activity itself (human or natural) and as a result of the farming activity (impact on the environment)



The social factor

Visual alteration on scenic places, organic matter discharge, farmed fish escapes and interaction with the local species

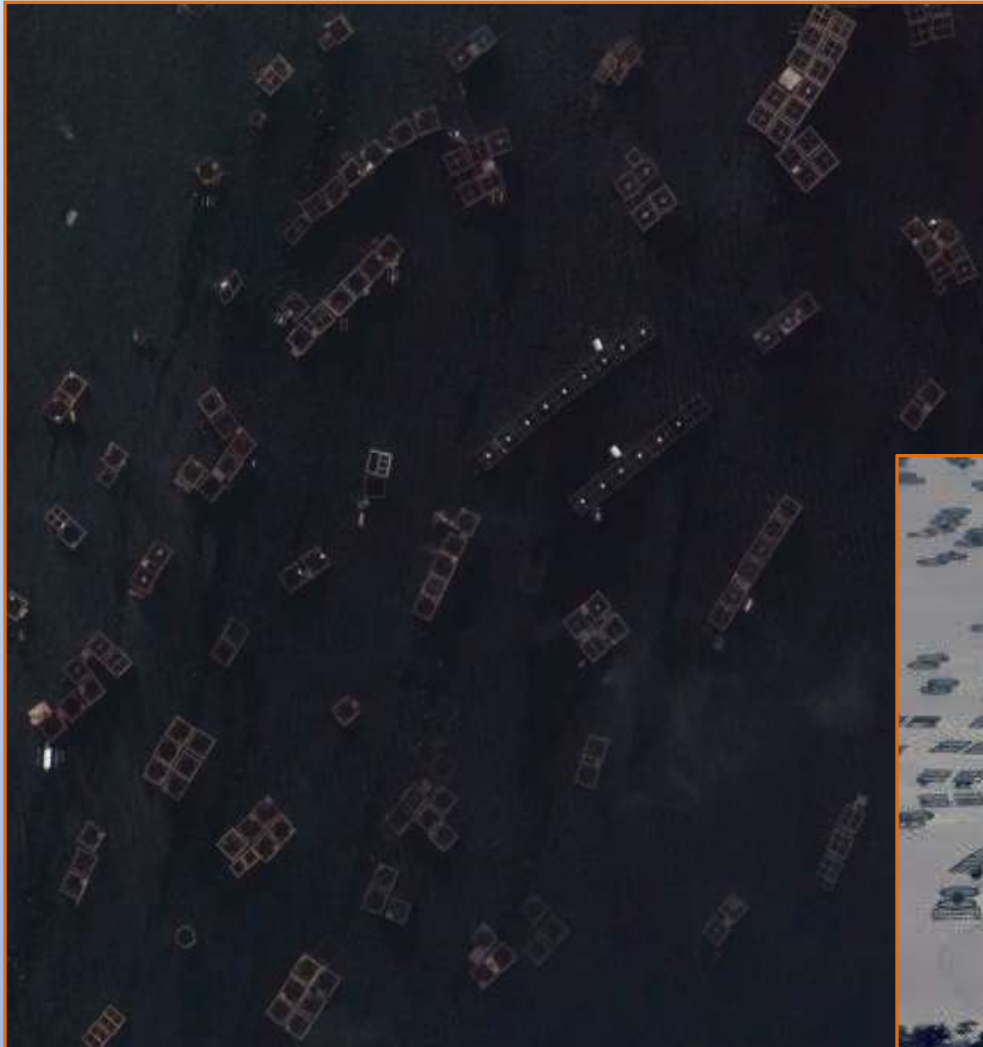
THE FARM SITE

Relative to the farmed species	Relative to the farming structure	Relative to the environment (protection)	Logistical, political and social aspects
Temperature	Wind speed	Current speed	Coastal activities
Dissolved oxygen	Current speed	Bathymetry	Land-based logistics
Salinity	Wave height	Sea bottom type	Access to the sites
Current speed	Bathymetry	Fauna and flora	Markets
Organic load	Sea bottom type	Cultured biomass	
Primary production	Fouling	Dissolved oxygen	
Pathogens	Coastal activities		
Pollution			

THE FARM SITE

Mindanao, Philippines

Carrying capacity of a site
Rightly a hot topic!!!
Long-term
sustainability



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WHAT SPECIES?



Important biological factors:

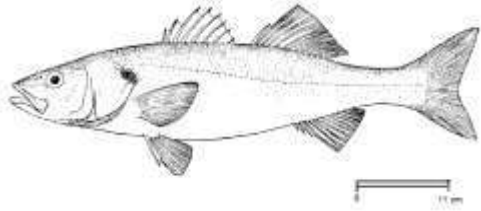
- A robust fish with an elevated resistance to stress (e.g. handling)
- A fish that can be easily reproduced in captivity and in large numbers
- A fish that grows fast and converts feed efficiently
- A fish that is not highly vulnerable to external diseases
- A fish that can grow to market size in confined enclosures (the cage volume)

Important socio-economic factors:

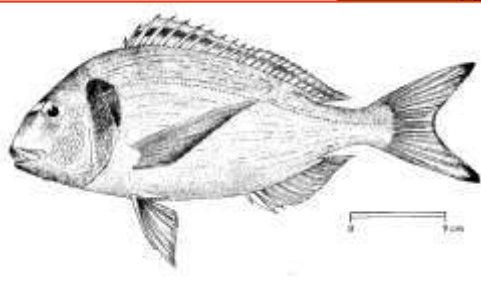
- A fish that has a market demand (local and/or international)
- A fish that can be produced economically and competitively
- A fish that has a good flesh yield (product differentiation / processing)



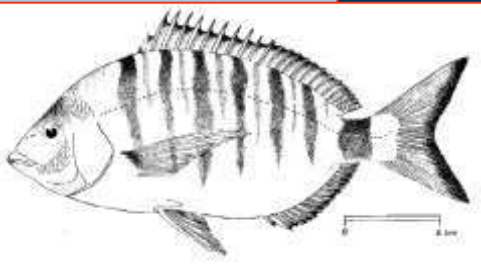
E.g. Europe



European seabass



Gilthead seabream



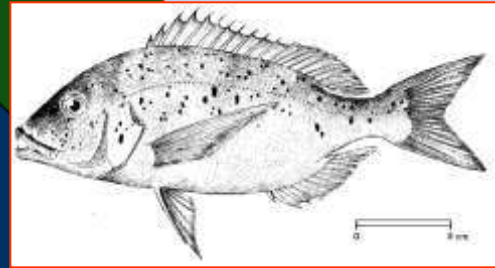
Sharpsnout seabream

New
species

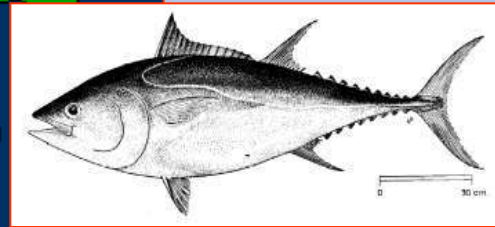
Traditional
species



Meagre



Common dentex



Atlantic bluefin tuna



Cobia ?

Meagre ?



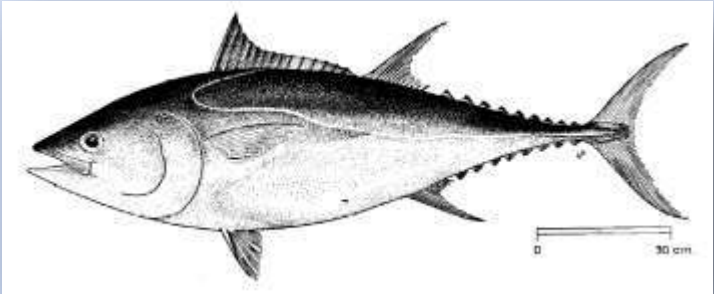
- Artificial propagation
- Fast growing / sturdy
- Good meat yield
- Market acceptance
- Attractive for processing





Groupers ?

Bluefin tuna ?



- **Market good**
- **Artificial reproduction?**



The presentation

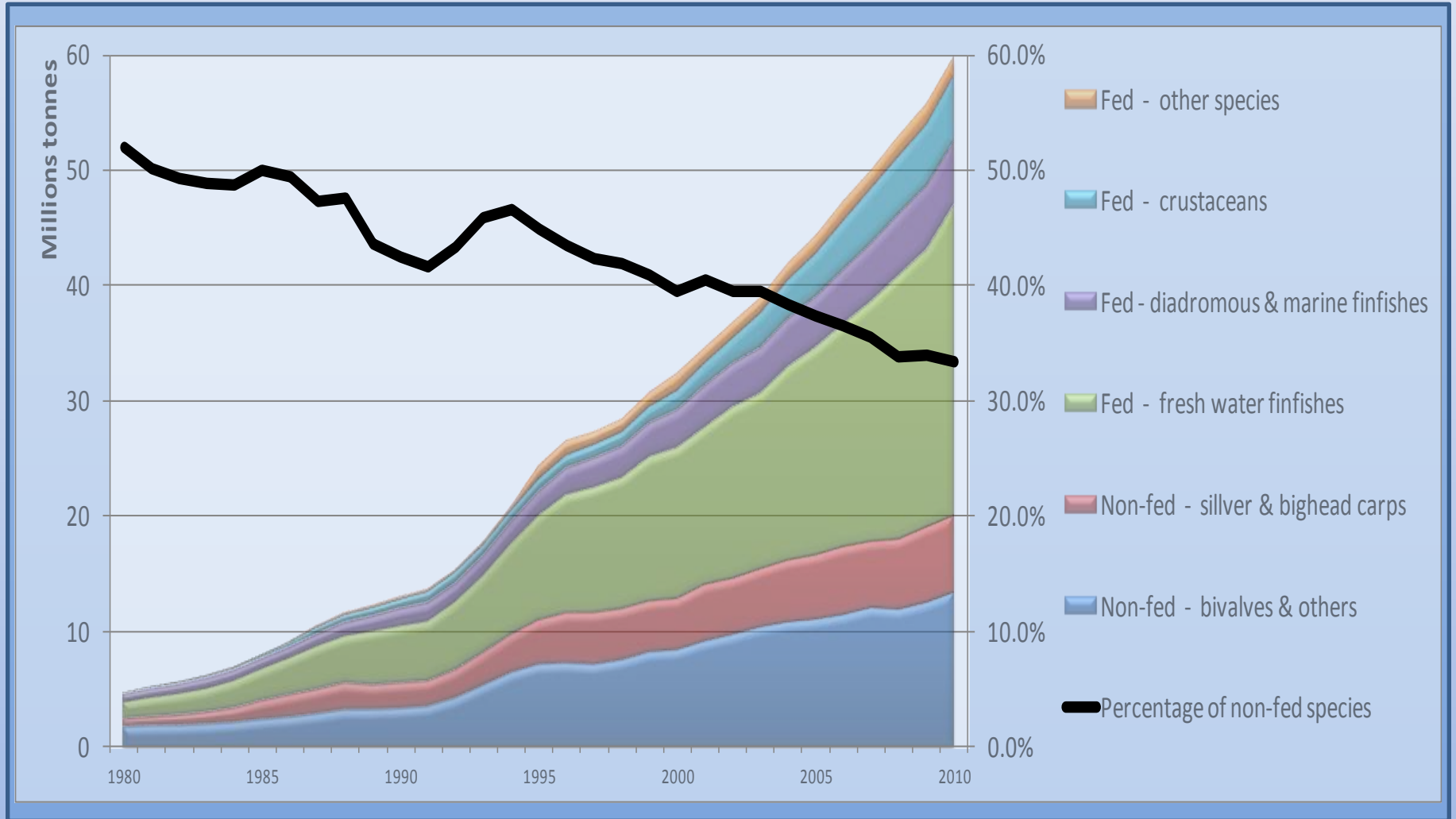
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More non-fed fish for future?



TCP Project: Low value fish versus pellet

Species /Country	Survival (%)		(SGR %)	
	Pellet	TF/LVF	Pellet	TF/LVF
CHN Grouper	36.9 ± 2.8	28.2 ± 0.2	0.38 ± 0.04	0.31 ± 0.06
TH Grouper	75.6 ± 3.2	77.9 ± 3.0	0.77 ± 0.3	0.77 ± 0.4
IND Grouper	48.6 ± 3.9	49.1 ± 3.4	2.45 ± 0.53	2.67 ± 0.75
CHN RS	71.7 ± 8.2	81.4 ± 4.8	2.45 ± 0.53	2.67 ± 0.75
VN RS	93.2	88.4	0.16	0.15
TH Seabass	97.8 ± 0.8	98.4 ± 0.6	1.92 ± 0.04	1.94 ± 0.03
VN Pompano	80.2 ± 2.4	73.4 ± 3.1	0.92 ± 0.04	0.90 ± 0.05



TCP Project: Low value fish versus pellet

- Use of pellet feeds achieves similar performance in terms of economic benefit
 - Variation in results is due to different farming and management practices
- => Greatest potential for improvement will come from better management practices



TCP Project: Results of feed analysis

Parameter	Moisture	Crude Protein	Ether extract	Crude Fiber	Ash	Ca	P	Essential Amino acid
Max %	9.28	50.08	14.36	2.09	15.58	3.36	2.09	22.45
Min %	5.02	40.02	8.16	0.52	7.91	1.62	1.25	13.59

- Feed used in the trials varies significantly in terms of nutrient content;
 - The variation in the nutrients contents had no clear relationship with growing stage (size of feed) – inconsistency of feed quality;
- ⇒ Scope for standardization of feed composition and improvement in quality in the region.



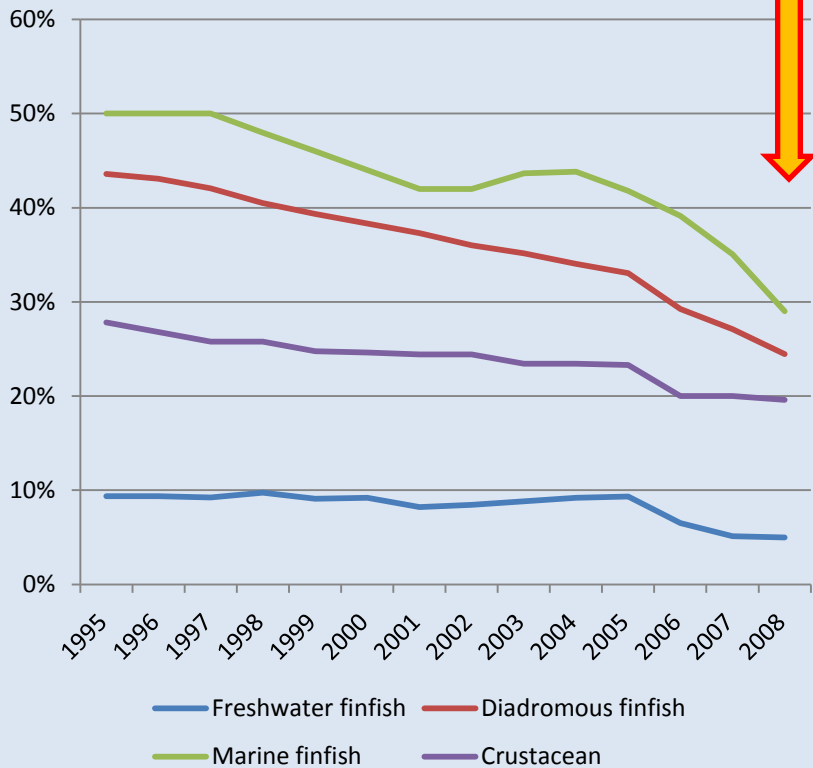
Selected conclusions of the TCP Project ..

- Greater efforts are needed to improve the feed quality - species and stage specific feed based on farm experiments;
- Improve the accessibility and affordability of the feed for marine fish;
- Develop and disseminate BMP for marine cage culture and technical manuals for good feeding practices in marine cage culture for both pellet and TF/LVF feeding.

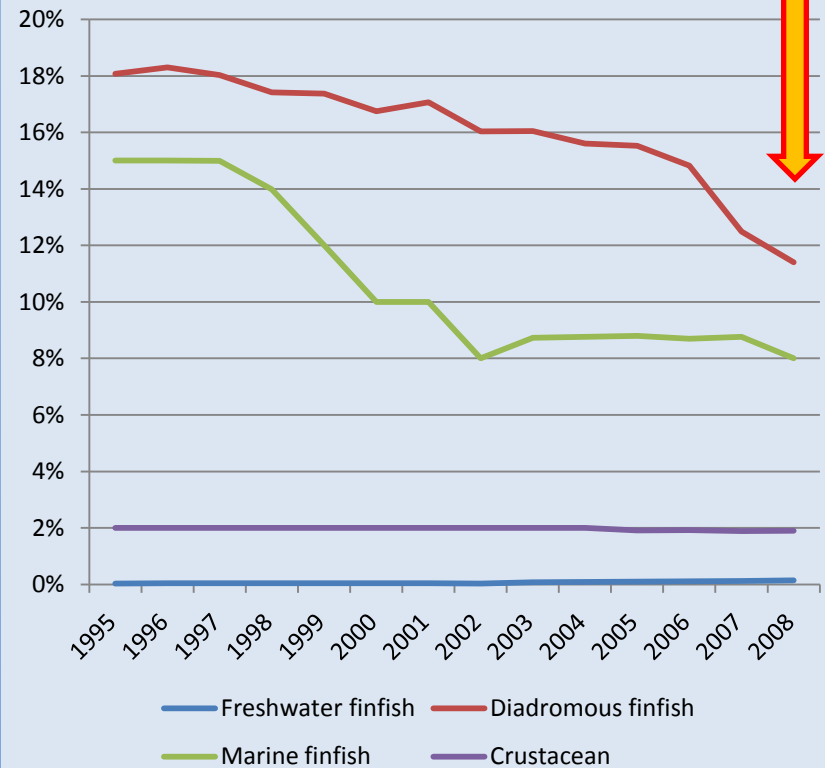


Feed: fishmeal and fish oil use

Fish meal content in aquafeed for different cultured species

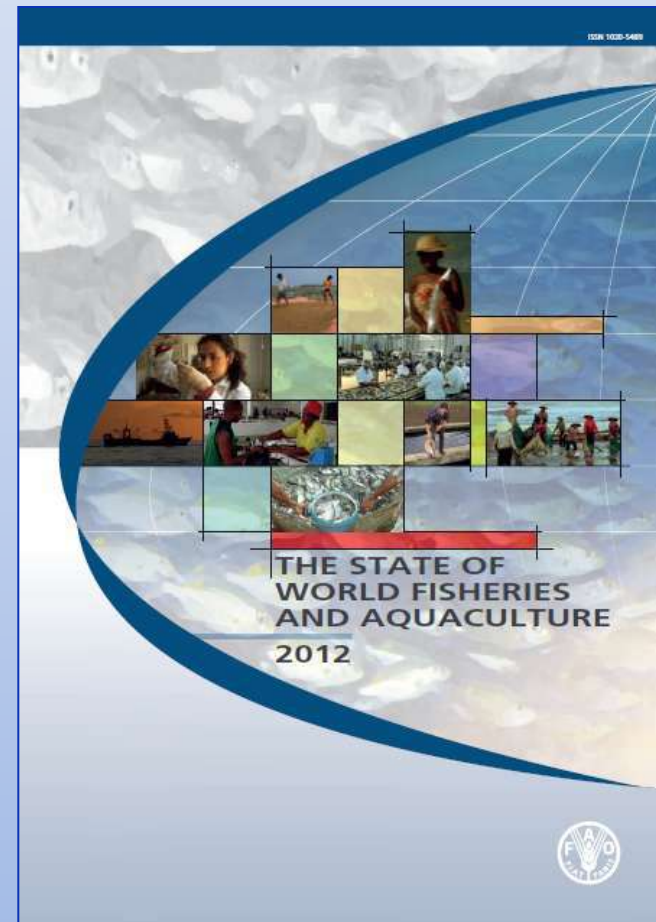


Fish oil content in aquafeed for different cultured species



Issues to be addressed

- Continued emphasis on **alternatives** to fishmeal and fish oil
- **Reducing** country dependence upon **imported feed ingredient** sources
- Special focus **on small-scale farmers** and aquafeed producers
- **Minimizing** the **environmental impacts** of feeds and feeding regimes
- **Diversification** of feed and fertilizer resources



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POLICY is it conducive?

- **Water space** – is there a coastal development plan? Does this plan take into account aquaculture as a rightful user?
- **Zone allocation** – have the best sites for aquaculture been identified and allocated?
- **Concession / licensing** – Do procedures exist, are they clear and comprehensible, well coordinated and permits obtainable in a reasonable time? One-stop-shop!
- **Documents** – type and details required must be clear (EIA)? Efficient information exchange between the authorities and entrepreneurs



GOVERNANCE

- FAO Committee on Fisheries (COFI)
 - Sub-Committee on Aquaculture
 - 7th Session in St. Petersburg, Russian Federation, October 2013
 - newly established: Advisory Working Group on Aquatic Genetic Resources and Technologies

COFI/AQ/V/2010/7

May 2010

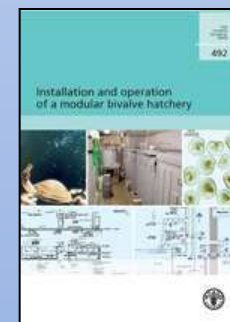
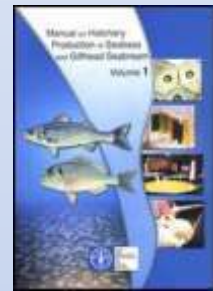
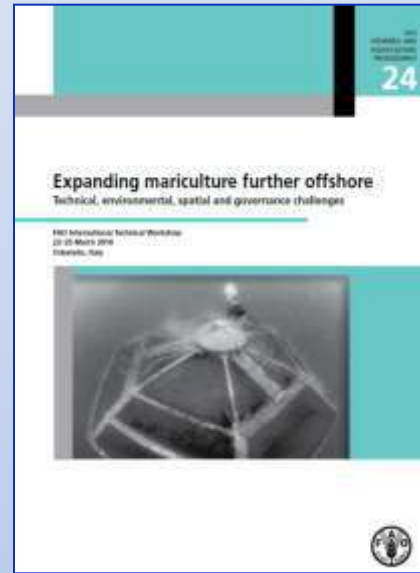
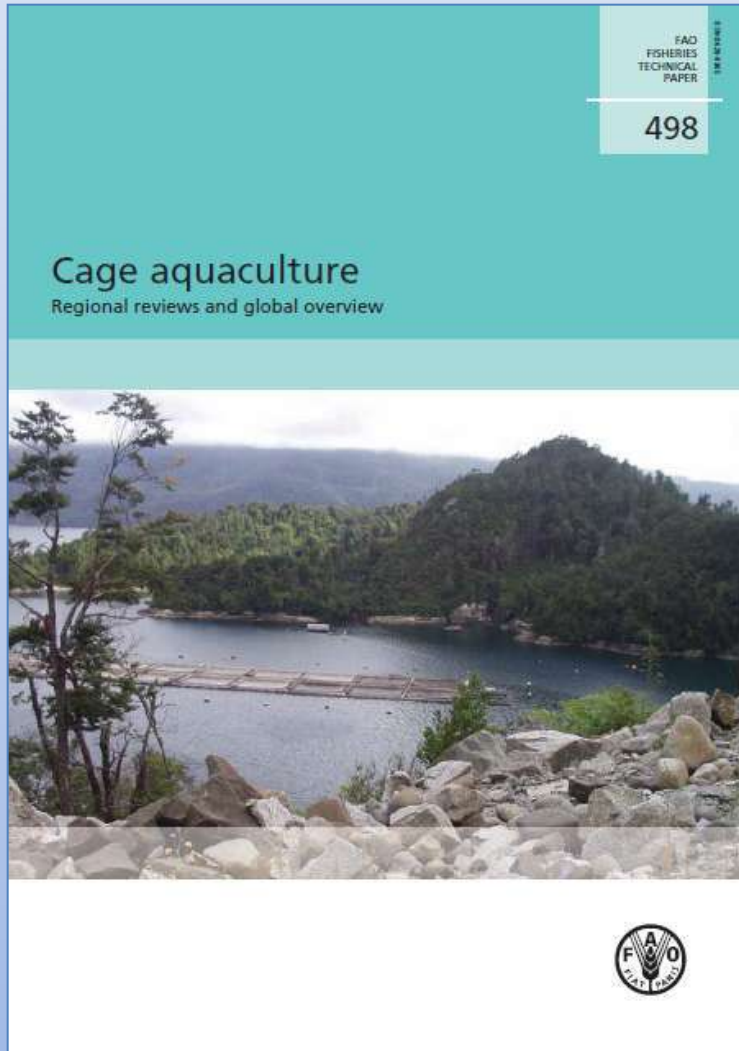
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SUB-COMMITTEE ON AQUACULTURE
Fifth Session
Phuket, Thailand, 27 September – 1 October 2010
MOVING AQUACULTURE FURTHER OFFSHORE: GOVERNANCE ISSUES AND CHALLENGES

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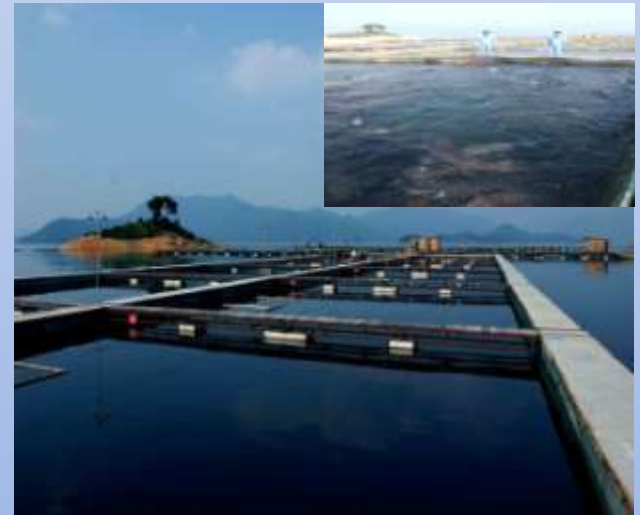
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The way forward

- **Great development potential** with different challenges in different regions
- Many parts of Asia - the challenge is **not to promote** but rather **how to manage**
 - Need to reduce dependence on low value fish
- “Cage culture development regions”
 - Need to **create an enabling economic, political and regulatory environment**
- Increasing agreement for focus on **environmental sustainability** including utilization of wastes



The way forward

- **Expansion and intensification**
 - going further offshore
 - integration with lower-trophic-level species
- Further Government policy, institutional and legal support required
- Confidence that the sector will successfully tackle its challenges





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Thank you
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