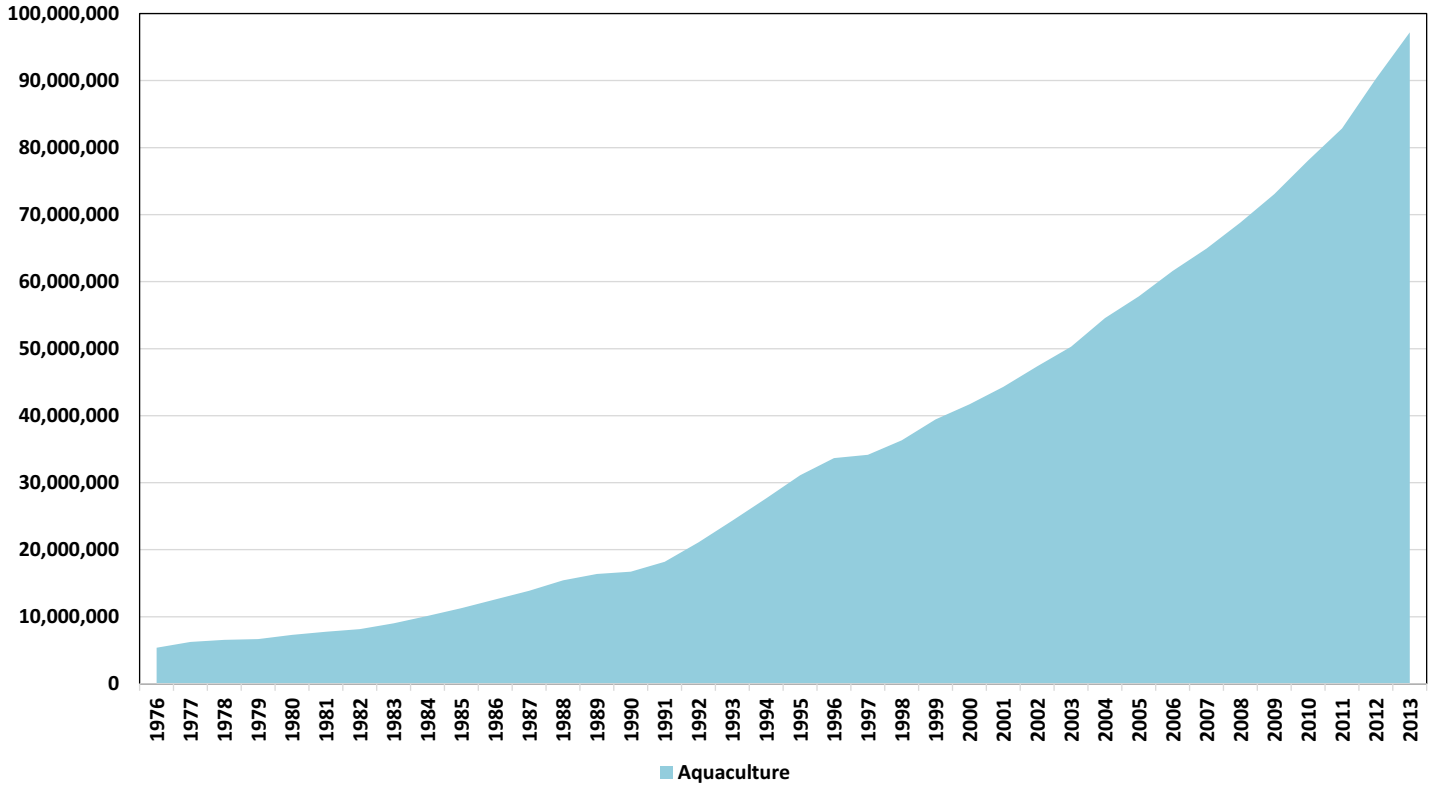

AQUACULTURE EQUIPMENT
CLEARANCE SALE
FAIVRE
FAIVRE
© Rob McCormack


FOR SALE
AUGUST 2013
SWAN BAY FISH FARM
Current aquaculture licences for 17 species
Marine and freshwater approved
40 hectares
Waterfront access
17 aquaculture ponds
Water storage dams
Single and 3 phase power
Tar sealed road access
Only 1 km from Pacific Hwy
2.3 hours from Sydney airport
PRIVATE SALE
Contact: Rob McCormack
©RB McCormack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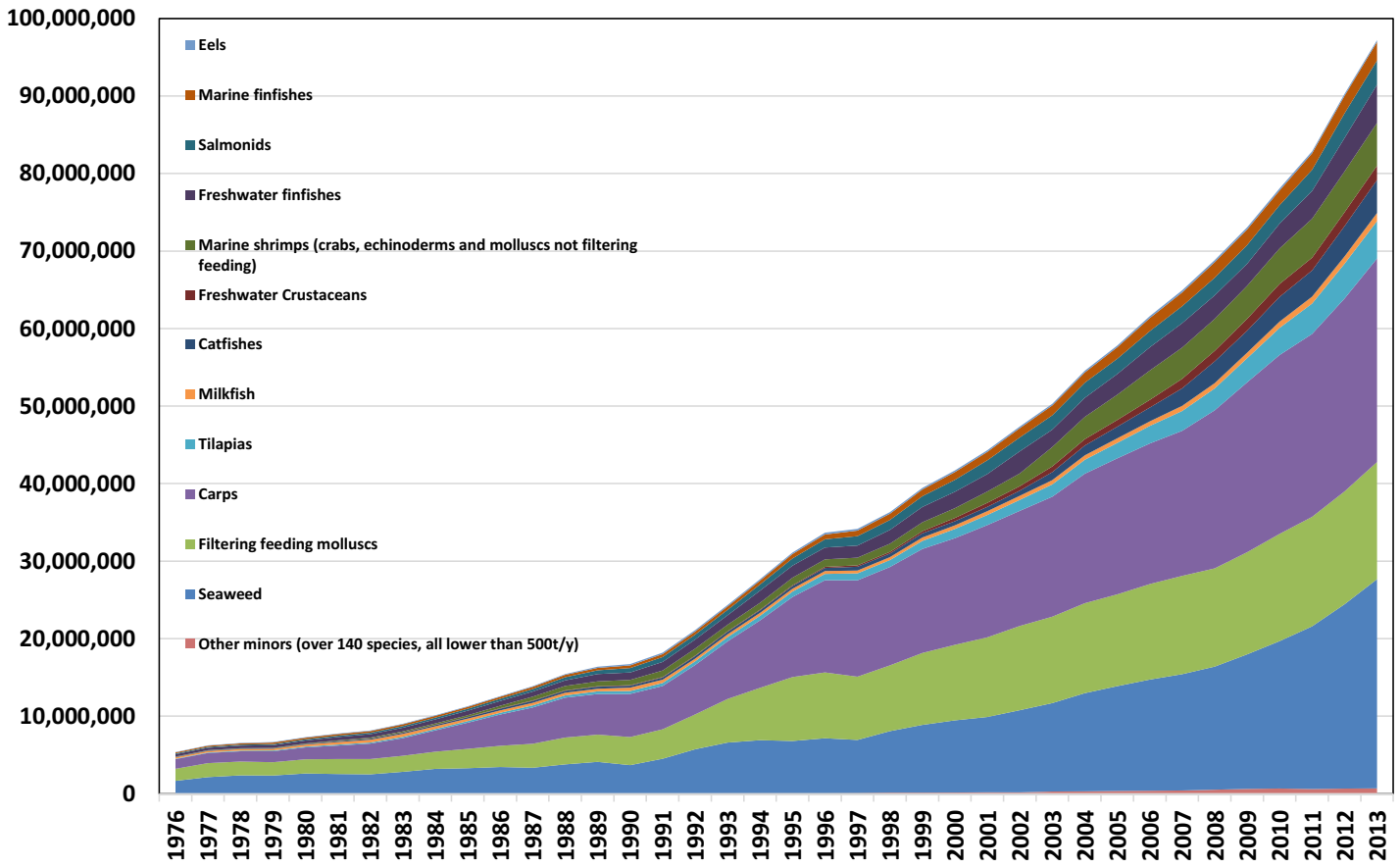
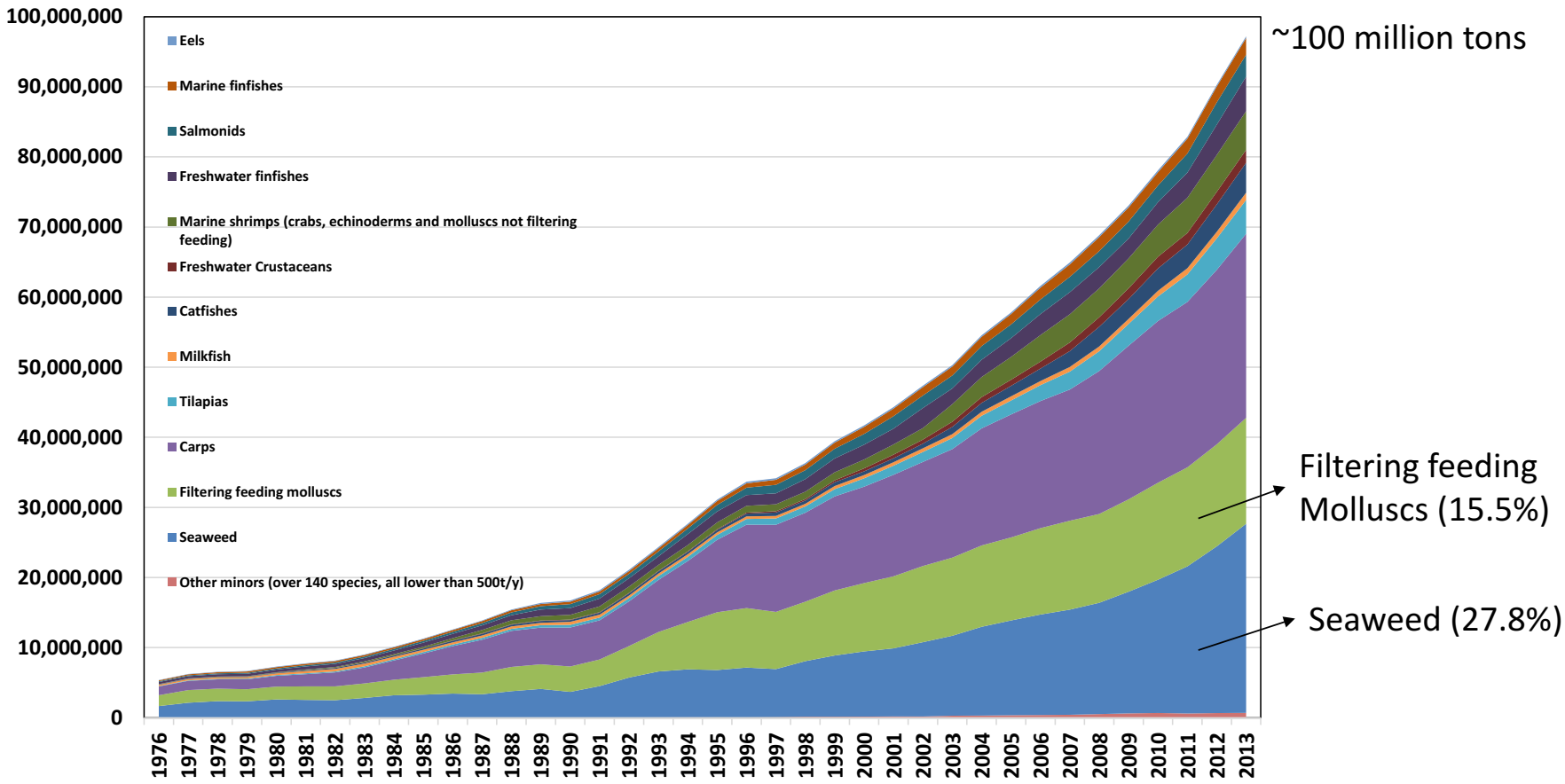
Aquaculture



~100 million tons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Eels
Marine finfishes
Salmonids
Freshwater finfishes
Marine shrimps (crabs, echinoderms and molluscs not filtering feeding)
Freshwater Crustaceans
Catfishes
Milkfish
Tilapias
Carps
Filtering feeding molluscs
Seaweed
Other minors (over 140 species, all lower than 500t/y)
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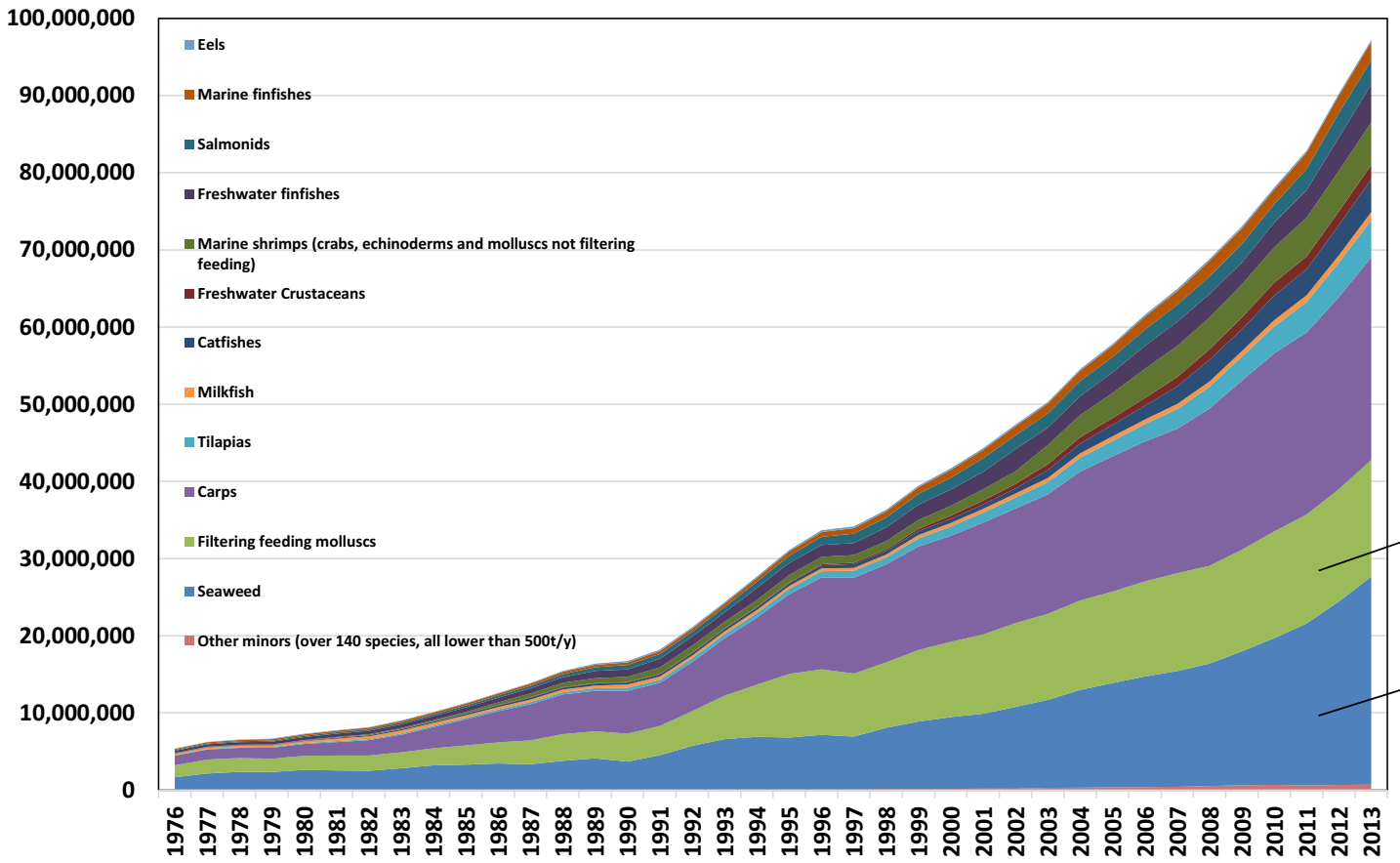
~100 million tons
Filtering feeding Molluscs (15.5%)
Seaweed (27.8%)

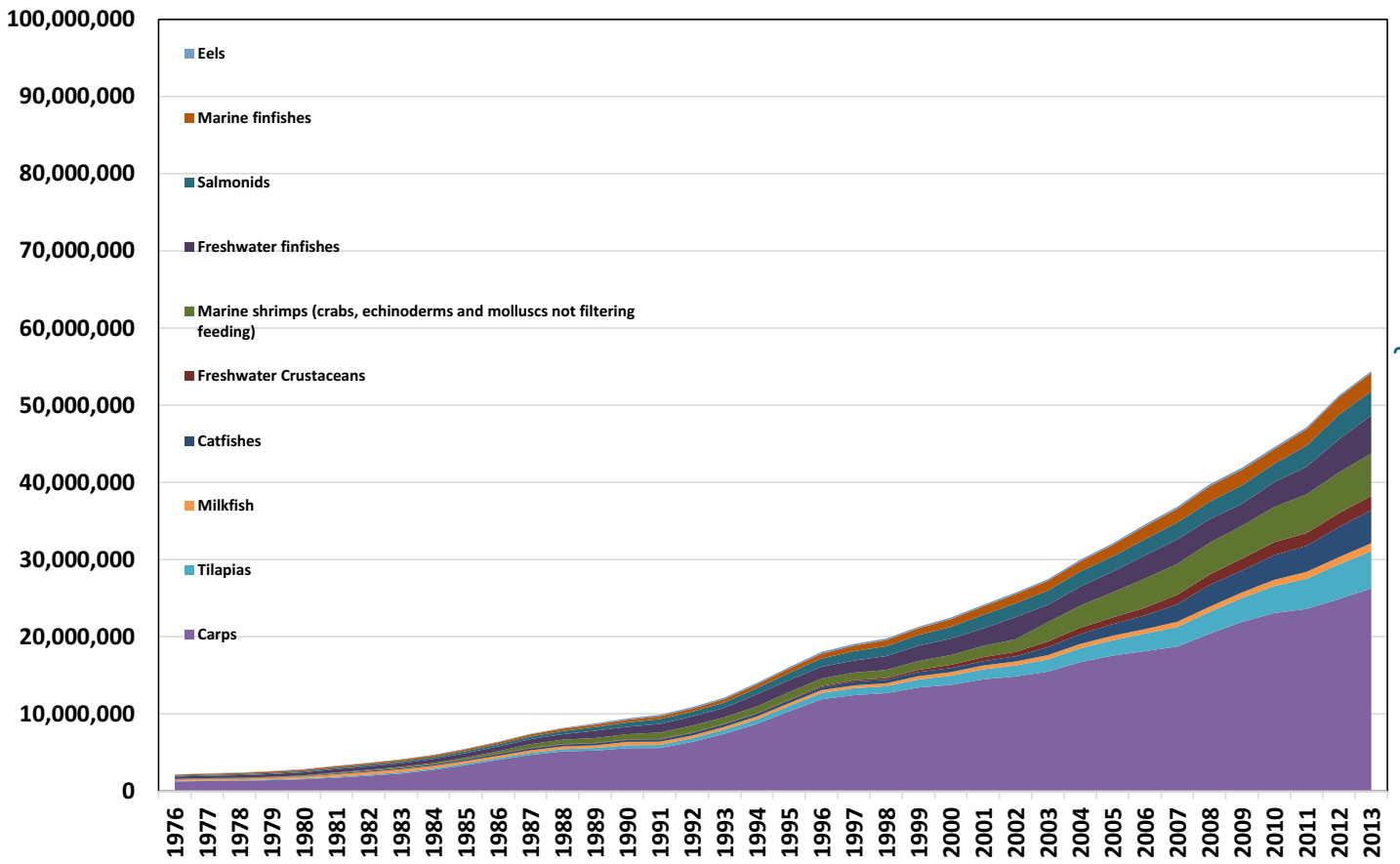


~100 million tons

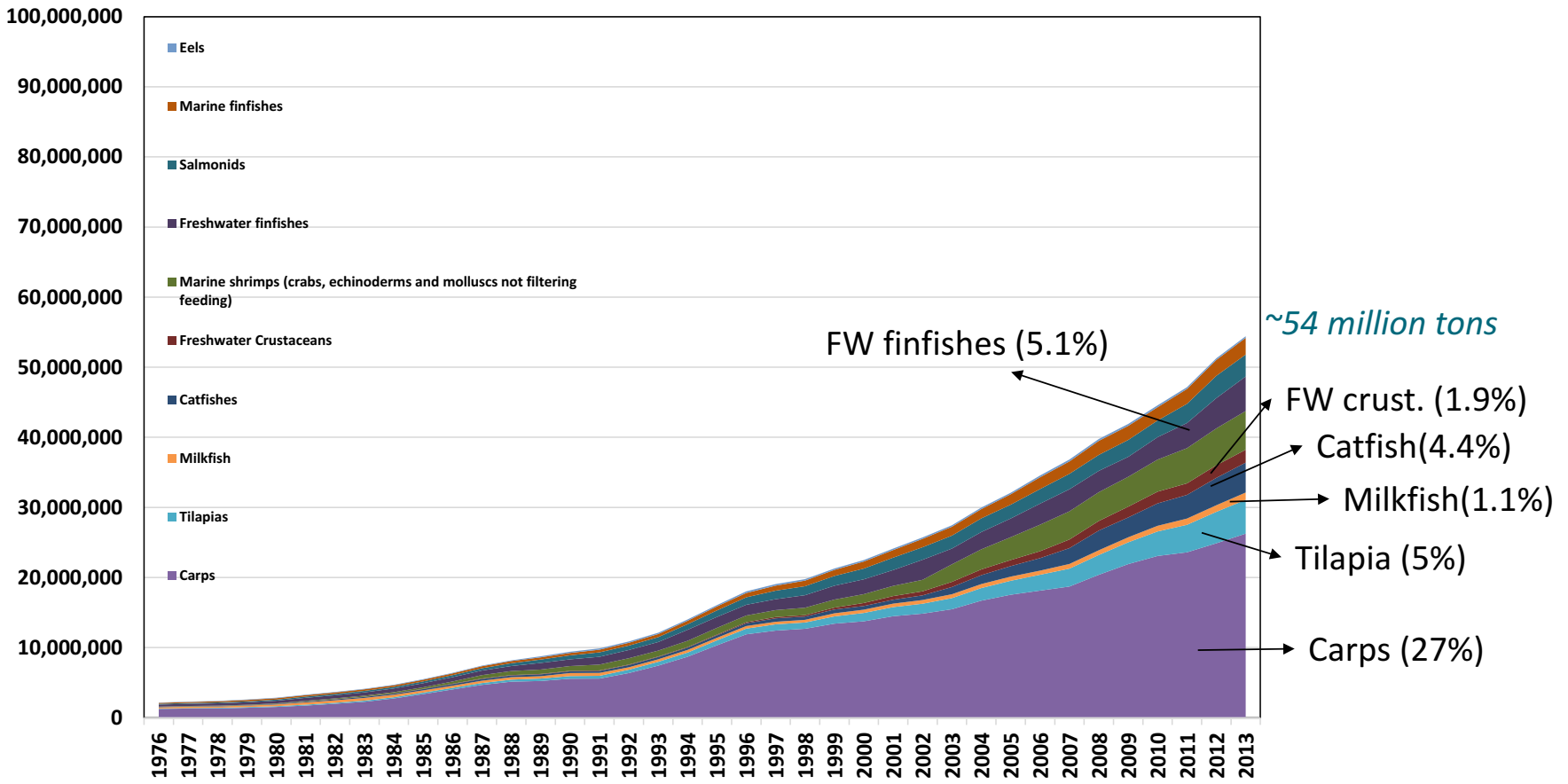
Not fed!

Filtering feeding Molluscs (15.5%)

Seaweed (27.8%)



~54 million tons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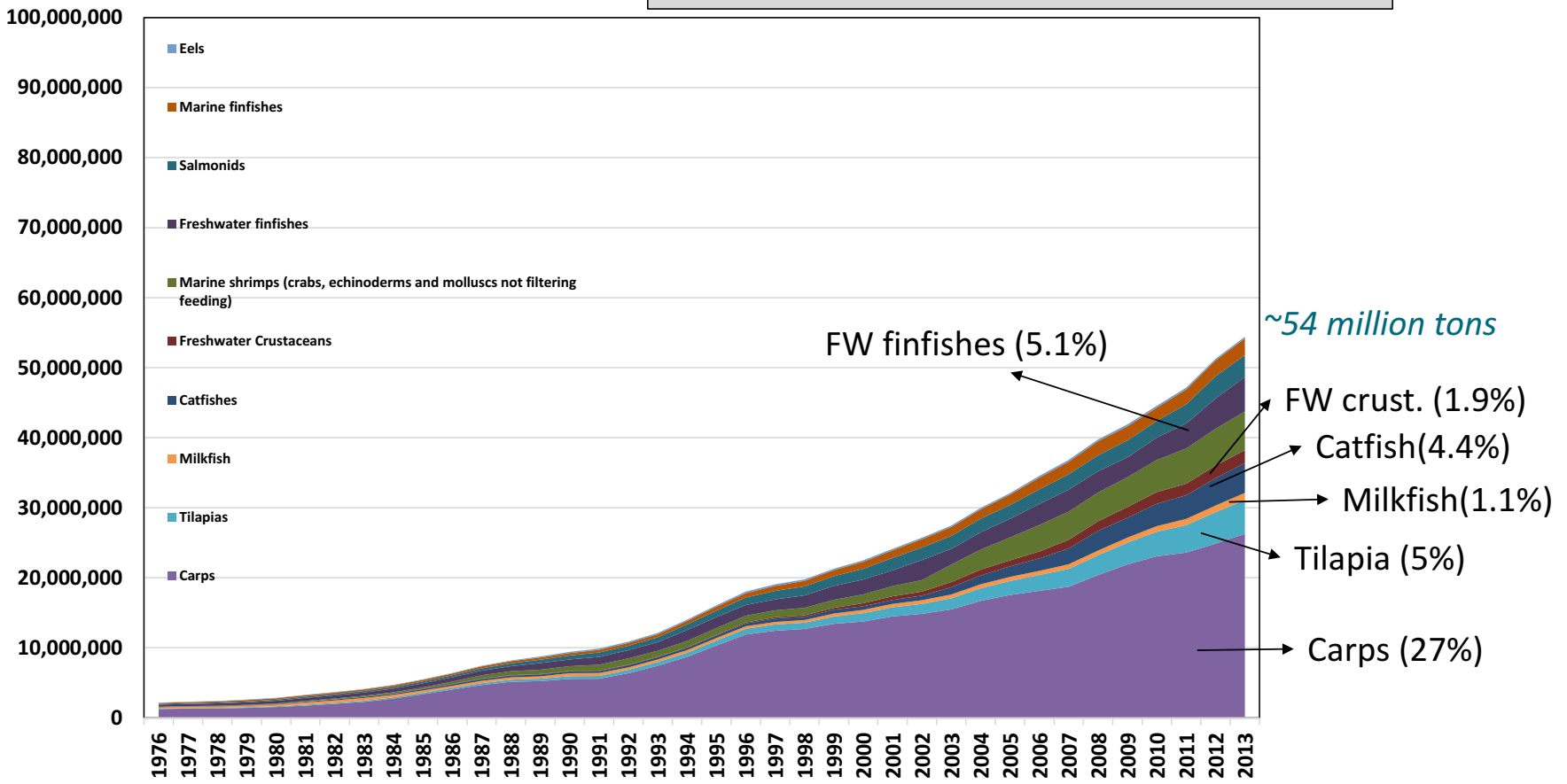
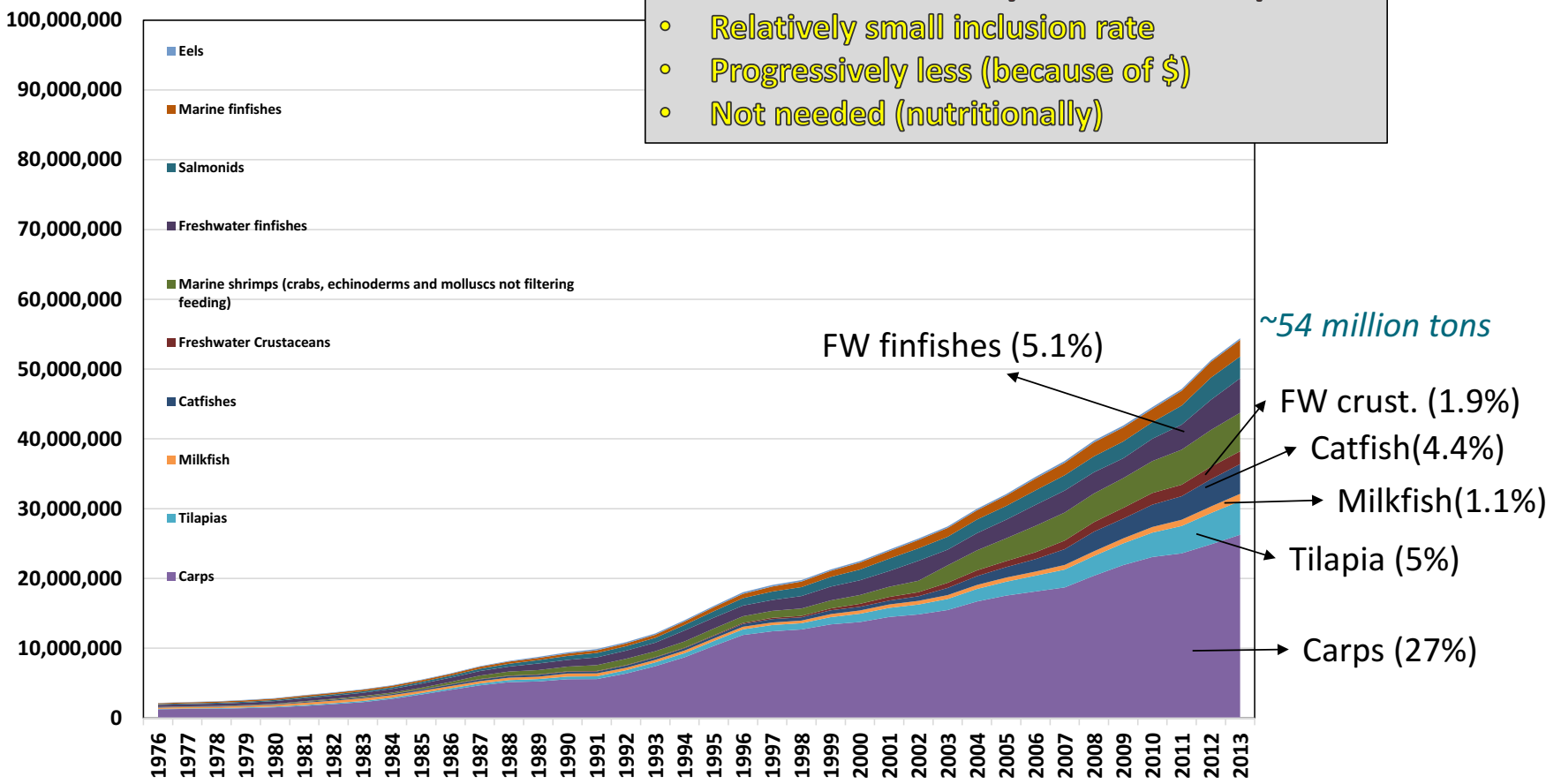
~54 million tons
FW finfishes (5.1%)
FW crust. (1.9%)
Catfish(4.4%)
Milkfish(1.1%)
Tilapia (5%)
Carps (27%)

FM and FO are currently used in their aquafeed



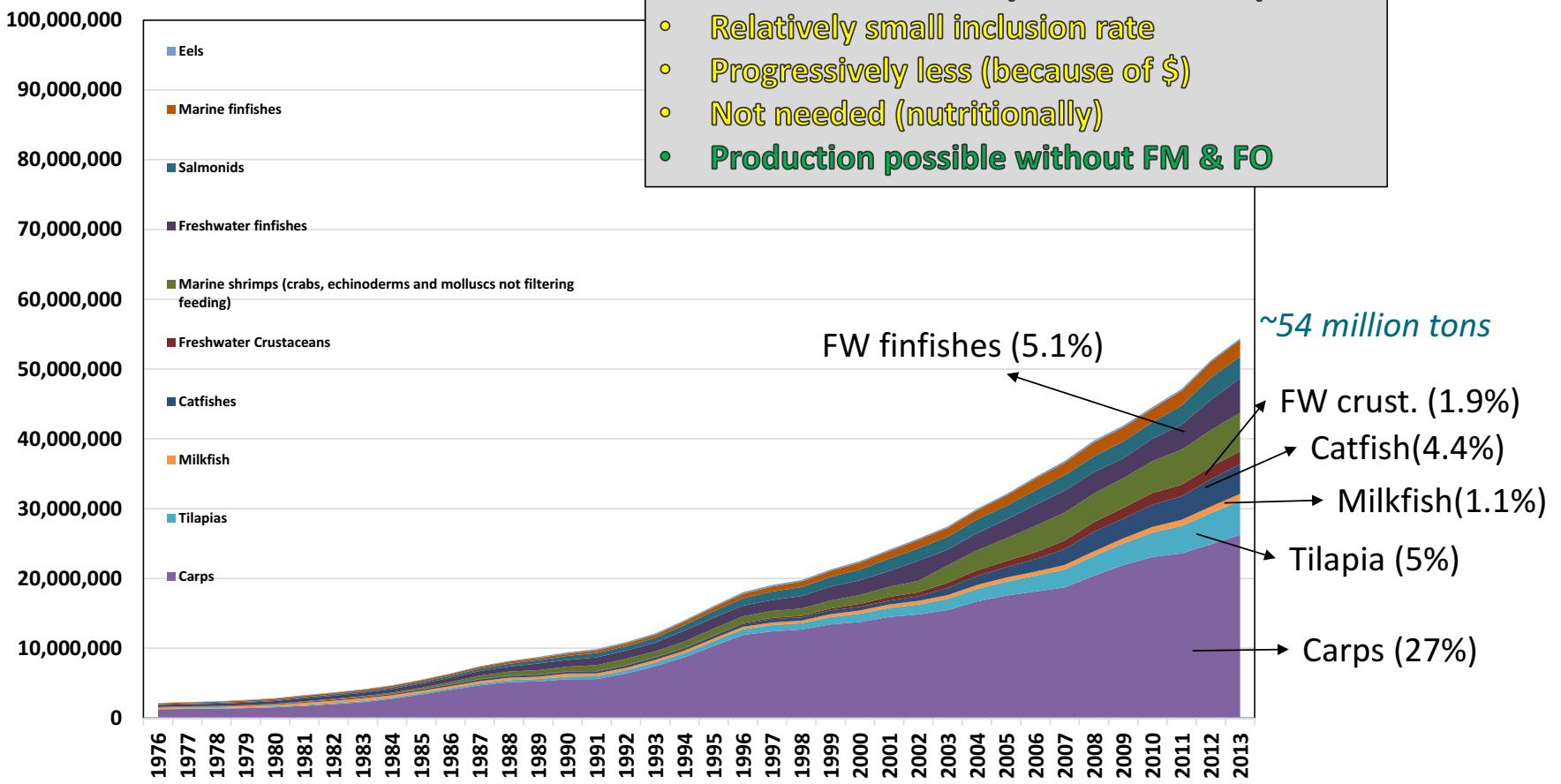
FM and FO are currently used in their aquafeed

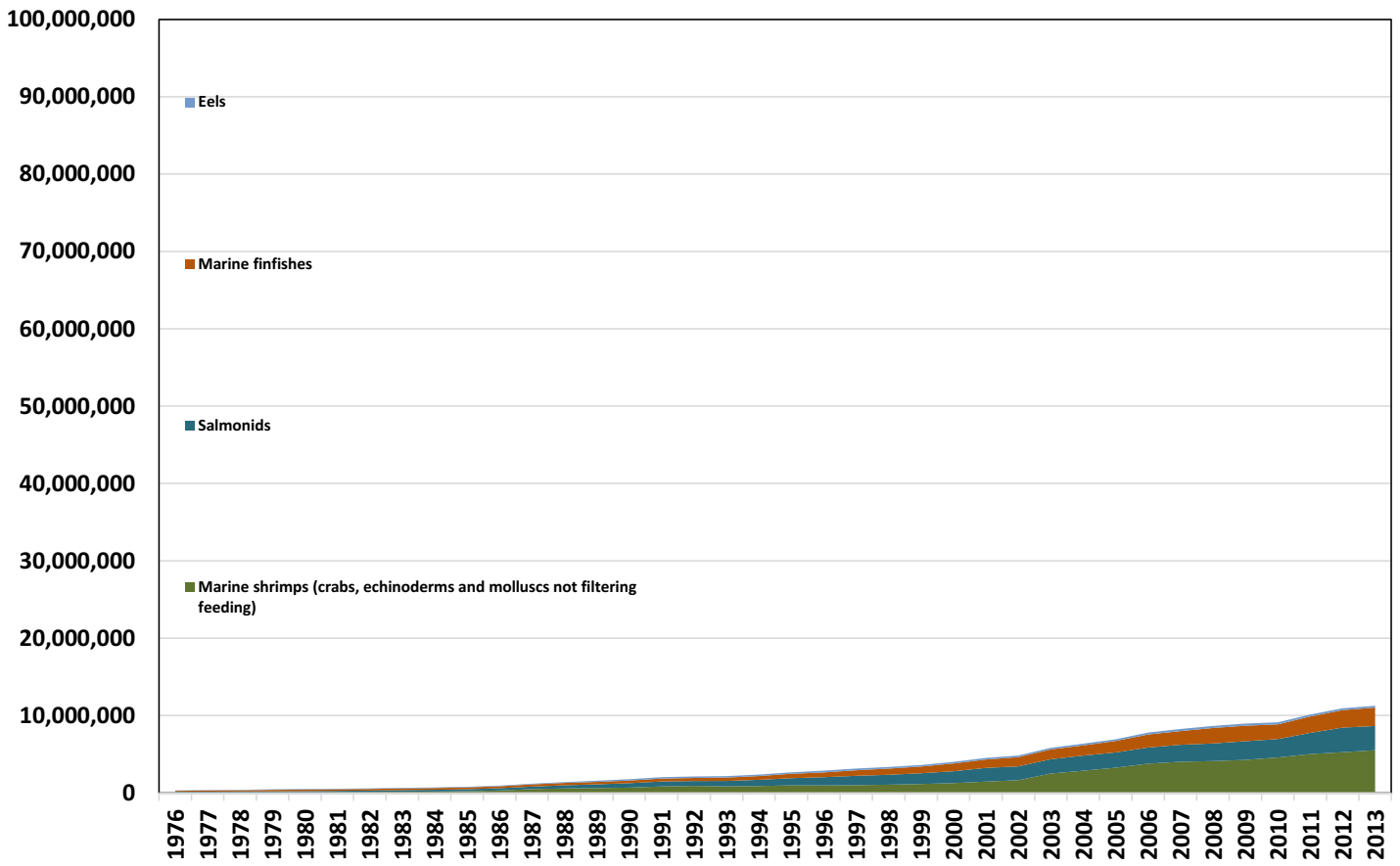
- Relatively small inclusion rate
- Progressively less (because of $)
- Not needed (nutritionally)



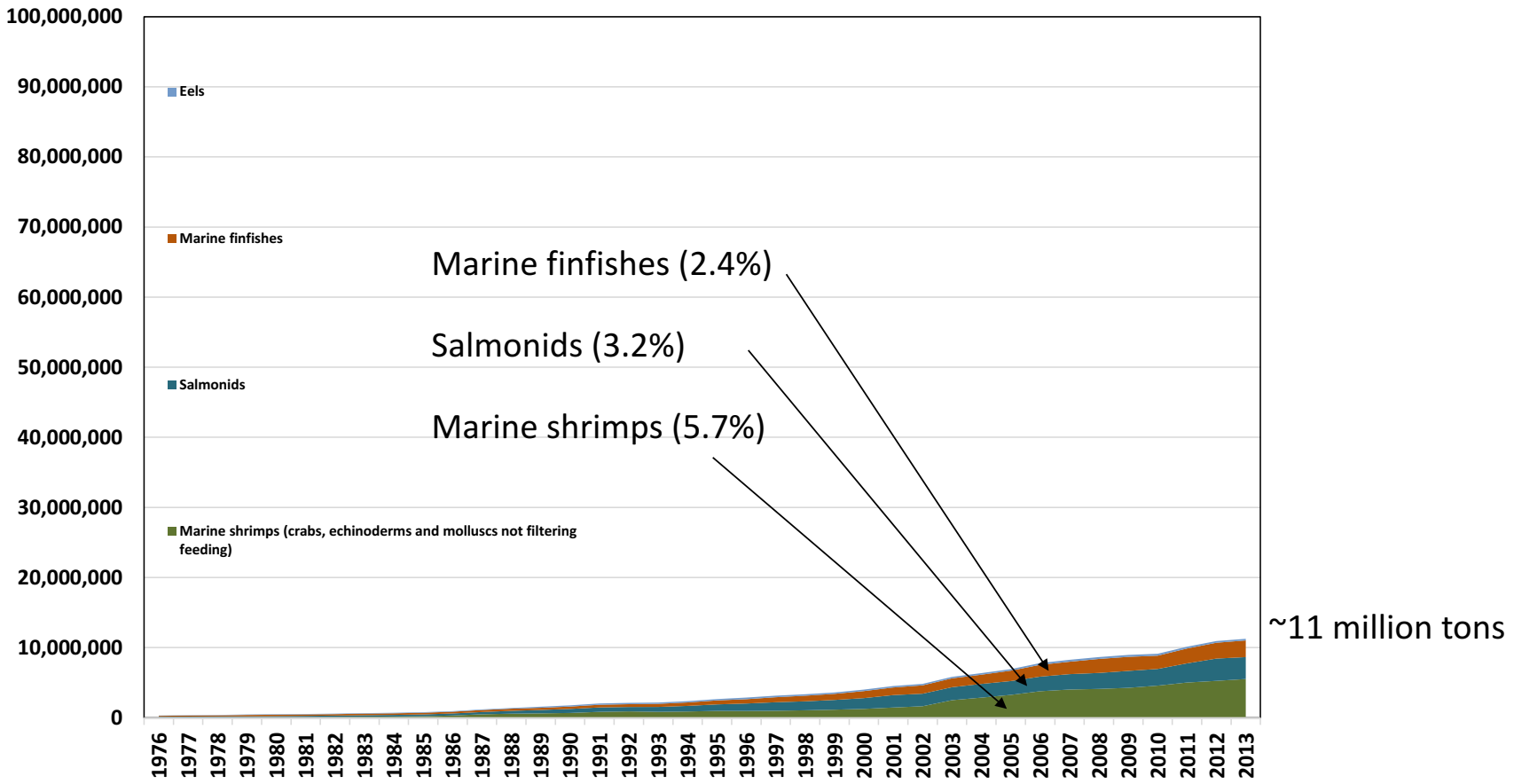
FM and FO are currently used in their aquafeed

- Relatively small inclusion rate
- Progressively less (because of $)
- Not needed (nutritionally)
- **Production possible without FM & FO**





~11 million tons



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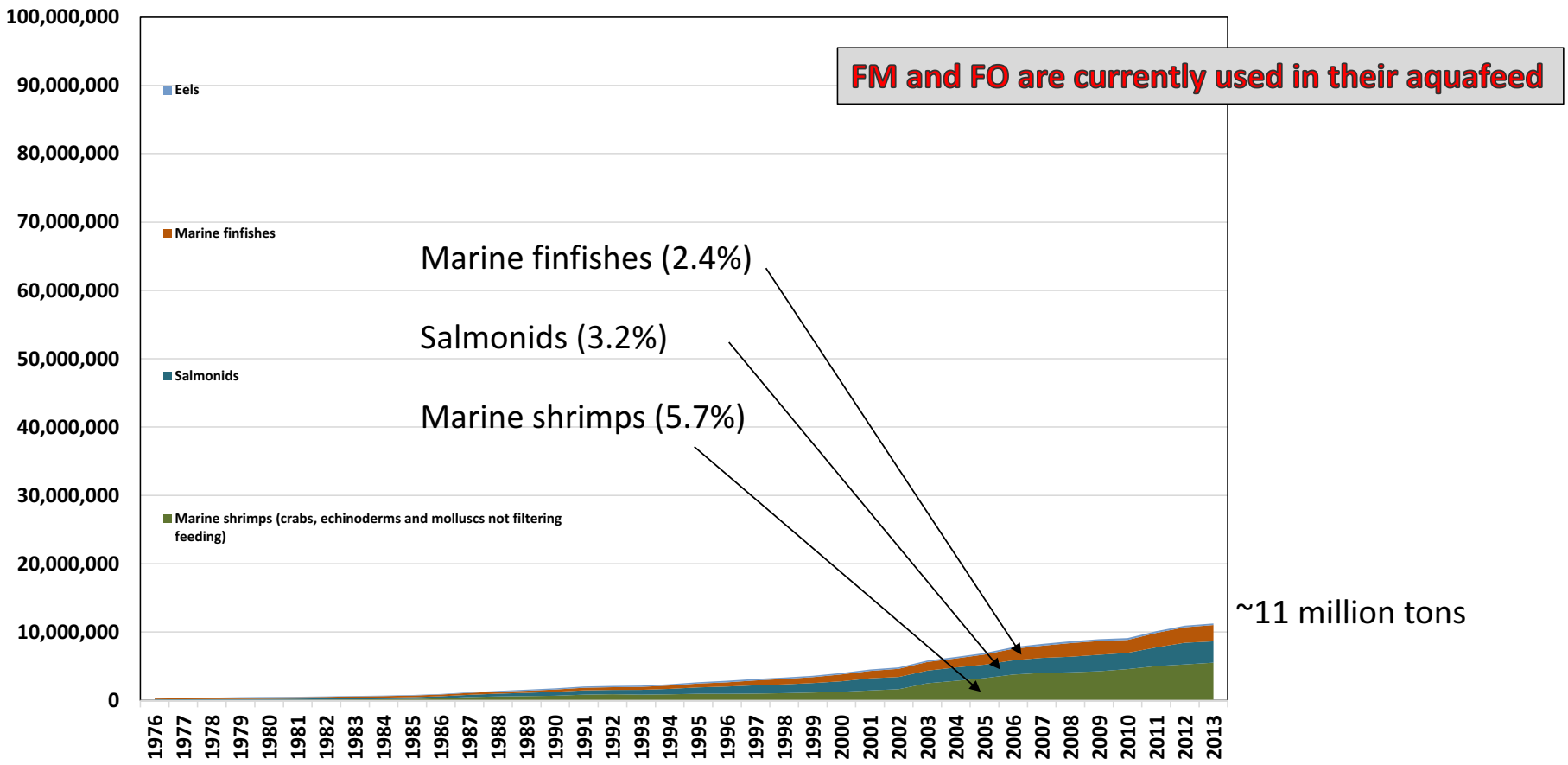
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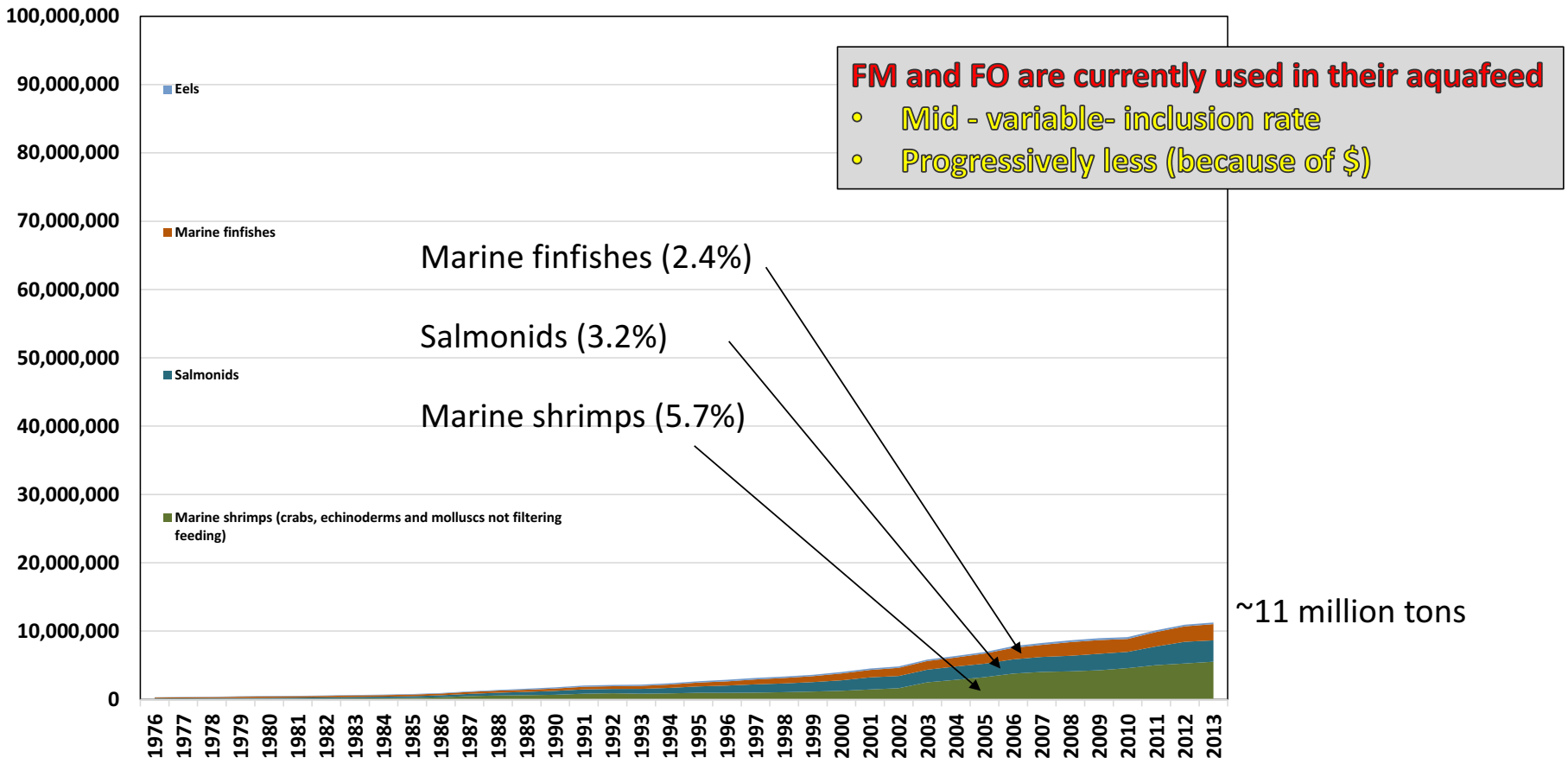
FM and FO are currently used in their aquafeed
Marine finfishes (2.4%)
Salmonids (3.2%)
Marine shrimps (5.7%)
~11 million tons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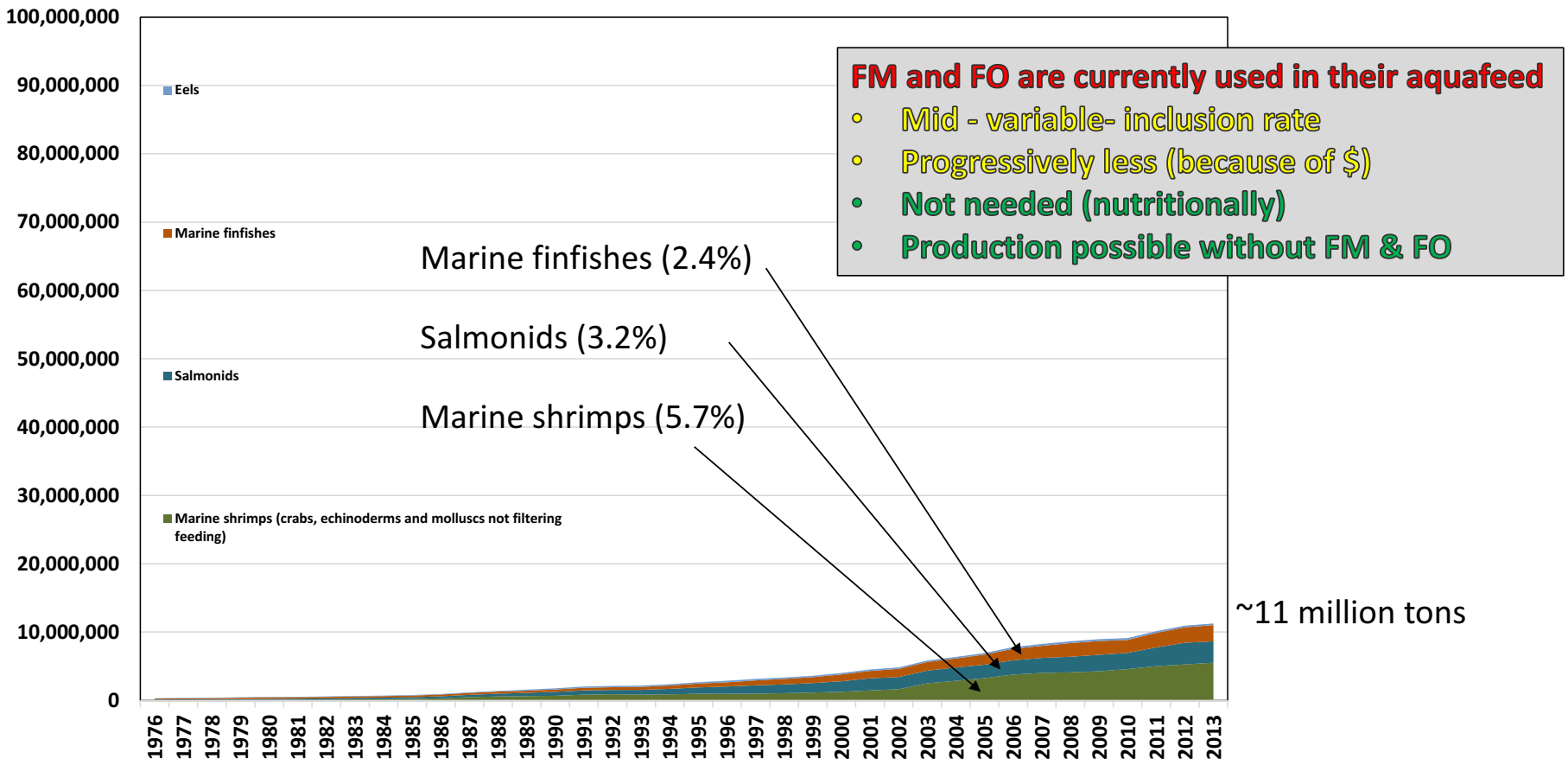
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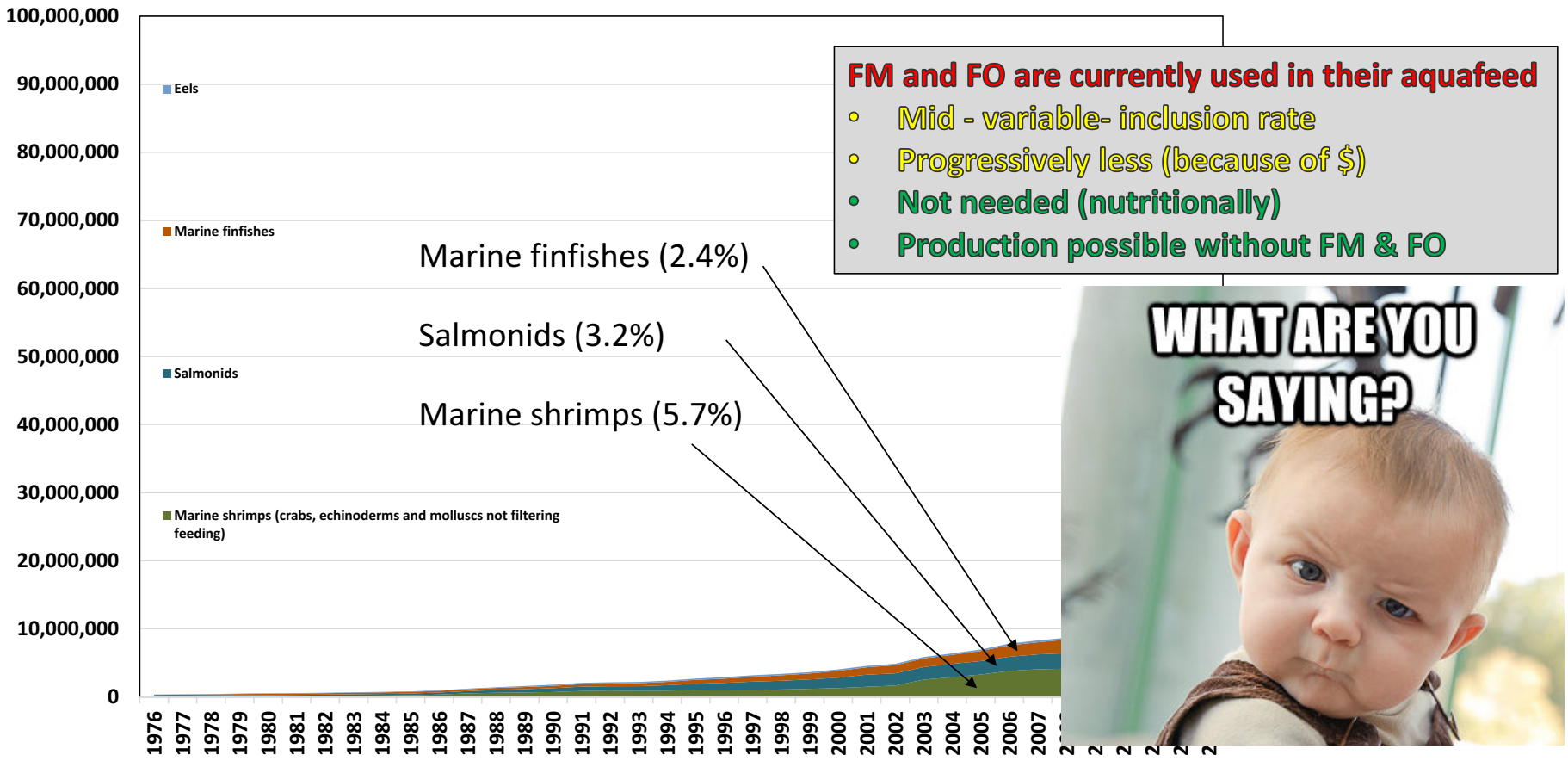
• Not needed (nutritionally)
• Production possible without FM & FO
~11 million tons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FM and FO are currently used in their aquafeed
• Mid - variable- inclusion rate
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WHAT ARE YOU SAYING?

Fishmeal

No fish, nor shrimp, needs any fishmeal

- They need:
  - Essential amino acids
  - Correct protein/energy ratio

FM is just an excellent source of highly digestible, highly palatable, dietary protein, with an excellent AA composition (essential and not, + taurine) and no anti-nutritional factors.

- FM can be replaced! …. but it will cost $.
- We need coordinated and adequately supported R&D investments to reduce costs of FM replacement.

Gatlin et al. 2007 *Aquaculture Research,* 38**,** 551-579
Hardy 2010 *Aquaculture Research,* 41**,** 770-776

Fish oil

No fish, nor shrimp, needs any fish oil

They need:

- Highly digestible energy sources
- Essential fatty acids (and in particular omega-3)
- Shrimp: also need phospholipids and cholesterol

Plenty of options of alternative oils providing highly digestible energy, phospholipids and cholesterol.

The only real bottleneck is omega-3 (long-chain) (aka n-3 LC-PUFA)

- EPA (20:5n-3; *eicosapentaenoic acid*)
- DHA (22:6n-3; *docosahexaenoic acid*)

Turchini et al. 2009 *Reviews in Aquaculture, 1, 10-57*
Turchini, Ng, Tocher 2011. *Fish Oil replacement and Alternative Lipid Sources in Aquaculture Feeds*. CRC Press, Taylor & Francis Group

EFA Requirements of Fish

1. Physiological EFA Requirement. To prevent EFA deficiency/nutritional pathology.

Low: Some species C_{18} PUFA can satisfy, even in species requiring LC-PUFA, only ~ 0.2 to 0.8% of diet.

Not too big a problem.

Tocher 2015. *Aquaculture* 449:94–107

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Higher: but unknown & variable. Probably related to dietary lipid, endogenous metabolism, and other factors

Problem only for some species ($ for EPA/DHA)

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3. Nutritional quality Requirement

Very High: To satisfy human requirements for n-3LC-PUFA, i.e. for fish to remain as the major providers of EPA and DHA

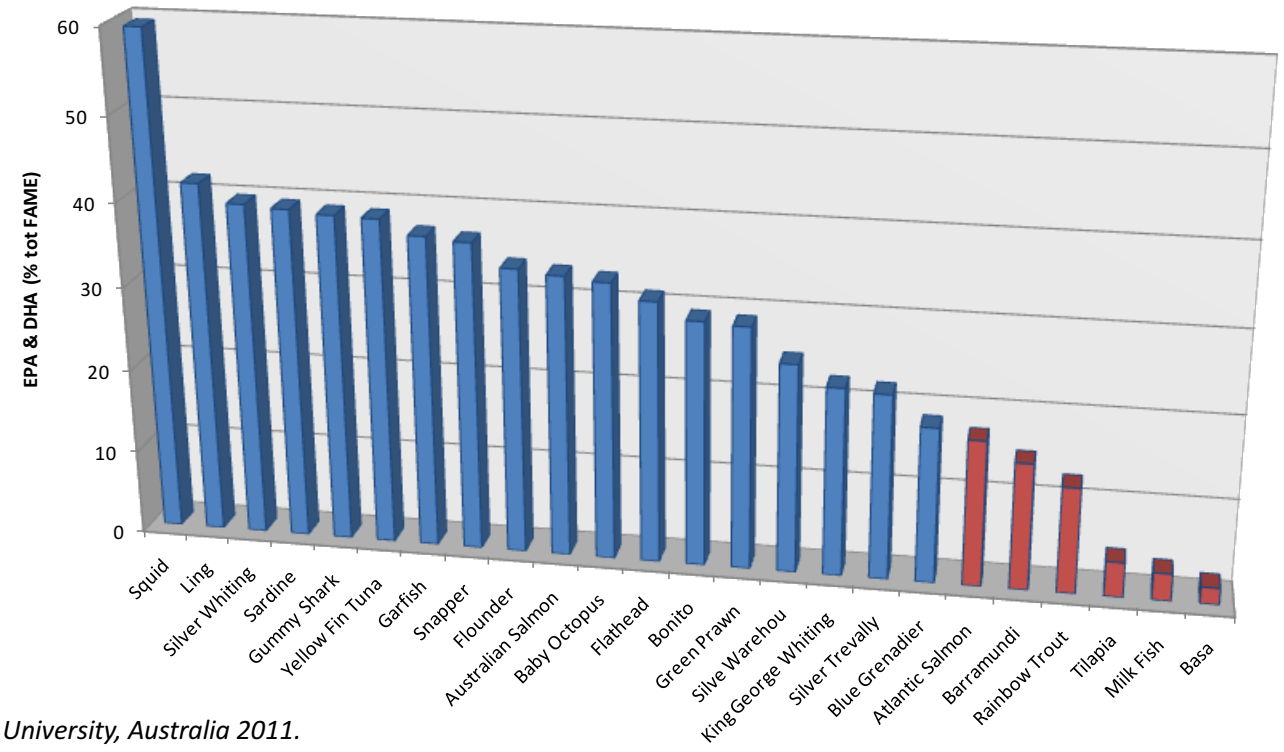
That is the big problem!

it is impacting the sector and it will shape it

Tocher 2015. *Aquaculture* 449:94–107

Changing aquafeed and effects on nutritional composition

Farmed fish (RED) are the worst for LC Omega-3 (**when expressed as %**).



Unpublished data:
Francis et al. Deakin University, Australia 2011.

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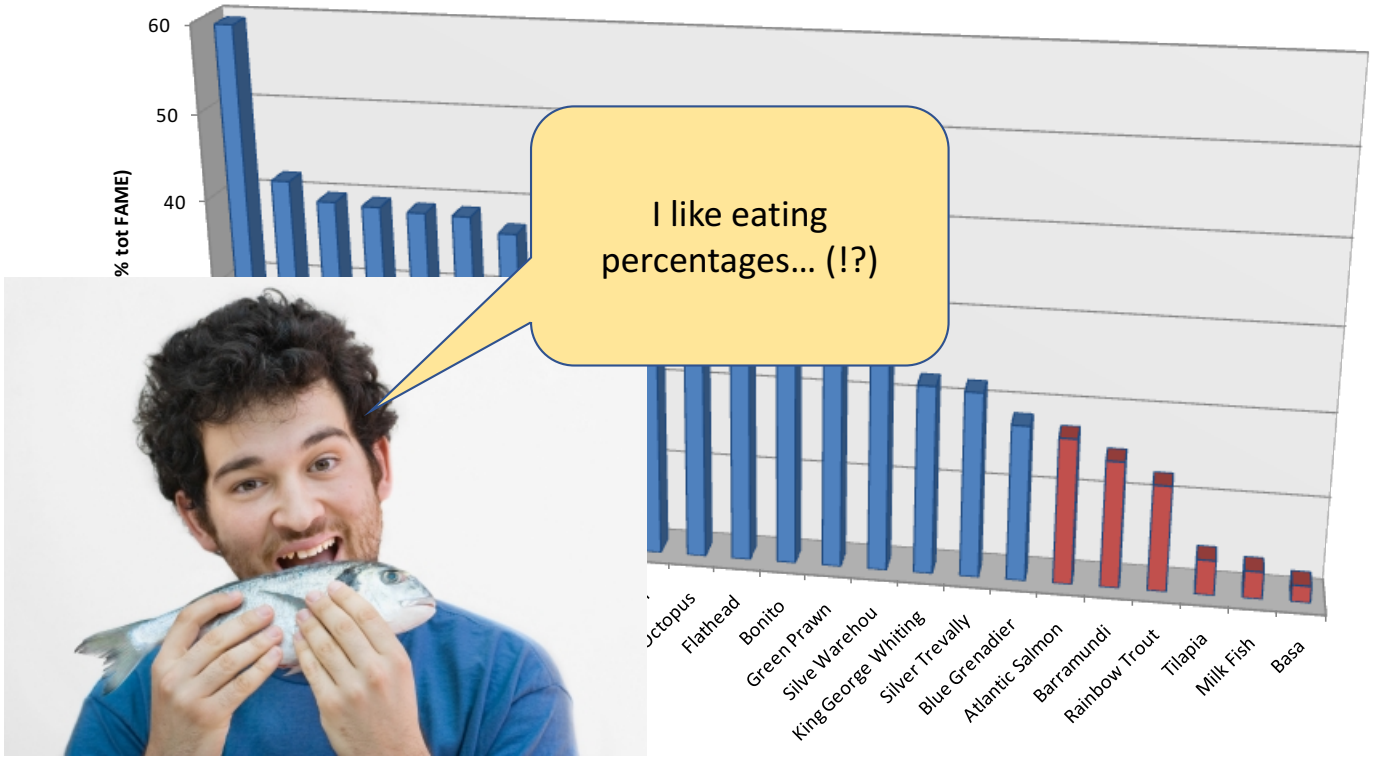

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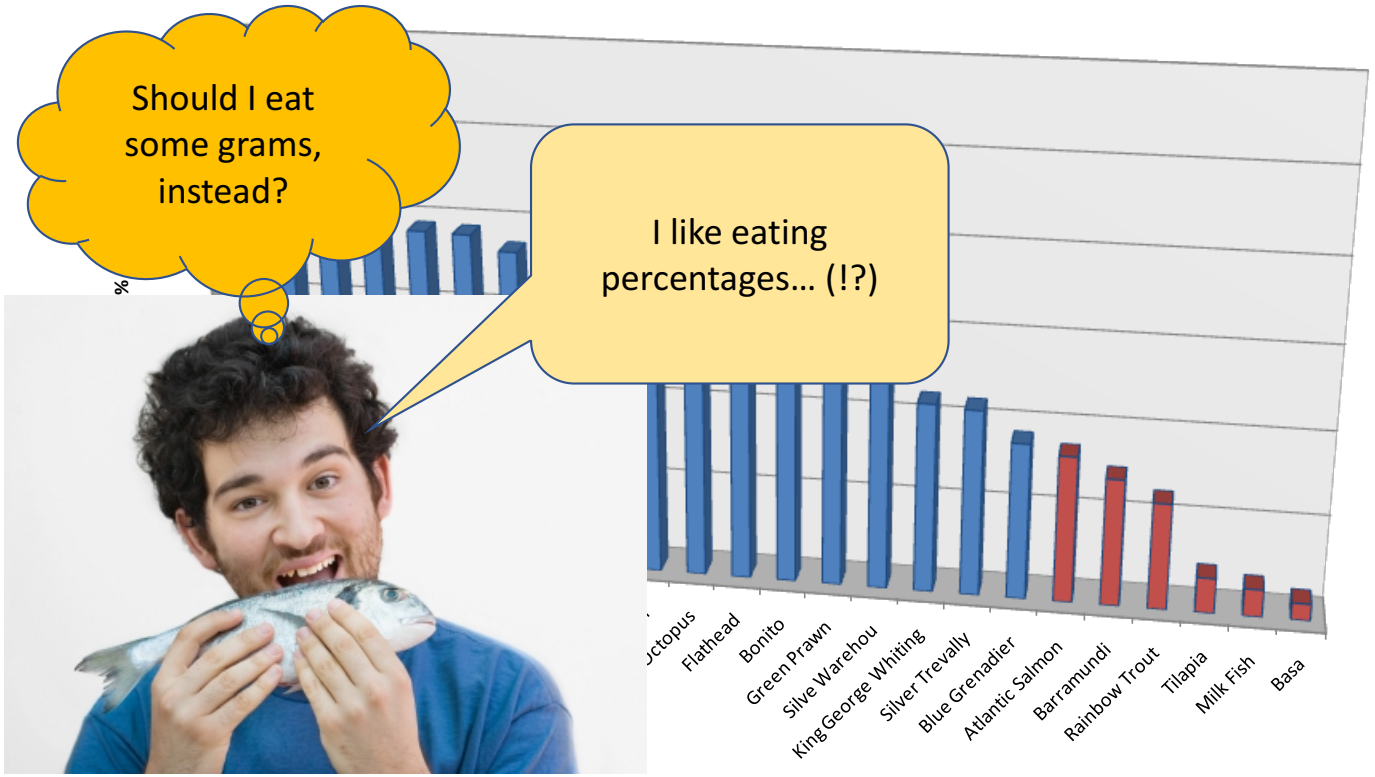
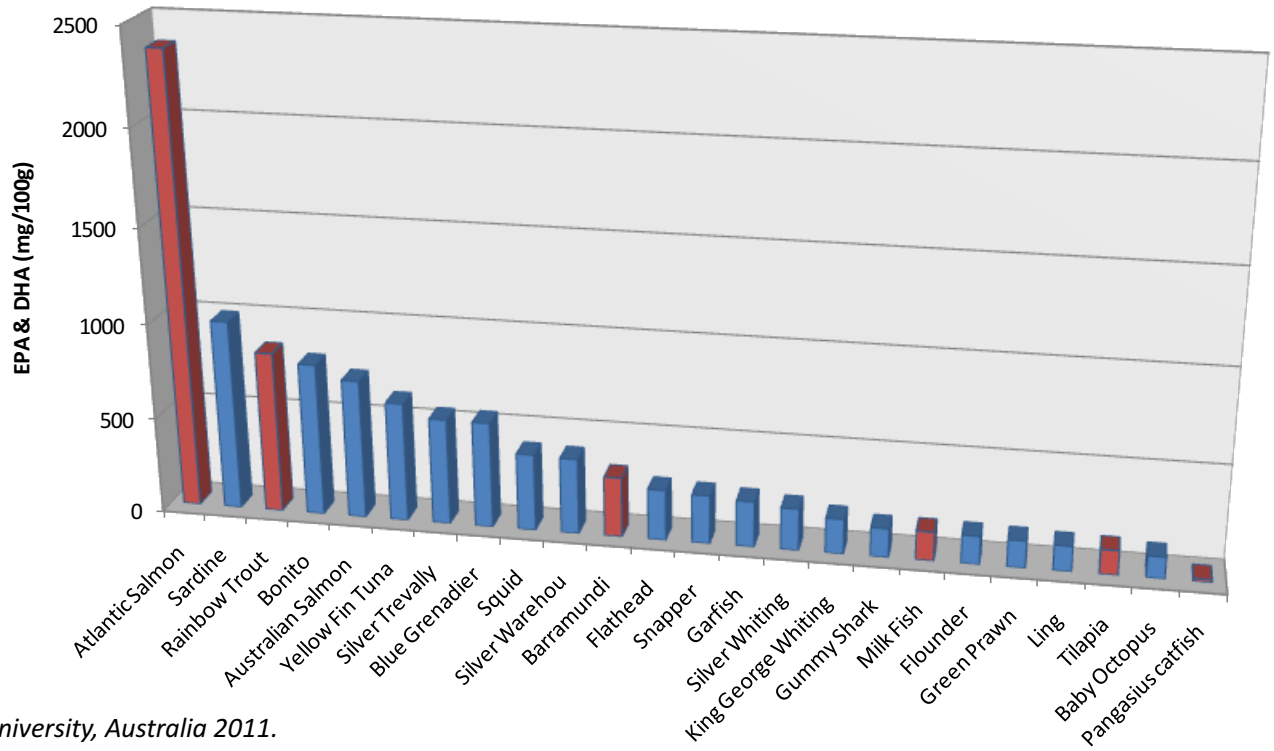


Changing aquafeed and effects on nutritional composition

Farmed fish (RED) are amongst the best for LC Omega-3 (as **mg/100g**).



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Changing aquafeed and effects on nutritional composition

UNIVERSITY OF
STIRLING

Sprague et al. XVI ISFNF. Idaho, June 2016

Changing aquafeed and effects on nutritional composition

Rapeseed oil most commonly used FO alternative

Between 2000-2012 Global fed aquaculture increased from 15 to 35 million tonnes

Fish oil production for same period remained at 0.8 million tonnes per year

18:1n-9

18:2n-6

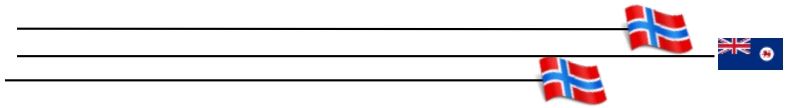
EPA
DHA
18:3n-3

UNIVERSITY OF STIRLING

Sprague et al. XVI ISFNF. Idaho, June 2016

Sprague et al. 2016. Scientific Reports, 6: 21892 ; DOI: 10.1038/srep21892

EPA+DHA Levels in Scottish Farmed Salmon



Jensen et al. (2012). *Nutr. Bull.*, 37, 25-29

Ytrestøyl et al. (2015). *Aquaculture*, 448, 365-374

Nichols et al. (2014). *Nutrients*, 6, 1063-1079

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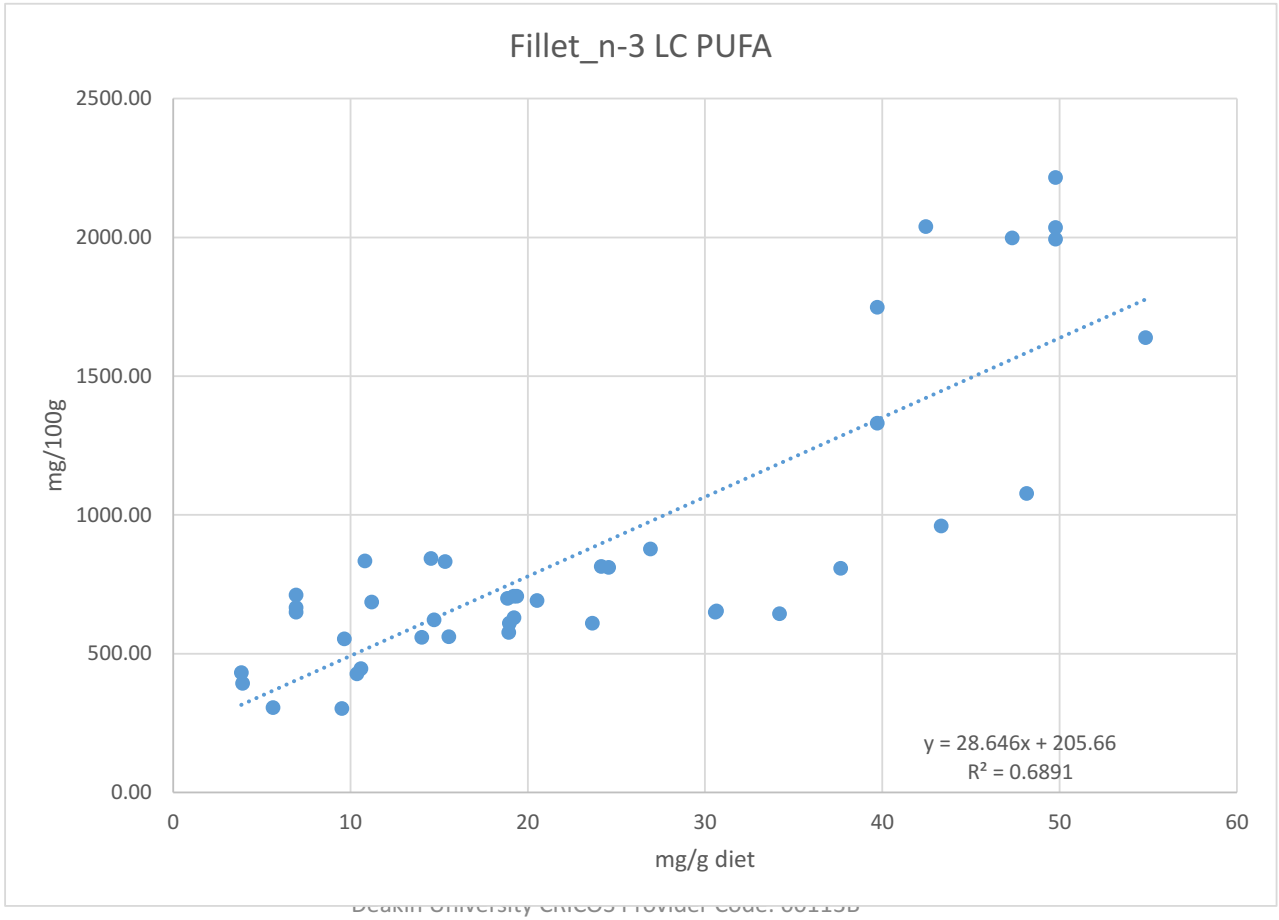
n-3LC-PUFA content of salmon fillet

(from scientific literature meta-analysis; in progress at Deakin)



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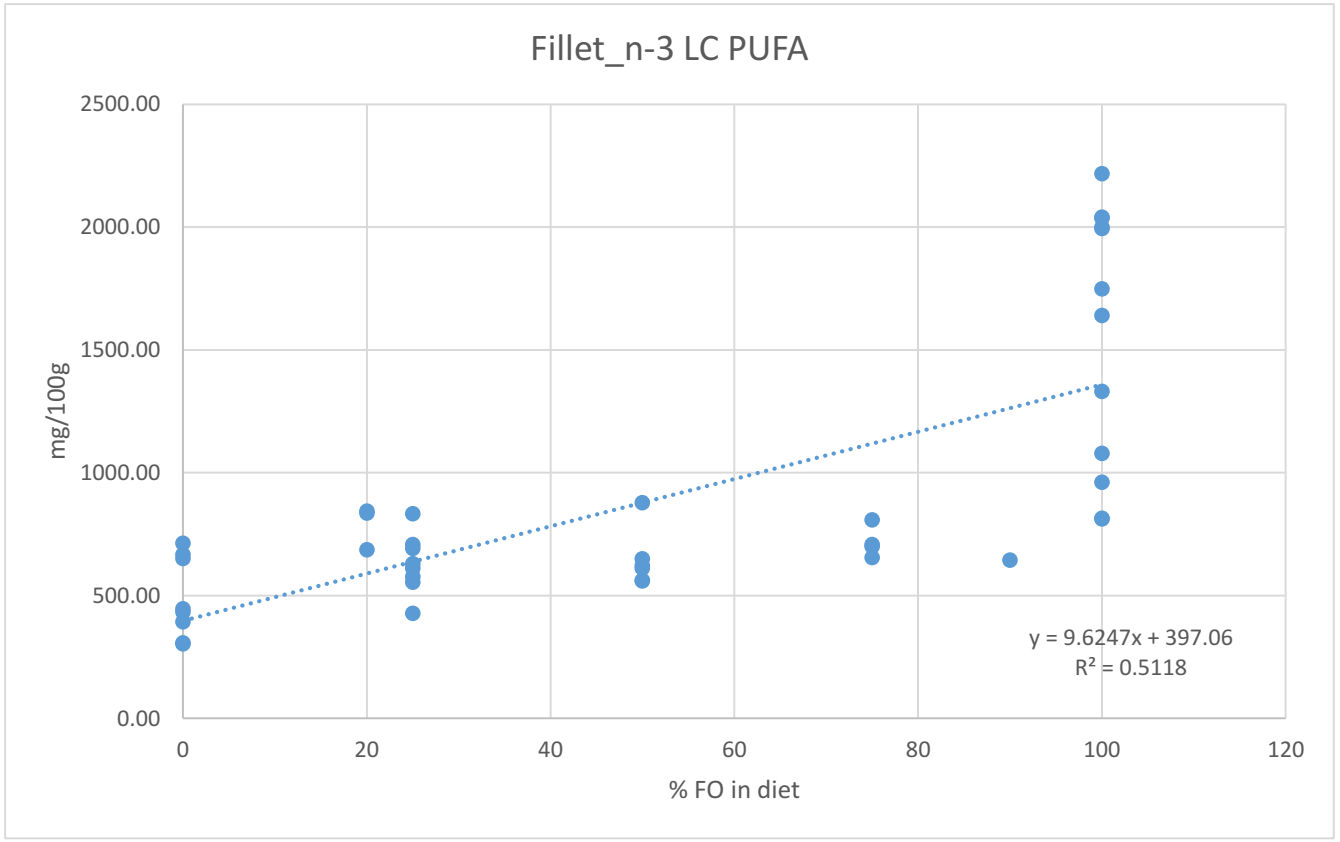

Fish oil in Aquafeed: Alternative and Complementary oils

- Soybean oil,
- Canola oil,
- Palm oil,
- Terrestrial animal fat,
- Other Vegetable oils,

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- Single cell/Algae oils
- GM oilseed crops
- Fishery by-products oil

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- Other Vegetable oils,

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- They are “complementary” and perfect to fulfil energy source.
- New R&D directions and support are needed

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- Growing in volume.
- Some contentious (krill, GM)
- Technologies and production costs
  - Nutraceuticals always the biggest threat/competitor

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- **Aquaculture:**
  Scavenger for non-edible EPA & DHA

The future

Fish meal:

- Entire global production available for aquafeed
- No longer a protein source, but a specialty ingredient

Fishmeal

Fish oil:

- Small (nil) fraction of global production available for aquafeed
- Alternative sources of n-3 LC-PUFA needed
  - not edible (or low edible qualities)
    - By-products oil
    - GM crops
    - single cell/algae oils (?)

Fish oil

A/Prof. Giovanni M. Turchini

School of Life and Environmental Sciences,

Deakin University, Geelong, Australia

giovanni.turchini@deakin.edu.au

http://lab.org.au/

NuSea.Lab

The Nutrition and Seafood Laboratory

Deakin University - Australia