

# ESTIMATING FUTURE FISH DEMAND

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## Co-authors

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# Our study is complement to other work on estimating future fish demand and supply

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- OECD-FAO Fish Model: A forecasting model for predicting the most likely situation of global fish consumption, production and trade. The results of the model are used to prepare the “Fish and Seafood” chapter in OECD-FAO Agricultural Outlook (an annual publication).
- WB-IFPRI-FAO Fish to 2030: A forecasting model developed based on IFPRI’s IMPACT model. Kind of a sequel of IFPRI’s Fish to 2020.
- Our model estimates future fish demands in nearly 200 countries and for 5 major fish species groups. The results can:
  - Allow us to examine potential future fish supply-demand gaps at the national, regional and global levels.
  - Provide systematically estimated elasticity parameters which could be used in other general equilibrium models.
  - Derive a fish-loving index to compare countries’ preference over fish consumption.
  - Enhance understanding of the results of general equilibrium models.

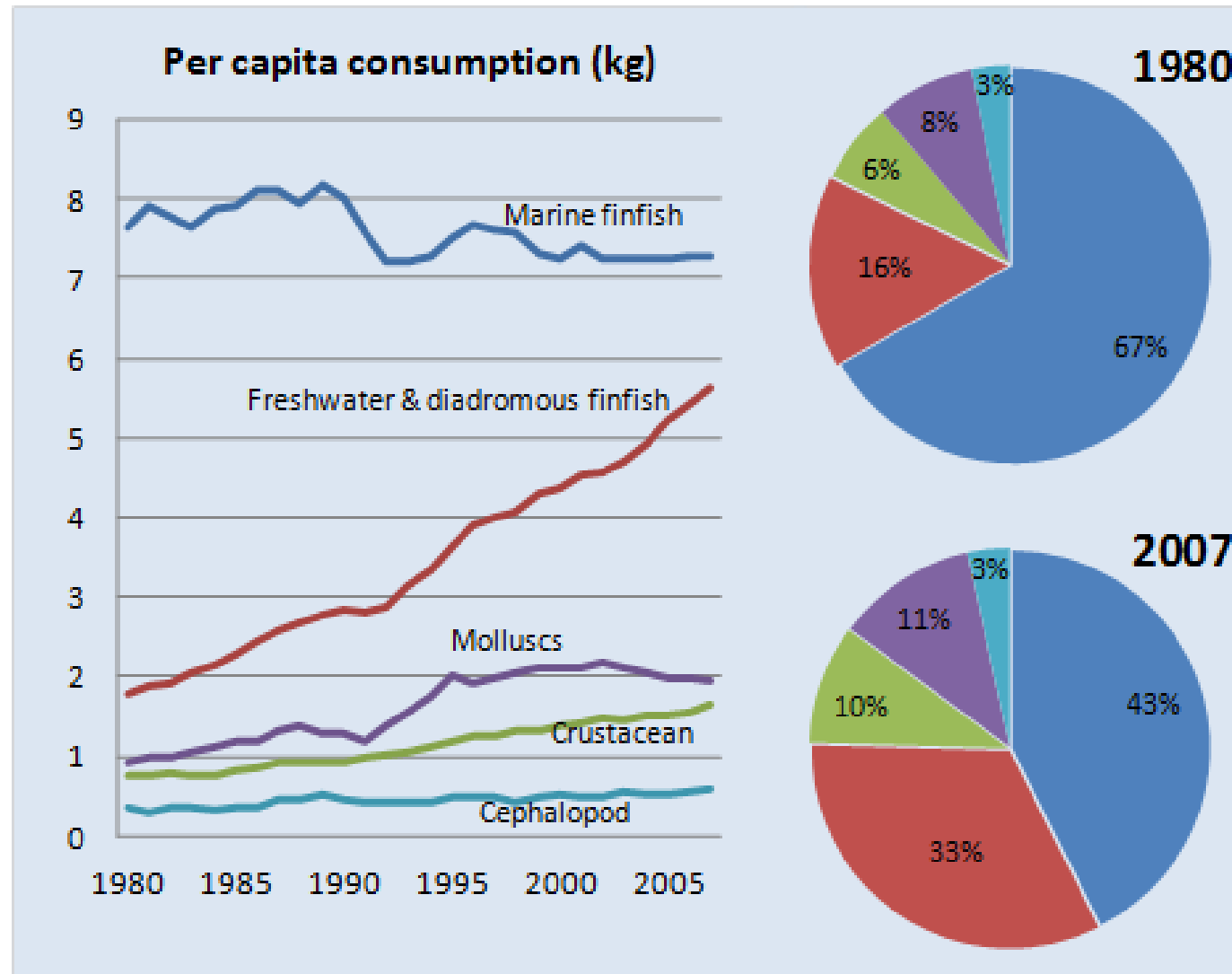
# The model

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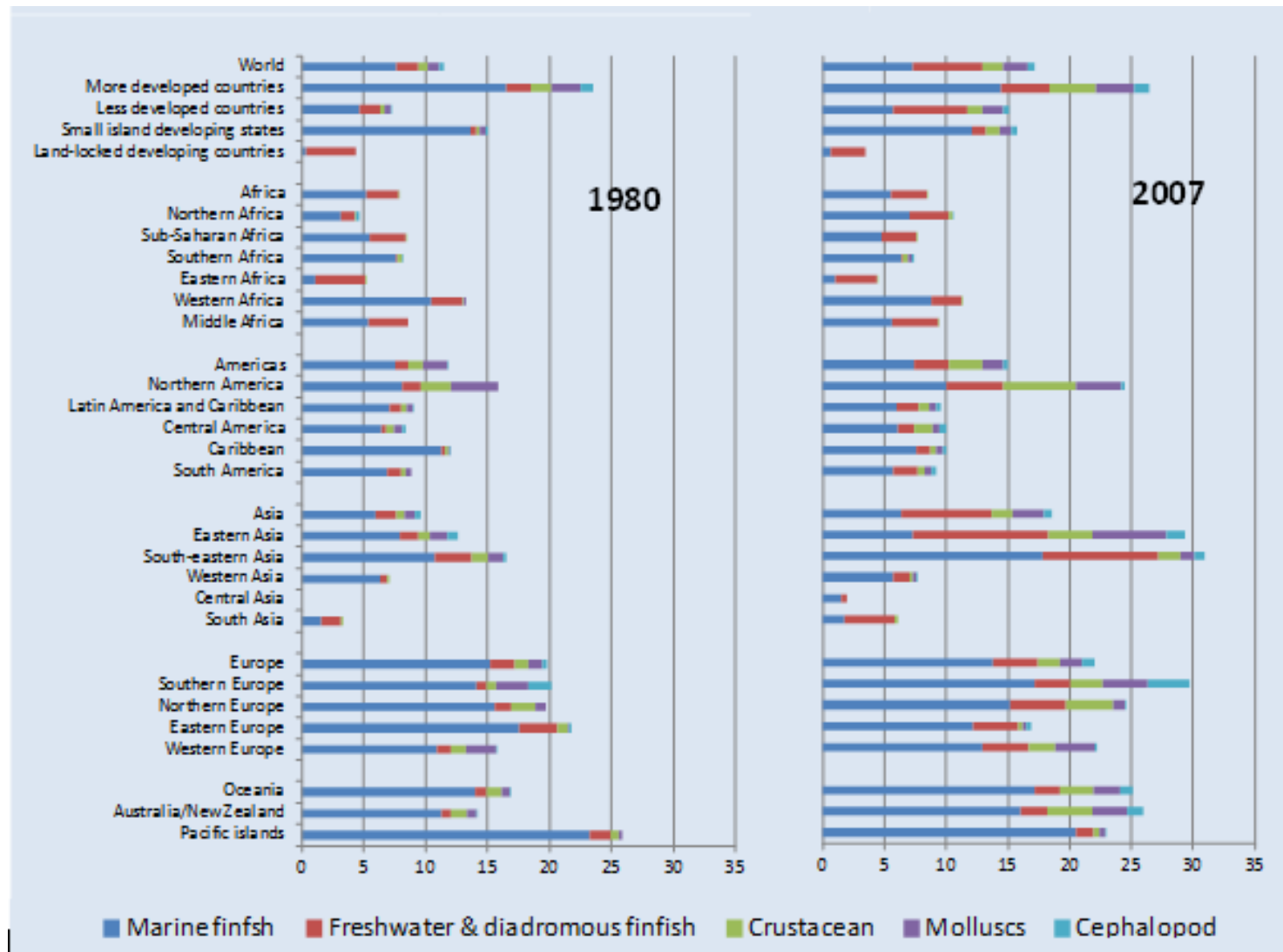
$$C_{it} = \alpha + \beta Y_{it} + \gamma P_{it} + \theta X_{it} + u_i + e_{it}$$

- $i$ : 174 countries or territories
- $t$ : 1980-2007 (will be updated to 2013)
- $C$ : Per capita fish consumption
- $Y$ : GDP per capita
- $P$ : Fish price
- $X$ : Other factors that may affect fish demand, such as meat price, age, ratio of urban population, etc.
- $u$ : fixed/random effect parameter that captures countries' idiosyncratic preference over fish consumption.
- $e$ : random shock.
- 20 geographic regions: elasticity parameters ( $\beta$  and  $\gamma$ ) same for countries within a region.

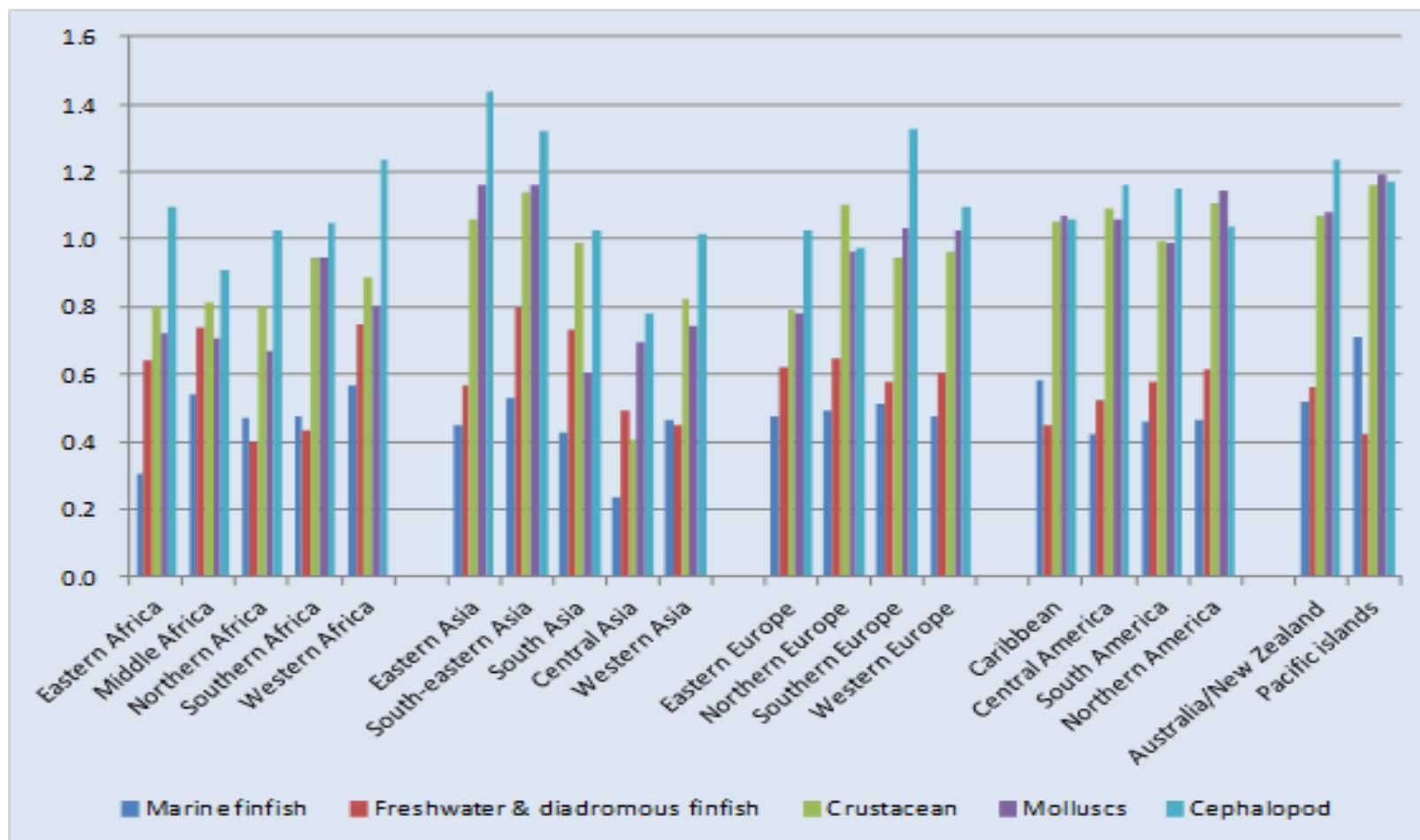
## World average per capita fish consumption by species: 1980 - 2007



# Per capita fish consumption by region: 1980 vs. 2007

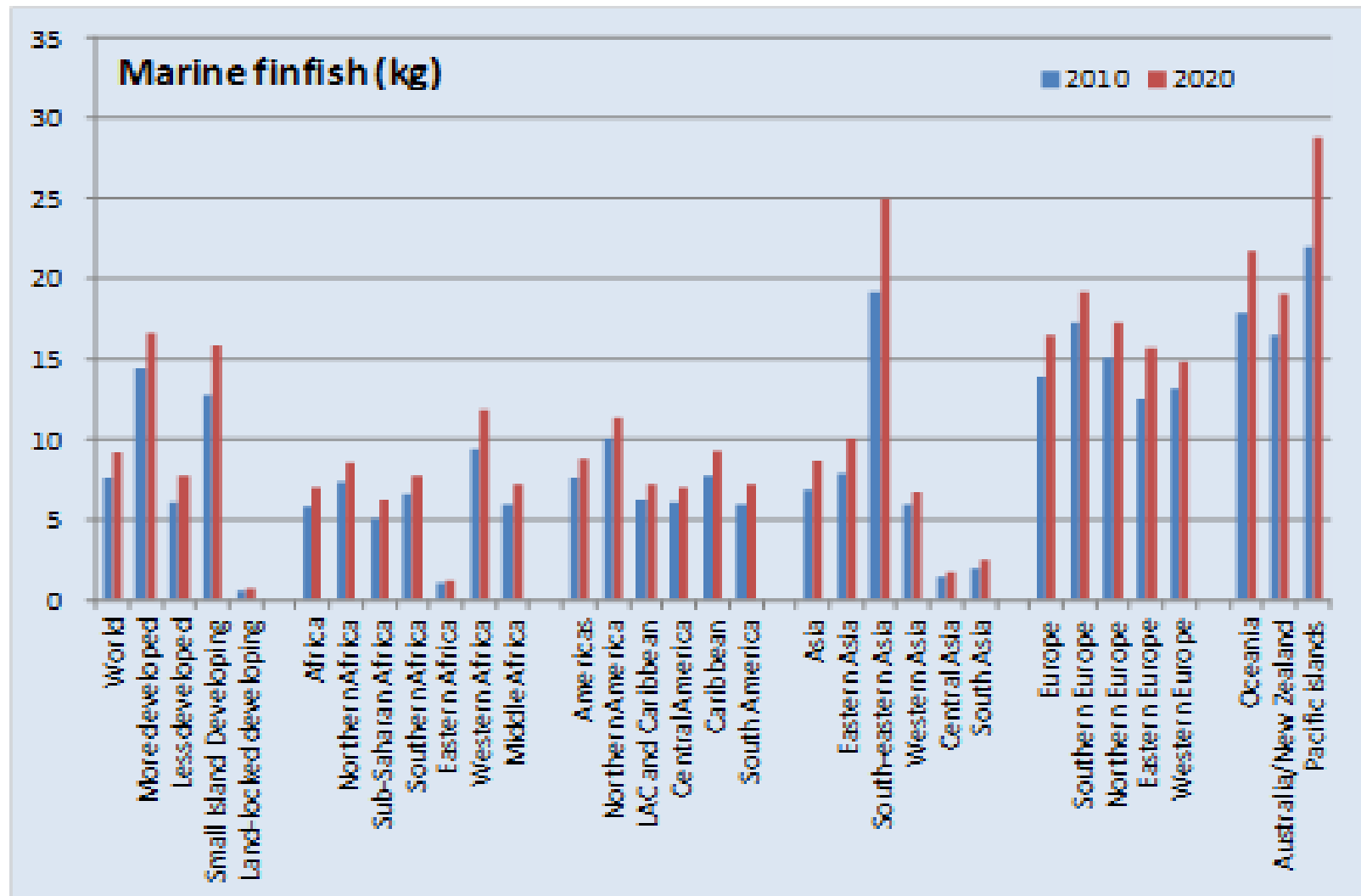


# Estimated income elasticities



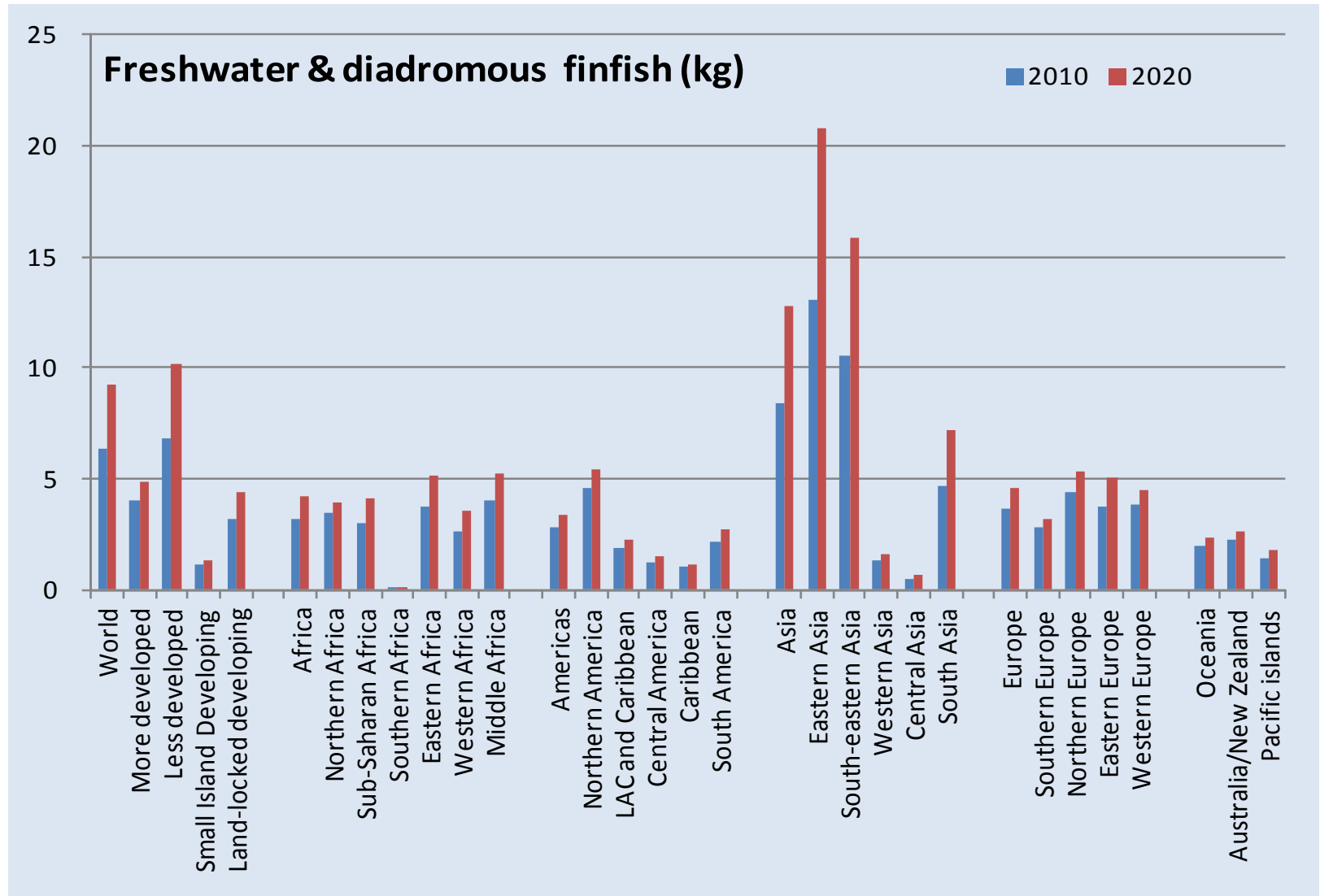
- Higher income elasticity for shellfish than finfish.
- Relatively low income elasticity for region with low preference over fish consumption (e.g. Central Asia).

## Per capita demand for marine fish: 2010 vs. 2020

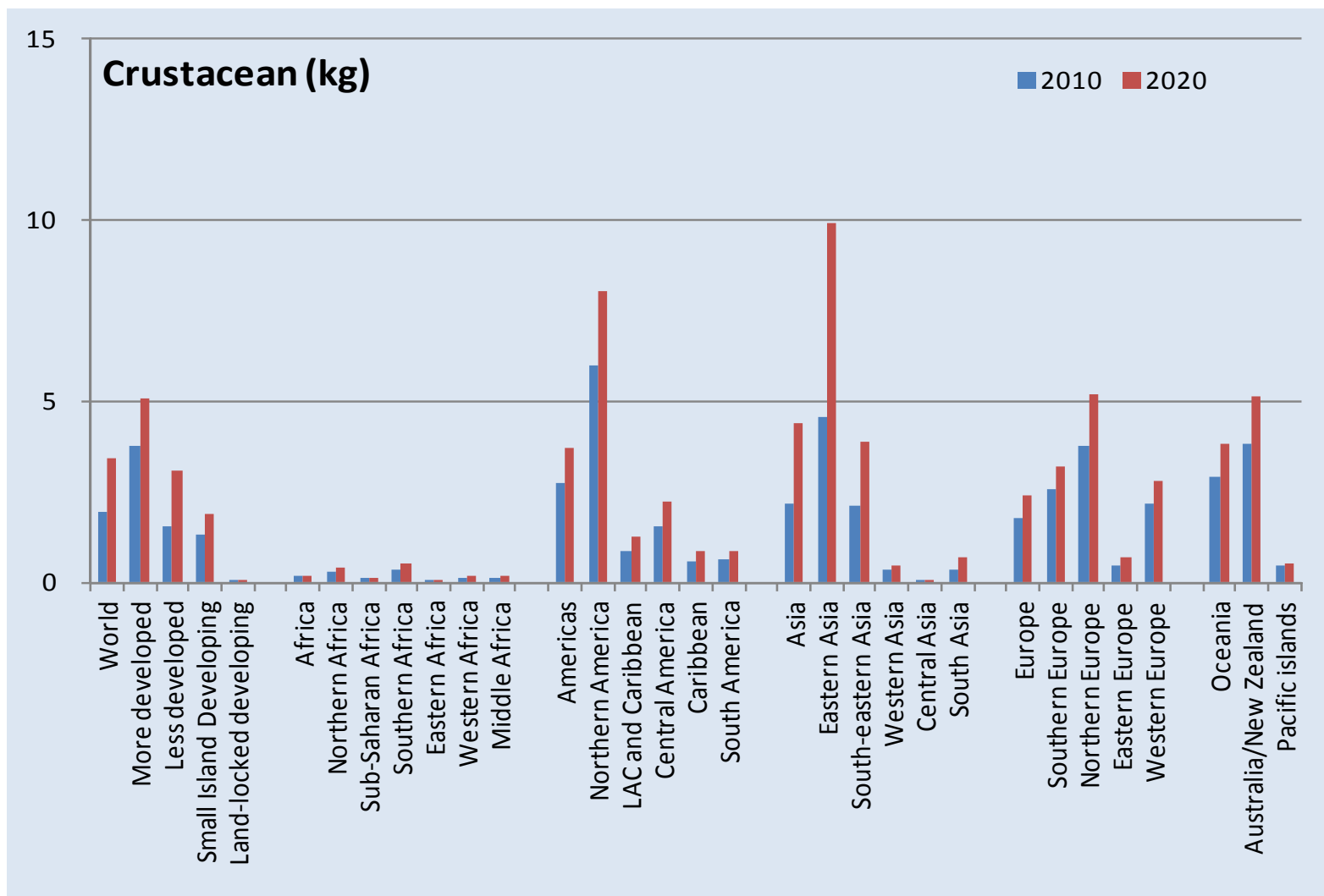




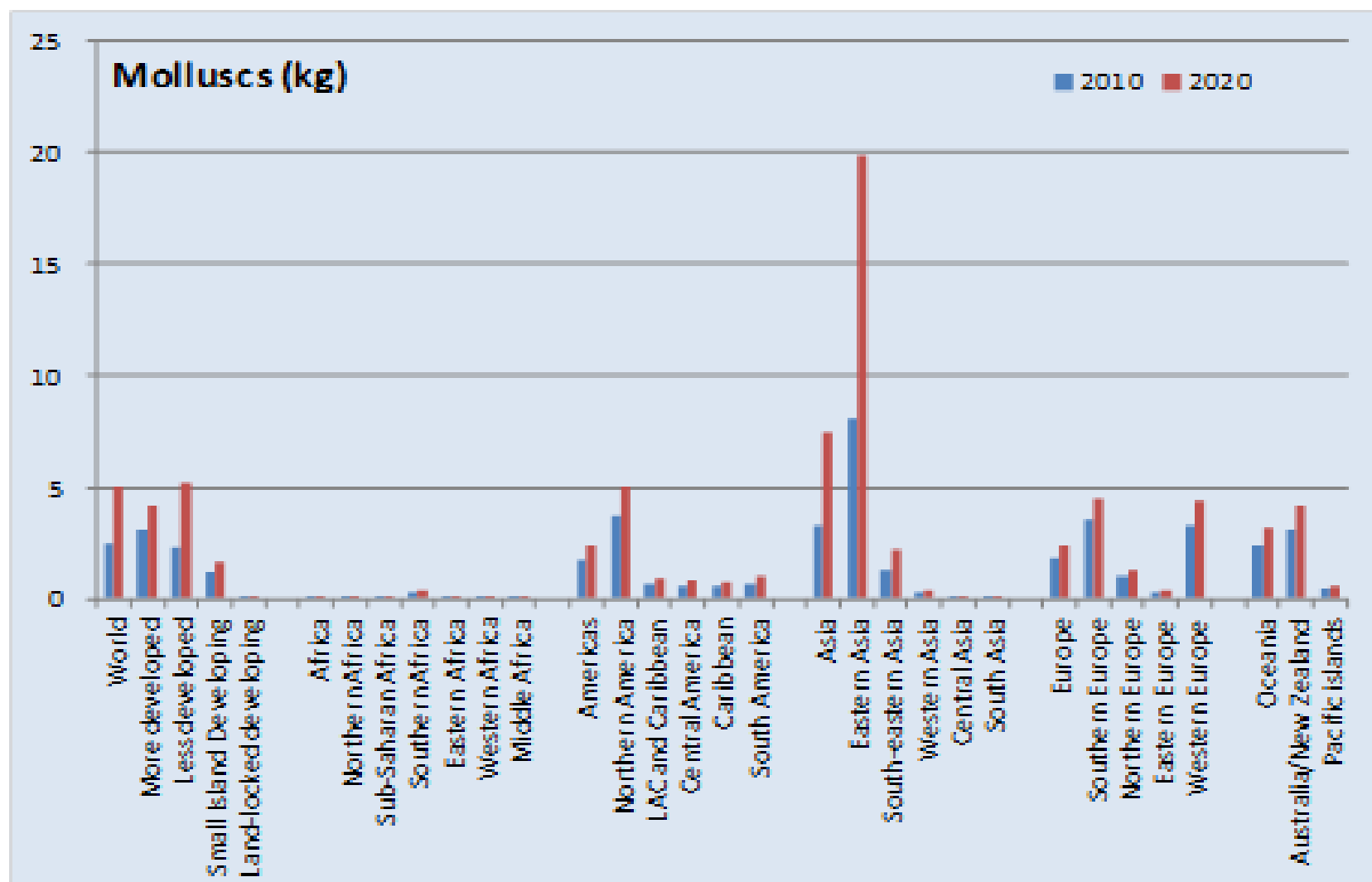
# Per capita demand for freshwater/diadromous finfish: 2010 vs. 2020



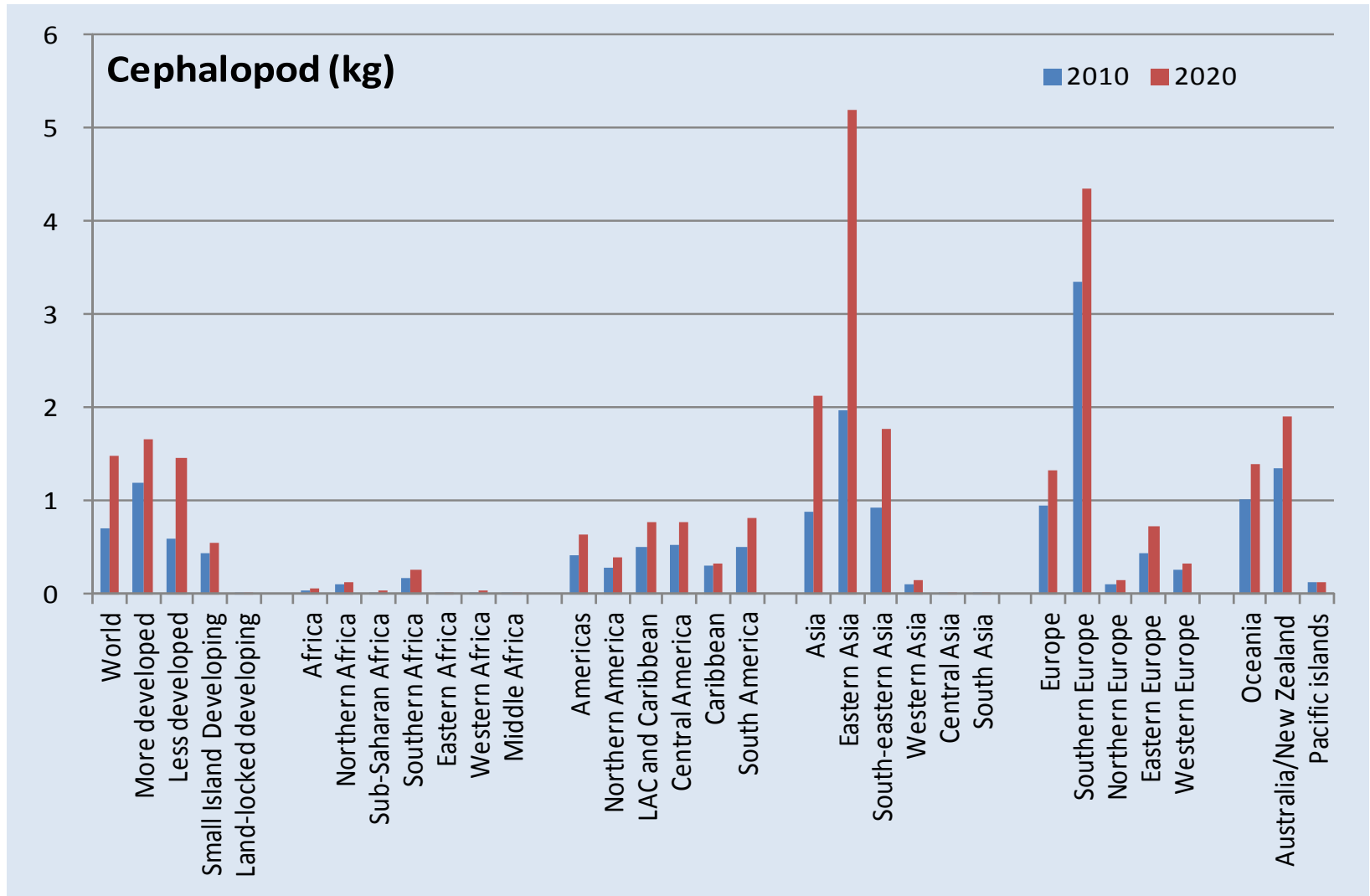
# Per capita demand for crustaceans: 2010 vs. 2020



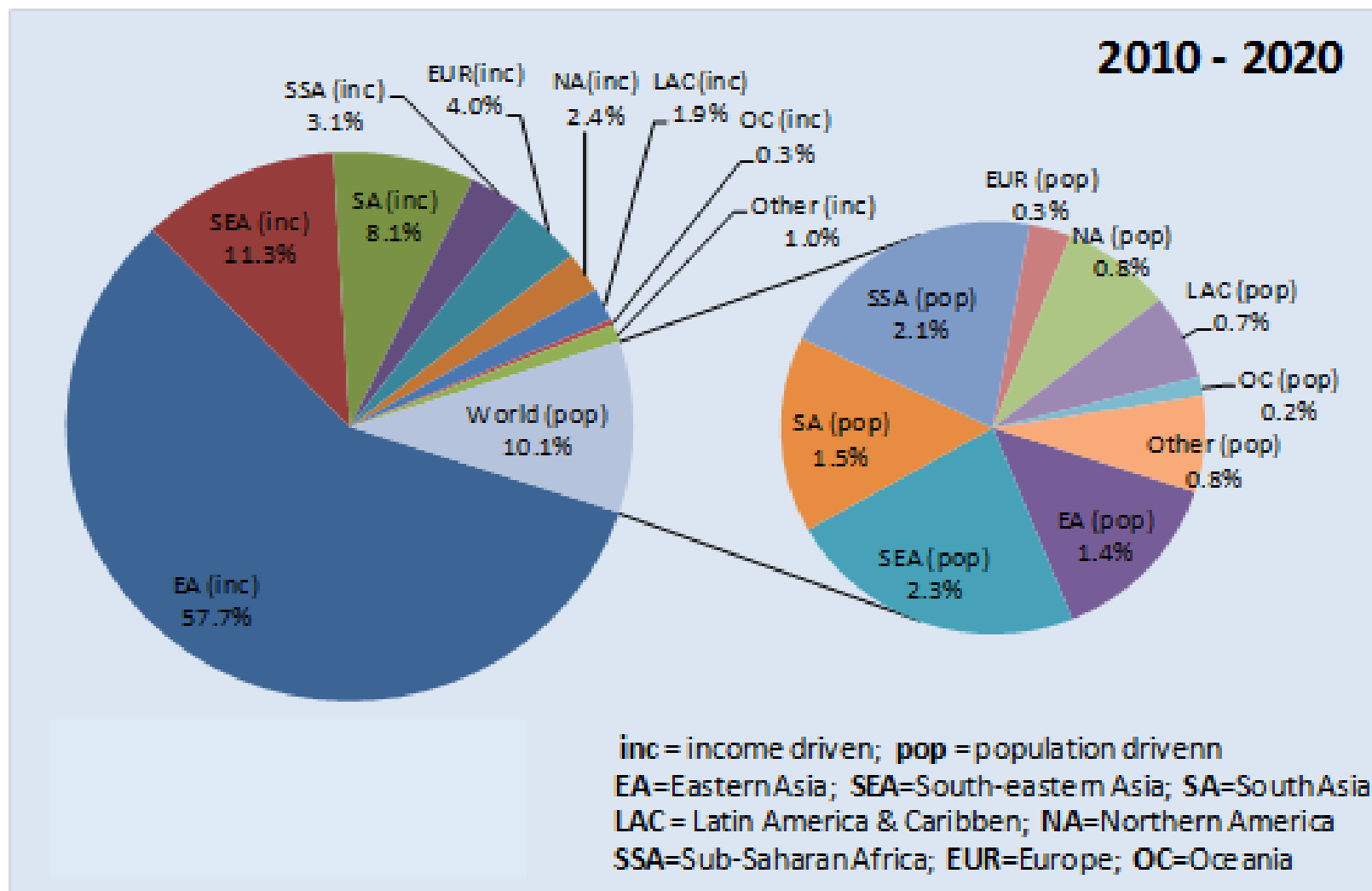
# Per capita demand for molluscs: 2010 vs. 2020



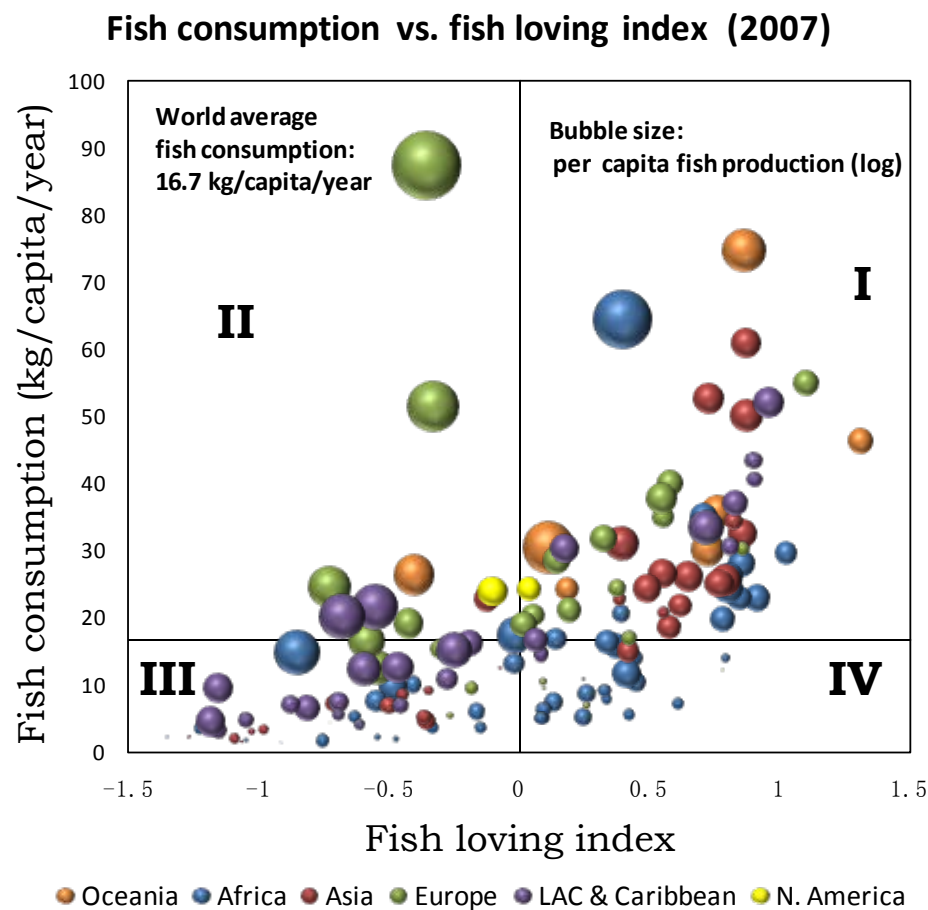
# Per capita demand for cephalopods: 2010 vs. 2020



# Accounting for growth in world fish demand during 2010-2020



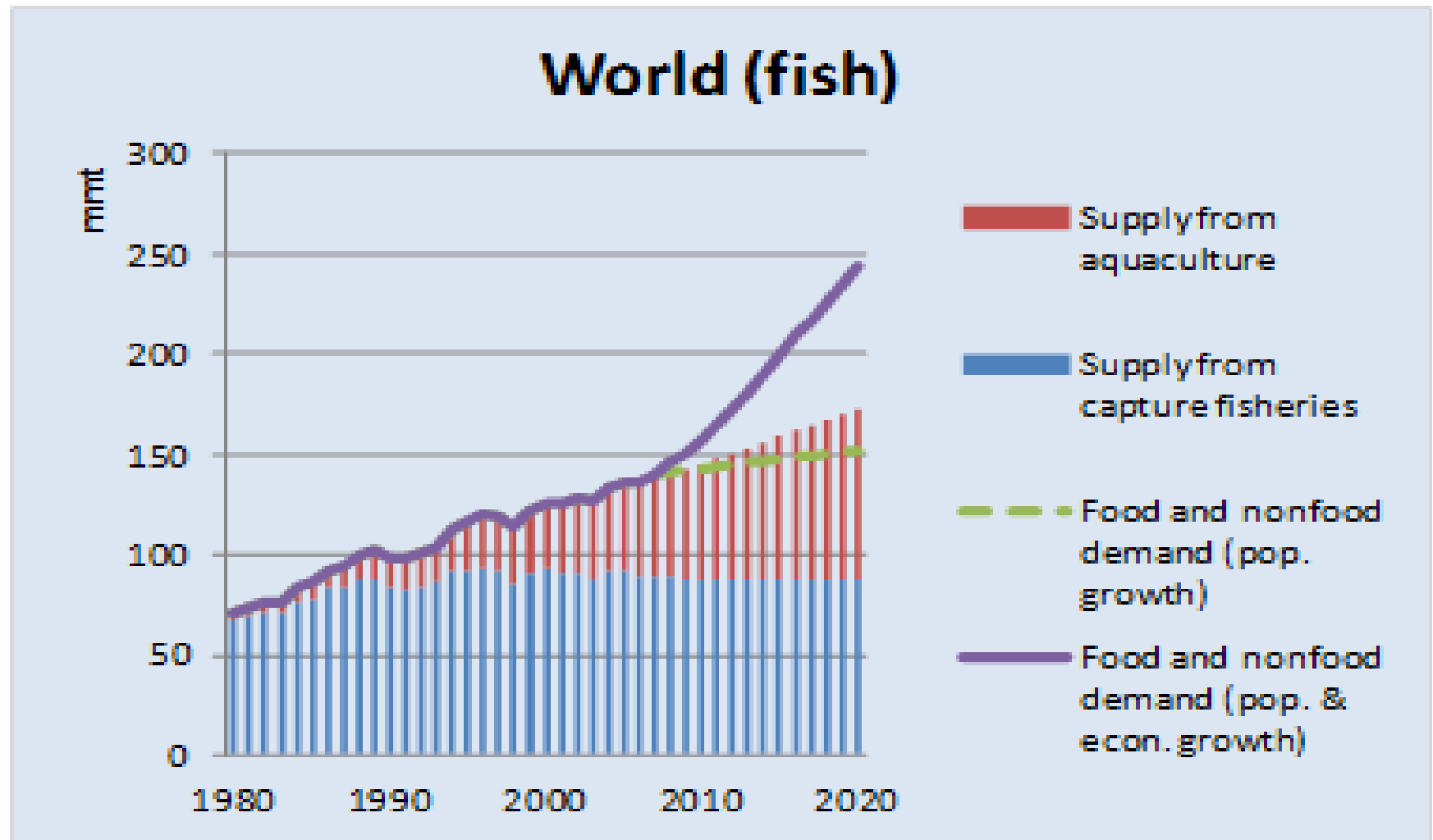
# Measuring countries' preference over fish consumption



| Quadrant<br>(no. of<br>countries)                                                                                                                      | Share<br>of<br>world<br>pop. | Share of<br>world<br>fish<br>production | Share of<br>world fish<br>consumption |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------|---------------------------------------|
| I (53 )                                                                                                                                                | 47%                          | 67%                                     | 77%                                   |
| II (11 )                                                                                                                                               | 2%                           | 16%                                     | 3%                                    |
| III (59)                                                                                                                                               | 40%                          | 13%                                     | 12%                                   |
| IV (32)                                                                                                                                                | 12%                          | 5%                                      | 8%                                    |
| I: Like eating fish AND eat more<br>II: Dislike eating fish BUT eat more<br>III: Dislike eating fish AND eat less<br>IV: Like eating fish BUT eat less |                              |                                         |                                       |

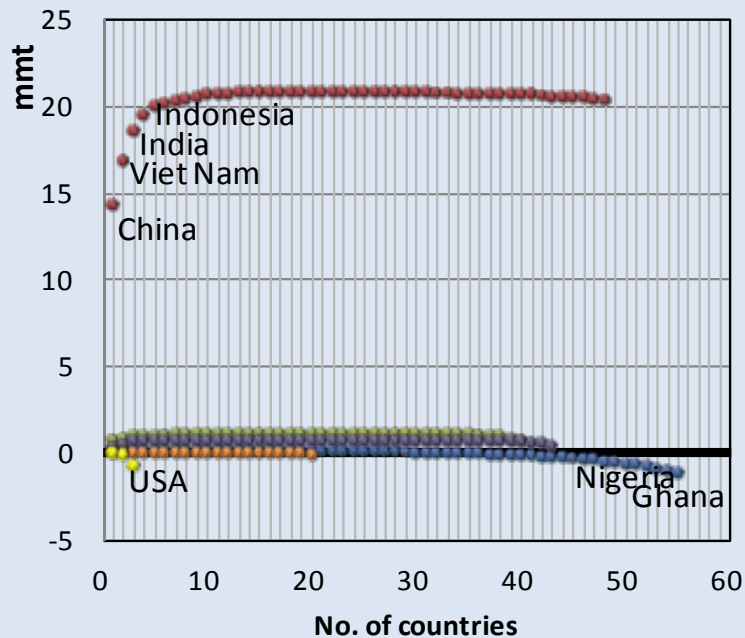
# World fish supply and demand gap

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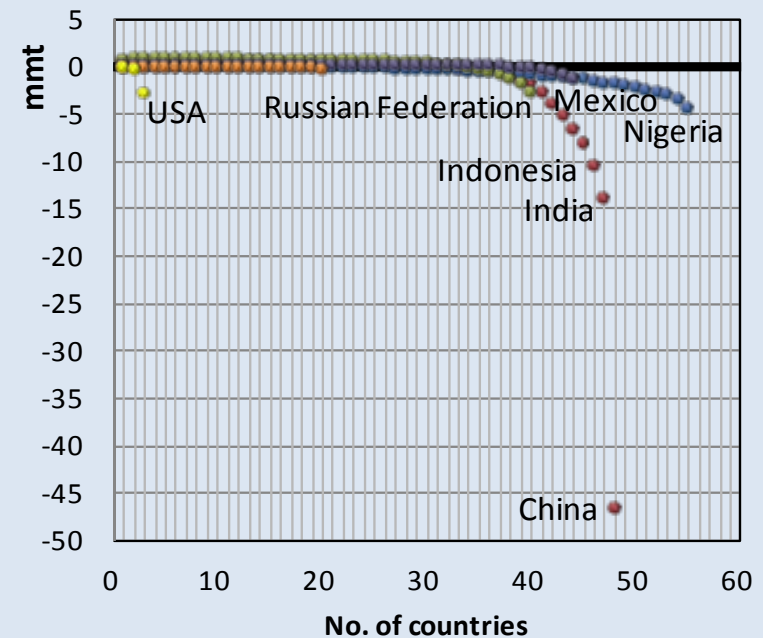


# Countries' contribution to world fish supply and demand gap

## Population growth



## Pop. & econ. growth



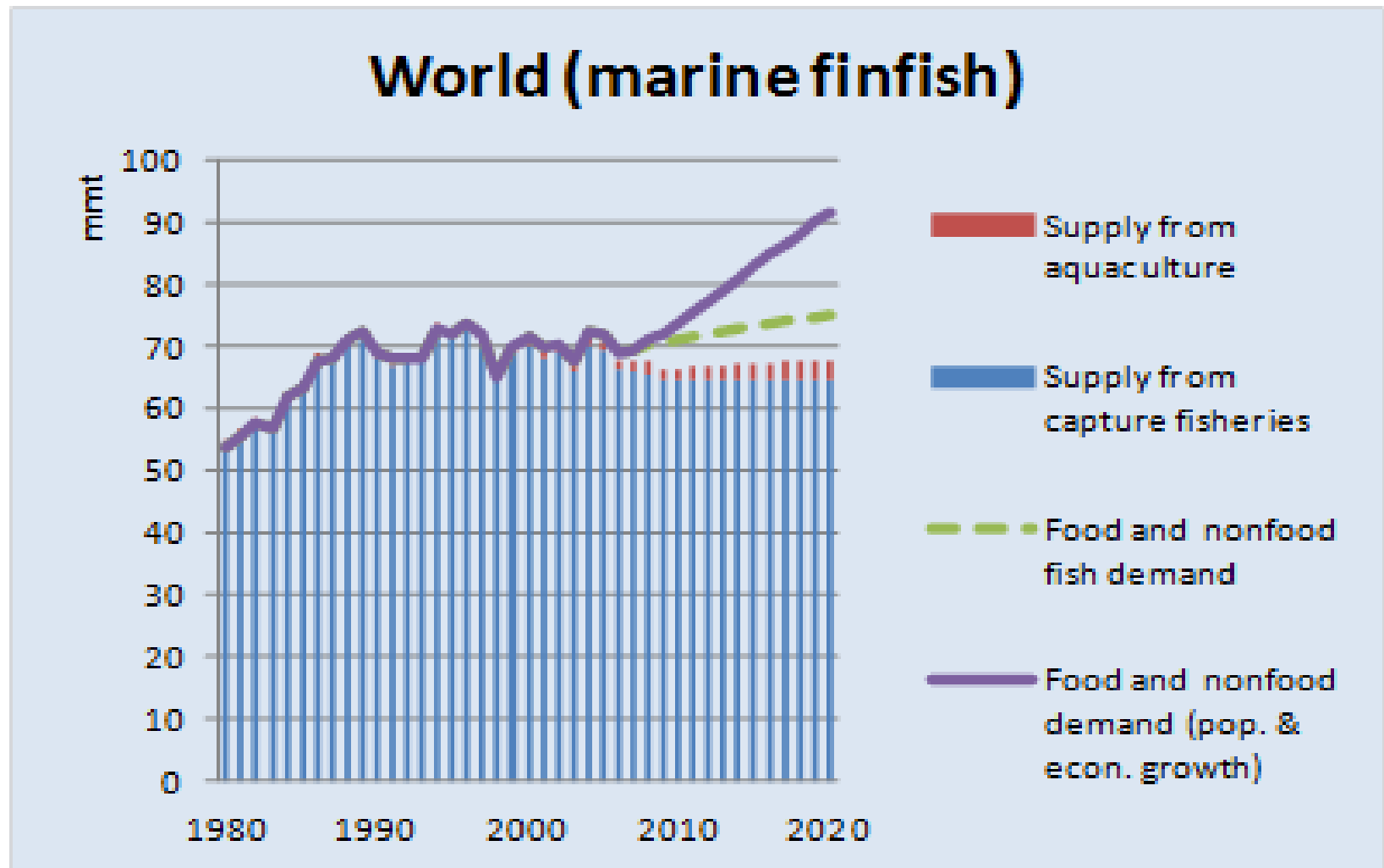
**Fish**

● Asia ● Africa ● Europe ● LAC ● Oceania ● NA

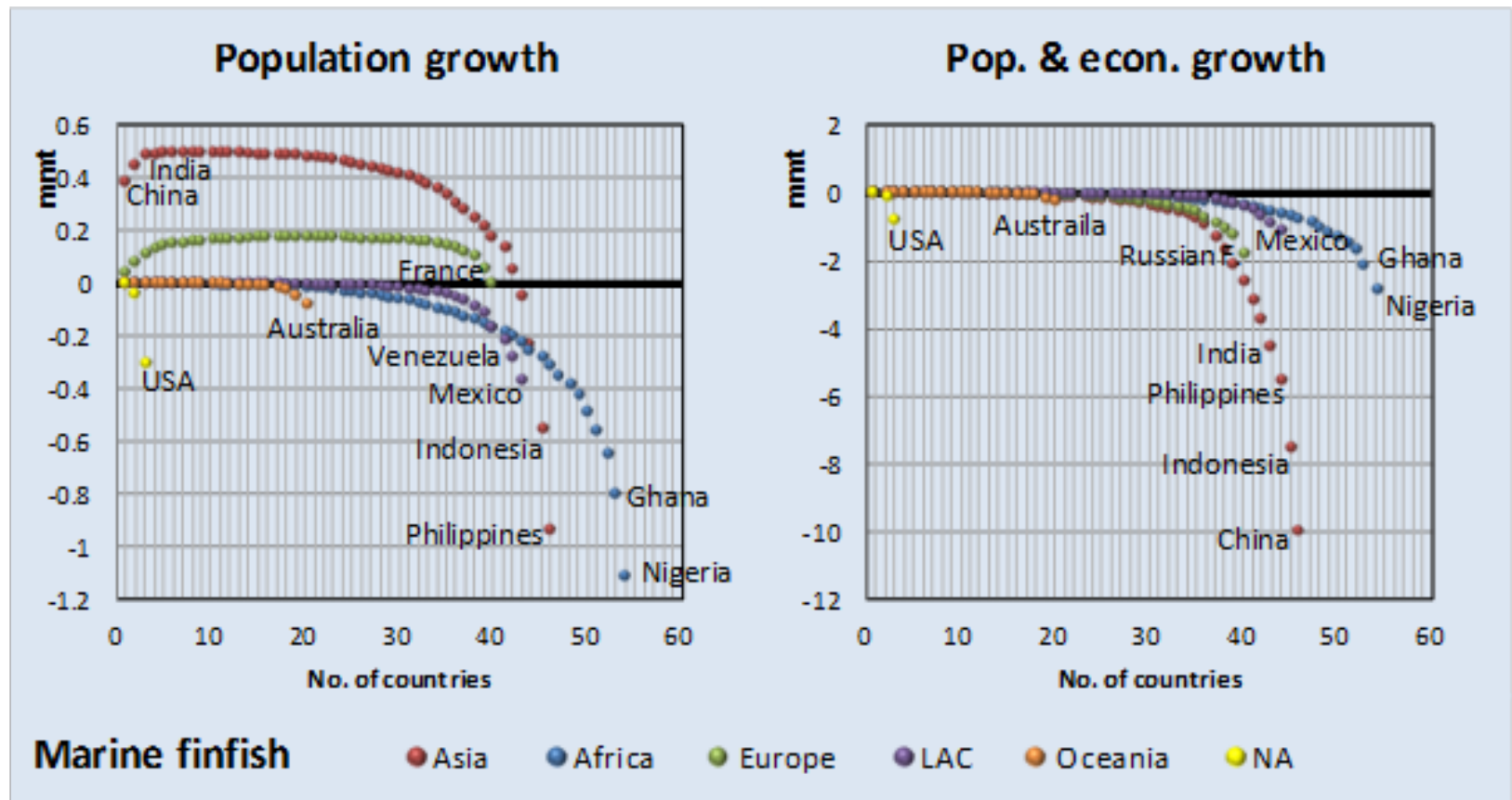


# World marine fish supply and demand gap

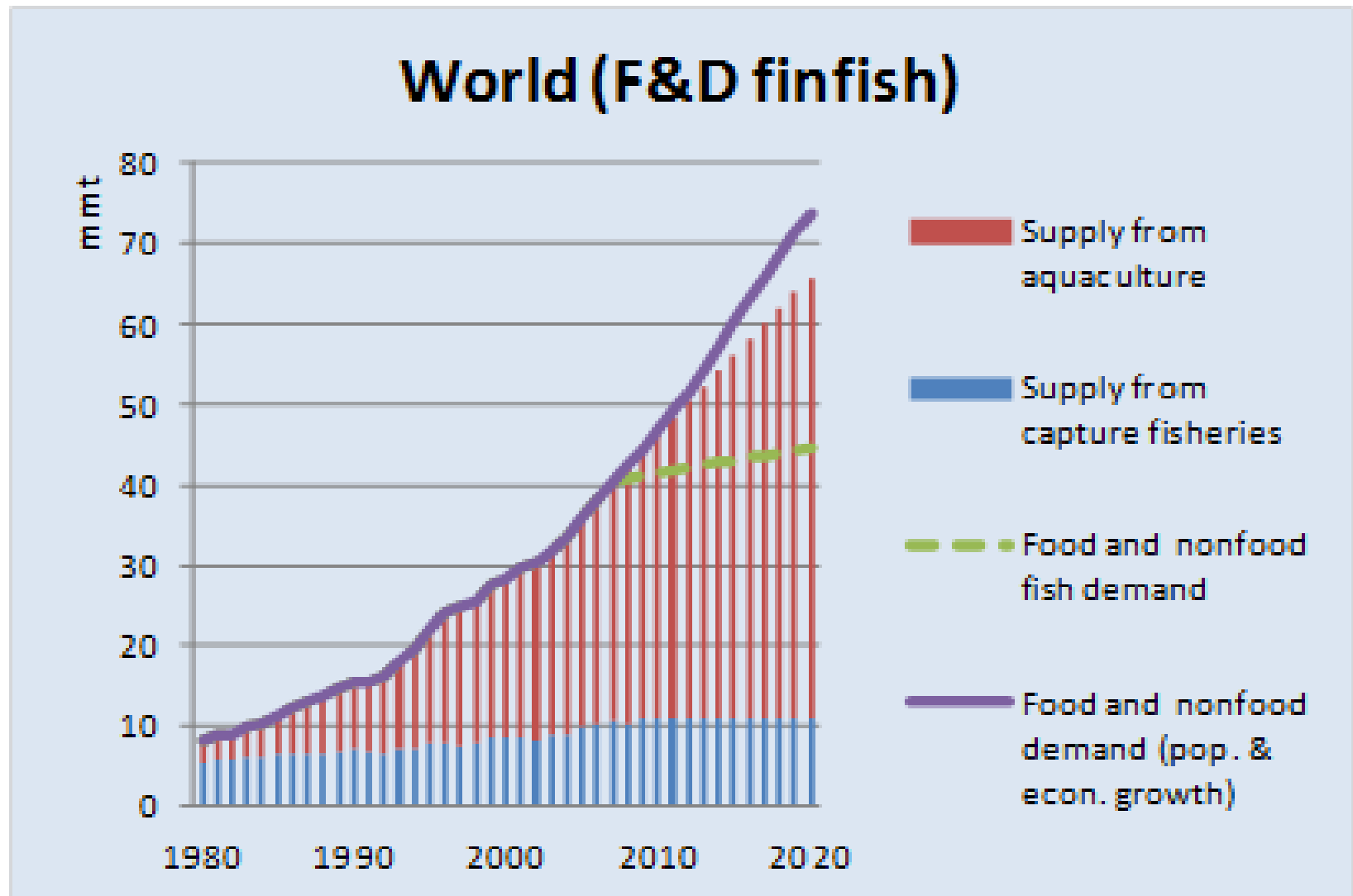
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# Countries' contribution to world marine fish supply and demand gap

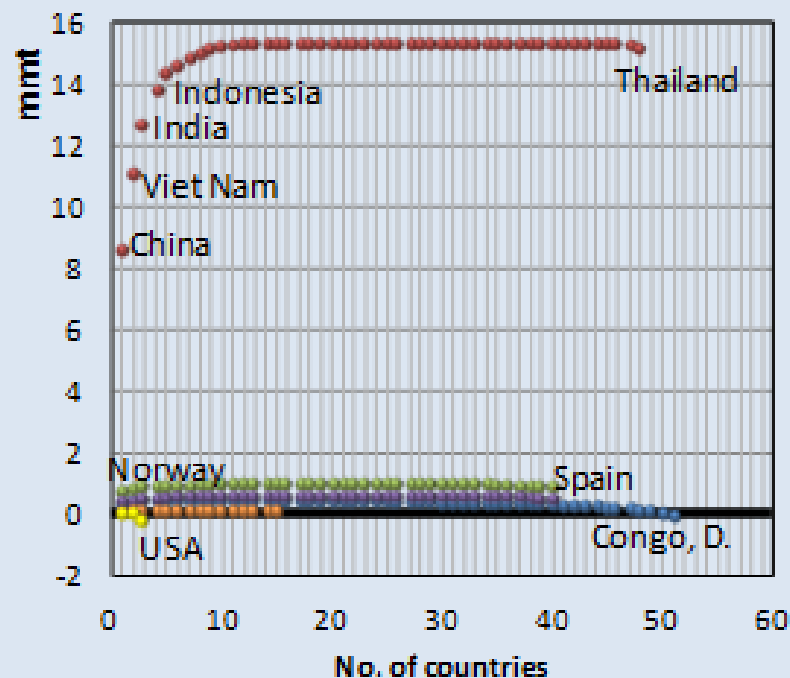


## World freshwater/diadromous fish supply and demand gap

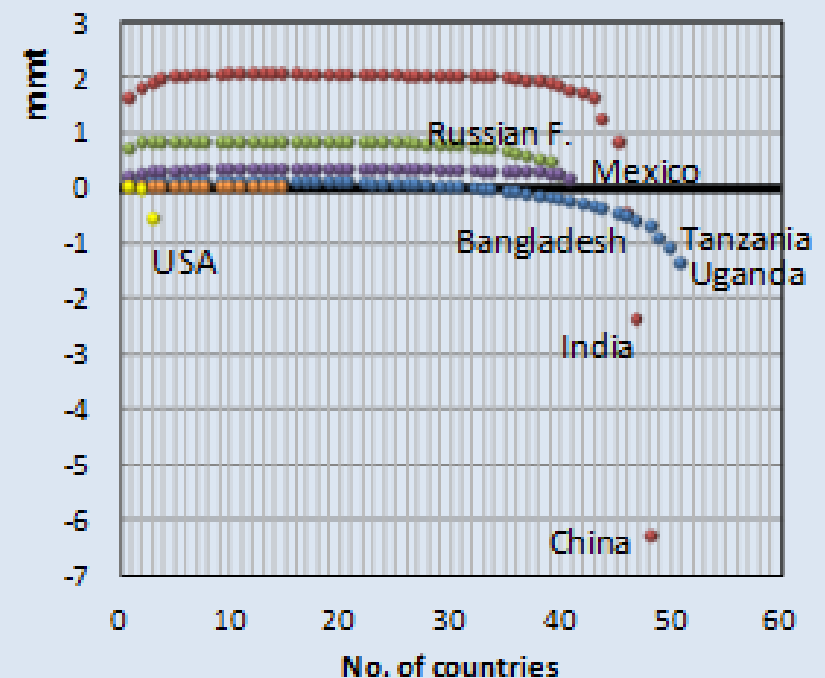


# Countries' contribution to world freshwater/diadromous fish supply and demand gap

## Population growth



## Pop. & econ. growth

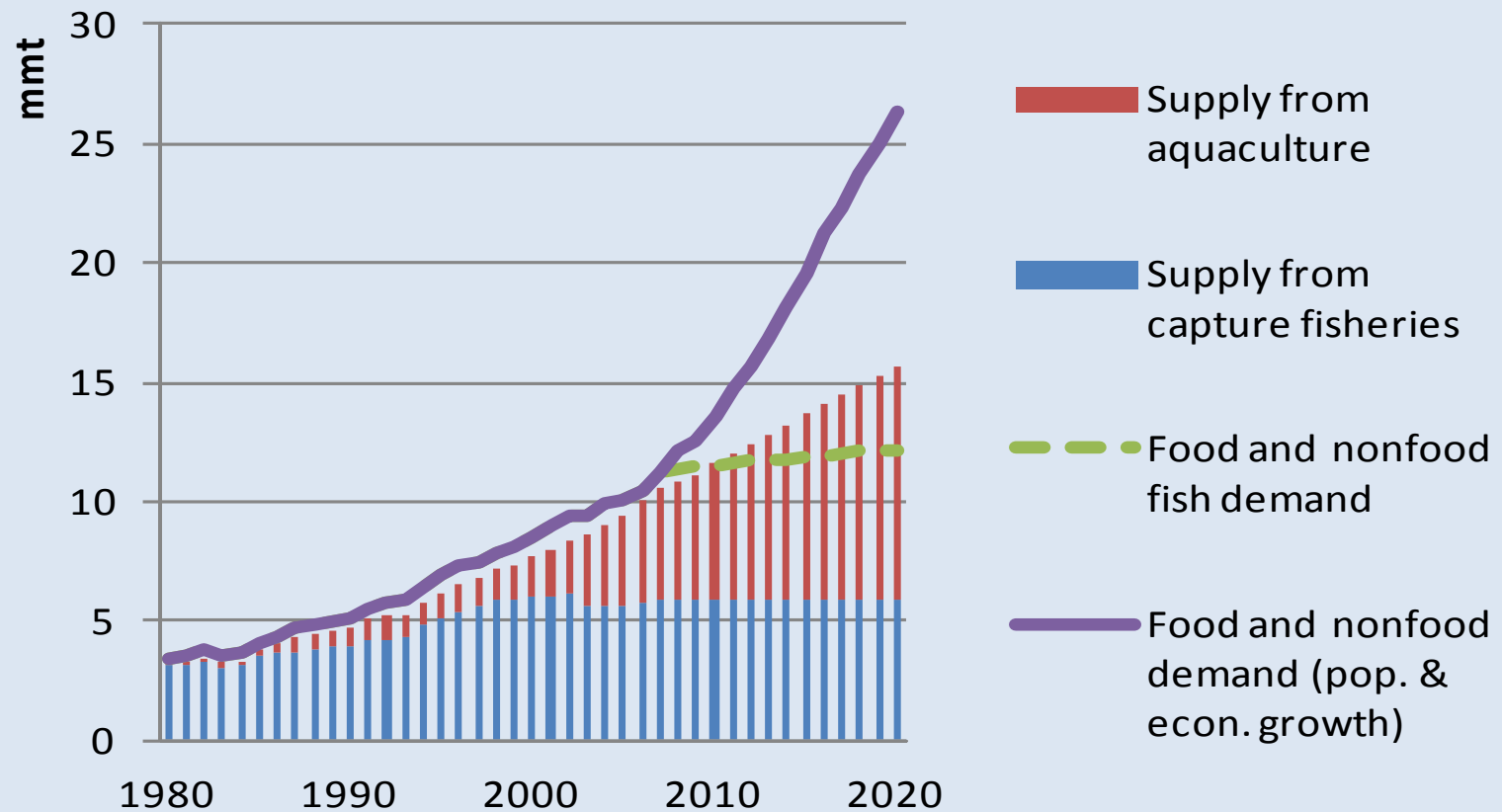


**F&D finfish**

● Asia ● Africa ● Europe ● LAC ● Oceania ● NA

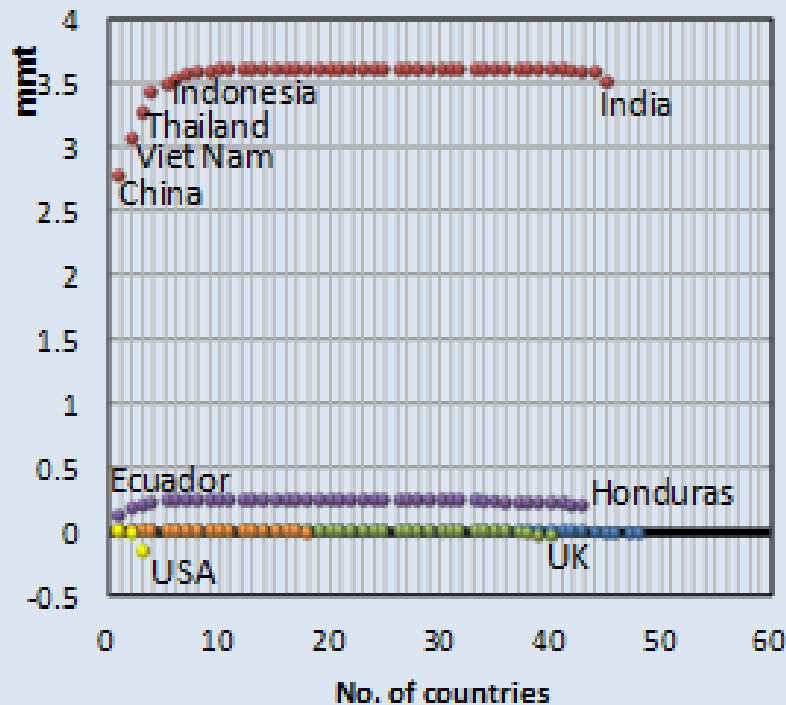
# World crustacean supply and demand gap

## World (crustacean)

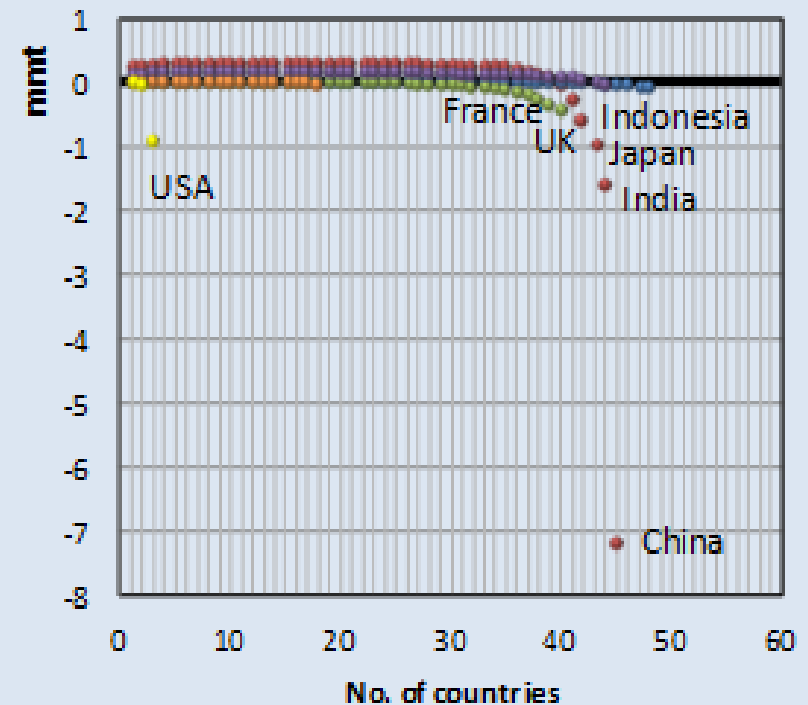


# Countries' contribution to world crustacean supply and demand gap

Population growth



Pop. & econ. growth

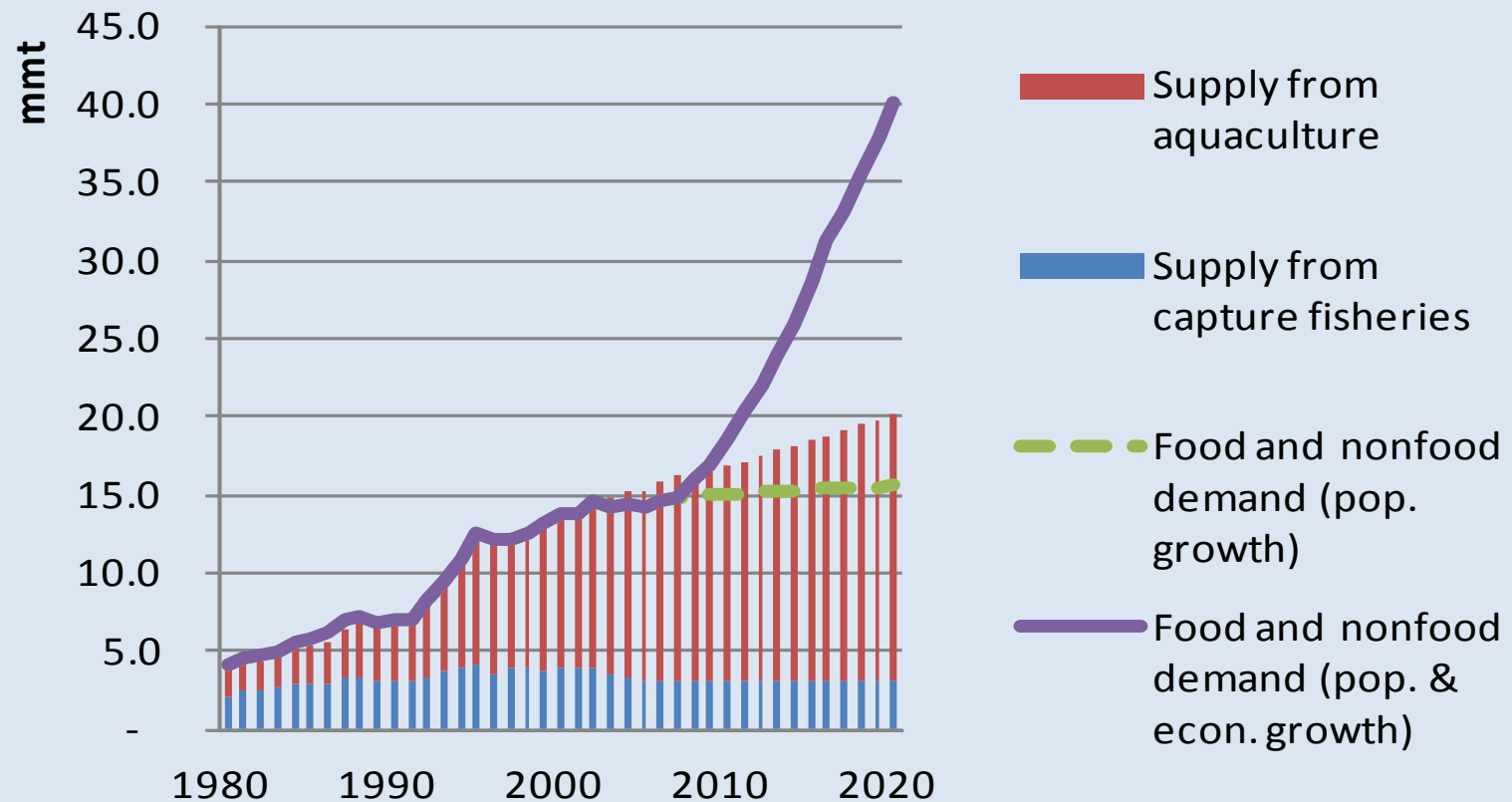


Crustacean

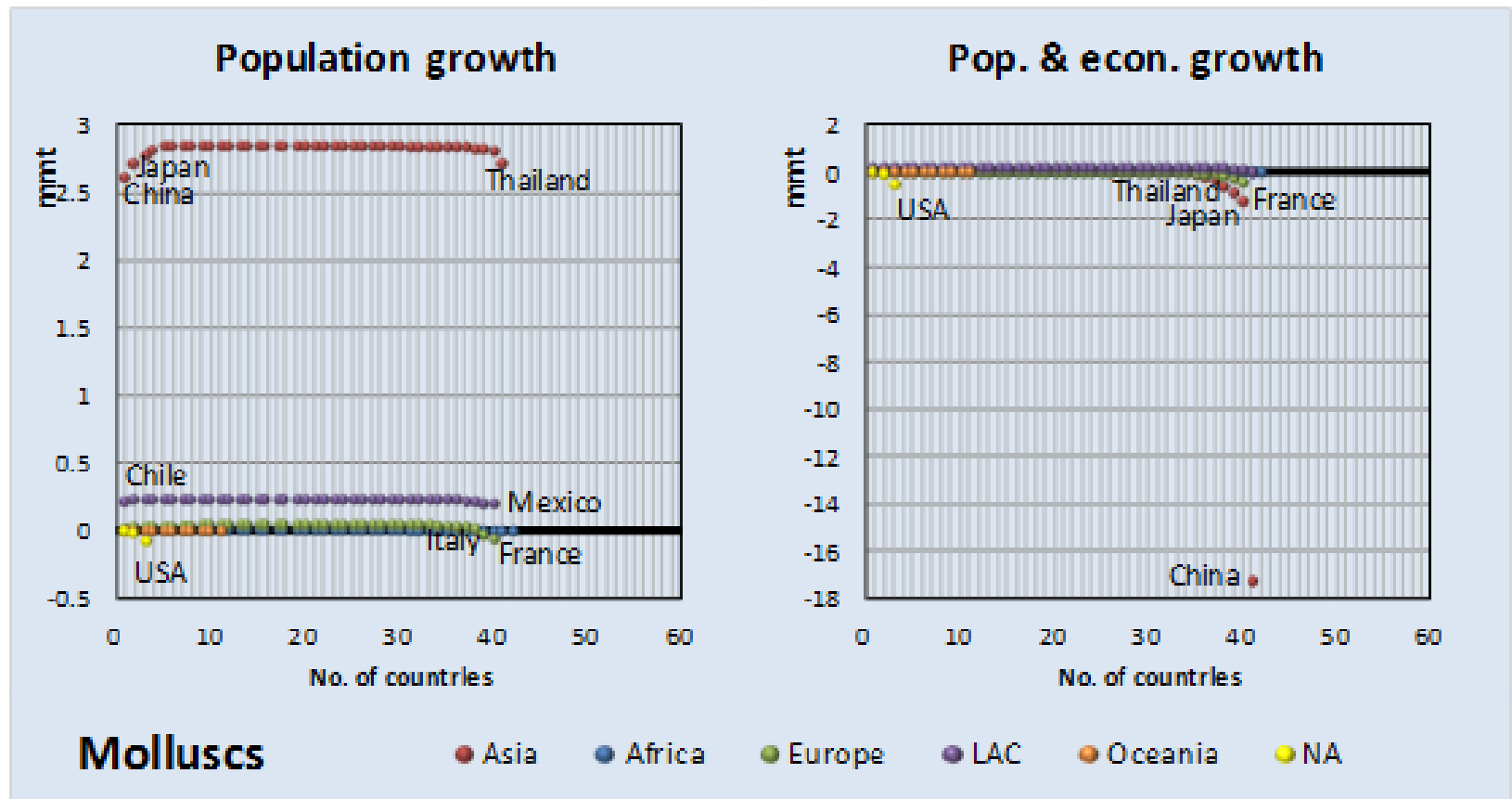
● Asia ● Africa ● Europe ● LAC ● Oceania ● NA

# World molluscs supply and demand gap

## World (molluscs)



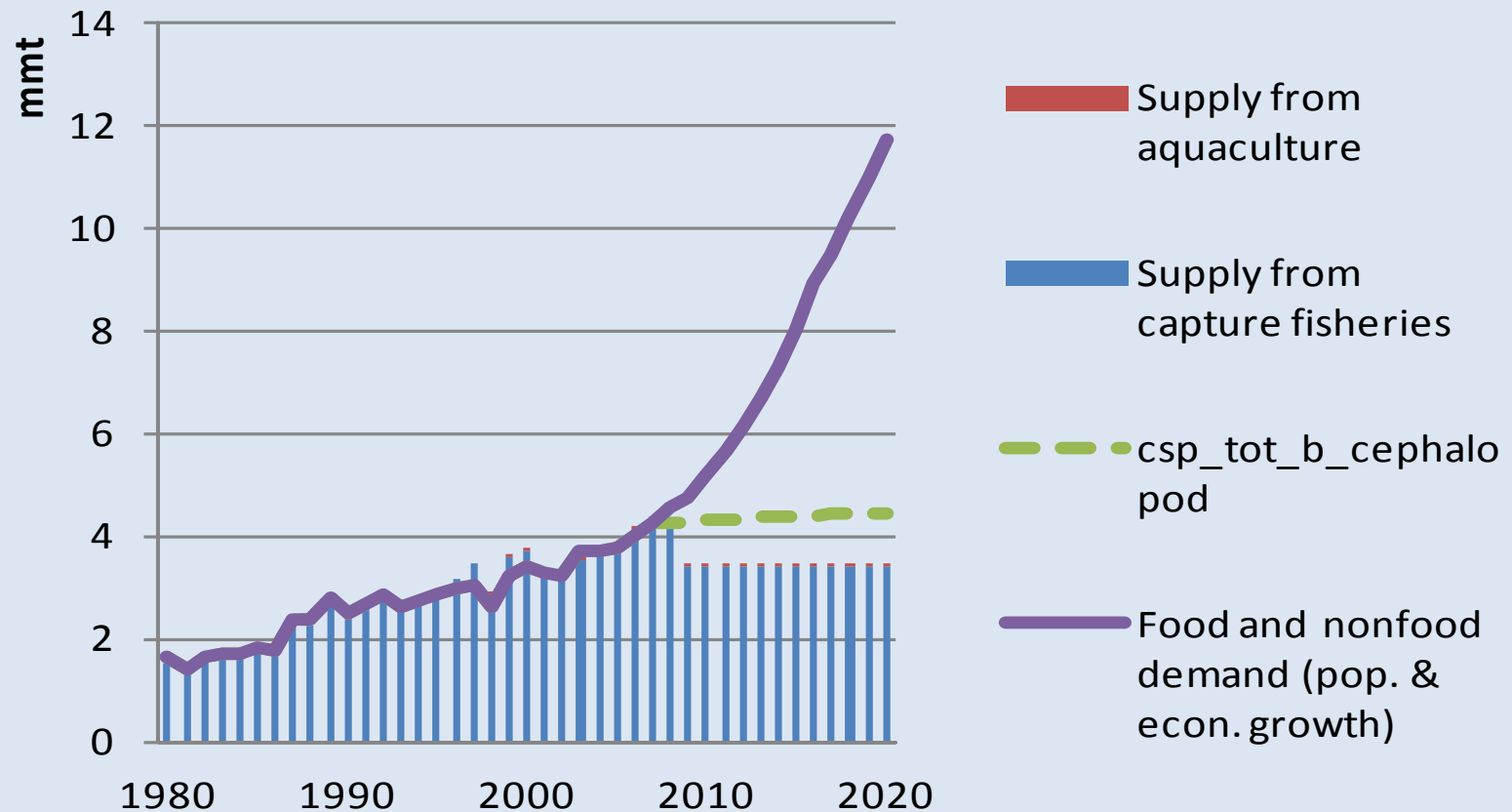
# Countries' contribution to world supply and demand gap



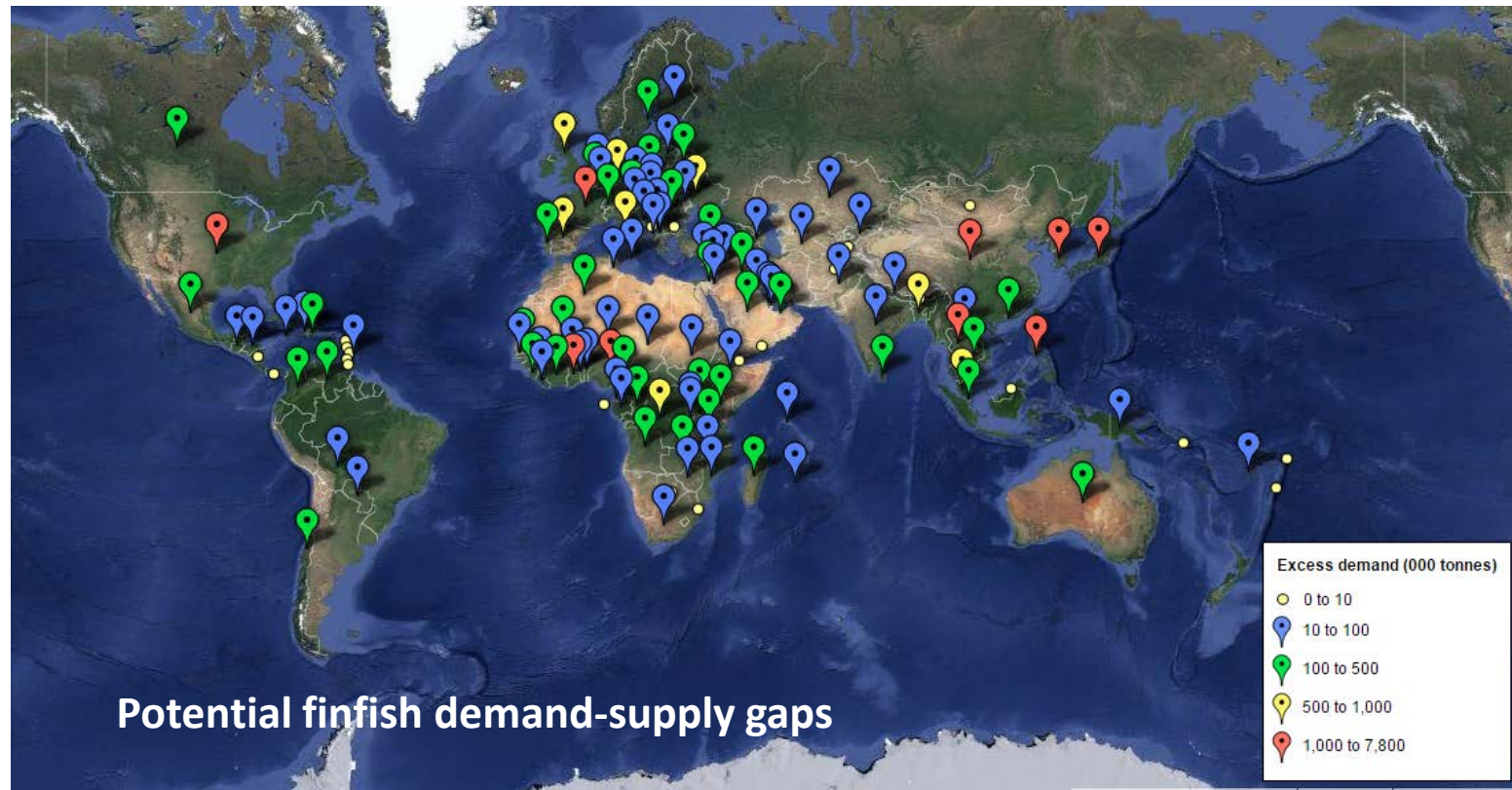


# World cephalopod supply and demand gap

## World (cephalopod)

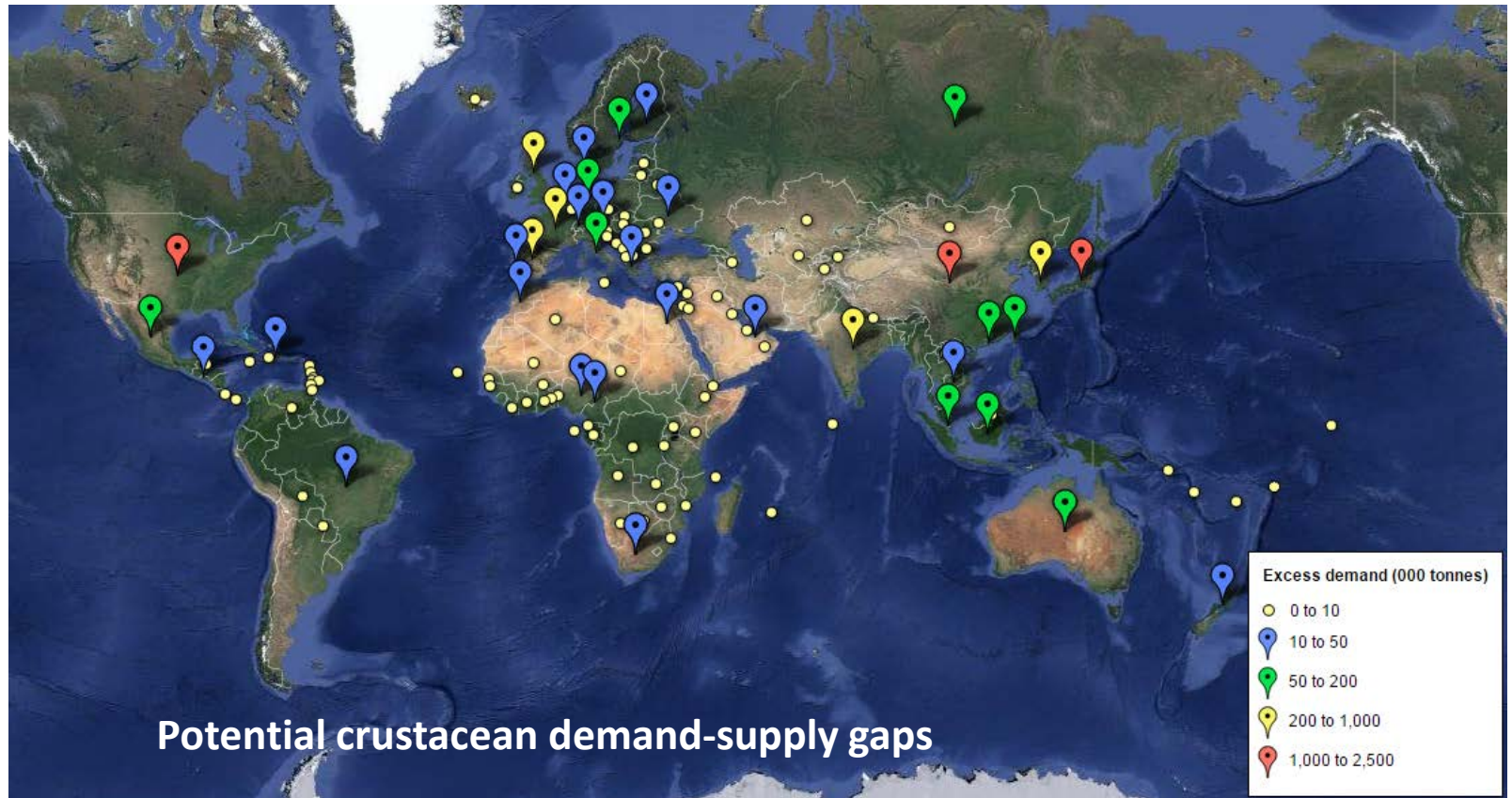


# Aquaculture growth potential in finfish



In order to satisfy increasing demand for finfish by growing and wealthier domestic population in 2025, aquaculture in 137 countries or territories would need to grow faster than its baseline trend.

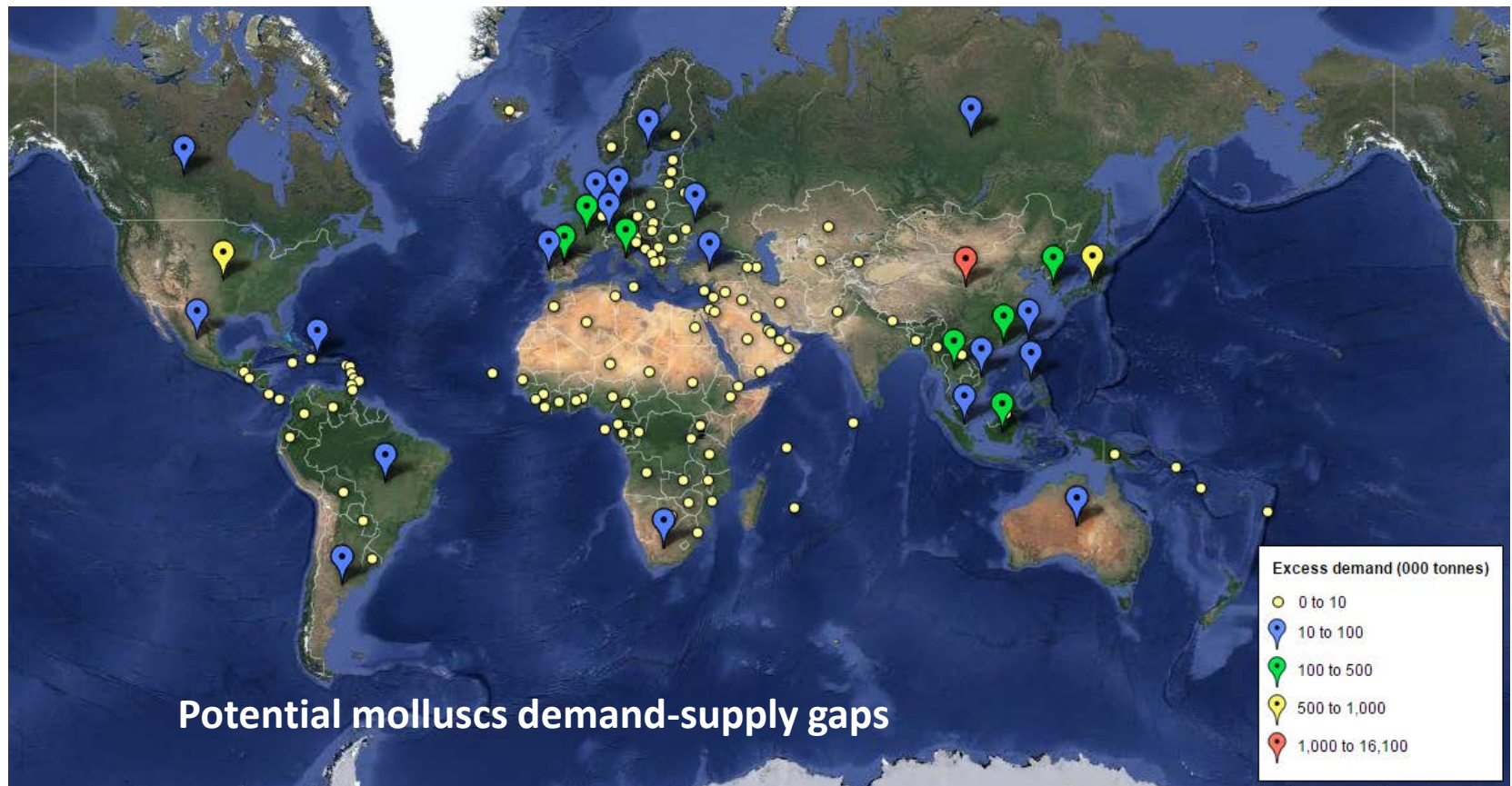
# Aquaculture growth potential in crustacean



In order to satisfy increasing demand for crustacean by growing and wealthier domestic population in 2025, aquaculture in 135 countries or territories would need to grow faster than its baseline trend.



# Aquaculture growth potential in molluscs



In order to satisfy increasing demand for molluscs by growing and wealthier domestic population in 2025, aquaculture in 136 countries or territories would need to grow faster than its baseline trend.

## Discussion

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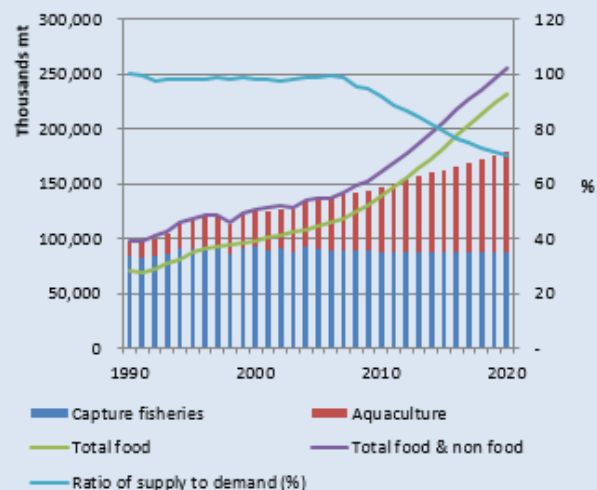
- Is it appropriate to use elasticities estimated from micro consumption data to project demand at the country level?
- Examining demand and supply separately would help us better understand the results of general equilibrium models.
- How should forecasting/projection results be used to facilitate evidence-based policymaking and/or business planning?

# Estimation of future fish supply-demand gaps would become a feature template in the WAPI fish consumption module

## Future supply-demand gaps: Trend

| Select country and species |                         | Parameters                    | Enter alternative parameters | Default parameters (both pop. & income growth) | Baseline year |
|----------------------------|-------------------------|-------------------------------|------------------------------|------------------------------------------------|---------------|
| Country or                 | World                   | Capture production APR (%):   |                              | 0.0                                            | 2010          |
| Species:                   | Fish                    | Culture production APR (%):   |                              | 4.4                                            | 2010          |
| Projection                 | 2020                    | Population APR (%):           |                              | 1.1                                            | 2010          |
| CALCULATE                  | Future S-D gap: Summary | Total nonfood demand APR (%): |                              | 0.0                                            | 2007          |
| Detailed table             | Supply & Utilization:   | Per capita GDP ARP (%):       |                              | 4.0                                            | 2010          |
| MAIN MENU                  |                         | Income elasticity:            |                              | 1.1                                            | 2007          |

## Domestic Fish Supply-Demand Gaps in World: 1990-2020



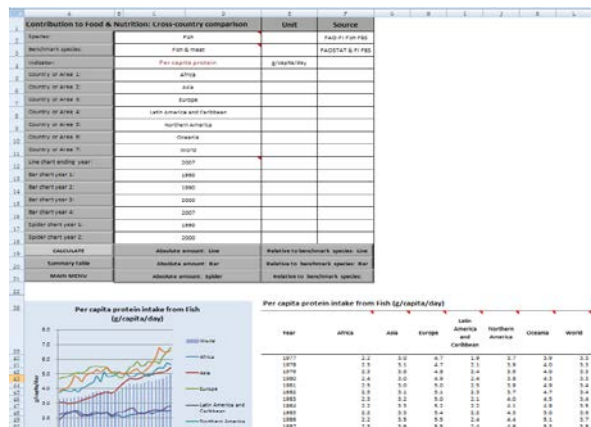
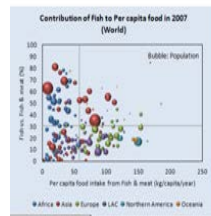
## Domestic Fish Supply-Demand Gap in World in 2020

| Indicators                                 | Baseline year:<br>2007 | Projection year:<br>2020 |
|--------------------------------------------|------------------------|--------------------------|
| <b>Supply-Demand gap</b>                   |                        |                          |
| Supply minus demand (mt)                   | -2,197,579             | -75,872,218              |
| Ratio of supply to demand (%)              | 98                     | 70                       |
| <b>Aquaculture growth during 2007-2020</b> |                        |                          |
| Expected APR (%)                           |                        | 4.8                      |
| Required APR (%)*                          |                        | 9.7                      |

\*Required APR in order to maintain the Supply-Demand gap (mt) at the baseline level.

# The prototype of World Aquaculture Performance Indicators: a user-friendly tool for evidence-based decision making

| Contribution to Food & Nutrition: Global and Regional Overview |                 | Unit           | Source           |
|----------------------------------------------------------------|-----------------|----------------|------------------|
| Food & Nutrient                                                | Per capita food | kg/capita/year |                  |
| Species                                                        | Fish            |                | FAO-FI Fish FIS  |
| Benchmark species                                              | Fish & meat     |                | FAOSTAT & FI FIS |
| Year                                                           | 2007            |                |                  |
| Calculate                                                      | World           | Africa         | Americas         |
| Summary table                                                  | Asia            | Europe         | Oceania          |
| Freeze                                                         | Unfreeze        |                | MAIN MENU        |



## Scope

- 233 countries (or territories); 42 country groups; major species groups (FAOSTAT groups)

## Data sources utilized

- FISHSTAT; Food Balance Sheet; FAOSTAT; UN Comtrade; UN Population; IMF WEO; World Bank WDI; FAO Statistics Division; ILO databases; China Fishery Statistics Yearbook; Global Aquaculture Performance Index (GAPI); FAO-INFOOD, among others.

## Data sources untapped

- FI data (land & water, employment, etc.); National fishery statistics; FATPs (feed, seed, small scale, etc.); Globefish; many others

## Components

- Selection menus; Tables & charts; Supporting materials (papers, websites, etc.)

# Welcome collaboration on WAPI

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**WAPI@fao.org**



Thank you