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ASIA-PACIFIC FISHERY COMMISSION

Thirty-fifth Session

Cebu, the Philippines, 11-13 May 2018

**Regional overview of the status and trends of fisheries and
aquaculture in the Asia-Pacific Region 2016**

DRAFT

ASIA-PACIFIC FISHERY COMMISSION (APFIC)

Regional overview of the Status and Trends of Aquaculture and Fisheries in the Asia Pacific Region 2016

**Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific
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Preparation of this document

This document was prepared for the 35th Session of the Asia-Pacific Fishery Commission (APFIC), which was held in the Philippines. APFIC has continued to implement its new role as a regional consultative forum and is endeavouring to respond effectively to the changing requirements in the fisheries and aquaculture sector in the region. APFIC is committed to improving the quality of information on the status and trends of fisheries and aquaculture in the region and to reviewing and analyzing this information regularly. The purpose of this document is to inform APFIC Member States of the current status and potential of fisheries and aquaculture in Asia and the Pacific region and the emerging issues facing the sector.

Table of Contents

| | |
|--|-----------|
| Preparation of this document | 4 |
| Table of Contents | 5 |
| List of Tables | 9 |
| List of Figures | 10 |
| Abbreviations and Acronyms | 11 |
| Introduction | 12 |
| Fisheries | 12 |
| Aquaculture | 12 |
| Geographical scope of this review: states, entities and areas | 13 |
| Regional overview of fisheries and aquaculture | 16 |
| CONTRIBUTIONS OF FISHERIES IN ASIA AND THE PACIFIC REGION | 16 |
| CONTRIBUTION TO NATIONAL ECONOMIES | 16 |
| Trade | 17 |
| Employment | 23 |
| IMPORTANCE OF FISH IN HUMAN NUTRITION | 26 |
| PRODUCTION TRENDS IN ASIA AND THE PACIFIC REGION | 27 |
| MARINE WATERS | 29 |
| INLAND WATERS | 30 |
| THE FISHING FLEET IN ASIA AND THE PACIFIC REGION | 30 |
| SPECIES COMPOSITION TRENDS IN ASIA AND THE PACIFIC REGION | 34 |
| PRODUCTION IN TEMPERATE AND TROPICAL SEAS | 37 |
| TUNA | 39 |
| SUBREGIONAL TRENDS | 44 |
| South Asia | 44 |
| CHINA CAPTURE FISHERIES | 48 |
| OTHER ASIA | 51 |

| | |
|---|----|
| OCEANIA..... | 53 |
| REGIONAL TRENDS FISHERIES..... | 54 |
| Contribution of Aquaculture | 55 |
| Introduction | 55 |
| General Status and Trends in Aquaculture Production in the Asia-Pacific Region..... | 57 |
| Status and Trends in Aquaculture Production in the Various Sub-regions in the Asia-Pacific Region..... | 58 |
| CHINA SUB-REGION | 58 |
| Species | 62 |
| Country..... | 63 |
| Southeast Asia (SEA) sub-region..... | 64 |
| Country..... | 67 |
| SOUTH ASIA (SA) SUB-REGION..... | 70 |
| THE “REST OF ASIA” (ROA) SUB-REGION..... | 74 |
| OCEANIA SUB-REGION..... | 80 |
| Status and Trends in the Aquaculture Production of the Major Commodity Groups in the Asia-Pacific Region..... | 85 |
| Eels (Order Anguilliformes and Synbranchiformes)..... | 86 |
| Perch-like fishes (Family Percichthyidae)..... | 86 |
| Snakeheads (Family Channidae) | 88 |
| Salmonids (Family Salmonidae) farmed in freshwater..... | 88 |
| Herbivorous and omnivorous freshwater fishes with low input requirements..... | 88 |
| Carps and barbs (Family Cyprinidae)..... | 88 |
| Catfish (Order Siluriformes)..... | 90 |
| Tilapia (Family Cichlidae)..... | 91 |
| Gourami (Family Osphronemidae) | 92 |
| Milkfish (Genus <i>Chanos</i>)..... | 92 |
| Freshwater fishes nei and other low value freshwater finfish..... | 92 |
| MARINE AND BRACKISHWATER FISHES..... | 93 |
| Milkfish (Genus <i>Chanos</i>)..... | 93 |

| | |
|---|-----|
| Japanese Sea bass and Barramundi (Family Centropomidae and Percichthyidae) .. | 94 |
| Jacks (Family Carangidae)..... | 95 |
| Seabream and Porgies (Family Sparidae) | 95 |
| Flatfishes (Genus <i>Psetta</i> and <i>Paralichthys</i>)..... | 96 |
| Tilapia cultured in marine environments (Genus <i>Oreochromis</i>)..... | 97 |
| Salmonids cultured in brackishwater and marine environments (Genus <i>Salmo</i> and <i>Oncorhynchus</i>) | 97 |
| Cobia (Family Rachycentridae)..... | 98 |
| Mulletts (Genus <i>Mugil</i> and <i>Liza</i>) | 98 |
| Snappers (Family Lutjanidae)..... | 98 |
| Other marine fish species..... | 99 |
| CRUSTACEANS | 99 |
| White leg shrimp (<i>Litopenaeus vannamei</i>) | 100 |
| Giant tiger prawn (<i>Penaeus monodon</i>)..... | 101 |
| Other shrimp and prawn species (Family Caridea) | 102 |
| Freshwater prawns (Genus <i>Macrobrachium</i>)..... | 104 |
| Crabs (Infra-order Brachyura) | 104 |
| Freshwater crayfish and crawfish (Genus <i>Procambarus</i> and <i>Cherax</i>)..... | 106 |
| Lobsters (Genus <i>Panulirus</i>) | 106 |
| MOLLUSKS AND OTHER SHELLFISHES | 106 |
| High value mollusks species | 106 |
| Low value mollusks species | 108 |
| SEAWEEDS AND OTHER AQUATIC PLANTS | 109 |
| Seaweeds for food purposes | 110 |
| Seaweeds as sources of highly valuable bioactive compounds..... | 111 |
| CURRENT AND EMERGING ISSUES THAT ARE CURRENTLY AFFECTING AND MAY POSSIBLY AFFECT FUTURE AQUACULTURE PRODUCTION IN THE REGION | 111 |
| Preventing disease outbreaks in aquaculture farms | 111 |
| Maintaining the health of the environment in aquaculture areas..... | 112 |
| Ensuring the sustainability of the use of pelleted feeds in aquaculture | 112 |

| | |
|---|------------|
| Preparing the aquaculture sector in a future warmer global climate..... | 113 |
| Developing inclusive aquaculture value chain for equitable benefit sharing | 114 |
| Appendix A Geographical scope of the review..... | 116 |
| Appendix B..... | 119 |
| LITERATURE CITED AQUACULTURE..... | 119 |
| Appendix C (Aquaculture Annex tables: 01-15)..... | 121 |

List of Tables

List of Figures

Abbreviations and Acronyms

Introduction

Fisheries

In Asia and the Pacific region, capture fisheries have increased slightly in terms of production whereas aquaculture has continued to grow at a rapid rate since the publication of the previous APFIC biennial review Status and potential of fisheries and aquaculture in Asia and the Pacific region. In terms of food security, revenue generation and employment, both capture fisheries and aquaculture sectors continue to be of fundamental importance to the region as can be seen by the tonnage and value produced.

In many of the countries of the region, catching or farming aquatic resources forms a vital part of rural people's livelihoods. Fisheries and aquaculture also have a deep cultural significance and are more than just sources of income or food supply; traditional fishery products such as fish sauce and fish-based condiments have always been important ingredients of people's daily diets and are not easily substituted. All sizes and types of fish are utilized in a wide variety of ways and there is very little discarding or wastage.

The role that fish play in both the food security and nutritional security of many rural and coastal populations has often been underestimated in the past. It is also now increasingly recognized that fisheries and aquaculture are important contributors to the national economies of some APFIC member countries, especially those in the Asian region. In value terms, fish products are also the most heavily traded natural food commodity in the world and trade issues involving fish are becoming increasingly important.

Based on earlier data, it has been estimated that Asia and the Pacific region is one of the heaviest fished areas in the world .

Aquaculture

The aquaculture production in the Asia-Pacific Region during the two year period (2012-2014) is reviewed to see how the aquaculture sector in the region performed during these 2 years. This will allow for the determination of the driving factors that are responsible for the over-all performance of the aquaculture sector. Country production data from the FAO database is the main source of the production statistics used.

The over-all performance of the aquaculture sector in the Asia-Pacific region remained healthy and strong. The total aquaculture production in 2014 reached 92.3 million tonnes and is 12.6 percent higher than the production in 2012. The region remains the largest contributor to the global supply of fishery products from aquaculture supplying 91.3 percent of the total global supply of aquaculture products in 2014. As in the previous years, China remained the largest producing country of aquaculture products contributing 63.7 percent of the total production in the Asia-Pacific region, and 58 percent to the global supply. Indonesia is fast catching up with its 2014 production up by almost 50 percent compared to 2012. Other countries that posted modest increase in their aquaculture production between 2012 and 2014 include India (15.9 percent), Bangladesh (13.4 percent), Viet Nam (10.2 percent), New Zealand (9.7 percent) and Myanmar (8.5 percent). Although the volume of the production is not much and the production data are all FAO estimates, it is noteworthy to mention that the aquaculture production of Cambodia increased by 62 percent during the 2-year period due to substantial increase in freshwater fishes production.

Similarly, Sri Lanka and Bhutan posted significant increase in its aquaculture production by 287 and 71 percent, respectively, largely due to almost 11x increase in the production of *Tilapia* in Sri Lanka, and carps in Bhutan. The productions in central Asian countries of Uzbekistan and Tajikistan have also increased by 67 and 61 percent, respectively. Among the major aquaculture producing countries in the region, Thailand posted the largest decline (26.5 percent) in its production between 2012 and 2014 largely due to more than 50 percent decrease in the production of the white leg shrimp as it is affected by a major disease specifically the Acute Hepatopancreatic Necrosis Disease (AHPND or popularly called Early Mortality Syndrome or EMS). The aquaculture productions in Malaysia, the Philippines and Australia have decreased as well by 17.9, 8.7 and 8.4 percent, respectively. A number of countries in the region with minimal volume of aquaculture production that posted substantial reduction in its production include Kazakhstan (-44 percent) and the small Pacific islands of Kiribati (-56 percent), Nauru (-70 percent), Palau (-77 percent) and Tonga (-99 percent).

The herbivorous and omnivorous freshwater fishes like the carps remained the top commodity for culture in the region with production volume in 2014 equivalent to 41.6 percent of the total fish production in the region. This has increased by 10.7 percent over the 2012 volume. Aside from the carps, other freshwater fishes like the tilapias, catfishes and the freshwater fishes *neil* also posted significant increase in production. In addition, the seaweeds particularly *Eucheuma* in Indonesia and Japanese kelp and *Gracilaria* in the China sub-region showed more than 30 percent increase in production between 2012 and 2014. On the other hand, the production of white leg shrimp in Thailand and giant tiger prawn in Indonesia suffered significant decline of more than 30 percent during the 2-year period. It must be noted, however, that white leg shrimp production in other Asia-Pacific countries like in India and Indonesia remained strong with increase in annual production of more than 50 percent.

Some important issues like the need to prevent outbreaks of diseases in aquaculture farms, the awareness and the commitment among the players to ensure the good health of the surrounding environment where the aquaculture activities are happening, the need to ensure the sustainability of the use of pelleted feeds, the necessary preparations that have to be put in place for the future warmer global climate, and an inclusive value chain that promotes equitable benefit sharing from aquaculture have to be consistently in the radar screen to ensure the sustainability and the continued growth of the sector, and thereby for humanity to continue reaping the benefits that can be derived from the industry.

Geographical scope of this review: states, entities and areas.

This review covers the states, entities and areas of Asia and the Pacific region that report fisheries and aquaculture statistics to FAO, and which are within the area of competence of the Asia-Pacific Fishery Commission. They are sub-divided into the following sub-regions.

Marine capture fisheries

| | |
|-------------------------------|---|
| Oceania | American Samoa, Australia, the Cook Islands, Republic of Fiji Islands (Fiji), French Polynesia, Guam, Republic of Kiribati (Kiribati), the Marshall Islands, the Federated States of Micronesia (Micronesia), Republic of Nauru (Nauru), New Caledonia, New Zealand, Republic of Niue (Niue), Norfolk Island, Commonwealth of the Northern Mariana Islands (Northern Mariana Islands), Republic of Palau (Palau), Papua New Guinea, Pitcairn Island, Independent State of Samoa (Samoa), Solomon Islands, Tokelau, Kingdom of Tonga (Tonga), Tuvalu, Republic of Vanuatu (Vanuatu), Wallis and Futuna Islands |
| South Asia | The People's Republic of Bangladesh (Bangladesh), the Kingdom of Bhutan (Bhutan) the Republic of India (India), the Republic of Maldives (Maldives), Federal Democratic Republic of Nepal (Nepal), Islamic Republic of Pakistan (Pakistan), the Democratic Socialist Republic of Sri Lanka (Sri Lanka) |
| Southeast Asia | Brunei Darussalam, the Kingdom of Cambodia (Cambodia), the Republic of Indonesia (Indonesia), Lao People's Democratic Republic (Lao PDR), Malaysia, the Union of Myanmar (Myanmar), the Republic of the Philippines (Philippines) the Republic of Singapore (Singapore), the Kingdom of Thailand (Thailand), the Democratic Republic of Timor-Leste (Timor-Leste), the Socialist Republic of Viet Nam (Viet Nam). |
| China | People's Republic of China (China), Hong Kong SAR Special Administrative Region of China (Hong Kong SAR), Macao Special Administrative Region of China (Macao SAR). Taiwan Province of China (Taiwan POC) |
| Other Asia (East and central) | Islamic Republic of Iran (Iran), Japan, the Republic of Kazakhstan (Kazakhstan) Democratic People's Republic of Korea (DPR Korea), Mongolia, Republic of Korea (RO Korea), the Republic of Tajikistan (Tajikistan), the Republic of Uzbekistan (Uzbekistan) |

APFIC member countries are Australia, Bangladesh, Cambodia, China, France, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Sri Lanka, Timor-Leste, Thailand, United Kingdom, United States of America and Viet Nam.

FAO member countries in Asia and the Pacific. Asia: Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, DPR Korea, India, Indonesia, Iran, Japan, Kazakhstan, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Russian Federation*, Singapore, Sri Lanka, Thailand, Timor-Leste, Uzbekistan, and Viet Nam. Pacific: Australia, Cook Islands, Fiji, France*, Kiribati, Marshall Islands, Micronesia, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, United States of America*, and Vanuatu. * Denotes an FAO member country that has administrative territory in the Asia-Pacific region and participates in the biennial FAO Regional Conference for Asia and the Pacific.

Production areas

All catches made outside the sub-regional areas mentioned above are excluded from this review.

The sub-regional areas cover the FAO major fishing areas (MFAs) as follows:

Inland waters:

- Asia — Inland waters (MFA 04)
- Oceania — Inland waters (MFA 06)

Marine waters:

- Western/Eastern Indian Ocean (MFA 51 and 57)
- Northwest, Western/Eastern Central and Southwest Pacific Ocean (MFA 61, 71, 77 and 81)

Aquaculture

For the Aquaculture overviews the following subdivisions are used.

| | |
|-----------------------------|---|
| China sub-region | China (People's Republic of), Hong Kong SAR (Special Administrative Region of China) and Taiwan POC (Province of China) |
| Southeast Asia sub-region | Brunei Darussalam, Cambodia (the Kingdom of), Indonesia (the Republic of), Lao PDR (People's Democratic Republic), Malaysia, Myanmar (the Union of), Philippines (the Republic of the), Singapore (the Republic of), Thailand (the Kingdom of), Timor-Leste (the Democratic Republic of) and Viet Nam (the Socialist Republic of) |
| South Asia sub-region | Bangladesh (the People's Republic of), Bhutan (the Kingdom of), India (the Republic of), Maldives (the Republic of), Nepal (Federal Democratic Republic of), Pakistan (Islamic Republic of) and Sri Lanka (the Democratic Socialist Republic of) |
| The Rest of Asia sub-region | Japan, Kazakhstan (the Republic of), Korea DPR (Democratic People's Republic of), Korea (Republic of), Tajikistan (the Republic of) and Uzbekistan (the Republic of) |
| Oceania sub-region | American Samoa, Australia, the Cook Islands, Fiji Islands (the Republic of the), French Polynesia, Guam, Kiribati (the Republic of), the Marshall Islands, the Federated States of Micronesia (FSM), Nauru (the Republic of), New Caledonia, New Zealand, Northern Mariana Islands (the Commonwealth of the), Palau (the Republic of), Papua New Guinea (PNG), Samoa (the Independent State of), Solomon Islands, Tonga (the Kingdom of), Tuvalu, Vanuatu (the Republic of) |

Sources of data

Data are sourced from the FAO Fishtat database, Globefish.

Regional overview of fisheries and aquaculture

CONTRIBUTIONS OF FISHERIES IN ASIA AND THE PACIFIC REGION

Capture fisheries production in Asia and the Pacific region has been stable for many years but with a very slight increase since the previous publication of “APFIC Regional overview of fisheries and aquaculture in Asia and the Pacific 2012”.

CONTRIBUTION TO NATIONAL ECONOMIES

Fisheries continues to make a significant contribution to national economies in the region including to GDP, Trade, Employment and Nutrition, especially those in the Pacific and for Least-developed countries (LDCs). The contribution is quantified here through analysis of the volume of catch, value generated as contribution to Gross Domestic Product (GDP) and to the food and nutritional security of many rural and coastal communities in the region.

Gross Domestic Production (GDP)

The contribution fisheries makes to GDP follows the methodology used previously for the APFIC Status and Trends is calculated by multiplying the total fisheries production for each country (in 2013) by a notional 1US\$/kg average price. This value is then calculated as a percentage of GDP (taken from the ESCAP - Statistical Yearbook for Asia and the Pacific 2015) of the same year. This methodology is an underestimate and does not take into account the large variation in fish prices. The results indicate that fisheries accounts for more than one percent of GDP in many of the Pacific countries and as high as 43 percent in Marshall island (Table 1). The economic contribution of capture fisheries production is relatively smaller in Southeast and South Asian states, yet five of these states have fisheries that contribute more than one percent of GDP.

Table 1. Contribution of capture fisheries to GDP (2013)

| Country | Percentage |
|-------------------|------------|
| Marshall Islands | 42.7 |
| Tuvalu | 39.6 |
| Micronesia (F.S.) | 10.8 |
| Vanuatu | 7.3 |
| Myanmar | 6.0 |
| Maldives | 4.6 |
| Cambodia | 4.2 |
| Solomon Islands | 3.4 |
| Viet Nam | 1.6 |
| Samoa | 1.6 |
| Papua New Guinea | 1.4 |
| DPR Korea | 1.4 |
| Cook Islands | 1.2 |
| Fiji | 1.1 |
| Bangladesh | 1.0 |
| Philippines | 0.9 |
| Sri Lanka | 0.7 |
| Indonesia | 0.7 |
| Malaysia | 0.5 |
| Tonga | 0.4 |

| | |
|----------|-----|
| Thailand | 0.4 |
| Palau | 0.4 |
| Lao PDR | 0.4 |
| Nauru | 0.3 |
| India | 0.2 |

Trade

Fisheries and aquaculture seafood commodities are amongst the most traded food commodities worldwide. This trade generates employment along the value chain and contributes to the economic growth of the countries.

Table 2 Top ten trading states in fishery commodities in 2013 (World), excluding the added value along the value chain.

| Import (US\$ Million) | | Export (US\$ Million) | |
|----------------------------------|-------|----------------------------------|-------|
| USA | 19174 | China | 19711 |
| Japan | 15655 | Norway | 10392 |
| China | 8363 | Thailand | 7068 |
| France | 6571 | Viet Nam | 6901 |
| Spain | 6463 | USA | 5685 |
| Italy | 5781 | Chile | 5173 |
| Germany | 5476 | Denmark | 4682 |
| United Kingdom | 4541 | India | 4622 |
| Sweden | 4490 | Canada | 4391 |
| China, Hong Kong SAR | 3811 | Indonesia | 4025 |

Source: Fishery Commodities Global Production and Trade (online query)

Seven states of Asia and the Pacific ranked in the top ten importing and exporting countries in the world (Table 2) with overall China remaining as the biggest exporter of fisheries commodities in the world. These exported products are increasingly produced from aquaculture with an “export” focus. The USA remains the largest importer followed by Japan, China, France and Spain.

China is the largest exporter of the fishery commodities in the APFIC region by far with value of US\$19.8 billion in 2013. Thailand is the second largest exporter, followed closely by Viet Nam

exporting US\$7.1 billion and US\$6.9 billion respectively in 2013 (Table 3). Total exports amongst top ten states in the region were 12 million tonnes worth around US\$51 billion. China's main export trading partners were Japan, USA, and Hong Kong SAR.

In terms of import value (Table 3), Japan is the highest value in the region followed by China, Hong Kong SAR, Republic of Korea and Thailand. Within the top ten states in the region, imports totalled 12 million tonnes worth US\$41 billion in 2013. It is worth noting that Hong Kong SAR is third largest importer in value terms, however seventh in volume term indicating a preference for importing high value marine species.

Table 3. Top ten trading states in fishery commodities in 2013 (Asia and the Pacific Region) ¹

| Country | Export | | Country | Import | |
|--------------------|--------------|---------|----------------------|--------------|---------|
| | US\$ million | Tonnes | | US\$ Million | Tonnes |
| China | 19711 | 3896453 | Japan | 15655 | 2478331 |
| Thailand | 7068 | 1618684 | China | 8363 | 4155143 |
| Viet Nam | 6901 | 1528850 | China, Hong Kong SAR | 3811 | 454849 |
| India | 4622 | 965658 | Korea, Republic of | 3679 | 1207027 |
| Indonesia | 4025 | 1228475 | Thailand | 3239 | 1667847 |
| Japan | 2060 | 551386 | Australia | 1668 | 309581 |
| Taiwan POC | 1977 | 717176 | Taiwan POC | 1142 | 464717 |
| Korea, Republic of | 1950 | 623100 | Singapore | 1071 | 206906 |
| New Zealand | 1213 | 309233 | Malaysia | 1070 | 463234 |
| Philippines | 1186 | 317973 | Viet Nam | 917 | 339272 |

Source: Database from Globefish.

Trade flows

China exports their fisheries products all over the world with the largest partners being Japan, USA, Hong Kong SAR and Thailand (Figure 1a). Similarly Thailand and Vietnam exports their products mainly to Japan and USA as well as EU countries (Figure 1b and 1c). These top exporters have small number of key partners sharing large portion of their total value. For example, China's top 4 export partners account for more than half of China's total exporting value in 2015. This highlights potential vulnerabilities to trade-based incentives/disincentives (e.g. EU red cards).

Figure 1a China's exporting partners for fisheries commodities in 2015

¹ Fisheries commodities trading states were delivered from the Globefish database concerning items classified in the Combined Nomenclature as chapter 03 or headings 1604 and 1605. These exclude for instance products classified in chapter 05 (fish waste or other fishery products not fitted for human consumption) and chapter 15 (fish meals and oils) which will be examined in the section 3 of this review.

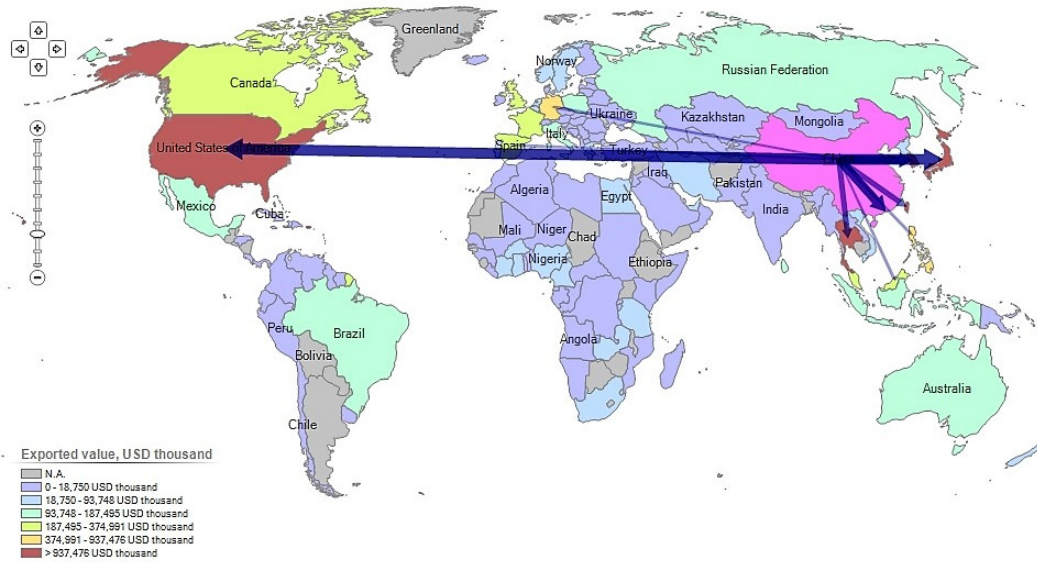


Figure 1b. List of importing markets for a product exported by Thailand in 2015 (Value)

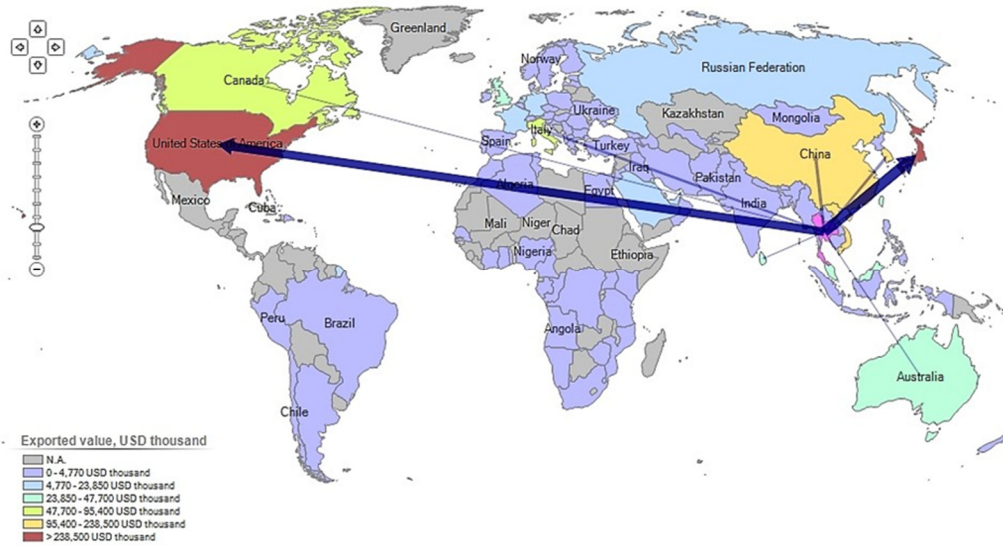
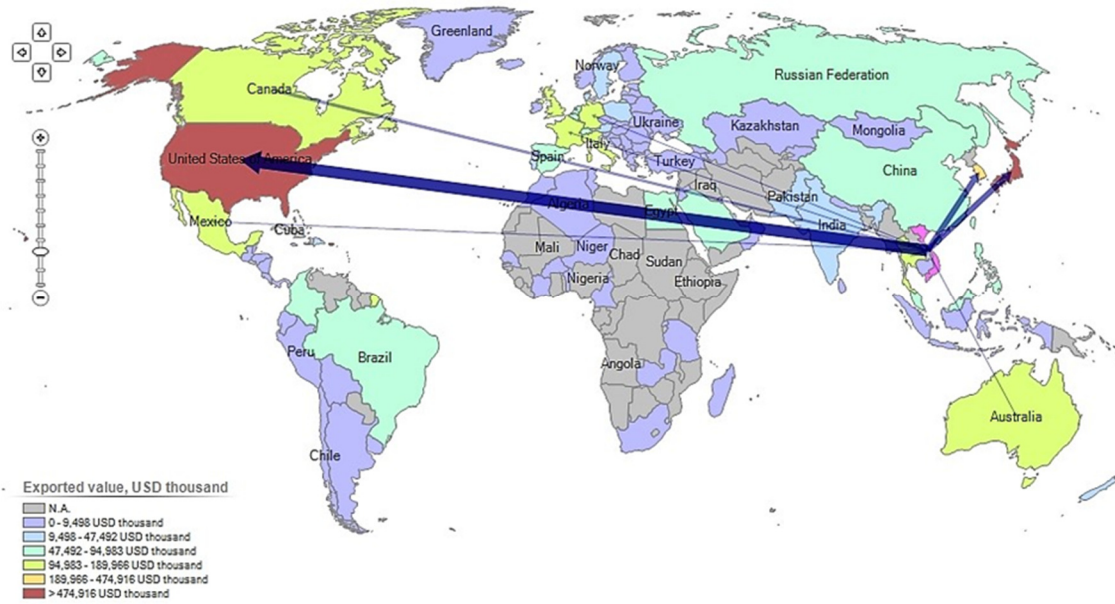


Figure 1c List of importing markets for a product exported by Vietnam in 2015 (Value)

Source: International Trade Centre (ITC) is the joint agency of the World Trade Organization and the United Nations. ITC calculations based on UN COMTRADE statistics.

http://www.trademap.org/Country_SelProductCountry_TS_Map.aspx



Japan imports fisheries products all over the world with the largest partners being China worth 2.4 billion US\$ followed by USA, Chile, Thailand and Russian Federation account for 50% of the total imported value in 2015 (Figure 2a). China is the second largest importer of fisheries commodities in the region, and trading partners are Russian federation, USA, and Canada (Figure 2b).

Figure 2a List of exporting markets for a product imported by Japan in 2015 (Value)

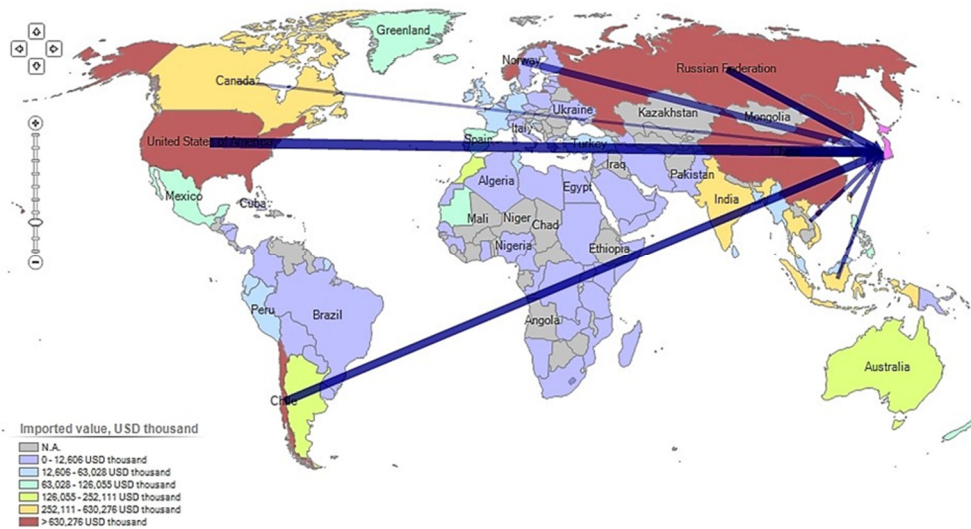


Figure 2b List of exporting markets for a product imported by China in 2015 (Value)

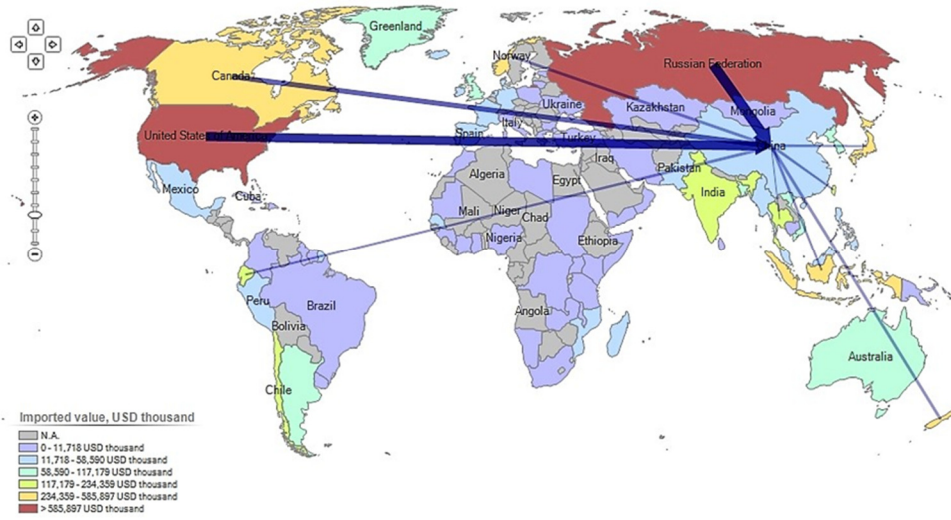
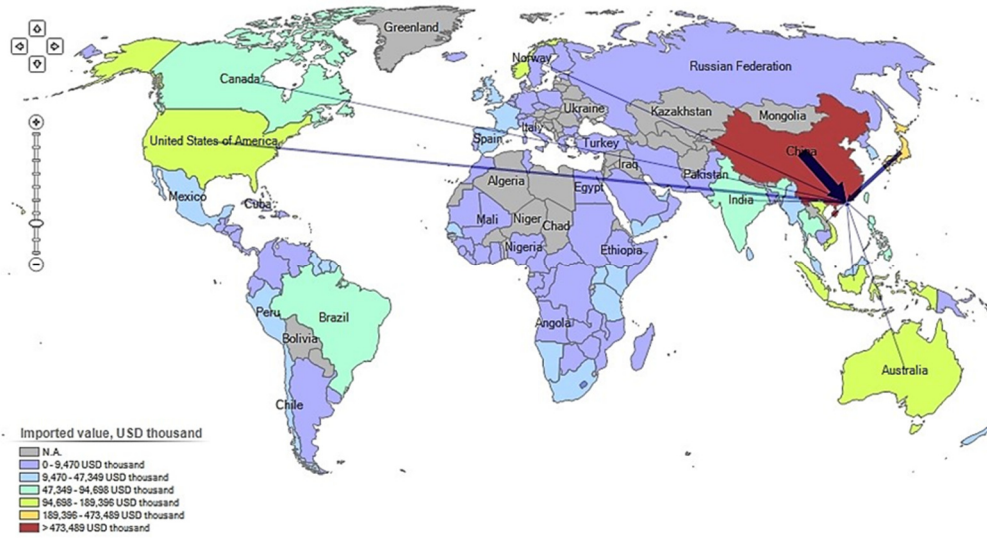


Figure 2c List of exporting markets for a product imported by Hong Kong SAR, China in 2015 (Value)



Fish fillet is growing fishery products category and its global trade valued at US\$23.1 billion in 2014, including various product forms such as chilled, frozen, salted, brined but excluding smoked. The top exporters of fish fillets are China (US\$ 4.22 billion), Chile (US\$2.53 billion), Norway (US\$2.43 billion), Vietnam (US\$2.15 billion) and the United States (US\$1.33 billion).

The Asia and the pacific region is the largest exporter of fish fillet accounting one third of the global total (Figure 3a). On the other hand, importing of fish fillet is the third largest region after Europe and the North America (Figure 3b). The top importers are the United States (US\$5.16 billion), Japan (US\$2.75 billion), Germany (US\$1.87 billion), France (US\$1.5 billion) and the United Kingdom (US\$1.17 billion).

Figure 3a. The export trade share of fish fillet in value term, by country and continent (2014)

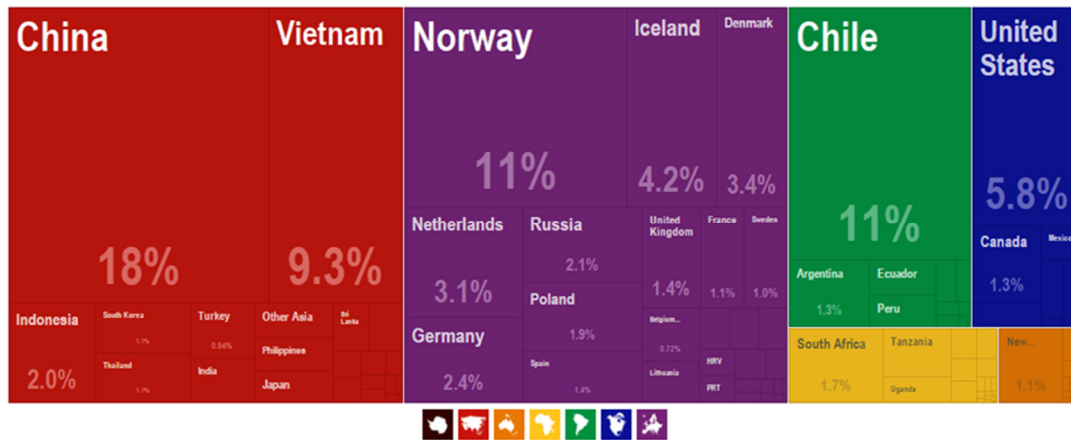
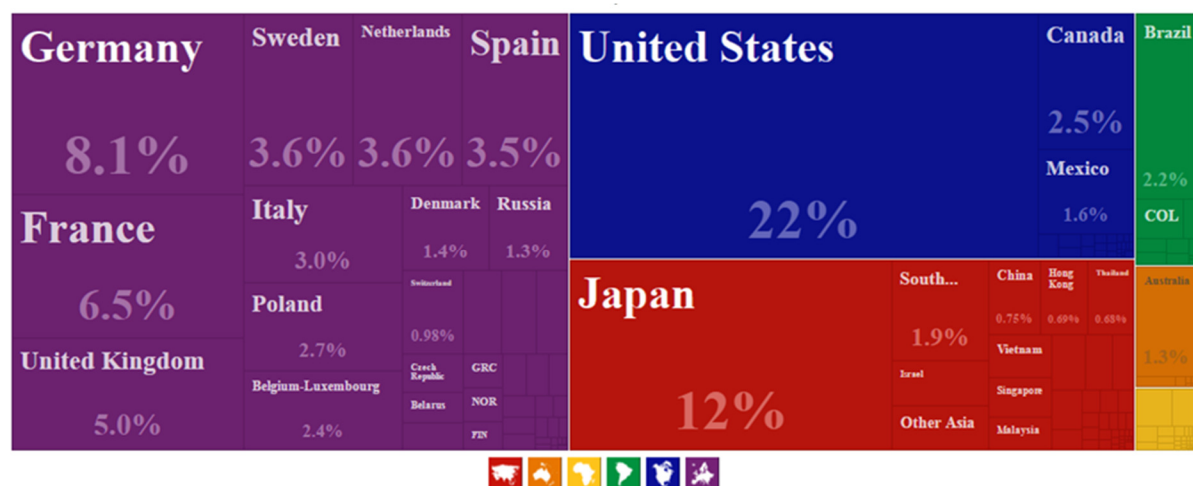


Figure 3b. The import trade share of fish fillet in value term by country and continent (2014)

Source: <http://atlas.media.mit.edu/en/profile/hs92/0304/#Exporters>. AJG Simoes, CA Hidalgo. 2011. The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence.



Employment

In terms of direct full or part time employment, FAO has estimated that Asia accounts for 84 percent of total global number of persons engaged in fisheries production (a total of 56.6 million)² (Table 4). China, the country with the highest number of fishers, had an estimated 9.9 million engaged in capture fisheries in 2014, accounting for 24 percent of the world's total and 38 percent of the total number of fishers in selected Asia and Pacific countries (Table 4). Follow by India, total number of fishers recorded in 2013 is 8.4 million people, of which 3.3 million people were full-time engaged in fishing. In Myanmar, almost 3 million people were engaged in capture fisheries, of which 24 percent of total number are full-time fishers and the rest are seasonally or as a supplemental part of their diverse livelihood. Although a number of people employed in fisheries and has increased in several countries in the region, the number in developed countries has declined (e.g. Australia, Japan, and New Zealand).

There is only limited and up-to-date data available on employment in capture fisheries in Asia and the Pacific region, the inadequate and incomparability of available data is significant obstacle to formulate the fisheries-related employment situation in the region. Apart from those are directly

² FAO SOFIA, FAO, Rome, 2016

engaged in primary production sector, there are also a number of people involve in related fishing industries that generate significant incomes as part of their livelihoods.

Gender-disaggregated employment data is also significantly important, since women are actively engaged in secondary post-harvest and service sectors, improving statistical data collection in fisheries sector would address actual engagement of women and elevate their access to necessity resources and decision-making capacity.

Table 4. Number of fishers in selected countries in Asia and the Pacific (thousands)

| | year | | | | |
|--------------------|-----------------|-----------------|-----------------|-----------------|----------------|
| Country/Time | 2011 | 2012 | 2013 | 2014 | 2015 |
| Total | 29 596.6 | 29 899.3 | 26 350.3 | 18 819.6 | 8 095.7 |
| Australia | 7.3 | 7.0 | 5.1 | 3.6 | 6.7 |
| Full time | 5.2 | 5.0 | 3.5 | 2.2 | 4.6 |
| Part time | 2.1 | 2.0 | 1.6 | 1.4 | 2.1 |
| Bangladesh | 1 506.1 | 1 506.1 | 1 538.5 | 1 712.0 | 1 050.2 |
| Full time | 833.4 | 833.4 | 850.6 | 933.2 | 257.4 |
| Occasional | 253.6 | 253.6 | 259.7 | 291.3 | 291.3 |
| Part time | 419.1 | 419.1 | 428.2 | 487.5 | 501.5 |
| Cambodia | 657.3 | | | | |
| Status Unspecified | 657.3 | | | | |
| China | 9 295.0 | 9 226.2 | 9 238.8 | 9 906.3 | |
| Full time | 2 693.9 | 2 689.2 | 2 694.4 | 2 971.3 | |
| Occasional | 1 495.7 | 1 580.1 | 1 614.0 | 1 569.8 | |
| Part time | 5 105.5 | 4 956.9 | 4 930.4 | 5 365.2 | |
| India | 8 397.6 | 9 319.2 | 8 423.8 | | |
| Full time | 3 412.8 | 3 447.7 | 3 276.8 | | |
| Occasional | 1 912.2 | 2 558.7 | 2 401.9 | | |
| Part time | 2 621.8 | 2 850.3 | 2 345.1 | | |

| | | | | | |
|--------------------|----------------|----------------|----------------|----------------|----------------|
| Status Unspecified | 450.7 | 462.5 | 400.0 | | |
| Indonesia | 2 755.2 | 2 748.9 | 2 640.1 | 2 667.4 | 2 724.7 |
| Full time | 1 205.1 | 1 550.7 | 1 395.9 | 1 410.3 | 1 437.0 |
| Occasional | 460.1 | 407.2 | 401.7 | 405.9 | 417.4 |
| Part time | 1 090.0 | 791.0 | 842.5 | 851.2 | 870.3 |
| Japan | 177.9 | 173.7 | 181.0 | 173.0 | 166.6 |
| Status Unspecified | 177.9 | 173.7 | 181.0 | 173.0 | 166.6 |
| Malaysia | 134.1 | 136.5 | 144.0 | 143.4 | |
| Full time | 134.1 | 136.5 | 144.0 | 143.4 | |
| Myanmar | 2 952.8 | 2 979.2 | 2 980.0 | 2 985.1 | 2 999.5 |
| Full time | 706.3 | 709.7 | 717.0 | 718.6 | 704.0 |
| Occasional | 916.0 | 921.0 | 916.0 | 917.0 | 917.0 |
| Part time | 550.5 | 554.5 | 551.0 | 553.0 | 582.0 |
| Status Unspecified | 780.0 | 794.0 | 796.0 | 796.5 | 796.5 |
| Nepal | 462.1 | 462.1 | 462.1 | 462.1 | 462.1 |
| Status Unspecified | 462.1 | 462.1 | 462.1 | 462.1 | 462.1 |
| New Zealand | 1.8 | 1.4 | 1.4 | 1.3 | 1.3 |
| Full time | 0.0 | 1.3 | 1.2 | 1.2 | 1.2 |
| Status Unspecified | 1.8 | 0.2 | 0.2 | 0.1 | 0.1 |
| Pakistan | 361.5 | 366.9 | 378.3 | 385.5 | 406.0 |
| Full time | 186.8 | 189.6 | 194.0 | 197.7 | 205.4 |
| Occasional | 62.0 | 63.1 | 65.3 | 67.2 | 72.8 |
| Part time | 112.7 | 114.1 | 119.0 | 120.7 | 127.9 |
| Philippines | 1 907.4 | 1 907.4 | | | |
| Status Unspecified | 1 907.4 | 1 907.4 | | | |

| | | | | | |
|--------------------------|--------------|--------------|--------------|--------------|--------------|
| Republic of Korea | 73.9 | 130.4 | 106.4 | 103.4 | |
| Status Unspecified | 73.9 | 130.4 | 106.4 | 103.4 | |
| Sri Lanka | 246.8 | 244.4 | 250.9 | 276.5 | 278.6 |
| Full time | 186.0 | 185.7 | 174.9 | 185.7 | 183.0 |
| Occasional | 12.3 | 14.6 | 17.5 | 22.0 | 23.4 |
| Part time | 45.0 | 39.7 | 53.8 | 63.1 | 63.5 |
| Status Unspecified | 3.4 | 4.3 | 4.7 | 5.7 | 8.8 |
| Thailand | 160.0 | 160.0 | | | |
| Status Unspecified | 160.0 | 160.0 | | | |
| Viet Nam | 500.0 | 530.0 | | | |
| Status Unspecified | 500.0 | 530.0 | | | |

IMPORTANCE OF FISH IN HUMAN NUTRITION

Fish and fish products are one of the most important sources of animal protein, accounting for about 17 percent at the global level, but exceeding 50 percent in many countries. They also provide other valuable nutrients such as the long-chain omega-3 fatty acids. There is convincing evidence of beneficial health outcomes from fish consumption for reducing the risk of death from coronary heart disease and improving neurodevelopment in infants and young children, when the mother consumes fish before and during pregnancy. In addition to the health benefits of these macronutrients, fish also provides micronutrients such as iodine, selenium, zinc, iron, calcium, phosphorus, potassium, and vitamins such as A, D and B.³

Fish and fish products play a very important role in the food and nutritional security of rural, urban and coastal populations throughout Asia and the Pacific. An APFIC study of fish and fish product consumption in 30 countries across the region, examines household survey data, was carried out by Asia Pacific Fishery Commission⁴. The study found countries of the Asia-Pacific region have very different access to fish in its different forms and unsurprisingly, fish consumption figures vary considerably; from 110.7 kg per capita per year in the Pacific island of Tuvalu to 0.18 kg per capita per year in Mongolia and parts of western China.

³ FAO State of World Fisheries and Aquaculture 2016 *Nutrition: from commitments to action – the role of fish and fisheries*

⁴ Needham, S. & Funge-Smith, S. J. (2014) "The consumption of fish and fish products in the Asia-Pacific region based on household surveys". FAO Regional Office for Asia and the Pacific, Bangkok, Thailand. RAP Publication 2015/12. 87pp

Fish consumption figures are further broken down across geographical regions as follows:

- **Pacific:** Of the sixteen countries and territories reviewed, Tuvalu had the highest consumption at 110.7 kg per capita per year while Papua New Guinea was lowest at 13 kg per capita per year.
- **Southeast Asia:** Of the eight countries in Southeast Asia reviewed Cambodia was highest at 63.5 kg per capita per year while Timor-Leste was lowest at 6.1 kg per capita per year.
- **South Asia:** Of the four countries in South Asia reviewed Sri Lanka recorded the highest consumption of 15.3 kg per capita per year while Pakistan recorded the lowest at 0.6 kg per capita per year.
- **North Asia:** Of the two North Asian countries reviewed. Consumption in Bhutan was recorded as 5.6 kg per capita per year while Mongolia stood at 0.2 kg per capita per year.

From the data analysed it is clear that per capita fish consumption in the Asia-Pacific region is highest in the Pacific followed by Southeast East Asia, South Asia and North Asia. However, although fish consumption in countries such as India and Pakistan is relatively low (2.85 and 0.6 kg per capita per year respectively) the large population size of these nations results in significant quantities of fish being consumed (e.g. for India this equates to more than 3.4 million tonnes/annum) and especially in coastal states.

Where data were available, inland species would appear to play a major role in diets with Tilapia and catfish featuring prominently.

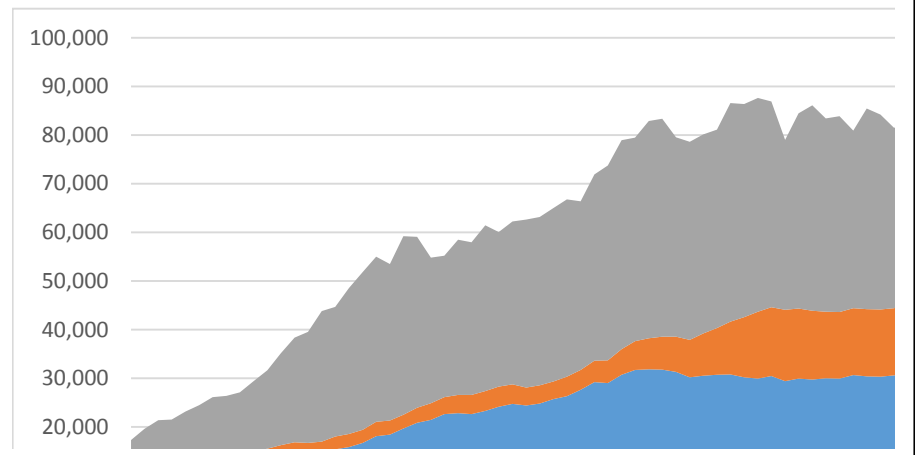
Household surveys are uniquely positioned to gather detailed data on fish consumption on nationwide and local scales. Continued technical support should therefore be provided to national statistics offices to help them put into practice more effective data collection methods so as to enhance the accuracy, quality and value of fish consumption statistics both in quantity and nutrient values.

The session of COFI 2016 recommended developing policies and field programmes that allowed countries to invest in nutrition-focused fish and aquaculture value chain development, giving particular attention to the role of small- and medium-scale enterprises. The Committee further pointed to the need to give adequate consideration to policies and interventions that make the nutritional benefits of increased fish consumption available to all.

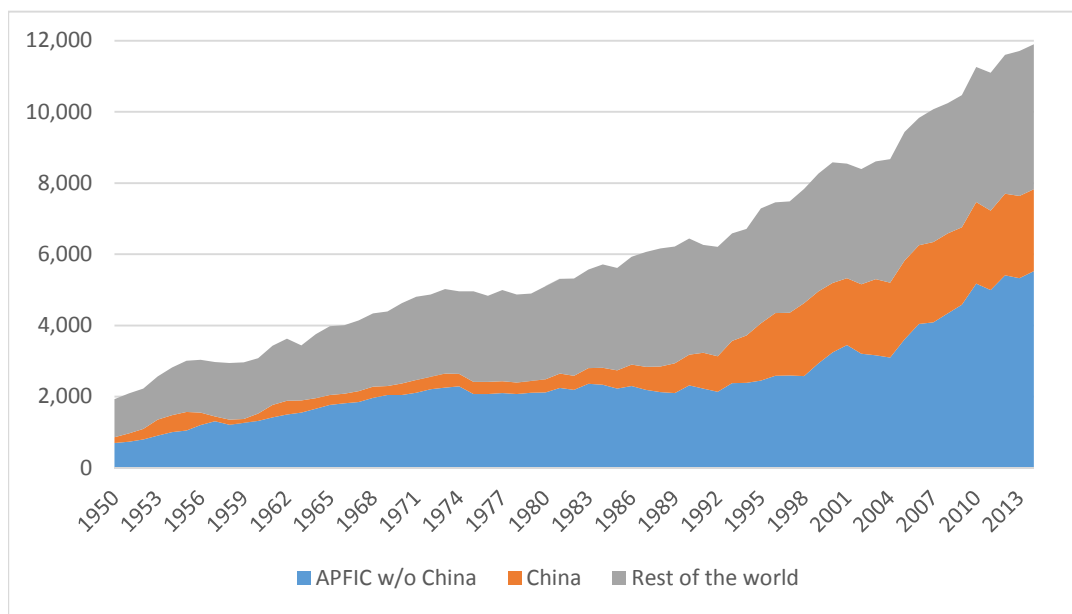
PRODUCTION TRENDS IN ASIA AND THE PACIFIC REGION

Overall global capture fisheries production continue to remain relatively stable but with a small growth of 2.3 percent since 2012, and amounted to 94.6 million tonnes in 2014. Marine capture yield dominated the production with 82.7 million tonnes (Figure 4a), and inland capture was 11.9 million tonnes in 2014 (Figure 4b). Asia and the Pacific region continue to be the world's largest producer of fish and represents 61 percent of the global production (61 percent of marine water and 66 percent of inland water).

Figure 4a Trends in global marine capture production (1000 tonnes)



... Figure 4b Trends in global inland capture production (1000 tonnes)

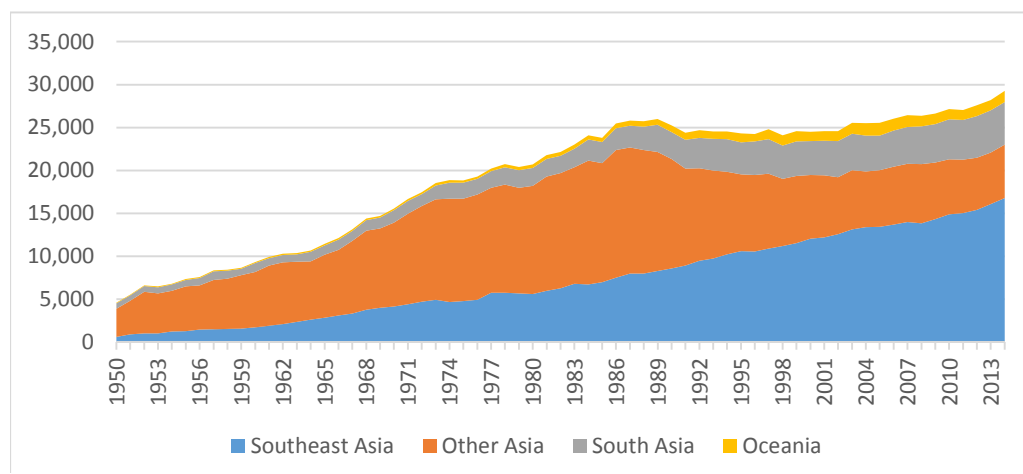


MARINE WATERS

In 2014, the marine capture fisheries production in Asia and the Pacific reported its highest catch ever at 50 million tonnes, and 29 million tonnes without China (Figure 5a) largely due to the growth of the south East Asian production in the recent years.

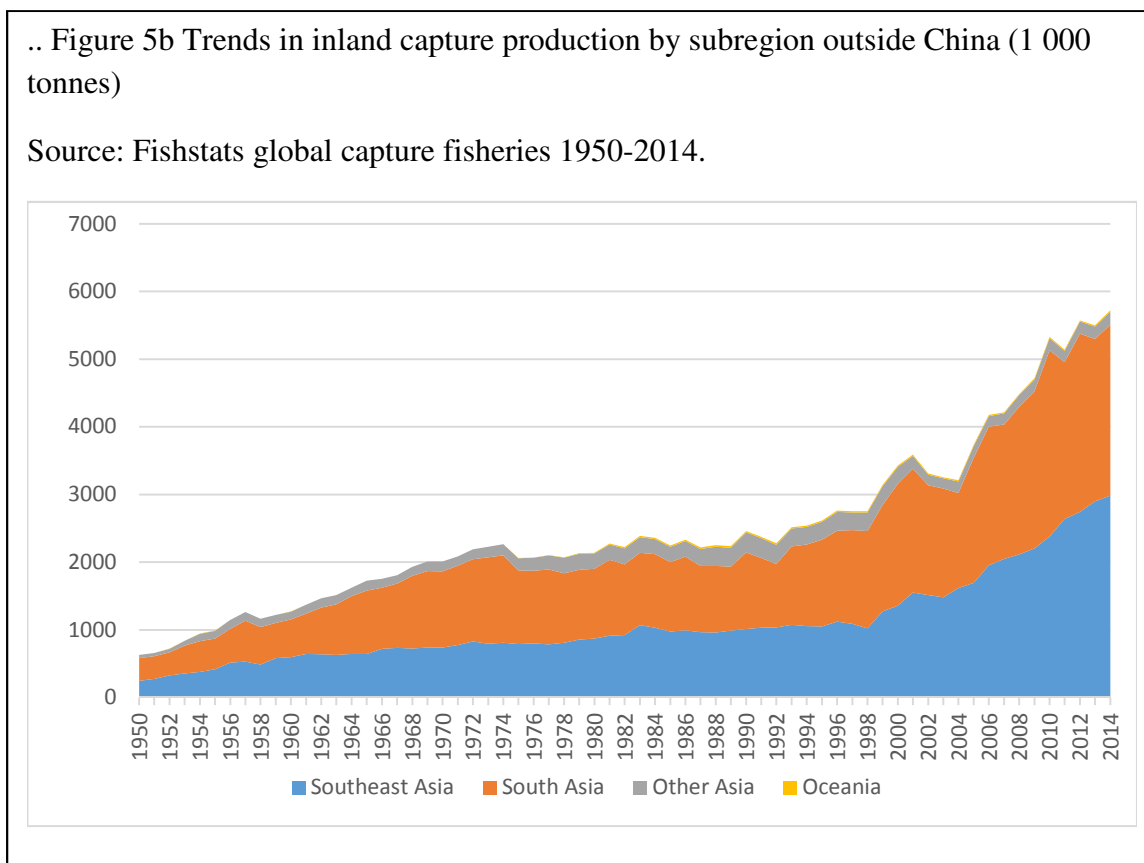
.. Figure 5a Trends in marine capture production by subregion outside China (1 000 tonnes)

Source: Fishstats global capture fisheries 1950-2014



INLAND WATERS

The total inland capture production without China was highest recorded volume in the history, indicating a remarkable growth of the sector with 44 percent increase from 3.2 million tonnes in 2004 to 5.7 million in 2014 mostly due to the increase of production in the South East Asian subregion (Figure 5b).



THE FISHING FLEET IN ASIA AND THE PACIFIC REGION

The total number of fishing vessels in the world was estimated to be around 4.6 million in 2014. Approximately 3.5 million fishing vessels were in Asia and 8.6 thousand vessels in Pacific and

Oceania, accounting for 75 and 0.2 percent of the global fleet respectively.⁵ In Asia and the Pacific region, China is the largest fishing fleet nation, 1 million vessels in 2014, followed by Indonesia (0.81 million vessels), the Philippines (0.47 million vessels), and Australia (0.32 million vessels) (Table 5). A number of registered fishing vessels had increased from 3.3 million in 2010 to 3.5 million in 2014. Indonesia, in particular, reported number of un-motorized vessels increased 10 folds from 31 thousand vessels in 2010 to 321 thousand vessels in 2014, and number of motorized vessels increased from 0.40 million vessels to 0.48 million vessels in the same period. Japanese authorities implemented various schemes to regulate its fishing fleets, as well as the impact of the 2011 Tohoku earthquake and tsunami resulted in substantial reduction in the number of vessels from 0.3 million vessels in 2010 to 0.08 million vessels in 2014.

According to the FAO statistic data, 70 percent of registered fishing vessel (excluded Australia) were engine-powered in 2014, and the proportion of motorized vessels ranged from 39 to 98 percent in the region (Figure yy). Due to insufficient data in the FAO reporting system, the figure of non-powered vessels were most likely underestimated and could not reflect the accurate vessel compositions and their fishing capacity.

Note: The issue of underestimated and outdated figure of vessels in FAO statistical data should be taken into consideration. For example, the earlier APFIC regional review in 2012, reported the number of non-power vessels in Malaysia to be 7.9 thousand vessels in 2010 (combined figures in South China Sea, Bay of Bengal and Sulu Sulawesi, and Timor-Arafura, based on the expert questionnaires), however the data shown in FAO statistical yearbook was only 3 thousand vessels in the same year. Similarly a number of countries do not report the figures of non-powered vessels available to the FAO statistical data.

Table 5 Number of fishing vessels in selected countries in Asia and the Pacific.

| Country | | Vessels (Thousands) | |
|------------|-------|---------------------|--------|
| | | 2010 | 2014 |
| Australia* | Total | 309 | 318 |
| China** | PW | 695.5 | 709 |
| | NP | 390.9 | 379.1 |
| | Total | 1088.4 | 1090.1 |
| Indonesia | PW | 403.9 | 484.8 |

⁵ FAO. 2016. *The State of World Fisheries and Aquaculture 2016. Contributing to food security and nutrition for all*. Rome. 200 pp.

| | | | |
|-------------|-------|-------|-------|
| | NP | 31.1 | 321 |
| | Total | 435.1 | 805.7 |
| India | PW | 133.3 | 133.3 |
| | NP | 104.1 | 100 |
| | Total | 237.3 | 233.3 |
| Myanmar | PW | 15.9 | 15.2 |
| | NP | 17.1 | 13.7 |
| | Total | 32.9 | 29 |
| Japan | PW | 283.9 | 81.6 |
| | NP | 8.9 | 3.8 |
| | Total | 292.8 | 85.4 |
| Vietnam | PW | 131 | 129.4 |
| | NP | - | - |
| | Total | 131 | 129.4 |
| Philippines | PW | 184 | 184 |
| | NP | 292.2 | 290 |
| | Total | 476.2 | 474 |
| Thailand | PW | 15.4 | 16.5 |
| | NP | - | - |
| | Total | 15.4 | 16.5 |
| Korea, Rep | PW | 74.7 | 69.3 |
| | NP | 2.3 | 2 |
| | Total | 77 | 71.3 |
| Bangladesh | PW | 21.1 | 22.1 |
| | NP | 33.1 | 34.3 |

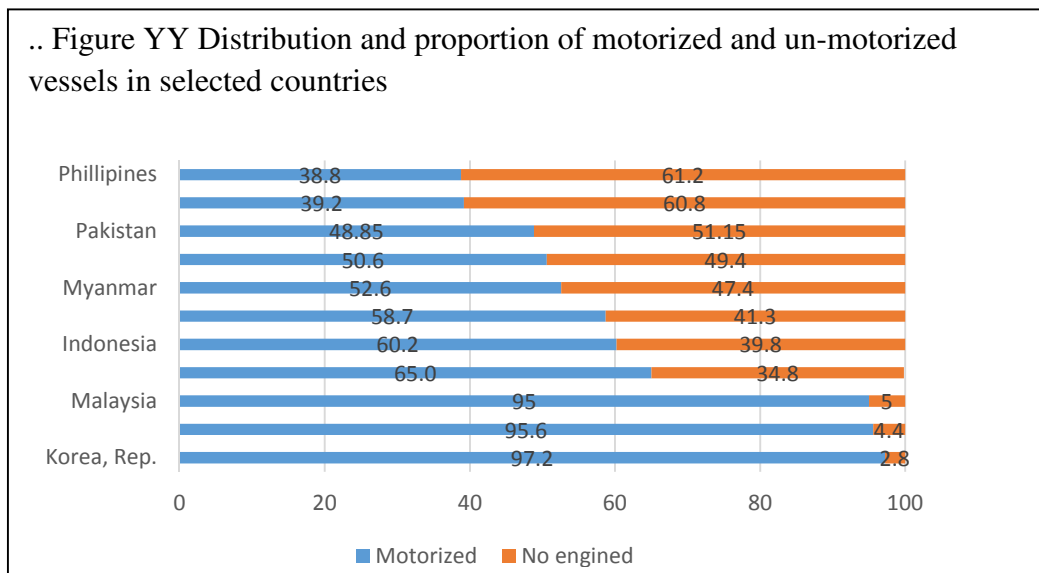
| | | | |
|------------------|-------|------|------|
| | Total | 54.2 | 56.4 |
| Malaysia | PW | 46.8 | 57.9 |
| | NP | 3 | 3 |
| | Total | 49.8 | 61 |
| Sri Lanka | PW | 26 | 31.2 |
| | NP | 28.2 | 22 |
| | Total | 54.1 | 53.1 |
| Pakistan | PW | 17.2 | 17.5 |
| | NP | 18 | 18.3 |
| | Total | 35.2 | 35.8 |
| New Zealand | PW | 1.4 | 1.3 |
| | NP | - | - |
| | Total | 1.4 | 1.3 |
| Papua New Guinea | PW | 0.6 | 0.7 |
| | NP | - | - |
| | Total | 0.6 | 0.7 |
| Korea, DPR | PW | 1.5 | 1.5 |
| | NP | 1.5 | 1.5 |
| | Total | 3 | 3 |

PW: Motorized vessels propelled by engines, NP: Un-motorized vessels propelled by oars or sails.

Remark: *China in this table refers to People's Republic of China and Taiwan Province of China

** Data from OECD.Stat

.. Figure YY Distribution and proportion of motorized and un-motorized vessels in selected countries



SPECIES COMPOSITION TRENDS IN ASIA AND THE PACIFIC REGION

In 2014, the region's catch composition was dominated by pelagic marine fish (32 percent, 12.6 million tonnes), followed by demersal marine fish (19 percent, 7.7 million tonnes), marine fish nei (18 percent, 7.0 million tonnes), freshwater and diadromous (16 percent, 6.2 million tonnes), crustaceans (6 percent, 2.5 million tonnes), cephalopods (4 percent, 1.6 million tonnes), molluscs excluding cephalopods (4 percent, 1.5 million tonnes), and aquatic plants (1 percent, 0.2 million tonnes).

The catch of pelagic marine fish in Asia and Pacific region peaked at 13.7 million tonnes in 1988 and declined to around 11 million tonnes where it has been relatively stable between late 1990s and early 2000 (Figure 6). The production has been slightly but contentiously increasing since 2009.

Freshwater and diadromous recorded the most prominent increase during the past decade (+ 34 percent), whereas molluscs excluding cephalopods was the most decreased species group (- 5%).

.. Figure 6 Trends in capture production by species group

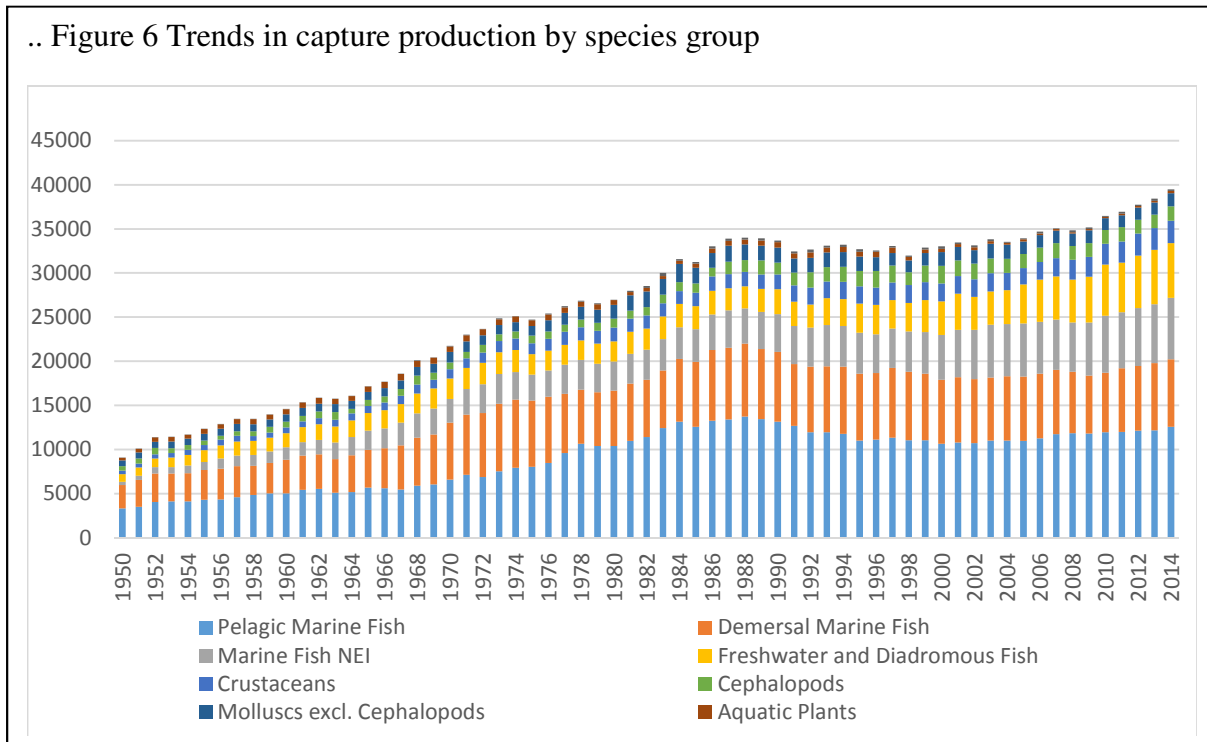
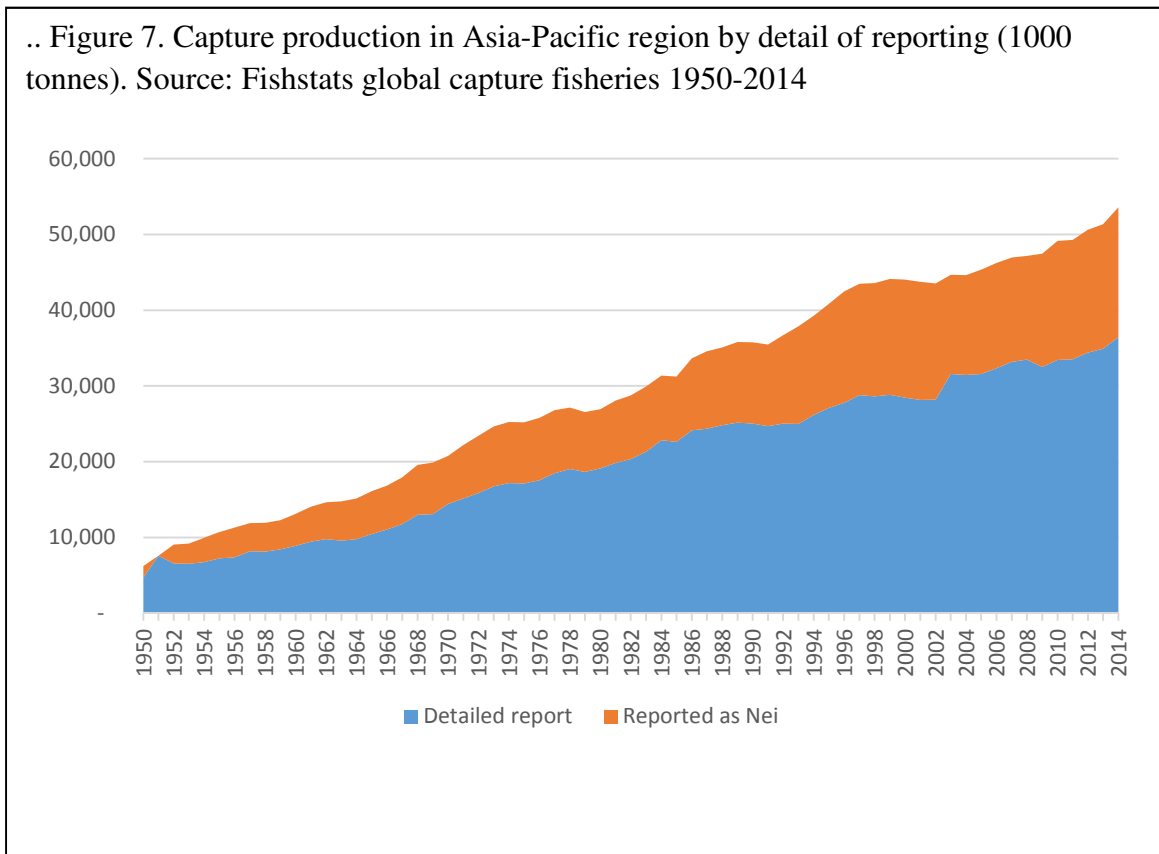


Table 6 Top twenty capture production species in Asia and the Pacific region in 2004 and 2014. Source: Fishstats.

| Ranking | 2004 | 1000 tonnes | 2014 | 1000 tonnes |
|---------|--------------------|-------------|--------------------|-------------|
| 1 | Japanese anchovy | 1636 | Skipjack tuna | 2071 |
| 2 | Skipjack tuna | 1626 | Japanese anchovy | 1396 |
| 3 | Largehead hairtail | 1336 | Scads nei | 1267 |
| 4 | Scads nei | 1156 | Largehead hairtail | 1198 |

| | | | | |
|-----------|-------------------------|-----|--------------------------|------|
| 5 | Chub mackerel | 971 | Chub mackerel | 1179 |
| 6 | Natantian decapods nei | 904 | Natantian decapods nei | 1117 |
| 7 | Marine molluscs nei | 807 | Yellowfin tuna | 837 |
| 8 | Yellowfin tuna | 773 | Croakers, drums nei | 830 |
| 9 | Croakers, drums nei | 731 | Argentine shortfin squid | 652 |
| 10 | Various squids nei | 647 | Threadfin breams nei | 639 |
| 11 | Akiami paste shrimp | 580 | Marine molluscs nei | 632 |
| 12 | Threadfin breams nei | 524 | Gazami crab | 606 |
| 13 | Japanese flying squid | 447 | Various squids nei | 590 |
| 14 | Sardinellas nei | 390 | Cyprinids nei | 571 |
| 15 | Seerfishes nei | 373 | Pacific saury | 558 |
| 16 | Freshwater molluscs nei | 361 | Akiami paste shrimp | 556 |
| 17 | Bigeye tuna | 353 | Seerfishes nei | 473 |
| 18 | Aquatic plants nei | 335 | Indian oil sardine | 462 |
| 19 | Silver pomfrets nei | 328 | Cephalopods nei | 445 |
| 20 | Indian oil sardine | 326 | Sardinellas nei | 436 |

.. Figure 7. Capture production in Asia-Pacific region by detail of reporting (1000 tonnes). Source: Fishstats global capture fisheries 1950-2014



PRODUCTION IN TEMPERATE AND TROPICAL SEAS

Following the methodologies used in the 2008 APFIC review, the reported data were divided into two distinct regions, temperate and tropical, allows a degree of analysis of the changes in composition of reported catch and some trends in the fisheries. The FAO reporting areas 61 and 81 being temperate and the others being predominantly tropical (FAO areas 51, 57, 71 and 77). In order to identify trends, the species were aggregated into some clear functional groups to illustrate better the effect of targeted fishing for larger or more valuable species.

The divisions used are as follow:

Pelagics — split between large high-value carnivores, lower-value carnivores and plankton feeding species.

- Large (tuna type species, seerfish, large mackerels).
- Small (small mackerels, scads etc.).
- Anchovies, herrings etc.

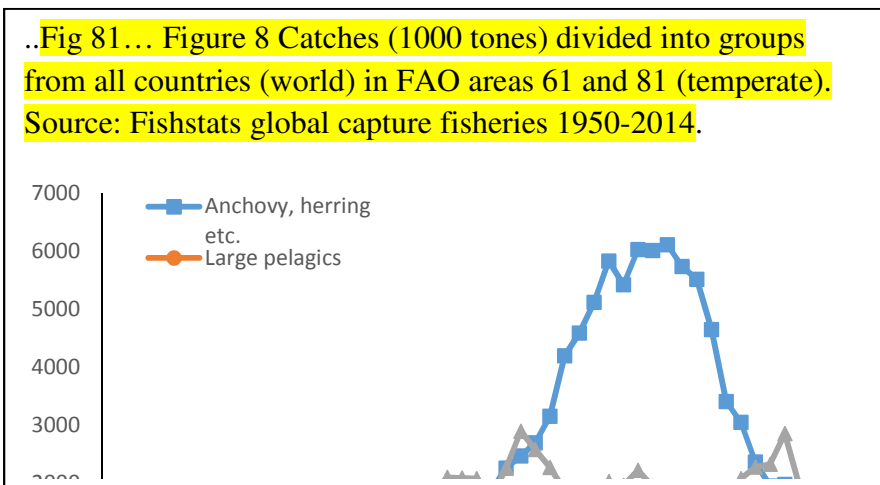
Demersals — generally considered to be nearshore species or associated with bottom fisheries, reef fisheries, and not particularly migratory.

- High-value (Alaska pollock, snappers, croakers, groupers, reef fish, flatfish).
- Low-value (small species).
- Sharks, rays etc. (maybe high- or low-value, but worth considering separately because of their size and sensitivity to fishing pressure).

Shrimp, prawns, other crustaceans — can be divided into those with high value and specifically targeted and the low-value species caught as by-catch.

- High value (*Peneaus* spp, lobsters, crabs).
- Low value (especially *Acetes*, caught in huge volumes but low value).

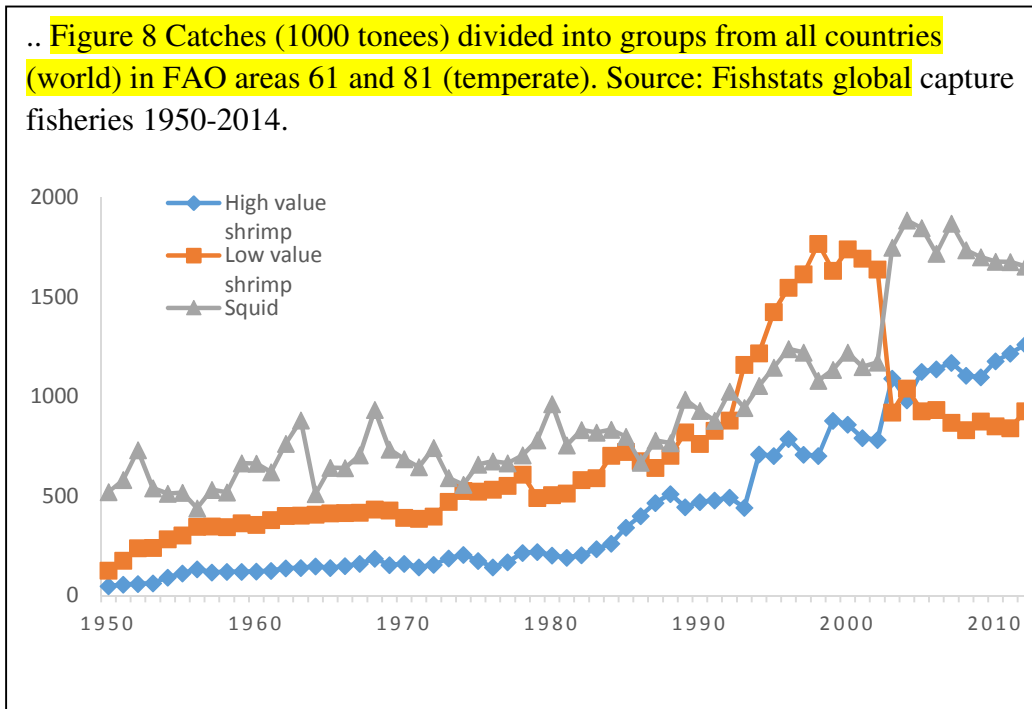
Squids and other cephalopods (carnivorous species, but often increase when their natural predators, the larger carnivores (pelagic/demersal) are fished down.



.. Figure 8 Catches (1000 tones) divided into groups from all countries (world) in FAO areas 61 and 81 (temperate). Source: Fishstats global capture fisheries 1950-2014.



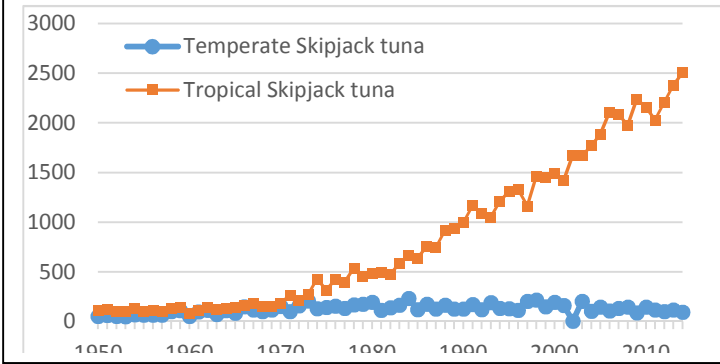
.. Figure 8 Catches (1000 tonnes) divided into groups from all countries (world) in FAO areas 61 and 81 (temperate). Source: Fishstats global capture fisheries 1950-2014.



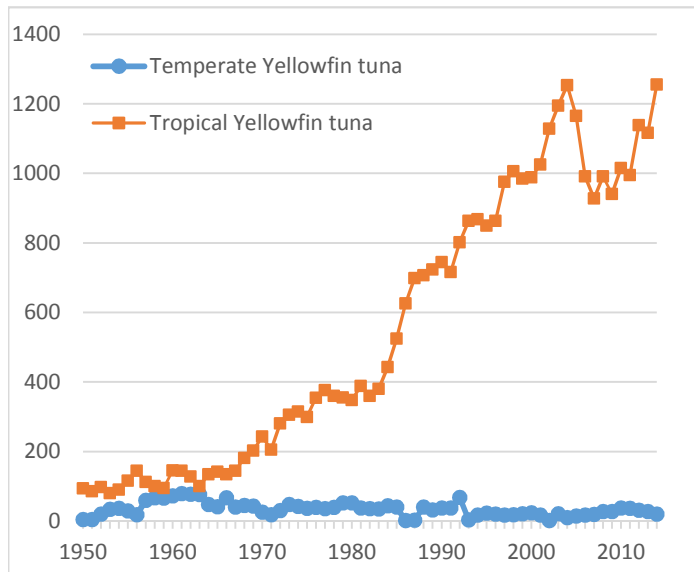
TUNA

Tuna species have distinctive historical catch trends between tropical and temperate area. The fishery yields from tropical water are rapidly increasing during the past decades, where as that of temperate area is stagnated if not decreasing. The trend is observed for many tuna species except bluefin tuna where both tropical and temperate catches are decreasing with some yearly variations.

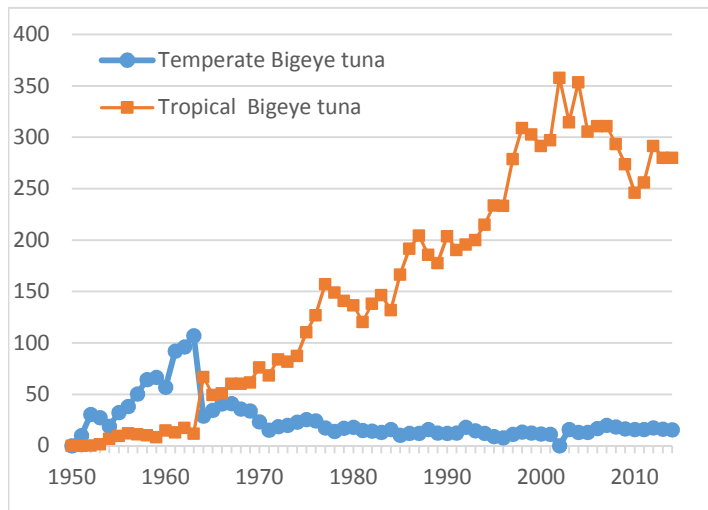
.. Figure 10 Tuna catches by species in temperate and tropical seas of Asia and the Pacific region. Source: Fishstats global capture fisheries 1950-2014 (Species by ISSCAAP group).



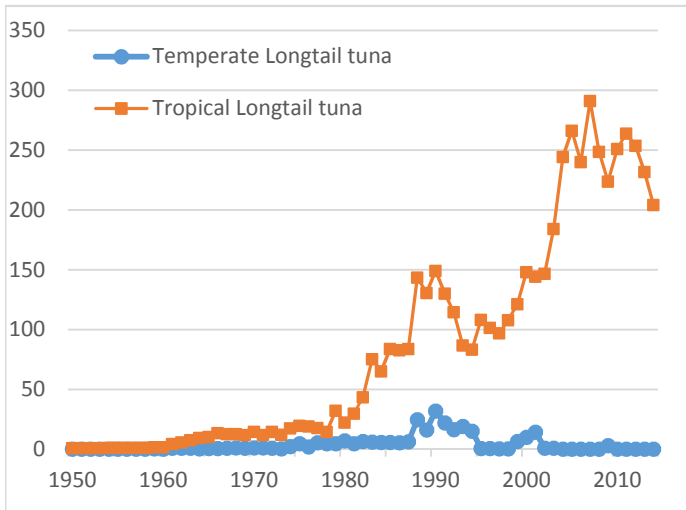
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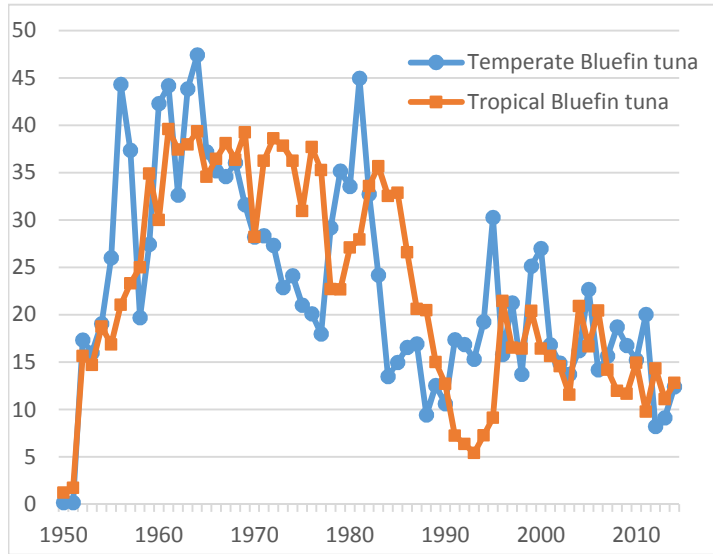
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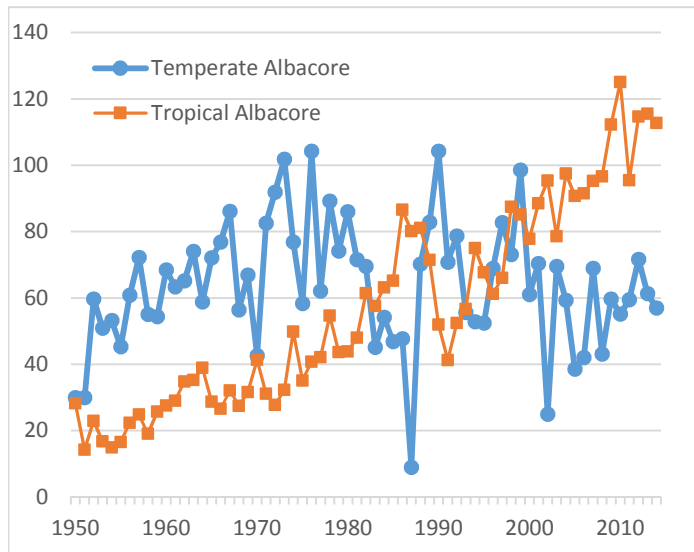


Table 7 Latest tuna stock assessment 2015. Source: IOTC and WCPFC data

Table 8 Tuna management measures that need to be implemented according to IOTC and WCPFC. IOTC and WCPFC website data

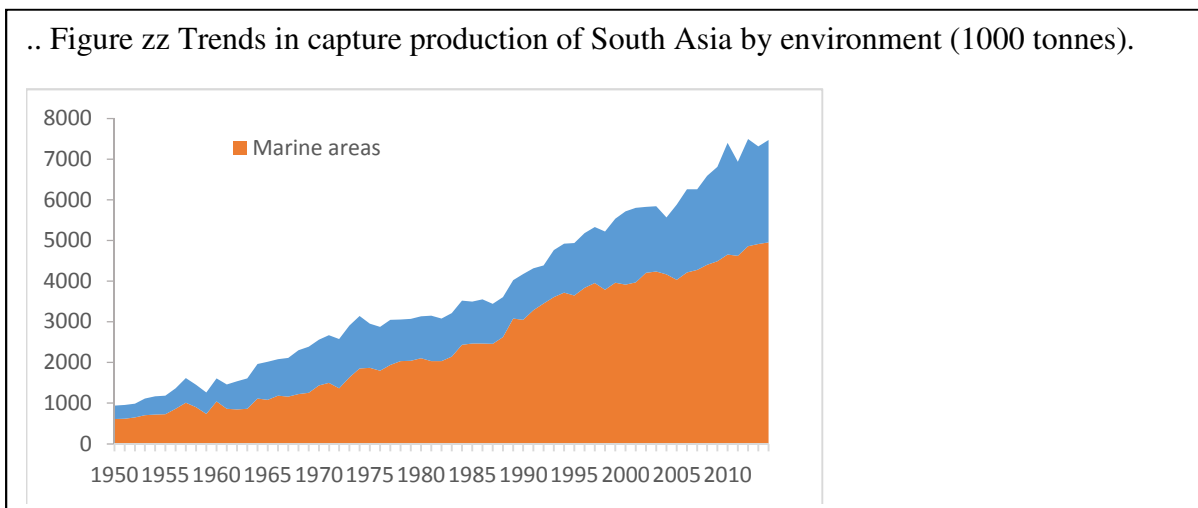
4.3 Sharks Figure xx Sharks caught in either temperate or tropical seas in Asia and the Pacific region Source: Fishstats global capture fisheries 1950-2014 (Species by ISSCAAP group)

4.4 Low-value/trash fish production

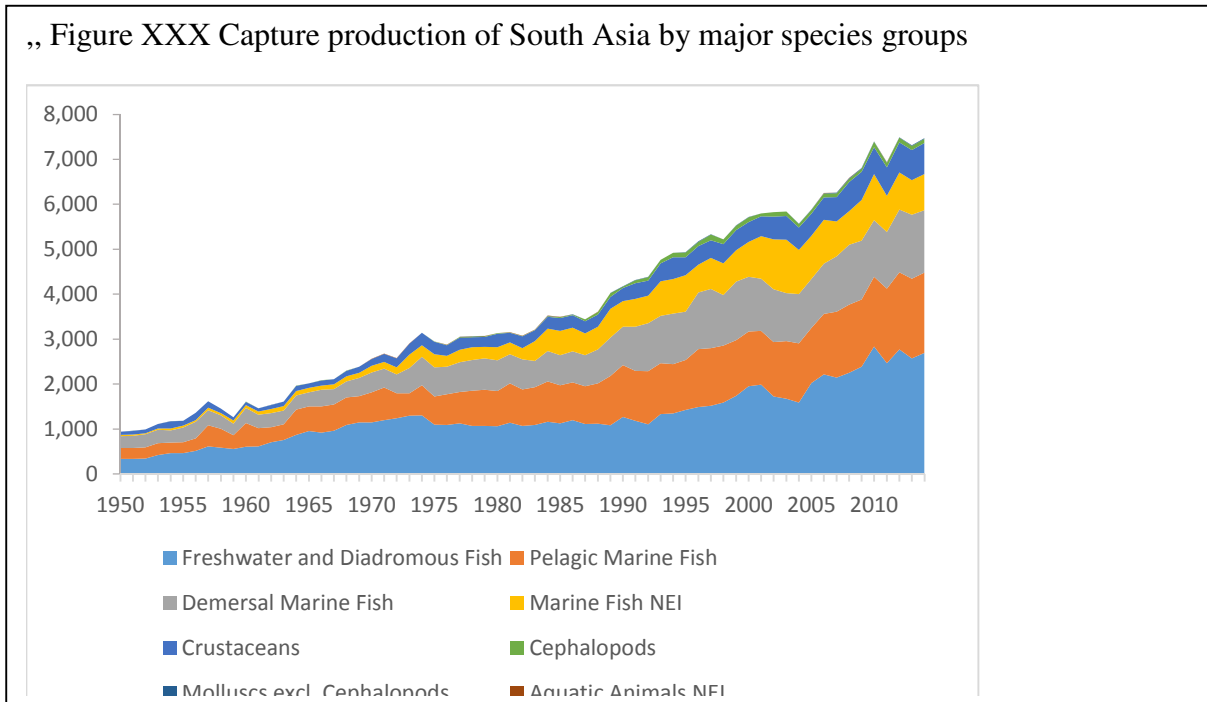
SUBREGIONAL TRENDS

South Asia

Total capture production of South Asia has been continuously increasing during the past decade. Since 2004, South Asia subregion had become a second largest share of inland capture production in Asia and the Pacific after Southeast Asia subregion. Inland capture production increased from 1.8 million tonnes in 2005 to 2.5 million tonnes in 2014 (+ 27.7 percent), of which India, Bangladesh, and Sri Lanka were the main contributors (accounted for 45.7, 8.0, and 6.2 percent of total marine production respectively). Meanwhile, marine capture production increased from 4 million tonnes in 2005 to nearly 5 million tonnes in 2014 (+ 18.5 percent), of which India, Bangladesh and Pakistan are the main contributors (accounted for 17.4, 13.3, and 1.7 percent of total marine production respectively) (Figure zz).



In term of species compositions, South Asia’s catch was dominated by freshwater fish (36 percent of total catch), marine pelagic species (24 percent) and demersal species (19 percent) which were relatively equally distributed compare to the other subregions (Figure XXX). Between 2005 and 2014, following three species groups showed outstanding growth; cephalopods (accounted for 40.6 percent), pelagic marine fish (31.5 percent), and crustaceans (28.4 percent).



The most dominant capture species in the region was cyprinids nei, 516 thousand tonnes, accounted for 18.5 percent of total top ten species (Table XX), and followed by hilsa shad (14.5 percent). It should be noted that increasing volume of freshwater fish production were not identified down to species level and reported as freshwater fishes nei (1.5 million tonnes in 2014, 56 percent of total top ten species). A number of pelagic and demersal species were also ranked high in the list such as Indian oil sardine (14.5 percent) and croakers/drums (10.3 percent).

Table 9 South Asia capture fisheries production, top ten species. Source: Fishstats global capture fisheries 1950-2014.

| | Species | (1000 tonnes) |
|-----------|------------------------|----------------------|
| 1 | Cyprinids nei | 529 |
| 2 | Indian oil sardine | 462 |
| 3 | Hilsa shad | 410 |
| 4 | Croakers, drums nei | 292 |
| 5 | Clupeoids nei | 249 |
| 6 | Bombayduck | 248 |
| 7 | Natantian decapods nei | 206 |
| 8 | Skipjack tuna | 206 |
| 9 | Yellowfin tuna | 177 |
| 10 | Giant tiger prawn | 176 |
| | | |
| 11 | Cyprinids nei | 516 |
| 12 | Hilsa shad | 406 |

.. Figure 13 Trends in capture production of Southeast Asia by environment (1000 tonnes) Source: Fishstats global capture fisheries 1950-2014

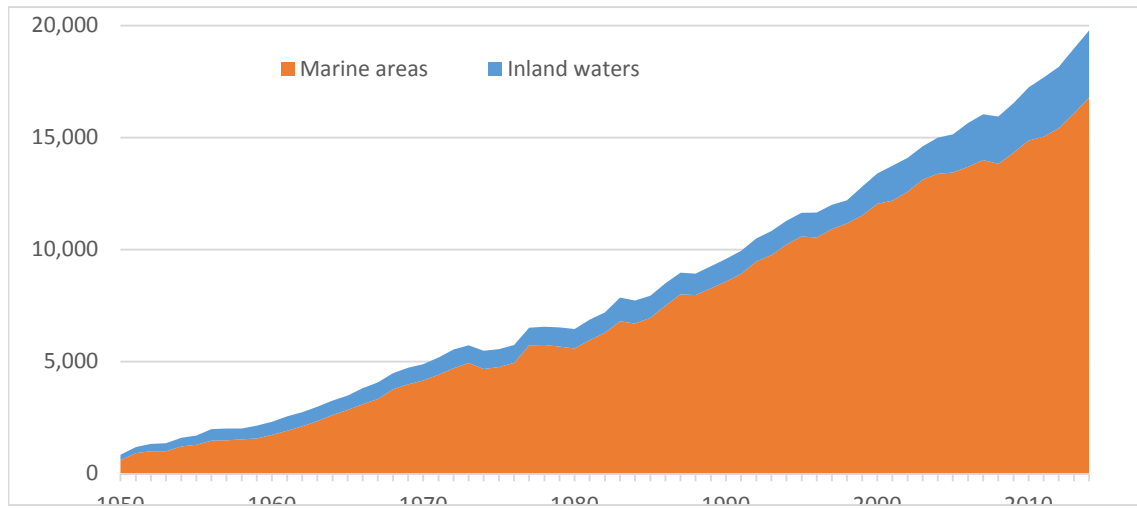


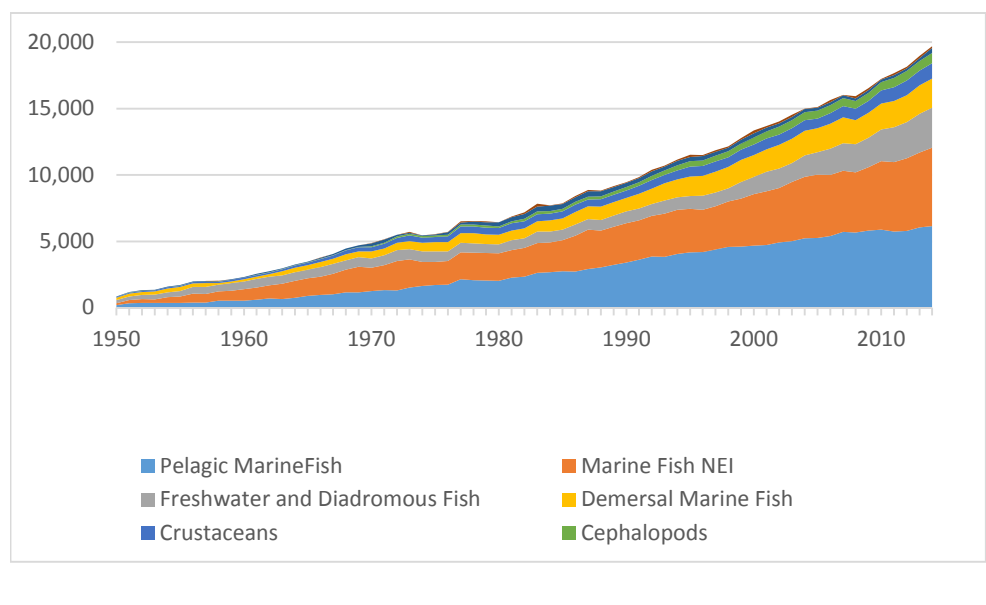
Table 10 Southeast Asia capture fisheries production, top ten species

Source: Fishstats global capture fisheries 1950-2014

| | Species | (1000 tonnes) |
|----|---------------------------|----------------------|
| 1 | Skipjack tuna | 713 |
| 2 | Scads nei | 653 |
| 3 | Natantian decapods nei | 625 |
| 4 | Sardinellas nei | 435 |
| 5 | Yellowfin tuna | 339 |
| 6 | Indian mackerels nei | 324 |
| 7 | Short mackerel | 309 |
| 8 | Stolephorus anchovies nei | 295 |
| 9 | Common squids nei | 291 |
| 10 | Kawakawa | 288 |

•

.. Figure 14 Capture production of Southeast Asia by major species groups (1000 tonnes) Source: Fishstats global capture fisheries 1950-2014



CHINA CAPTURE FISHERIES

Table 11 China capture fisheries production, top ten species (1000 tonnes). Source: Fishstats global capture fisheries 1950-2014

| | Species | (1000 tonnes) |
|----|--------------------------|---------------|
| 1 | Largehead hairtail | 1089 |
| 2 | Japanese anchovy | 927 |
| 3 | Scads nei | 605 |
| 4 | Gazami crab | 578 |
| 5 | Chub mackerel | 546 |
| 6 | Akiami paste shrimp | 538 |
| 7 | Argentine shortfin squid | 537 |
| 8 | Seerfishes nei | 433 |
| 9 | Threadfin brems nei | 429 |
| 10 | Various squids nei | 419 |

Table 12 Unidentified capture production in China (1000 tonnes)

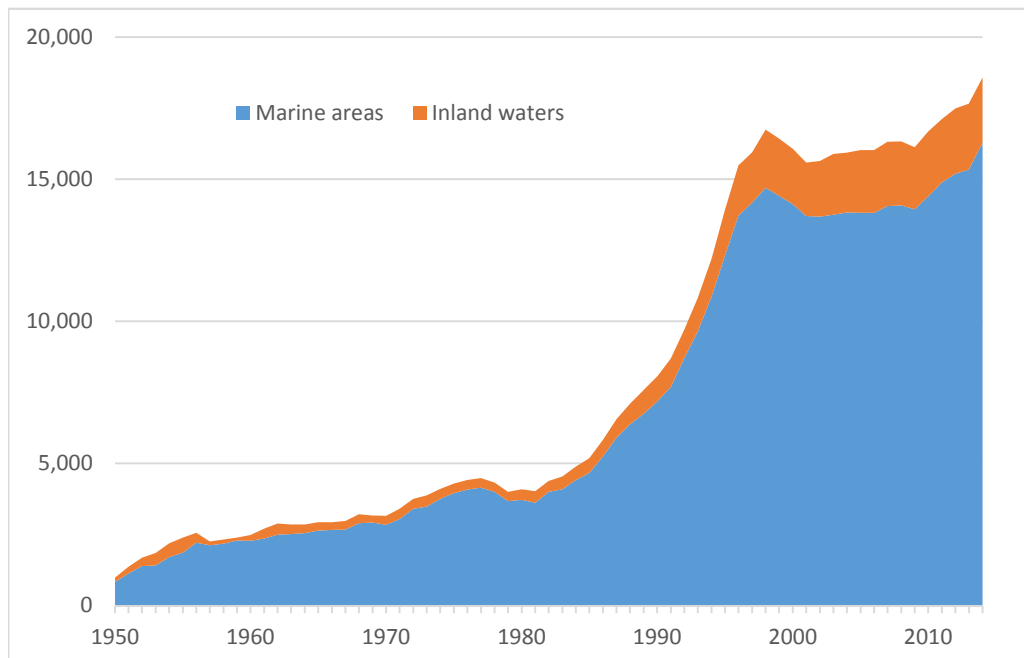
Source: Fishstats global capture fisheries 1950-2014

| Species group | 2004 | 2009 | 2014 |
|-------------------------|------|------|------|
| Freshwater fishes nei | 1494 | 1526 | 1673 |
| Freshwater molluscs nei | 298 | 284 | 263 |

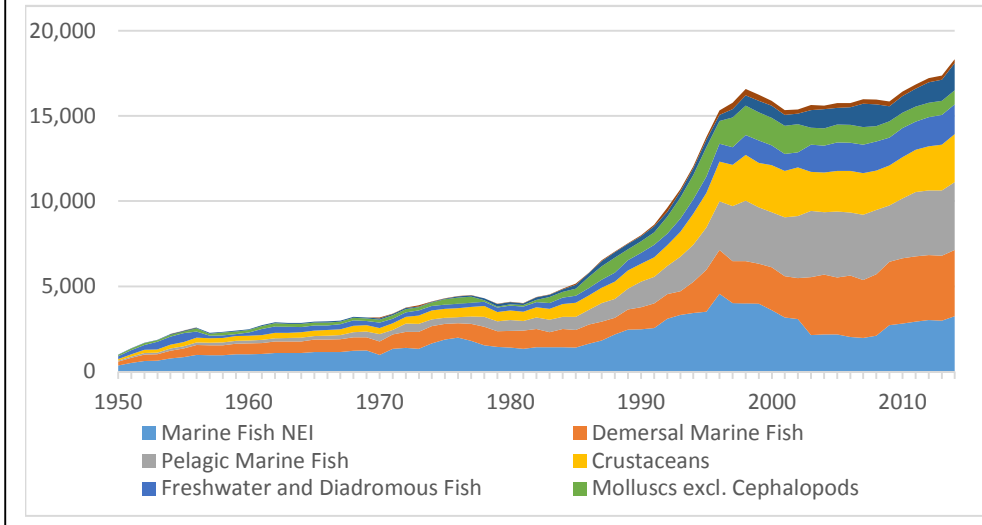
| | | | |
|-------------------------------|-------|-------|-------|
| Freshwater crustaceans nei | 0 | 0 | 0 |
| Marine fishes nei | 2164 | 2721 | 3252 |
| Marine molluscs nei | 722 | 672 | 553 |
| Marine crustaceans nei | 0 | 0 | 0 |
| Total of "nei" groups | 6682 | 7213 | 7755 |
| Total capture production | 15934 | 16125 | 18581 |
| % contribution of "nei" group | 42 | 45 | 42 |

.. Figure 15 Trends in capture production of China by environment (1000 tonnes)

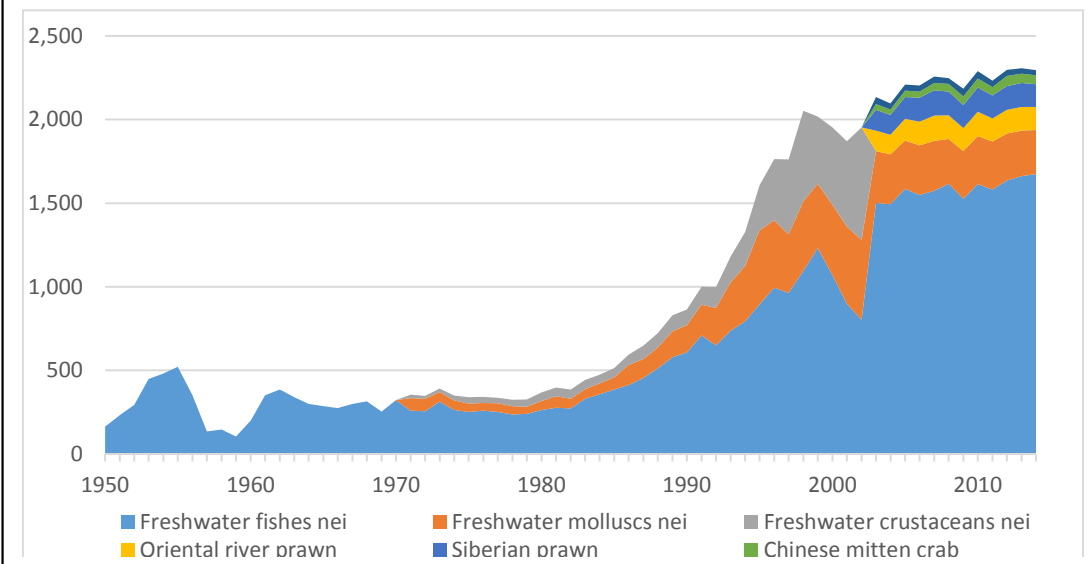
Source: Fishstats global capture fisheries 1950-2014



.. Figure 16 Capture production of China by major species groups (1000 tonnes)Source: Fishstats global capture fisheries 1950-2014



.. Figure 17 Inland water capture production of China by species (1000 tonnes)Source: Fishstats global capture fisheries 1950-2014



OTHER ASIA

The capture production in the other Asia region largely dominated by production of Japan, and Korea DPR shows quite a different trends from rest of the subregions. The historical production peaked in 1980's , with rapid reduction in 90's and remain stagnated or slightly decreasing for past two decades. However the production was slightly increased for the past 2 consecutive years.

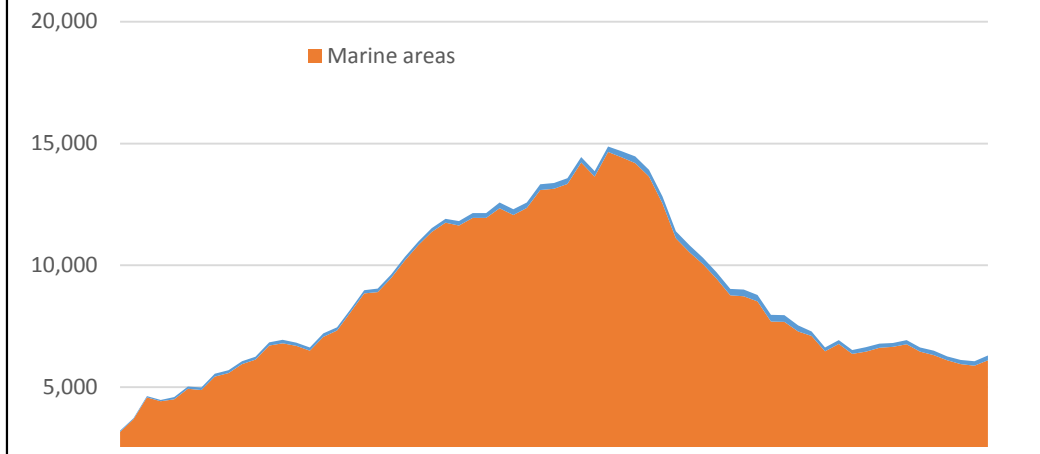
Species composition of 2014 was shown in Table 13, Chub mackerel was dominated species although the yield of this species fluctuate yearly (17 percent reduction from 2012 to 2013, followed by 23 percent increase between 2013 to 2014).

Table 13. Other Asia countries' capture fisheries — top ten species

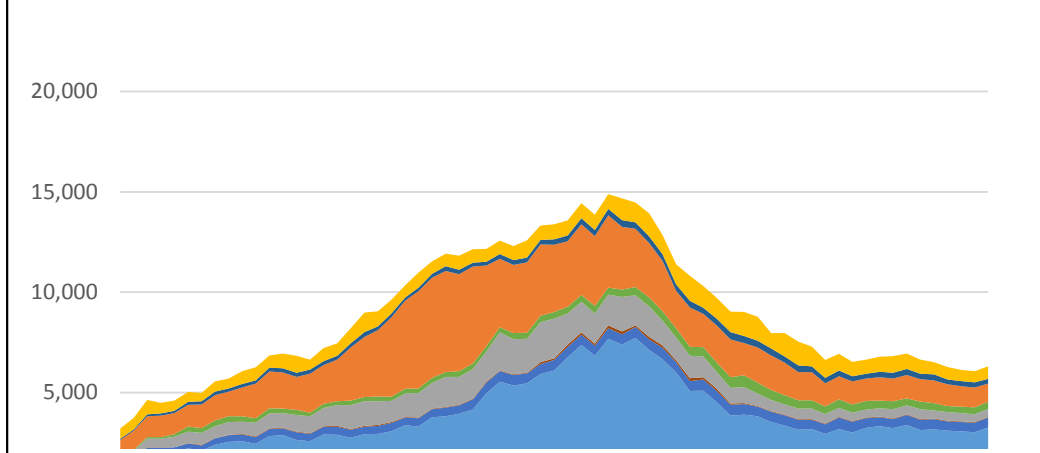
Source: Fishstats global capture fisheries 1950-2014

| | Species | (1000 tonnes) |
|-----------|--------------------------------|----------------------|
| 1 | Chub mackerel | 631 |
| 2 | Skipjack tuna | 502 |
| 3 | Japanese anchovy | 470 |
| 4 | Marine fishes nei | 397 |
| 5 | Japanese flying squid | 337 |
| 6 | Yesso scallop | 359 |
| 7 | Alaska pollock(=Walleye poll.) | 262 |
| 8 | Paciic saury | 251 |
| 9 | Japanese pilchard | 202 |
| 10 | Japanese jack mackerel | 171 |

.. • Figure 18 Trends in capture production of Other Asia by environment (1000 tonnes). Source: Fishstats global capture fisheries 1950-2014



.. Figure 19 Capture production of Other Asia by major species groups (1000 tonnes) Source: Fishstats global capture fisheries 1950-2014



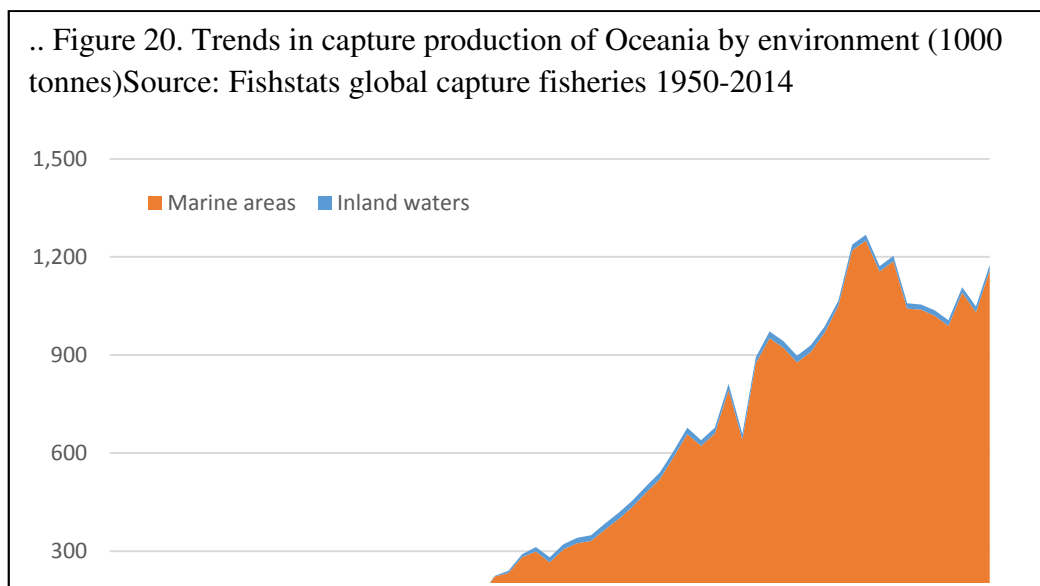
OCEANIA

Table 14 Oceania capture fisheries production — top ten species

Source: Fishstats global capture fisheries 1950-2014

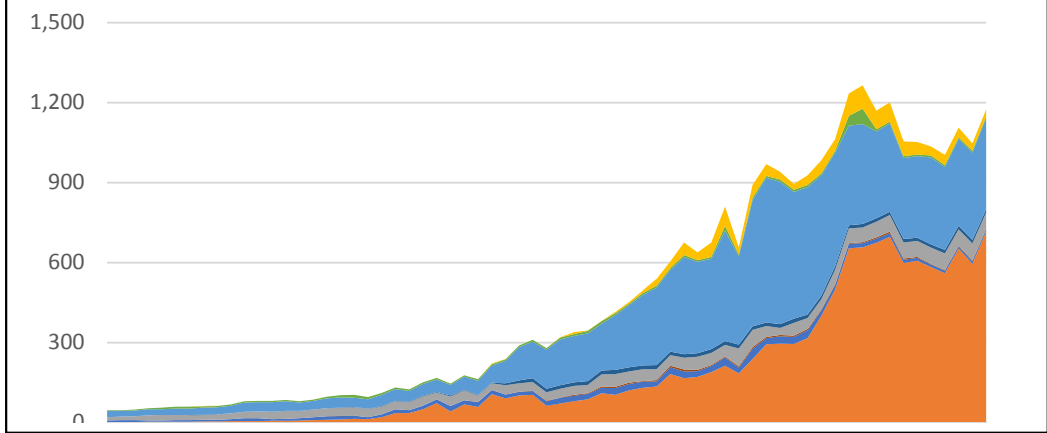
| | Species | (1000 tonnes) |
|-----------|------------------------------|----------------------|
| 1 | Skipjack tuna | 416 |
| 2 | Blue grenadier | 149 |
| 3 | Yellowfin tuna | 138 |
| 4 | Marine fishes nei | 60 |
| 5 | Jack and horse mackerels nei | 50 |
| 6 | Albacore | 41 |
| 7 | Southern blue whiting | 32 |
| 8 | Snoek | 26 |
| 9 | Chilean jack mackerel | 15 |
| 10 | Wellington flying squid | 15 |

.. Figure 20. Trends in capture production of Oceania by environment (1000 tonnes) Source: Fishstats global capture fisheries 1950-2014



.. Figure 21 Capture production of Oceania by major species groups

Source: Fishstats global capture fisheries 1950-2014



REGIONAL TRENDS FISHERIES

Contribution of Aquaculture

Introduction

Global aquaculture production has continued to increase significantly over the years. Indeed, for 2 decades (1990-2010), the sector registered the highest growth rate among the food production sectors, growing at an average growth rate of 7.8 percent outpacing those of poultry, pork and beef that grew by 1.0-4.6 percent over the same year period (Hall et al., 2011). With the unprecedented growth in the sector, it is not surprising to see that the contribution of the aquaculture sector to the supply of fish for human consumption surpassed that of capture fisheries for the first time in 2014. While the sector's contribution to the supply of fish for human consumption was only 7 percent in 1974, it increased to 39 percent in 2004, 49 percent in 2012, and was more than 50 percent in 2014 (FAO, 2016). This is very significant and timely considering that the share of the global capture fisheries to the global fish supply has remained constant in some regions and even showed a decline in the catch from several major fishing grounds indicating overexploitation of some species in some areas or that the maximum catch potential of some of the major fishing grounds have already been reached. The steady increase in the production of the aquaculture sector during the years when catch volume from the capture fisheries has leveled off can be considered as a saving factor enabling a continued increase in fish supply to the global market to meet the increasing demand for fishery products brought about by the increasing global population, and the appreciation among the population of the nutritional benefits that can be derived from consuming fishery products.

In the scenario of global aquaculture production, the Asia-Pacific region has always been the leader. For the past 2 decades, Asia has accounted for about 89 percent of the world's production of fish for human consumption. As in the previous years, the countries in the region contributed 91 percent to the total global production in 2014 and 7 of these countries are in the top ten highest aquaculture producing countries (Table 1). With the magnitude of fish production from aquaculture in the region, it can be said that the Asia-Pacific region is feeding the world with fish and other aquatic products that are produced in farms.

Because of the significance of the Asia-Pacific region in providing supply of aquaculture products to the global market, it is important that we review and evaluate the present status and trends of the aquaculture production in the region in the past years, particularly during the years 2012 to 2014. Mistakes in the past can then be avoided while successes of the fish farmers can be promoted and replicated in other places to improve current practices. The lessons learned from the past years can be very helpful in sustaining the growth of the sector in the future.

Table 1. Top ten aquaculture producing countries in 2014 and their production in 2012 (x 1000 Tonnes). (x

| Country | 2014 | | | 2012 | | | % Change (2012-2014) |
|----------------------------|-----------------|----------------|------------------|-----------------|----------------|------------------|----------------------|
| | Aquatic animals | Aquatic plants | Total production | Aquatic animals | Aquatic plants | Total production | |
| China | 45 469.0 | 13 326.3 | 58 795.3 | 41 108.3 | 12 832.0 | 53 940.3 | + 9.0 |
| Indonesia | 4 253.9 | 10 077.0 | 14 330.9 | 3 067.7 | 6 514.8 | 9 582.5 | + 49.5 |
| India | 4 881.0 | 3.0 | 4 884.0 | 4 209.4 | 4.5 | 4 213.9 | + 15.9 |
| Viet Nam | 3 397.1 | 14.3 | 3 411.4 | 3 085.5 | 234.6 | 3 320.1 | + 2.7 |
| Philippines | 788.0 | 1 549.6 | 2 337.6 | 790 894 | 1 751.01 | 2 542.0 | - 8.0 |
| Bangladesh | 1 956.9 | --- | 1 956.9 | 1 726.1 | --- | 1 726.1 | + 13.4 |
| Korea (Republic of) | 480.4 | 1 087.0 | 1 567.4 | 484.4 | 1 022.3 | 1 506.7 | + 4.0 |
| Norway | 1 332.5 | --- | 1 332.5 | 1 321.1 | --- | 1 321.1 | + 0.9 |
| Chile | 1 214.5 | 12.8 | 1 227.4 | 1 071.4 | 4.1 | 1 075.5 | + 14.1 |
| Egypt | 1 137.1 | --- | 1 137.1 | 1 017.7 | --- | 1 017.7 | + 11.7 |

In this biennial review on the current status and trends of aquaculture development in the AP region (2012-2014), the FAO Global Fishery and Aquaculture Statistics (FAO_FI_GLOBALS Version 2016.1.2) of the Food and Agriculture Organization of the United Nations (FAO) is the main source of the data. The time series data are generated using FAO FishStatJ software. To be consistent with the review done for the years 2010-2012, the current review categorized the countries in the region into the following sub-regions outlined in Annex A.

General Status and Trends in Aquaculture Production in the Asia-Pacific Region

The total global aquaculture production in 2014 reached 101.1 million tonnes, up by 10.7 million tonnes from the 2012 production of 90.4 million tonnes or an increase of 11.8 percent in the intervening 2 years. Of the total global production, the production of fish/aquatic animals represents 73 percent (73.8 million tonnes) and 27 percent is from seaweeds and other aquatic plants (27.3 million tonnes). The 2014 production of fish/aquatic animals is 10.8 percent higher than the production in 2012 (66.6 million tonnes) and that of seaweeds and other aquatic plants is 14.7 percent higher than in 2012 (23.8 million tonnes). The total value of the 2014 global aquaculture production is equivalent to USD 165.8 B, and 96.6 percent of this or USD 160.2 B is from fish/aquatic animals and the remaining 3.4 percent or USD 5.6 B is from seaweeds and other aquatic plants (FAO 2016, FAO 2014).

Over the years, countries in the Asia-Pacific region have always been the leader in global aquaculture production. The aquaculture sector in the Asia-Pacific region listed a staggering number of species that are being farmed. There is great diversity of species cultivated with some 225 species, at family or species level, that are cultured in the region. Among these are 129 species of finfish, 33 species of mollusks, 31 species of crustaceans, 18 aquatic plants, 10 other invertebrates (jellyfish, sea urchins, sea cucumber), 2 amphibians (frogs) and 2 reptiles (turtles) (APFIC, 2014). With this variety of species cultured in the region, the total (aquatic animals and plants) aquaculture production in the region in 2014 reached 92.3 million tonnes or 91.3 percent of the total global aquaculture production. About 65.1 million tonnes or 70.5 percent of the production is from fish/aquatic animals and 27.1 million tonnes or 29.5 percent is from aquatic plants. The production in the Asia-Pacific region in 2014 has increased by 12.6 percent over the 2012 level (81.9 million tonnes). In terms of value, the whole Asia-Pacific region contributed USD 127.2 B or 76.7 percent to the total value of the global aquaculture production in 2014. Of this amount, USD 121.6 B (70.5 percent) is from fish/aquatic animal production and USD 5.6 B (29.5 percent) is from aquatic plants.

For several decades now, the dominance of the countries in the Asia-Pacific region in its contribution to the global aquaculture production is evident in that many countries in the region are always at the top of the aquaculture producing countries worldwide. In 2014, 7 of these countries are in the top ten aquaculture producing countries in the world (Table 1), similar to the previous years. Due to the vastness of its area, the enormous number of people engaged in aquaculture activities, and the great diversity of species farmed, China alone accounted for 58.2 percent or 58.8 million tonnes in the global aquaculture production. Likewise, Indonesia and India contributed 14.3 million tonnes (14.2 percent) and 4.9 million tonnes (4.8 percent), respectively, to the global production. Within the Asia-Pacific region, China accounted for 63.7 percent of the total aquaculture production. The other major contributing countries are Indonesia (15.5 percent or 14.3 million tonnes), India (5.3 percent or 4.9 million tonnes), Viet Nam (3.7 percent or 3.4 million tonnes) and the Philippines (2.5 percent or 2.3 million tonnes). China's contribution to aquatic animal production in the region in 2014 is equivalent to 69.9 percent or 45.5 million tonnes, and the remaining 30 percent is contributed by India (7.5 percent or 4.9 million tonnes), Indonesia (6.4

percent or 4.2 million tonnes), Viet Nam (5.2 percent or 3.4 million tonnes), Bangladesh (2.9 percent or 1.9 million tonnes), Myanmar (1.5 percent or 0.96 million tonnes), Thailand (1.4 percent or 0.93 million tonnes), the Philippines (1.2 percent or 0.79 million tonnes), Japan (1.0 percent or 0.66 million tonnes), South Korea (0.7 percent or 0.48 million tonnes), Taiwan POC (0.5 percent or 0.34 million tonnes) and Malaysia (0.4 percent or 0.28 million tonnes). Likewise, China contributed 49.1 percent or 13.3 million tonnes of aquatic plant production in the region. Indonesia (37 percent or 10.1 million tonnes) and the Philippines (5.5 percent or 1.5 million tonnes) are the other 2 major contributing countries in 2014, as in the previous years.

Half of the world aquaculture production in 2014 comes from species that do not require feeding or non-fed species like the herbivorous and omnivorous freshwater species, the filter feeding organisms like the bivalves, and the seaweeds. Similarly, in the Asia-Pacific region, the carps remained the top commodity in terms of production in 2014, with a production volume equivalent to 41.6 percent of the total fish production in the region. This represents a 10.7 percent increase during the 2 year period from 2012-2014. In addition, the seaweeds particularly *Eucheuma* in Indonesia and Japanese kelp and *Gracilaria* in the China sub-region registered more than 30 percent increase in production between 2012 and 2014.

How the different sub-regions in the Asia-Pacific region contributed to the over-all aquaculture production in the region is discussed below. The trend in the aquaculture production of the various countries constituting the different sub-regions during the last ten years (2004-2014) is described. In addition, the trend in the production of the major species that largely contributed to the over-all aquaculture production during the last decade is also discussed.

Status and Trends in Aquaculture Production in the Various Sub-regions in the Asia-Pacific Region

CHINA SUB-REGION

Mainland China, Hong Kong SAR of China and Taiwan Province of China comprise this sub-region. The total aquaculture production of this sub-region in 2014 is 59.1 million tonnes which is equivalent to 64 percent of the total aquaculture production in the Asia-Pacific region. The 2014 production of the sub-region is 8.9 percent higher than in 2012, 22.8 percent than in 2010 and 63 percent than in 2004, and is composed of 45.8 million tonnes or 77.5 percent of fish production and 13.3 million tonnes or 22.5 percent of seaweeds and other aquatic plants. In terms of value, the 2014 production of the sub-region amounted to USD 77 B, which is equivalent to 60.5 percent of the total value of the production in the Asia-Pacific region. Of the said amount, the share of the value of fish and other aquatic animals is 97 percent or USD 74.7 B whereas that of seaweeds and the other aquatic plants amounted to USD 2.3 B or 3 percent of the total value of the sub-region's 2014 production. The trend in the total aquaculture production between 2004 and 2014 among the countries and the major commodity groups in the sub-region are shown in Figures 1 and 2.

Figure 1. China sub-region: Country aquaculture production from 2004-2014

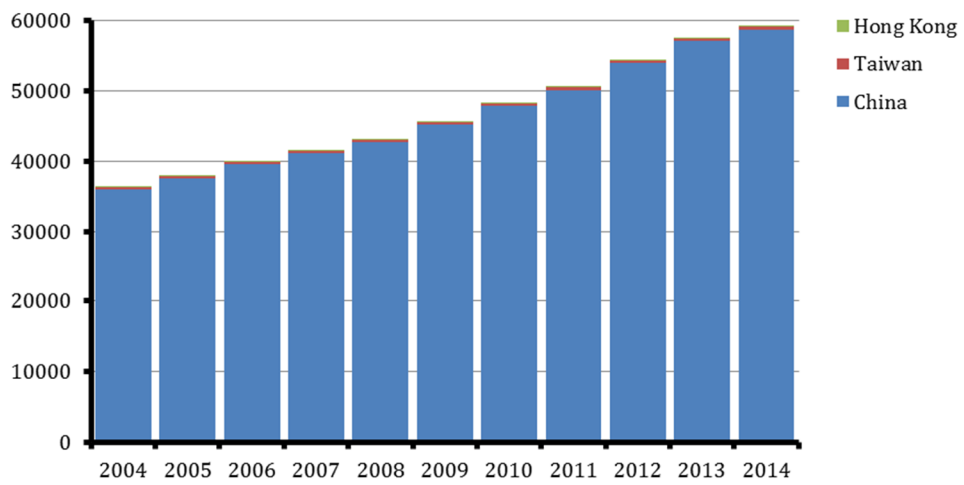
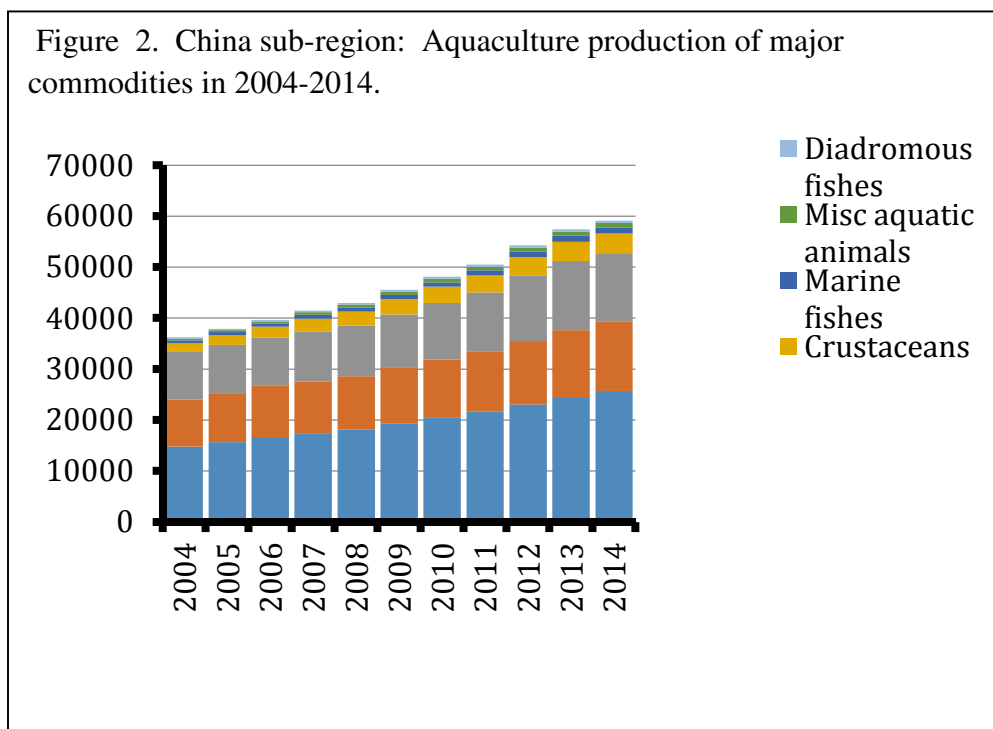


Figure 2. China sub-region: Aquaculture production of major commodities in 2004-2014.



The top 3 major commodities produced in the sub-region are freshwater (FW) fishes, mollusks and seaweeds. The combined production of these 3 major groups constitutes 88.9 percent of the sub-region's total aquaculture production in 2014. FW fishes production is 25.7 million tonnes or 43.5 percent of the total aquaculture production of the sub-region and is 11.5 percent higher than in 2012. The production of the various species of mollusks in 2014 is 13.5 million tonnes or 22.9 percent of the total aquaculture production of the sub-region and increased by 8.6 percent over that of 2012, and seaweeds production in 2014 (13.3 million tonnes) is 3.8 percent higher than in 2012 (12.8 million tonnes) and is equivalent to 22.5 percent of the total aquaculture production of the sub-region.

Among the FW fishes, the carps (grass carp, silver carp, bighead carp, common carp and crucian carp), and Nile tilapia are the major species produced in the sub-region and mainly from China. Grass carp is the top species produced in 2014 with 5 376 803 tonnes production from China, and 750 and 412 tonnes from Taiwan POC and Hong Kong SAR, respectively, and is 20.9 percent of the total FW fish production in the sub-region. The grass carp production in 2014 is 12.4 percent higher than in 2012 (4 781 698 tonnes). Similarly, silver carp (4 226 046 tonnes), bighead carp (3 203 825 tonnes), common carp (3 172 699 tonnes) and crucian carp (2 768 317 tonnes)

productions in the sub-region in 2014 increased by 14.6, 11.0, 9.5 and 12.9 percent, respectively, compared to 2012, and represent 16.4, 12.4, 12.3 and 10.8 percent of the total FW fish production in the sub-region, respectively. The production of the 5 carp species alone already constitutes 72.9 percent of the total production of FW fish in the sub-region in 2014 and almost 100 percent of the carp production is coming mainly from China with very negligible production from Taiwan POC and Hong Kong SAR. The production of Nile tilapia (1 278 483 tonnes) in 2014 also increased by 9.8 percent compared to the 2012 production and is equivalent to 5 percent of the total FW fish production.

The top 3 species of mollusks produced in the sub-region are all marine species namely cupped-oysters nei (*Crassostrea* spp.), Japanese carpet shell (*Ruditapes philipinarum*) and scallops nei. The combined production of these 3 species in 2014 is 9.97 million tonnes, of which 4.35 million tonnes is for cupped oysters nei, 3.97 million tonnes for Japanese carpet shell and 1.65 million tonnes for scallops nei, and is equivalent to 73.8 percent of the total mollusks production in the sub-region. The production of all the 3 mollusks species increased relative to the 2012 level with cupped oysters nei posting an increase of 10.2 percent, Japanese carpet shell with 6.2 percent and scallops nei with 16.2 percent. The production of abalones nei in the sub-region likewise posted a significant increase of 27.2 percent in China (from 90 694 tonnes in 2012 to 115 397 tonnes in 2014), and 170 percent in Taiwan POC (from 79 tonnes in 2012 to 213.5 tonnes in 2014).

Among the 15 kinds of seaweeds produced in the sub-region, the Japanese kelp (*Laminaria japonica*) is the top species produced particularly in China, the production of which is 39 percent higher in 2014 (6.80 million tonnes) than in 2012 (4.89 million tonnes) and represents 51.1 percent of the total seaweeds production in the sub-region. The production in 2014 of the 3 other major seaweed species namely, Gracilaria, wakame (*Undaria pinnatifida*) and Nori nei (*Porphyra* spp.) posted significant increases as well over that of 2012 level. The increase in Gracilaria production was 33 percent (1.97 million tonnes in 2012 and 2.62 million tonnes in 2014), 16 percent for wakame (1.75 million tonnes in 2012 and 2.03 million tonnes in 2014), and 1.6 percent for Nori nei (1.12 million tonnes in 2012 and 1.14 million tonnes in 2014). The combined production of these 3 major seaweeds is about 43.5 percent of the total seaweed production in the sub-region, and including the Japanese kelp, the production of these 4 major seaweed species represents 94.5 percent of the total seaweed production in the sub-region in 2014. Although the production is not that much in volume, fusiform sargassum (*Sargassum fusiforme*) also posted a significant increase of 56.3 percent in production in 2014 (175 430 tonnes) compared to 2012 (112 260 tonnes). It is important to mention that 3 other seaweed species in the top 10 namely, seaweeds nei, Eucheuma seaweeds nei and bright green nori (*Enteromorpha prolifera*) recorded significant reduction in their production in 2014 compared to 2012. The production of seaweeds nei in 2014 (421 100 tonnes) is 84.9 percent lower than in 2012 (2 793 340 tonnes). Similarly for Eucheuma seaweeds nei, the production decreased by 55.3 percent in 2014 (42 860 tonnes) over that of 2012 (95 880 tonnes), and 88.8 percent reduction for bright green nori.

About 18 different species of crustaceans are grown in the sub-region and the 2014 total production (4 015 372 tonnes) has increased by 11.1 percent over the 2012 value (3 614 041 tonnes). The species with production of more than 500 000 tonnes are the white leg shrimp (1 589 535 tonnes), Chinese mitten crab (796 609 tonnes) and red swamp crawfish (659 661 tonnes), all largely produced in China. The combined production of these top 3 species (3 045 805 tonnes) is 75.8 percent of the total crustacean production in the region and production of all these 3 species

have increased by an average of 13.3 percent between 2012 and 2014. In Taiwan POC, the top crustacean species cultivated are the giant river prawn (8 523 tonnes) and white leg shrimp (12 642 tonnes).

The sub-region also reported a sizable production of miscellaneous aquatic animals with production in 2014 of 843 096 tonnes and is 4.8 percent higher than in 2012 (804 738 tonnes). The production is dominated by the Chinese softshell turtle (341 288 tonnes) and Japanese sea cucumber (200 969 tonnes); the production of these 2 species between 2012 and 2014 have increased by 3.0 and 17.6 percent, respectively. The other miscellaneous aquatic animals produced in 2014 are frogs (95 991 tonnes), jellyfishes nei (67 532 tonnes), aquatic invertebrates nei (93 695 tonnes) and sea urchins nei (6 791 tonnes). The top 20 species produced in the sub-region and the change in their production between 2012 and 2014 is shown in Table 2.

China is the major producing country in the sub-region with 2014 production of 58.8 million tonnes or 99.4 percent of the total production in the sub-region and valued at USD 75.6 B. Compared to mainland China, the production in Taiwan POC (340 567 tonnes) and Hong Kong SAR (3 897 tonnes) are negligible (Table 3). Nevertheless, Taiwan POC's notable production are in Japanese hard clam (*Mercenaria*), tilapias nei, milkfish, groupers nei and pacific cupped oysters (*Crassostrea gigas*). These 5 species contribute to 69.7 percent of Taiwan POC's total aquaculture production in 2014. In Hong Kong, the top 7 species are marine fishes nei, flathead grey mullet, cupped oysters nei, grass carp, nile tilapia, orange-spotted grouper and big head carp, the combined production of which is equivalent to 89.3 percent of the total production of the country in 2014.

Table 2. China sub-region: Aquaculture production of Top 20 species in 2012 and 2014 (Tonnes).

| Species | 2012 | 2014 | % Change (2012-2014) |
|-----------------------|-------------|-------------|---------------------------------|
| Japanese kelp | 4 895 030 | 6 805 175 | + 39.0 |
| Grass carp | 4 782 190 | 5 377 215 | + 12.4 |
| Cupped oysters nei | 3 949 305 | 4 352 694 | + 10.2 |
| Silver carp | 3 687 781 | 4 226 021 | + 14.6 |
| Japanese carpet shell | 3 735 613 | 3 967 051 | + 6.2 |
| Bighead carp | 2 852 978 | 3 203 825 | + 12.3 |

| | | | |
|----------------------|-----------|-----------|--------|
| Common carp | 2 897 679 | 3 172 698 | + 9.5 |
| Crucian carp | 2 450 981 | 2 768 317 | + 12.9 |
| Gracilaria | 1 971 258 | 2 623 256 | + 33.1 |
| Wakame | 1 751 210 | 2 030 990 | + 16.0 |
| Scallops nei | 1 419 956 | 1 649 399 | + 16.1 |
| White leg shrimp | 1 466 559 | 1 589 535 | + 8.4 |
| Nile tilapia | 1 164 999 | 1 278 851 | + 9.8 |
| Nori nei | 1 123 290 | 1 141 710 | + 1.6 |
| Marine molluscs nei | 897 188 | 885 498 | - 1.3 |
| FW fishes nei | 951 808 | 858 926 | - 9.8 |
| Sea mussels nei | 764 395 | 805 583 | + 5.4 |
| Chinese mitten crab | 714 454 | 796 608 | + 11.5 |
| Constricted tagellus | 720 466 | 786 828 | + 9.2 |
| Wuchang bream | 705 821 | 783 023 | + 10.9 |

Table 3. China sub-region: Country aquaculture production in 2012 and 2014 (Tonnes).

| Country | 2012 | 2014 | % Change (2012-2014) |
|----------------|-------------|-------------|---------------------------------|
| China | 53 942 924 | 58 797 258 | + 9.0 |
| Taiwan POC | 347 900 | 340 567 | - 2.1 |
| Hong Kong SAR | 4 093 | 3 897 | - 4.8 |

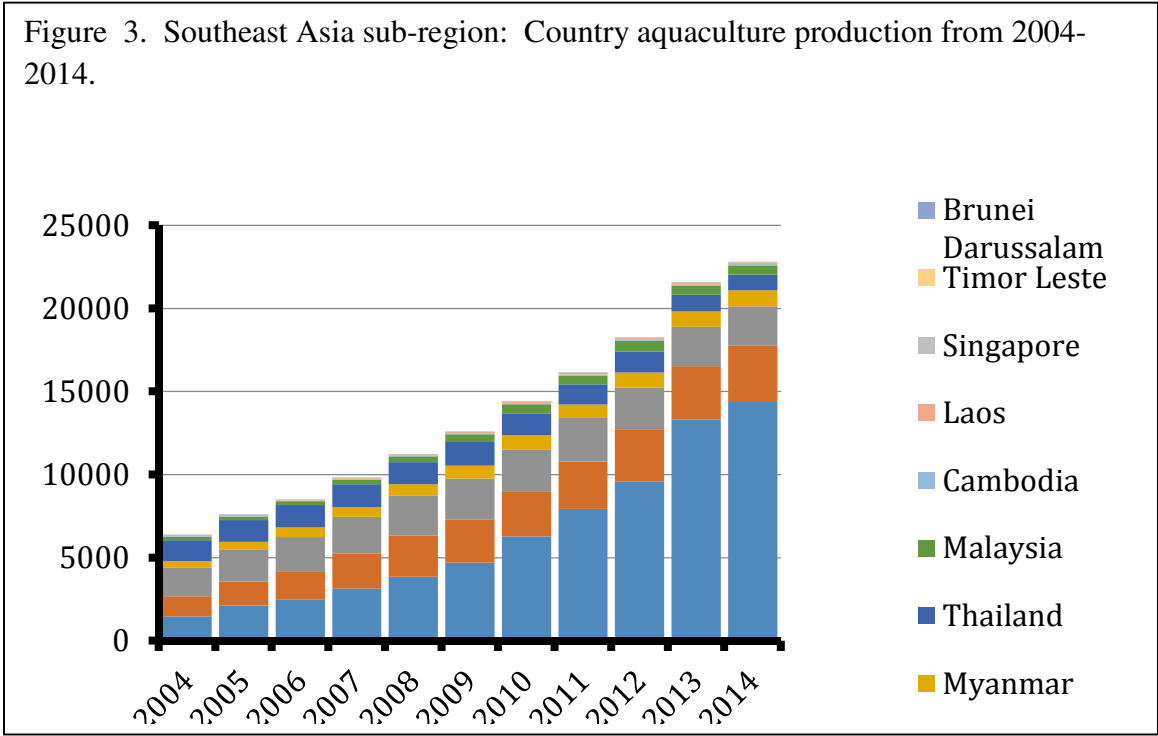
| | | | |
|-------|------------|------------|------|
| Total | 54 294 917 | 59 141 722 | +8.9 |
|-------|------------|------------|------|

Southeast Asia (SEA) sub-region

The 11 member countries in the sub-region contributed a total of 22.8 million tonnes to the entire aquaculture production in the Asia-Pacific region in 2014 and is valued at USD 25.8 B. This is composed of 10.8 million tonnes or 47.7 percent of fish production and 11.9 million tonnes or 52.3 percent of seaweeds and other aquatic plants. Although the share of the fish production in terms of quantity is only 47.7 percent, this volume accounts for 92.2 percent of the share in the value (USD 23.8 B) as compared to USD 1.97 B or 7.7 percent share for seaweeds and other aquatic plants that accounted for 52.3 percent share in volume. The sub-region’s 2014 aquaculture production is equivalent to 24.7 percent of the total aquaculture production in the Asia-Pacific region and is 20 percent higher than the production in 2012 (18.2 million tonnes), 36.9 percent higher than in 2010, and 72 percent higher than a decade ago, 2004 (6.4 million tonnes). The trend in the country’s total production between 2004 and 2014 is shown in Figure 3.

The share of the sub-region’s contribution to the total aquaculture production in the Asia-Pacific region increased over the last decade where the contribution was steadily increasing from 12.9 percent in 2004, 20.2 percent in 2010, 22.2 percent in 2012 and 24.7 percent in 2014, or an average increase of 19 percent during the last decade. The steady increase in the aquaculture production in the SEA sub-region in the last decade is attributed to the increase in the production of major commodities like seaweeds that increased by 37.9 percent from 2012 to 2014 and by 608.4 percent in the last 10 years from 2004 to 2014. Noteworthy of mentioning is Indonesia where the seaweeds production increased by 54.7 percent in the last 2 years (2012-2014) and a staggering 2354.4 percent in the last decade from 410 570 tonnes in 2004 to 10 076 992 tonnes in 2014. In addition to seaweeds, the production of FW fish species, diadromous fishes, crustaceans and mollusks also increased from 2012 to 2014. The production of FW fish species like tilapia, catfishes and carps increased by 25.6 percent, diadromous fishes increased by 11.9 percent, crustaceans by 31 percent and mollusks by 17 percent. The production of miscellaneous aquatic animals, especially aquatic invertebrates nei from Myanmar, also increased by 140.6 percent from 2012-2014. Except for the marine fishes where the production decreased by 15.9 percent, all the other major commodities increased from 2012 to 2014. The trend in the aquaculture production of major commodity groups in the sub-region between 2004 and 2014 is shown in Figure 4.

Among the countries in the sub-region, Indonesia, Viet Nam and the Philippines are the top performing countries in terms of production in 2014, similar to the previous years (Table 4). Indonesia, particularly, registered an almost 50 percent increase in its total aquaculture production between 2012 and 2014 due mainly to increases in the production of many major commodities. As stated earlier, its seaweeds production increased by 54.7 percent in 2012 to 2014. Likewise, its white leg shrimp production also increased. While Thailand suffered a significant reduction in its white leg shrimp production in 2013-2014 relative to the 2012 volume, 47.2 percent and 55 percent, respectively, due to the industry being hit by major diseases like Acute Hepatopancreatic Necrosis Disease (AHPND) or popularly called Early Mortality Syndrome (EMS) and Hepatopancreatic Microsporidiosis (HPM), in addition to white spot disease (WSD), Indonesia's white leg shrimp production remained strong and even registered a significant increase of 57.6 and 85.3 percent during the same years. Until recently, Indonesia is reported to have remained AHPND-free whereas other countries in SEA like Thailand, Viet Nam, Malaysia, and the Philippines experienced outbreaks of this disease that caused problems in their white leg shrimp production. The FW fishes in Indonesia also registered an increase of 36.1 percent in its production from 2012 to 2014, and this is mainly due to increases in the production of the following species such as snakeheads nei (213.1percent), FW fishes nei (109.7 percent), Torpedo-shaped catfish (53.6 percent), Nile tilapia (43.3 percent), giant gourami (40.3 percent), Pangas catfishes nei (20.5 percent) and common carp (16 percent). The diadromous fishes increased by 19.4 percent due to the 25x increase in production of river eels nei and milkfish (19.6 percent). Likewise, crustaceans also increased by 58.3 percent in 2014 over the 2012 volume. The production of the top 20 species produced in the sub-region during 2012 and 2014 is shown in Table 5.



. Figure 4. Southeast Asia sub-region: Aquaculture production of major commodities from 2004-2014

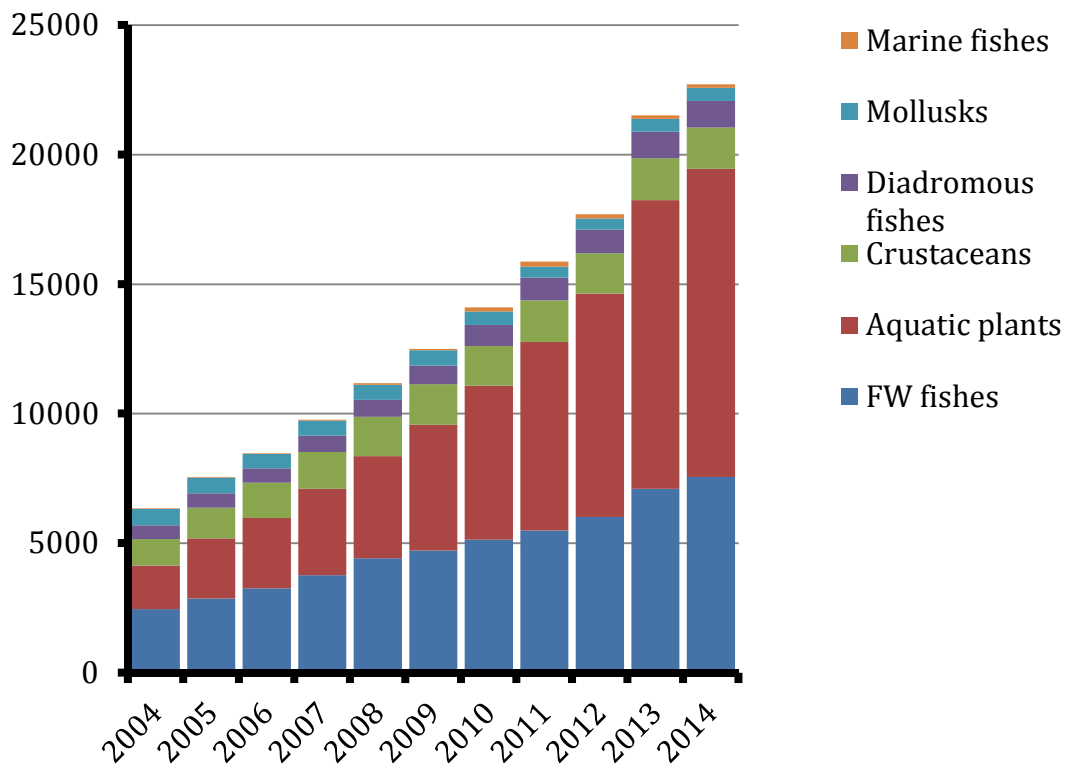


Table 4. Southeast Asia sub-region: Country aquaculture production in 2012 and 2014 (Tonnes).

| Country | 2012 | 2014 | % Change (2012-2014) |
|-------------------|------------|------------|----------------------|
| Indonesia | 9 599 765 | 14 375 281 | + 49.7 |
| Viet Nam | 3 103 351 | 3 411 391 | + 9.9 |
| Philippines | 2 541 965 | 2 337 605 | - 8.0 |
| Myanmar | 888 369 | 964 256 | + 8.5 |
| Thailand | 1 272 100 | 934 758 | - 26.5 |
| Malaysia | 634 876 | 521 014 | - 17.9 |
| Cambodia | 74 000 | 120 055 | + 62.2 |
| Lao | 101 895 | 108 360 | + 6.3 |
| Singapore | 3 627 | 4 971 | + 37.1 |
| Brunei Darussalam | 550 | 711 | + 29.3 |
| Timor-Leste | 1 556* | 1 556* | --- |
| Total | 18 222 054 | 22 779 958 | + 25.0 |

* - data are FAO estimates

Table 5. Southeast Asia sub-region: Aquaculture production of Top 20 species in 2012 and 2014 (Tonnes).

| Species | 2012 | 2014 | % Change (2012-2014) |
|--------------------------------|-----------|-----------|----------------------|
| Eucheuma | 5 877 791 | 9 086 090 | + 54.6 |
| Elkhorn sea moss (Kappaphycus) | 1 948 435 | 1 686 430 | - 13.4 |
| Pangas catfishes nei | 1 631 108 | 1 627 040 | - 0.2 |
| Nile tilapia | 1 053 379 | 1 335 539 | + 26.8 |
| White leg shrimp | 1 003 161 | 1 081 438 | + 7.8 |
| Marine mollusks nei | 1 031 300 | 1 074 412 | + 4.2 |
| Milkfish | 871 329 | 969 781 | +11.3 |
| FW fishes nei | 253 402 | 831 145 | + 228.0 |
| Torpedo-shaped catfishes nei | 521 688 | 760 193 | + 45.7 |
| Rohu labeo | 585 101 | 596 610 | + 2.0 |
| Common carp | 512 023 | 578 883 | + 13.0 |
| Cyprinids nei | 474 505 | 476 295 | + 0.4 |
| Blood cockle | 391 574 | 460 146 | + 17.5 |
| Giant tiger prawn | 591 590 | 406 927 | - 31.2 |
| Tilapias nei | 279 245 | 398 382 | + 42.7 |
| Green mussel | 136 916 | 149 974 | + 9.5 |
| Silver barb | 105 645 | 124 087 | + 17.4 |
| Giant gourami | 89 507 | 126 270 | + 41.1 |
| Africa/big head catfish hybrid | 124 460 | 113 520 | - 8.8 |
| Marine fishes nei | 126 266 | 90 202 | - 28.6 |

In Viet Nam, the top 5 species produced in the country are Pangas catfishes nei (33.4 percent), FW fishes nei (19.4 percent), cyprinids nei (13.1 percent), white leg shrimp (9.1 percent) and tilapias nei (7.2 percent). These 5 species contribute to 82.2 percent to the total production in the country in 2014. The country's 2014 production is 10.1 percent higher than that of 2012. Major increases in the production in 2014 were recorded in white leg shrimp (109.1 percent), marine mollusks nei (40.9 percent) tilapias nei (24.4 percent) and FW fishes nei (24.1 percent). The production of marine fishes nei has decreased by 31.2 percent during the same period. It is interesting to note that even if the country was hit by AHPND (EMS) in 2010, Viet Nam still doubled its white leg shrimp production in 2014. From a production level of 148 023 tonnes in 2012, the production increased to 236 242 tonnes in 2013 and 309 543 tonnes in 2014.

Aquaculture production in the Philippines in 2013 (2 373 386 tonnes) and 2014 (2 337 605 tonnes) decreased over that of 2012 (2 541 965 tonnes) by 7.1 and 8.7 percent, respectively. It must be recalled that the Philippines was hit by the strongest typhoon ever recorded in history in late 2013 that destroyed the farms along its path. The country's top aquaculture product, Kappahycus, decreased by 10.8 percent, from 1.61 million tonnes in 2012 to 1.43 million tonnes in 2014. Milkfish is produced in all culture environments namely FW, BW and SW in the country. Except in SW where the production increased by 10.2 percent (from 112 690 tonnes in 2012 to 124 247 tonnes in 2014), the production in both BW (from 232 515 tonnes in 2012 to 229 091 tonnes in 2014) and FW (from 41 524 tonnes in 2012 to 36 894 tonnes in 2014) decreased by 1.5 and 11.1 percent, respectively from 2012 to 2014.

In Myanmar, the total production in 2014 (964 255 tonnes) is 8.5 percent higher than in 2012 (888 369 tonnes). As in previous years, the country's top produce, Roho labeo, constitutes 60.8 percent of the total production in 2014, and its production increased by 1.6 percent from 2012 to 2014. The other top species produced in the country also registered modest increases in production. Silver barb increased by 45.9 percent, catlas by 27.7 percent, tilapias nei by 9.4 percent and mrigal carp by 9.4 percent. Noteworthy of mentioning are the production of aquatic invertebrates nei and Pirapitinga (Piaractus brachypomus) that increased by 801.5 percent and 283 percent, respectively over the last 2 years. The production of giant tiger prawn in the country has decreased by 24.1 percent due to disease problems.

As mentioned above, Thailand posted a significant decrease in the production of its top aquaculture species, the white leg shrimp, where the production in 2013 (310 705 tonnes) and 2014 (264 709 tonnes) were 47.2 percent and 55.0 percent, respectively, lower than that of 2012 (588 370 tonnes) due to disease problems notably AHPND (EMS). The production of the other top species cultivated in the country like Nile tilapia (203 029 tonnes in 2012 and 188 907 tonnes in 2014) and catfish hybrid of African and bighead catfish (124 463 tonnes in 2012 and 113 520 tonnes in 2014), also decreased by 7 percent and 8.8 percent, respectively. The country suffered widespread flood damage in 2011 that most likely contributed to the reduction in its aquaculture production in the following years. Among the top species produced in the country, only green mussel registered a modest increase of 22.8 percent (102 883 tonnes in 2012 and 126 292 tonnes in 2014). These top 4 species constitute 69.5 percent of the total aquaculture production of the country in 2014 similar to the previous years where these 4 species constitute 68.4 percent and 69.8 percent, respectively, in the 2013 and 2012 total production in the country. With the decrease in the production of 3 of the 4 top species produced in the country, it is not surprising that the total production of the country in 2014 decreased by 26.5 percent over that of 2012. Consequently, the value of the aquaculture production in the country decreased by 24 percent from 2012 (USD 3.5 B) to 2014 (USD 2.6 B). The decrease in the value of white leg shrimp alone in the same period is 35 percent from USD 2.3 B in 2012 to USD 1.5 B in 2014.

The production in Malaysia in 2014 also decreased by 17.9 percent, from 634 876 tonnes in 2012 to 521 014 tonnes in 2014. This was mainly due to the reduction in the production of the major species in the country during these 2 years. The elkhorn sea moss (Kappaphycus), the top species produced in the country, recorded a reduction in the production of 26 percent from 2012 to 2014. The production of this particular seaweed in 2014 is about 47.1 percent of the total production in the country and 52.2 percent in 2012. The production of the other top species, pangas catfish (-36.8 percent), tilapias nei (-12.1 percent), blood cockle (-3.8 percent) and torpedo-shaped catfishes

nei (-0.9 percent) also have decreased. Interestingly, the production of barramundi (+ 51.5 percent) and white leg shrimp (+16.8 percent) increased in the last 2 years.

Blue shrimp (*Penaeus stylirostris*) is the major species produced in Brunei Darussalam and constitutes 83.1 percent (591.2 tonnes) of its total production in 2014 (711.1 tonnes). The country's blue shrimp production in 2014 is 97 percent higher than in 2012. In Singapore, green mussel is the major species produced before 2010. From 2010 onwards, milkfish grown in the marine environment became the top aquaculture species produced in the country. In 2014, milkfish production (1 955 tonnes) increased by 17.5 percent over that of 2012 (1 664 tonnes) and represents 39.3 percent of its total aquaculture production (4 971 tonnes) in 2014.

The production data available for Cambodia are all FAO estimates and based on these estimates, the country posted an increase of 62.2 percent in its total aquaculture production in 2014 relative to 2012. This increase is largely due to increases in the production of its top aquaculture species like Pangas catfishes nei (67.9 percent), silver barb (61.5 percent), cyprinids nei (92.3 percent) and striped snakehead (60 percent), among others. The value of the country's total aquaculture production in 2014 (USD 207.6 M) is 59.3 percent higher than in 2012 (USD 130.3 M).

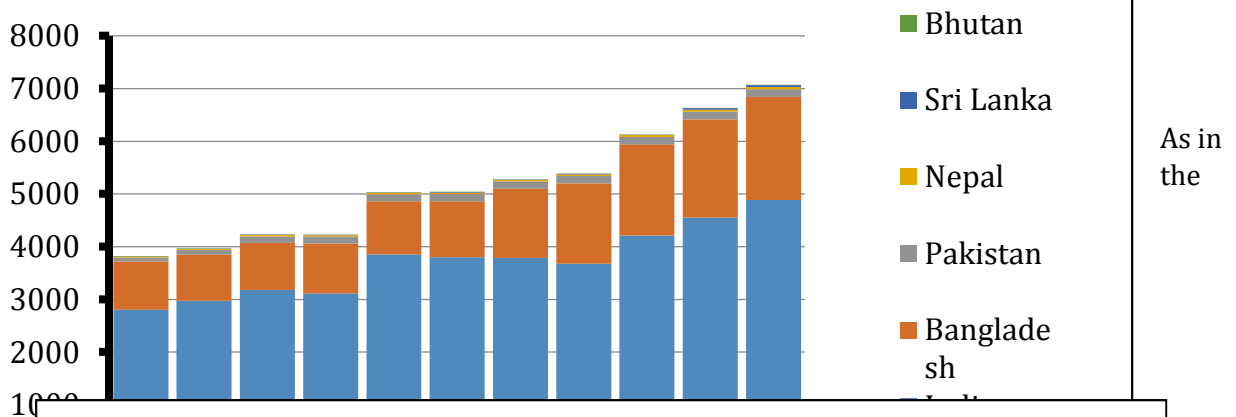
Similar to Cambodia, the production statistics for Lao PDR are also all FAO estimates and based on these, the country posted a modest increase (6.3 percent) in its production in 2014 (108 360 tonnes) compared to 2012 (101895 tonnes) mainly due to the increase in Nile tilapia production (5.9 percent). The country is producing only FW fishes and Nile tilapia production is about 25 percent of the total aquaculture production in the country for several years.

SOUTH ASIA (SA) SUB-REGION

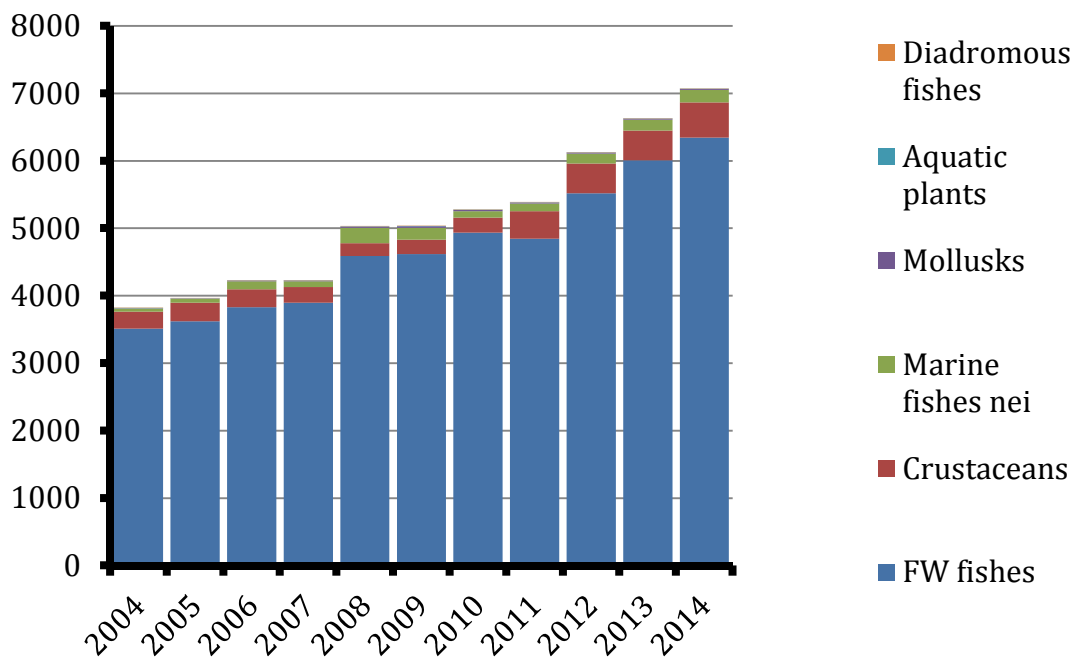
The total aquaculture production in SA sub-region in 2014 totalled 7.06 million tonnes. This represents an increase of 13.3 percent from the 2012 production (6.13 million tonnes), 25.4 percent from the 2010 figure (5.27 million tonnes) and 45.9 percent from the 2004 production (3.82 million tonnes). The sub-region's production in 2014 is 7.6 percent of the total aquaculture production in the Asia-Pacific region, similar to the previous years of 2012 (7.5 percent), 2010 (7.4 percent) and 2004 (7.7 percent). The share of the aquaculture production of the sub-region relative to the total production in the Asia-Pacific region remained more or less the same over the last 10 years (2004-2014) which is at 7.4-7.7 percent. In terms of value, the total production in the sub-region in 2014 is equivalent to USD 16.0 B, up by USD 2.5 B in 2012 (USD 13.5) and USD 5.5 B in 2010 (USD 10.5 B). The trend in the aquaculture production of the member countries in the sub-region between 2004 and 2014 is shown in Figure 5.

Over the years, the aquaculture production in the SA sub-region is mainly from aquatic animal or fish production. From 2004 until 2014, the share of the fish production relative to the total aquaculture production in the sub-region is about 99.7 percent. In 2014, the fish production in the sub-region is 7.06 million tonnes which is 13.3 percent higher than the production in 2012 (6.12 million tonnes), 25.4 percent higher than in 2010 (5.27 million tonnes) and 46 percent higher than in 2004 (3.81 million tonnes). Relative to the total aquaculture fish production in the whole Asia-Pacific region in 2014, the fish production of the SA sub-region is equivalent to 10.8 percent. This proportion has remained relatively constant over the last 10 years since the share was 10.4 percent in 2012, 10.1 percent in 2010, and 10.4 percent in 2004.

.. Figure 5. South Asia sub-region: Country aquaculture production from 2004-2014.



.. Figure 6. South Asia sub-region: Aquaculture production of major commodities in 2004-2014.



previous years, the major commodity groups produced in the sub-region in 2014 are the FW fish species (6.34 million tonnes) and crustaceans (0.52 million tonnes) which accounted for 89.8 percent and 7.4 percent of the production, respectively, or a combined share of 97.2 percent (Figure 6). The production of FW fishes in 2014 is 13 percent higher than that of 2012 whereas that of the crustaceans is 15.5 percent higher than in 2012. Carps are the major FW species produced in the sub-region. The production of major Indian carp (Catla) reached 2 699 987 tonnes, 93 percent of this is produced in India, and the rest in Bangladesh with very minimal production in Pakistan. There is no significant change in the production of Catla in 2014 to that of 2012 (Table 6). The production of Rohu labeo (*Labeo rohita*) in 2014 is 1 073 633 tonnes, 74 percent of this is also produced in India, the rest in Bangladesh and very little in Pakistan. The production of Rohu in 2014 is 10.6 percent higher than that of 2012 (970 445 million tonnes). Silver carp (*Hypophthalmichthys molitrix*) is also largely produced in India and Bangladesh with both countries jointly producing 521 009 tonnes in 2014, higher by 38.8 percent than that of 2012 (303 865 tonnes). The top crustacean species produced in the sub-region in 2014 are the white leg shrimp (*L. vannamei*) which is largely produced in India (305 251 tonnes), giant tiger prawn (*P. monodon*) which is produced in both Bangladesh (71 430 tonnes) and India (70 389 tonnes), and a little from Sri Lanka (5 150 tonnes), and the giant river prawn (*Macrobrachium*) which is also mainly produced in Bangladesh (45 167 tonnes) and India (8 680 tonnes).

India and Bangladesh are the top producing countries in the sub-region (Table 7). In 2014, India's share in the total aquaculture production in the sub-region is equivalent to 69.1 percent while that of Bangladesh is 27.7 percent. India's top produce are Catla (2.5 million tonnes), Rohu labeo (0.79 million tonnes) and FW fishes nei (0.49 million tonnes). In Bangladesh, the major species cultured in 2014 are the striped catfish (0.36 million tonnes), *Tilapia* nei (0.28 million tonnes), Rohu labeo (0.23 million tonnes), silver carp (0.20 million tonnes) and Catla (0.17 million tonnes). Production of marine fishes nei is more or less similar in both India (0.09 million tonnes) and Bangladesh (0.09 million tonnes). The major species produced in Pakistan are carps, mainly Rohu labeo (44 148 tonnes), Mrigal carp (*Cirrhinus cirrhosus*) (25 662 tonnes), grass carp (*Ctenopharyngodon idella*) (24 680 tonnes), silver carp (24 680 tonnes) and Catla (22 933 tonnes). *Tilapia* nei (19 985 tonnes) is the main species produced in Sri Lanka, and silver carp (11 050 tonnes) and Mrigal carp (10 535 tonnes) in Nepal,

Although the production volume is not much, the production in Sri Lanka during 2012 (8 840 tonnes) and 2014 (34 220 tonnes) has increased by 287 percent largely due to almost 11x increase in its production of *Tilapia* nei from 1 825 tonnes in 2012 to 19 985 tonnes in 2014. Similarly, Bhutan's aquaculture production in 2012 (78 tonnes) and 2014 (134 tonnes) increased by 71 percent due to increases in its carp production.

As mentioned above, the aquatic plant production in the sub-region over the years is very minimal since only India and Sri-Lanka reported aquatic plant production which is mostly Elkhorn sea moss (*Kappaphycus*) grown in India. In 2014, these 2 countries reported a seaweed production of 3 011 tonnes which is 99.7 percent *Kappaphycus* from India. This quantity is 33.3 percent lower than in

the previous 2 years (2012-2013 volume of 4 527 tonnes of Kappaphycus) and about 47.4 percent lower than the production in 2004 (5 676 tonnes).

Table 6. South Asia sub-region: Aquaculture production of Top 20 species in 2012 and 2014 (Tonnes).

| Species | 2012 | 2014 | % Change (2012-2014) |
|------------------------------|-------------|-------------|---------------------------------|
| Catla | 2 705 068 | 2 699 987 | - 0.2 |
| Rohu labeo | 970 445 | 1 073 633 | + 10.6 |
| Silver carp | 339 317 | 556 821 | + 64.1 |
| Freshwater fishes nei | 355 623 | 539 126 | + 51.6 |
| Mrigal carp | 356 875 | 371 477 | + 4.1 |
| Striped catfish | 259 637 | 361 654 | + 39.3 |
| White leg shrimp | 136 300 | 305 251 | + 124.0 |
| Tilapias nei | 125 537 | 303 922 | + 142.1 |
| Marine fishes nei | 147 384 | 183 657 | + 24.6 |
| Giant tiger prawn | 192 995 | 146 969 | - 23.8 |
| Common carp | 71 328 | 98 425 | + 38.0 |
| Grass carp | 167 263 | 72 827 | - 56.4 |
| FW siluroids nei | --- | 71 000* | |
| Giant river prawn | 45 242 | 53 919 | + 19.2 |
| Silver barb | 43 085 | 40 158 | - 6.8 |
| Climbing perch | 31 143 | 35 246 | + 13.2 |
| Cyprinids nei | 39 829 | 33 523 | - 15.8 |
| Orange fin labeo | 20 450 | 34 289 | + 67.7 |
| Green mussel | 8 703 | 9 500 | + 9.1 |
| Olive barb | 5 242 | 5 835 | + 11.3 |

--- - no data available in the FAO database; * - FAO estimate

Table 7. South Asia sub-region: Country aquaculture production in 2012 and 2014 (Tonnes).

| Country | 2012 | 2014 | % Change (2012-2014) |
|-------------------|-------------|-------------|---------------------------------|
| India | 4 213 980 | 4 884 021 | + 15.9 |
| Bangladesh | 1 726 066 | 1 956 925 | + 13.4 |
| Pakistan | 142 832 | 148 381 | + 3.9 |
| Nepal | 34 500 | 43 400 | + 25.8 |
| Sri Lanka | 8 840 | 34 220 | + 287.1 |
| Bhutan | 78 | 134 | + 71.8 |
| Total | 6 126 296 | 7 067 081 | + 15.3 |

THE “REST OF ASIA” (ROA) SUB-REGION

The countries in this sub-region include Japan, North and South Korea, Kazakhstan, Tajikistan and Uzbekistan. The total aquaculture production of this sub-region in 2014 totaled 3.12 million tonnes and represents 3.4 percent share of the total production in the Asia-Pacific region. The 2014 production is almost similar to the production in 2012 (3.11 million tonnes) with a minimal increase of only 0.5 percent higher, but is 14.5 percent higher compared to the production a decade ago in 2004 (2.72 million tonnes). The total production of the sub-region in 2014 is valued at USD 6.80 B which is slightly higher than the production value in 2013 (USD 6.71 B) but is lower than in 2012 (USD 7.77 B). The significant reduction in the value in 2014 over that of 2012 is largely due to the sizable decrease in the value of the 2 most valued species in the sub-region, laver nori and Japanese amberjack in Japan that decreased by USD 559.80 million (M) (-49.2 percent) and USD 390.44 M (-29.1 percent), respectively. The trend in the aquaculture production in the countries in the sub-region between 2004 and 2014 is shown in Figure 7.

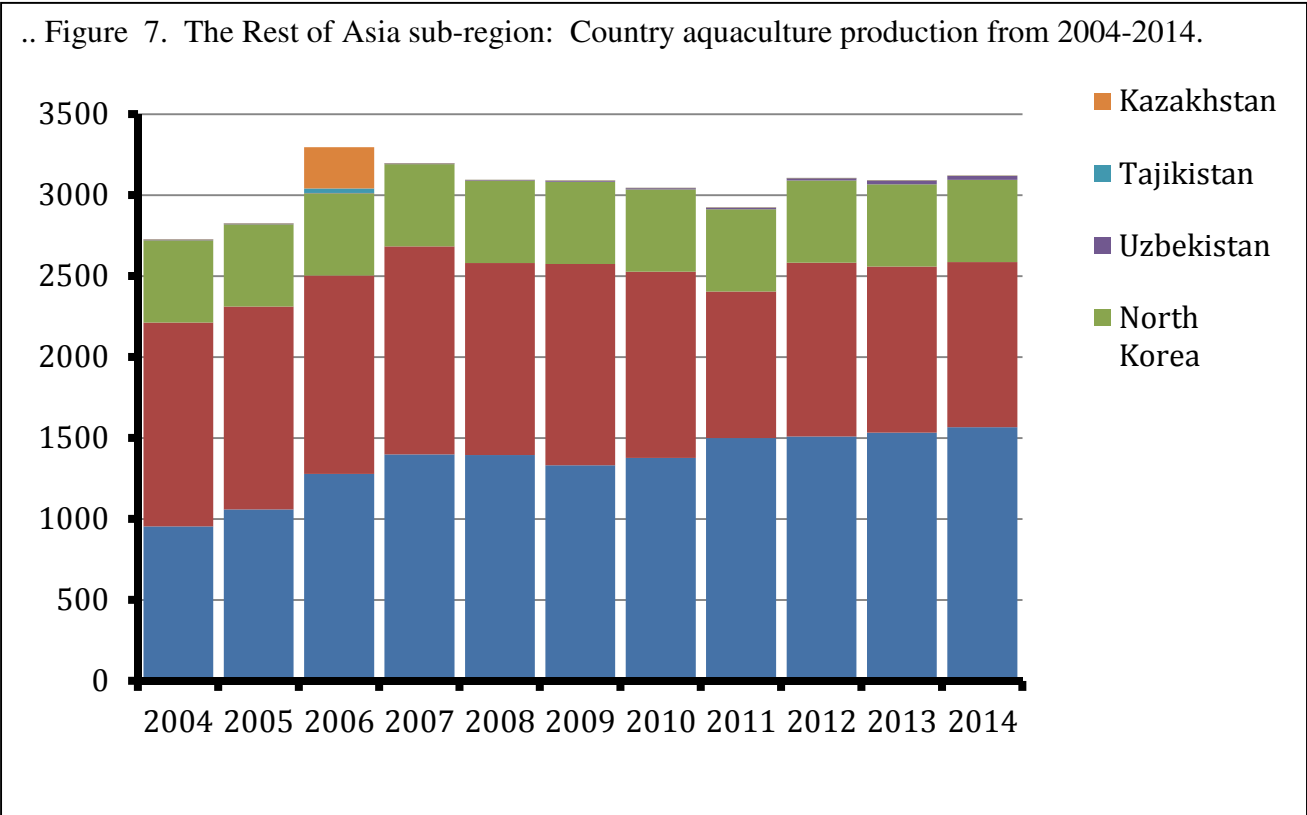
About 39.3 percent of the total production in the sub-region in 2014 is fish and other aquatic animal products (1.23 million tonnes) and the remaining 60.7 percent are seaweeds and other aquatic plants (1.89 million tonnes). In terms of value, however, the fish and other animal products are valued at USD 5.40 B or 79.4 percent of the total value whereas the seaweeds are valued at USD 1.31 B or 19.2 percent. These values are lower than the 2012 values of USD 5.79 B and USD 1.85 B, respectively.

Although some countries in the sub-region posted significant increase in their aquaculture production from 2012 to 2014, there are countries as well that registered reductions in their aquaculture production so that the total aquaculture production in the sub-region did not vary

much during the last 2 years as shown in Table 8. The production of some of the major commodity groups did show increases from 2012 to 2014 like the diadromous fishes (9.6 percent), FW fishes (28.6 percent), crustaceans (38.6 percent) and mollusks (2.1 percent) but seaweeds (-0.7 percent) and marine fishes (-2.4 percent) decreased as well during the same period (Figure 8).

Among the diadromous fishes, the production of coho salmon (*Oncorhynchus kisutch*) from Japan increased by 31.6 percent during the 2-year period from 9 728 tonnes in 2012 to 12 800 tonnes in 2014. The production of Japanese eel (*Anguilla japonica*), the top diadromous species in the sub-region, also posted an increase of 32.2 percent in South Korea (4 259 tonnes in 2012 and 5 631 tonnes in 2014) and a minor increase of 1.4 percent in Japan, (17 377 tonnes in 2012 and 17 627 tonnes in 2014). The production of the diadromous species like the trouts remained more or less the same over the same year period.

.. Figure 7. The Rest of Asia sub-region: Country aquaculture production from 2004-2014.



.. Figure 8. The Rest of Asia sub-region: Aquaculture production of major commodities from 2004-2014.

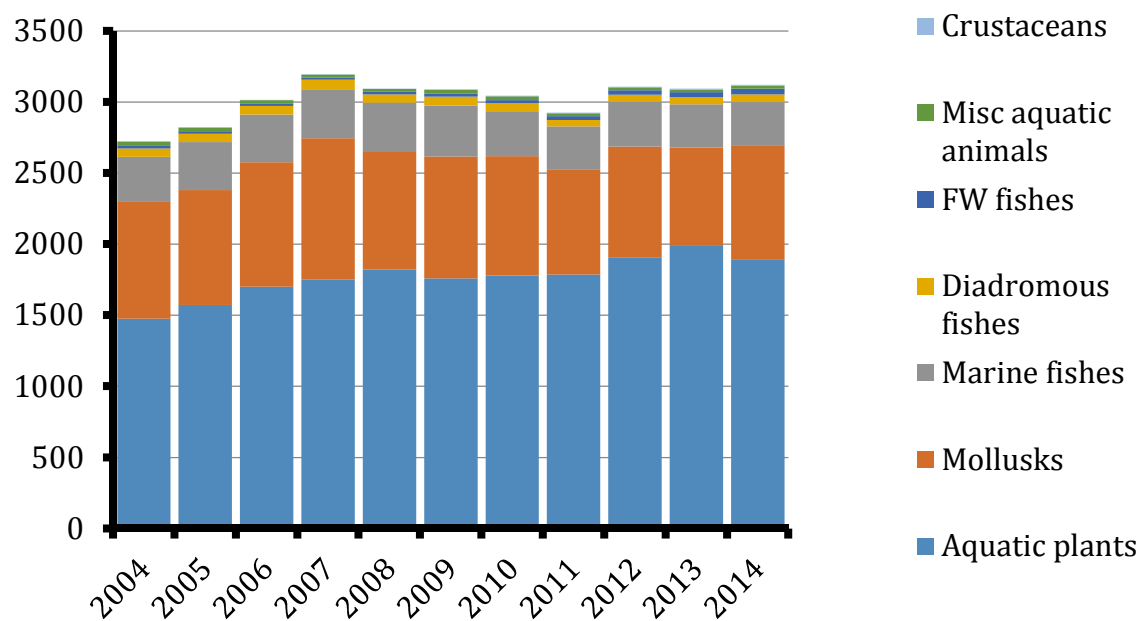


Table 8. The Rest of Asia sub-region: Country aquaculture production in 2012 and 2014 (Tonnes).

| Country | 2012 | 2014 | % Change (2012-2014) |
|-------------|-----------|-----------|----------------------|
| South Korea | 1 509 226 | 1 567 442 | + 3.8 |
| Japan | 1 073 821 | 1 020 420 | - 5.0 |
| North Korea | 508 350* | 508 450* | +0.02 |
| Uzbekistan | 14 359* | 24 020* | + 67.3 |
| Tajikistan | 275 | 444 | +61.4 |
| Kazakhstan | 738 | 410 | - 44.4 |

| | | | |
|--------------|-----------|-----------|-------|
| Total | 3 106 769 | 3 121 186 | + 0.5 |
|--------------|-----------|-----------|-------|

Silver carp is the top FW fish produced in the sub-region. The production in 2014 (16 512 tonnes – an FAO estimate), which is largely produced in Uzbekistan, is equivalent to 41.3 percent of the total FW fishes production in the sub-region and is 65 percent higher than in 2012 (10 006 tonnes – also an FAO estimate). The combined production of common carp in Uzbekistan and Japan in 2014 (7 273 tonnes) is 36.9 percent higher than that of 2012 (5 314 tonnes). Kazakhstan and Tajikistan also produced common carp in 2014 but their production are very minimal, 72 and 27 tonnes, respectively. Completing the top 5 highly produced FW fishes in the sub-region are Amur catfish, grass carp and FW fishes nei. Amur catfish production is from South Korea and the 2014 production (4 607 tonnes) showed an increase of 25.3 percent compared to that of 2012 (3 676 tonnes). Grass carp production, largely from Uzbekistan with minimal production from Tajikistan, almost doubled in 2014 (3 075 tonnes) compared to that of 2012 (1 757 tonnes) or an equivalent of 74.8 percent increase. Many countries in the sub-region reported production of FW fishes nei. South Korea, the largest producer of this group, reported a 50 percent decrease in its production in 2014 compared to that in 2012. Similarly, Japan and Kazakhstan also reported a decrease in its production. The production in Uzbekistan increased whereas that of North Korea remained the same.

White leg shrimp from South Korea is the top crustacean produced in the sub-region. The production in 2014 (4 488 tonnes) is equivalent to 73.1 percent of the total crustacean production in the sub-region, and increased by 61.2 percent over that of 2012 (2 784 tonnes). The other major crustacean species grown in the sub-region is Kuruma prawn (*Penaeus japonicus*) from Japan and its production remained more or less the same in the last 10 years. The 2014 production of 1 600 tonnes is 26 percent of the total crustacean production in the sub-region. Together with white leg shrimp, the combined production of both species of shrimps represents 99 percent of the total crustacean production in the sub-region in 2014.

The top 2 shellfishes produced in the sub-region, particularly in Japan and South Korea, are Pacific cupped oysters (*Crassostrea gigas*) and Yesso scallops (*Patinopecten yessoensis*). The combined production of these 2 species in 2014 (660 788 tonnes) - 467 332 tonnes of Pacific cupped oysters and 193 456 tonnes of Yesso scallops, is equivalent to 83 percent of the total mollusks production in the sub-region. South Korea is the top producer of Pacific cupped oysters and its 2014 production (283 232 tonnes) is almost similar to that of 2012 (284 856 tonnes). The production of Pacific cupped oysters in Japan, however, increased by 14.3 percent during the same year period from 161 116 tonnes in 2012 to 184 100 tonnes in 2014. The other shellfishes produced in the sub-region are marine molluscs nei, Korean mussel (*Mytilus coruscus*), abalones nei, Japanese carpet shell (*Ruditapes philipinarum*), FW molluscs nei and inflated ark, although the production of these species are minimal.

The sub-region, particularly South Korea and Japan, produced sea squirts nei (tunicates) that are classified under Miscellaneous Aquatic Animals (MAA). In 2014, South Korea produced 15 703 tonnes which is 73.9 percent higher than its production in 2012 (9 031 tonnes). The production in Japan in 2014 (5 700 tonnes) is 800 times higher than that of 2012 (610 tonnes) or an increase of 834 percent.

As mentioned above, the total marine fish production in the sub-region in 2014 (309 308 tonnes) decreased by 2.4 percent over that of 2012 (316 931 tonnes). Japanese amberjack (*Seriola quinqueradiata*) is the top marine fish produced in the sub-region, mainly in Japan. The share of its production to the total production of marine fishes in the sub-region in 2014 is 44 percent. Its production in 2014 (135 998 tonnes), however, is 15.2 percent lower than that of 2012 (160 396 tonnes). The other major marine fish species grown in the sub-region with their 2014 production values are silver seabream (*Pagrus auratus*) (65 566 tonnes), bastard halibut (*Paralichthys olivaceus*) (44 733 tonnes), Korean rockfish (*Sebastes schlegelli*) (24 598 tonnes), and Pacific bluefin tuna (*Thunnus orientalis*) (14 700 tonnes). All these values are slightly higher than the 2012 production values with increases of 10.1 percent (silver seabream), 5.3 percent (bastard halibut), 6.5 percent (Korean rockfish) (Table 9). The Pacific blue fin tuna in Japan posted a significant increase in production of 52.5 percent from 2012 to 2014. The combined production of these 4 species constitutes 48.3 percent of the total marine fish production in the sub-region and together with Japanese amberjack, the production of these top 5 species is equivalent to 92.3 percent of the total marine fish production in the sub-region in 2014.

Among the seaweeds, the top species produced in the sub-region are Japanese kelp (*Laminaria japonica*), Laver (Nori) (*Porphyra*), Wakame (*Undaria*) which are produced largely in North Korea, South Korea and Japan. The combined production of the 3 seaweed species in 2014 (1.84 million tonnes) is equivalent to 97.2 percent of the total seaweed production in the sub-region (1.89 million tonnes). Japanese kelp is the number 1 species produced with the combined production from the 3 countries in 2014 reaching 849 411 tonnes and is 7.9 percent higher than in 2012 (787 048 tonnes). Laver (Nori) and Wakame are largely produced in South Korea and Japan with 2014 production of 664 441 tonnes and 327 607 tonnes, respectively. These values decreased over the 2012 levels by 3.9 percent and 15.6 percent, respectively. Brown seaweeds, fragile codium, *Gelidium* and seaweeds nei are produced as well in the sub-region in minimal quantities.

Among the countries in the sub-region, South Korea listed 61 species under cultivation in the country and its aquaculture production in 2014 (1 567 442 tonnes) contributes 50.2 percent to the total aquaculture production in the sub-region. The production in 2014 is 3.8 percent higher than in 2012 (1 509 226 tonnes). The top species produced in terms of quantity are seaweeds namely Laver (Nori) (397 841 tonnes), Japanese kelp (372 311 tonnes) and wakame (283 707 tonnes), and Pacific cupped oysters (283 232 tonnes) where the combined production of these 4 species is equivalent to 85.3 percent of the total production of the country. Compared to 2012, the production of Laver (Nori) and Japanese kelp in 2014 increased by 13.7 percent and 20.6 percent, respectively. The production of wakame decreased by 16.5 percent whereas that of Pacific cupped oysters remained more or less the same.

After South Korea, Japan is the second largest producer of aquaculture products in the sub-region. Japan's production in 2014 (1 020 420 tonnes) is equivalent to 32.7 percent of the total production in the sub-region and decreased by 5.2 percent over the 2012 volume (1 073 821 tonnes). The country listed 44 species that are produced in aquaculture systems and the top 4 species in terms of quantity are Laver (Nori) (266 600 tonnes), Yesso scallops (192 300 tonnes), Pacific cupped oysters (184 100 tonnes) and Japanese amberjack (135 800 tonnes). The combined production of these 4 species (778 800 tonnes) is equivalent to 76.3 percent of the total aquaculture production in the country in 2014. In terms of value, however, the top species are Japanese amberjack (USD 0.95 B), Laver (Nori), (USD 0.58 B), Japanese eel (USD 0.55 B), silver seabream (USD 0.50 B), Pacific bluefin

tuna (USD 0.39 B), Yesso scallops (USD 0.35 B) and Pacific cupped oysters (USD 0.32 B) where the combined production value in 2014 (USD 3.64 B) is equivalent to 81.5 percent of the total production value (USD 4.47 B) of the country.

North Korea, with a total production in 2014 of 508 450 tonnes or equivalent of 16.3 percent of the total aquaculture production in the sub-region, is the third largest producer of aquaculture products in the sub-region. Together with South Korea and Japan, these 3 countries contributed 99.2 percent of the total aquaculture production in the sub-region. The other countries in the sub-region with minimal contribution to the aquaculture production in the sub-region are the Central Asian countries of Kazakhstan, Tajikistan and Uzbekistan. The production in Uzbekistan and Tajikistan between 2012 and 2014 increased by 67 and 61 percent, respectively, whereas that of Kazakhstan decreased by 44 percent.

Table 9. The Rest of Asia sub-region: Aquaculture production of Top 20 species in 2012 and 2014 (Tonnes).

| Species | 2012 | 2014 | % Change (2012-2014) |
|------------------------------|-------------|-------------|---------------------------------|
| Japanese kelp | 787 048 | 849 411 | + 7.9 |
| Laver (Nori) | 691 407 | 644 441 | - 6.8 |
| Pacific cupped oyster | 445 972 | 467 332 | + 4.8 |
| Wakame | 388 267 | 327 607 | - 15.6 |
| Yesso scallop | 185 006 | 193 456 | + 4.5 |
| Japanese amberjack | 160 396 | 135 998 | - 15.2 |
| Silver seabream | 59 523 | 65 566 | + 10.1 |
| Marine mollusks nei | 60 081* | 60 033* | -0.08 |
| Korean mussel | 61 310 | 51 463 | - 16.1 |
| Bastard halibut | 42 496 | 44 733 | + 5.3 |
| Korean rockfish | 23 085 | 24 598 | + 6.5 |
| Japanese eel | 21 636 | 23 258 | + 7.5 |
| Seaweeds nei | 16 684 | 20 100 | + 20.5 |
| Brown seaweeds | 14 378 | 16 653 | + 15.8 |

| | | | |
|------------------------------|--------|--------|--------|
| Silver carp | 10 006 | 16 512 | + 65.0 |
| Sea squirts nei | 9 641 | 21 403 | + 122 |
| Pacific blue fin tuna | 9 639 | 14 700 | + 52.5 |
| Coho salmon | 9 728 | 12 800 | + 31.6 |
| Abalones nei | 6 564 | 8 977 | + 36.8 |
| Japanese carpet shell | 12 623 | 7 300 | - 42.2 |

* - FAO estimate

OCEANIA SUB-REGION

Countries in this sub-region are Australia, New Zealand and the small island nations in the Central Pacific. The contribution of this sub-region to the total aquaculture production in the whole Asia-Pacific region is minimal. In 2014, this sub-region contributed 216 297 tonnes to the total production in the Asia-Pacific region or an equivalent of 0.23 percent which is more or less similar to its contribution in 2012 (0.26 percent). The production in 2014 is just 2.0 percent higher than the production in 2012 (212 006 tonnes) and 87.5 percent of this (189 183 tonnes) is fish and other aquatic animals, and the remaining 11.6 percent are seaweeds and other aquatic plants (25 130 tonnes). In terms of value, the sub-region contributed USD 1.52 B to the total aquaculture production in the Asia-Pacific region or an equivalent of 1.2 percent in 2014. The trend in the aquaculture production among the countries in the sub-region between 2004 and 2014 is shown in Figure 9.

The major commodity produced in the sub-region is mollusks, the production of which in 2014 (114 565 tonnes) is equivalent to 52.9 percent of the total production in the year. Diadromous fishes and seaweeds are the 2 other major commodities produced in the sub-region. The production of diadromous fishes (55 976 tonnes) and seaweeds (25 130 tonnes) in 2014 represents 25.9 percent and 11.6 percent, respectively of the total production in the year. The combined production of these 3 major commodities is 90.4 percent of the total production in the sub-region, and this has been the trend over the years.

Among the mollusks, the New Zealand mussel, and the flat and cupped oysters nei in Australia are the top 2 species produced in the sub-region. The production of these 2 species in 2014 is equivalent to 95 percent of the total mollusks production in the sub-region with the New Zealand mussel contributing 97 438 tonnes or 85 percent and the flat and cupped oysters nei contributing 11 402 tonnes or 10 percent. Relative to the 2012 production figure, the production of New Zealand mussel in 2014 increased by 12.7 percent whereas that of the flat and cupped oysters nei decreased by 9.2 percent (Table 10). Australian mussel, Pacific cupped oysters and abalones nei

that are also produced in Australia and New Zealand constitute the remaining 5 percent of the mollusks production in the sub-region. In terms of value, the total mollusks production in the sub-region in 2014 (USD 0.56 B) is equivalent to 37 percent of the total value of the aquaculture production in the sub-region, and the 5 species mentioned contributed 99.9 percent (USD 0.56 B) of the total value of mollusks production in the sub-region in 2014.

Atlantic salmon (*Salmo salar*), produced in Australia, is the top diadromous fish species produced in the sub-region with the 2014 production (41 591 tonnes) equivalent to 74.3 percent of the total diadromous fish production in the year (55 976 tonnes). The 2014 production has decreased by 8.3 percent from that of 2012. Chinook salmon (*Oncorhynchus tshawytscha*) from New Zealand and barramundi (*Lates calcarifer*) from Australia are the 2 other diadromous fish species with substantial production in the sub-region. The combined production of these 2 species (14 282 tonnes) is 25.5 percent of the total diadromous fish production with Chinook salmon contributing 10 840 tonnes (19.4 percent) and barramundi with 3 442 tonnes (6.1 percent). The small island countries of Guam, Palau, Tuvalu, Vanuatu, Kiribati, Northern Mariana, Papua New Guinea and Nauru are producing minimal quantities of milkfish. The total value of the diadromous fish species in the sub-region (USD 0.62 B) is 40.4 percent of the total value of aquaculture production in the sub-region. Among the diadromous fish species produced in the sub-region, Chinook salmon contributed 79.1 percent (USD 0.49 B) to the total value of the diadromous fish species production.

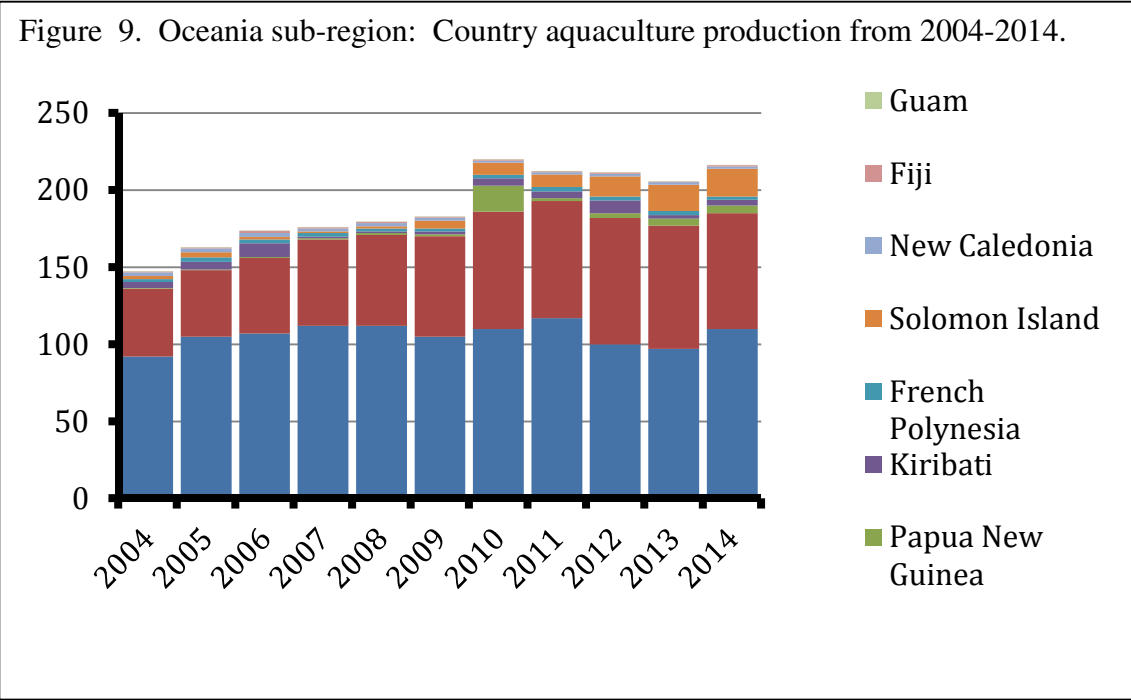


Table 10. Oceania sub-region: Aquaculture production of Top 20 species in 2012 and 2014 (Tonnes).

| Species | 2012 | 2014 | % Change (2012-2014) |
|-------------------------------------|-------------|-------------|---------------------------------|
| New Zealand mussel | 86 447 | 97 438 | +12.7 |
| Atlantic salmon | 43 982 | 41 591 | - 5.4 |
| <i>Eucheuma</i> seaweeds nei | 21 690 | 22 130 | +2.0 |
| Flat and cupped oysters nei | 12 559 | 11 402 | - 9.2 |
| Chinook salmon | 12 397 | 10 840 | - 12.5 |
| Southern bluefin tuna | 7 087 | 7 544 | +6.4 |
| Shrimps nei | 4 021 | 3 774 | - 6.1 |
| Barramundi | 4 473 | 3 442 | - 23.0 |
| Australian mussel | 3 672 | 3 237 | - 11.8 |
| Elkhorn sea moss | 1 400* | 3 000* | + 114.3 |
| Blacklip pearl oyster | 2 559 | 1 972 | - 22.9 |
| Blue shrimp | 1 714 | 1 738 | +1.4 |
| Nile tilapia | 1 643 | 1 981 | +20.6 |
| Pacific cupped oyster | 1 236 | 1 529 | +23.7 |
| Aquatic invertebrates nei | 2 841 | 1 354 | - 52.3 |
| Abalones nei | 604 | 859 | +42.2 |
| Marine fishes nei | 1 665 | 736 | - 55.8 |
| Freshwater fishes nei | 430 | 537 | +24.9 |
| Common carp | 450* | 450* | |
| Silver perch | 279 | 306 | + 9.7 |

* - FAO estimates

Seaweeds are the third major commodity produced in the sub-region. In 2014, the seaweed production is 25 130 tonnes or 11.6 percent of the total aquaculture production in the sub-region. The seaweeds are mainly *Eucheuma* seaweeds nei and Elkhorn sea moss (*Kappaphycus*) produced mainly from the island nations of Solomon Island, Kiribati, Papua New Guinea and Fiji. The 2014 production is 7.4 percent higher compared to the 2012 volume.

Penaeus shrimps nei and the blue shrimp are the top crustaceans produced in the sub-region, the former produced mainly in Australia and the latter from New Caledonia, while for the marine fishes, it's the Southern blue fin tuna (*Thunnus maccoyii*) in Australia. The trend in the production of the major commodities produced in the sub-region for the last 10 years is shown in Figure 10.

Among the countries in the sub-region, New Zealand is the top producer of aquaculture products with its 2014 production (109 874 tonnes) equivalent to 50.8 percent of the total aquaculture production in the sub-region (Table 11). The 2014 production of the country is 9.7 percent higher than in 2012 and the major species produced is New Zealand mussel with its 2014 production higher by 12.7 percent than the 2012 figure.

Australia comes second to New Zealand with aquaculture production in 2014 (74 913 tonnes) equivalent to 34.6 percent of the total production in the sub-region, and is 8.4 percent lower than in 2012. The decrease in the aquaculture production of the country in 2014 relative to the 2012 level is due to the reduction in the production of some of its aquaculture species. For instance, the production of Atlantic salmon, and flat and cupped oysters nei, the top 2 species produced in the country, decreased by 5.5 and 9.2 percent, respectively. In addition, the production of marine fishes nei, aquatic invertebrates nei, barramundi and *Penaeus* shrimps nei decreased as well. Marine fishes nei decreased by 61.5 percent, aquatic invertebrates nei by 52.3 percent, barramundi by 23.1 percent and *Penaeus* shrimps nei by 6.1 percent.

Solomon Island, Papua New Guinea, Kiribati, French Polynesia and New Caledonia are the other island countries that contributed to the total aquaculture production in the sub-region in 2014. The production data from most of the Pacific Island countries are all FAO estimates and based on these data, the production in Solomon Island and Papua New Guinea between 2012 and 2014 increased by 40 and 59 percent, respectively. The other island countries of Kiribati, Palau, Tonga and Nauru posted significant reductions in their production during the same period ranging from 56-99 percent.

.. Figure 10. Oceania sub-region: Aquaculture production of major commodities from 2004-2014.

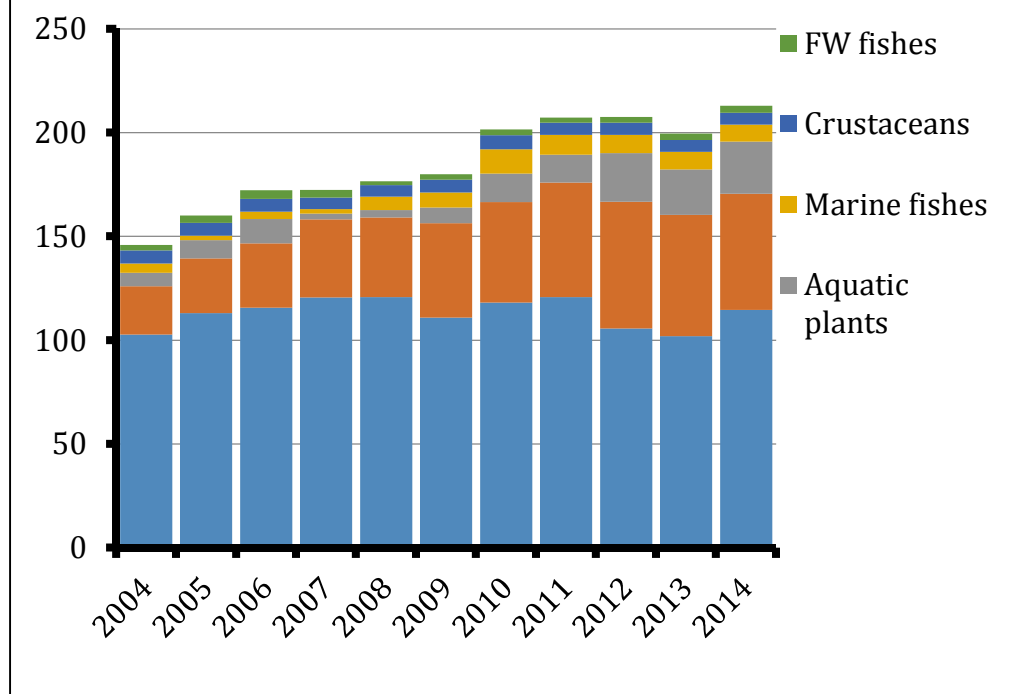


Table 11. Oceania sub-region: Country aquaculture production in 2012 and 2014 (Tonnes).

| Country | 2012 | 2014 | % Change (2012-2014) |
|-------------------------|---------|---------|----------------------|
| New Zealand | 100 161 | 109 874 | + 9.7 |
| Australia | 81 833 | 74 913 | - 8.4 |
| Solomon Island | 12 852* | 18 002* | + 40.1 |
| Papua New Guinea | 3 225* | 5 150* | + 59.7 |
| Kiribati | 8 291 | 3 582 | - 56.8 |
| French Polynesia | 2 655 | 2 086 | - 21.4 |

| | | | |
|--------------------------|-----------|-----------|--------|
| New Caledonia | 1 663 | 1 656 | - 0.4 |
| Fiji | 760* | 770* | + 1.3 |
| Guam | 111* | 110* | - 0.9 |
| Vanuatu | 60 | 80* | + 33.3 |
| Northern Marianas | 26* | 26* | 0 |
| American Samoa | 20* | 20* | 0 |
| Palau | 36 | 10* | - 72.2 |
| Cook Island | 6* | 8* | +33.3 |
| Samoa | 5 | 6 | + 20.0 |
| Tuvalu | 2.5* | 2.5* | 0 |
| Marshall Island | 0 | 0.6 | +0.6 |
| Tonga | 300* | 0.3* | - 99.9 |
| Nauru | 1* | 0.3* | - 70.0 |
| Total | 212 306.5 | 216 296.7 | + 1.9 |

* - data are FAO estimates

Status and Trends in the Aquaculture Production of the Major Commodity Groups in the Asia-Pacific Region

The status and trends in the production of the major aquaculture commodities produced in the Asia-Pacific region is discussed. These commodities include the carnivorous FW fishes, the herbivorous and omnivorous FW fishes, BW and marine fishes, crustaceans, mollusks and aquatic plants.

Carnivorous FW fishes with high input requirements

Included in this group are the high value species. They are mainly fed species and because they are carnivores they need high protein food. Majority of the species are relatively expensive and thus are marketed internationally and also within the region with the increasing affluence of the people in some countries in the region. The trend in the production of this group of fishes between 2004 and 2014 is shown in Figure 11.

Eels (Order Anguilliformes and Synbranchiformes)

Because this is a traditional delicacy for the people in some countries in the region, specifically the Japanese eel for the Japanese people, the demand for this species remains very high until the present time. To cope with the demand, the production of eels in the region has been increasing over the years. In 2014, the production is 602 615 tonnes and this has increased by 8.1 percent compared to the 2012 level (557 479 tonnes), by 12.1 percent over that of 2010 (537 530 tonnes) and by 80.8 percent from 2004 (333 243 tonnes). The eel production in the region is dominated by 2 eel species namely, Asian swamp eel (*Monopterus albus*), the production of which (358 035 tonnes) is 59.4 percent of the total eel production, and the Japanese eel (*Anguilla japonica*) with a production of 243 430 tonnes or 40.4 percent of the total eel production in the region in 2014. China is the top producer of these 2 eel species producing 99.9 percent of the Asian swamp eel and 89.7 percent of the Japanese eel. Japan, South Korea and Taiwan POC are the other countries in the region producing substantial quantities of Japanese eel. Eel production in Indonesia (1 148 tonnes) is classified as river eels nei. In terms of value, however, the value of Japanese eel (USD 1.38 M) constitutes 60 percent, whereas that of Asian swamp eel (USD 0.93 M) represents 40 percent, of the total value of eel production in the region in 2014.

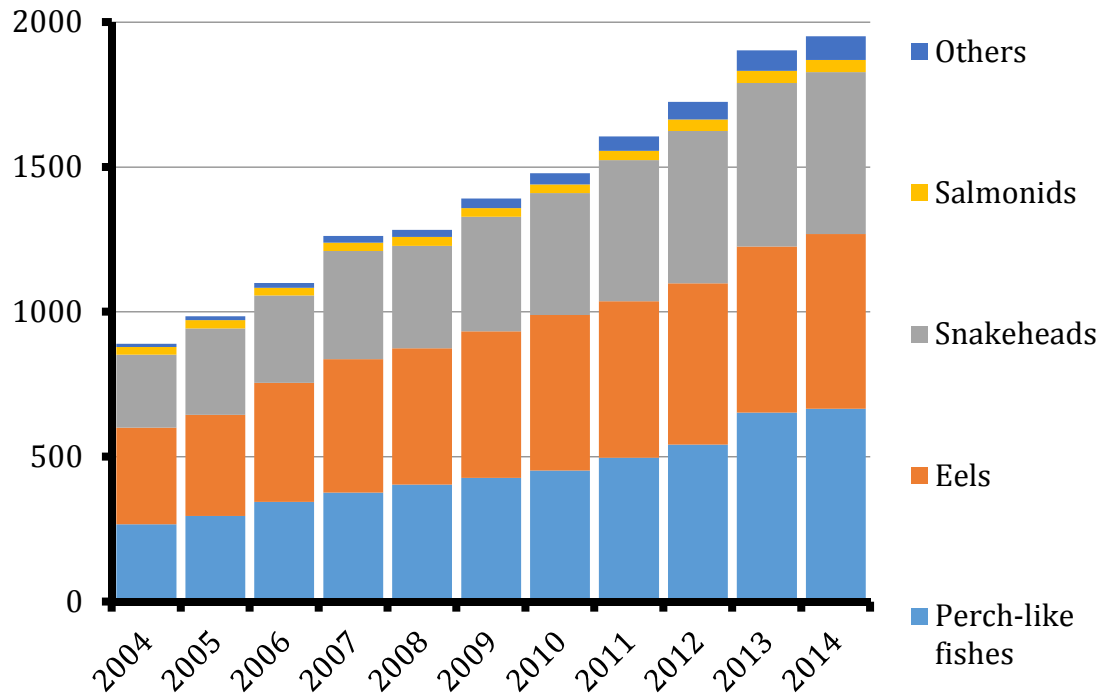
Although there have been much effort particularly by the Japanese to establish the full cycle aquaculture of the Japanese eel, unfortunately until the present, seeds used in the grow-out culture of this species is still sourced from the natural environment since the captive breeding technology of this species has not been successfully developed. As a result, there is too much extraction of eel fry and fingerlings (glass eels and elvers) from the wild for aquaculture purposes. Because of the concern that the heavy exploitation of this species from the natural environment will lead to depletion and eventually to its extinction, there were fears that this may be listed as an endangered species by CITES, similar to the European eel. However, as of the most recent meeting of CITES CoP 17 in South Africa in 2016, the Japanese eel was not listed as an endangered species.

Perch-like fishes (Family Percichthyidae)

Included under this group are the following major species, largemouth black bass (*Micropterus salmoides*), mandarin fish (*Siniperca chuatsi*), Japanese seabass (*Lateolabrax japonicus*), barramundi or giant sea perch (*Lates calcarifer*), pike perch, silver perch (*Bidyanus bibyanus*) and European perch (*Perca fluviatilis*).

The total production of this group of fishes in the Asia-Pacific region in 2014 is 666 087 tonnes and is 22.9 percent higher than the production in 2012 (541 855 tonnes), 47.2 percent in 2010 (452 494 tonnes) and 128.9 percent in 2004 (267 563 tonnes). The production in 2014 is dominated by largemouth black bass (351 772 tonnes) and mandarin fish (293 853 tonnes), both produced in China, with share in the total production of 52.8 and 44.1 percent, respectively. Japanese sea bass and Asian sea bass or barramundi completes the production in 2014. The Japanese sea bass was mainly produced in Taiwan POC and its aquaculture production data appeared for the first time in 2014. Although Australia, Malaysia and Hong Kong SAR produced barramundi, these countries did not report production data of this species during the last 4 years, from 2010-2014. Only Taiwan POC reported barramundi production in 2014 (7 449 tonnes) and this was significantly lower than in the previous years – 21 973 tonnes in 2013, 16 821 tonnes in 2012 and 13 595 tonnes in 2010 or a corresponding reduction in the production by 66.1, 55.7 and 45.2 percent, respectively.

.. Figure 11. Aquaculture production of carnivorous freshwater fishes in the Asia-Pacific Region.



Snakeheads (Family Channidae)

The total production of snakeheads in 2014 (559 396 tonnes) dipped a little compared to the 2013 level (565 592 tonnes) but is 6.5 percent higher than in 2012 (525 086 tonnes) and 32.8 percent in 2010 (421 274 tonnes). China again is the major producer of snakeheads producing 510 340 tonnes or 91.2 percent of the total snakehead production in the region in 2014. The production of snakehead in China continued to increase over the years, the 2014 production has already increased by 147.6 percent from the 2004 level. Indonesia and Cambodia are the other 2 countries in the region that posted substantial production of this species. Indonesia listed 2 groups, snakeheads (=Murrels) nei and Indonesian snakehead. The production of the former in 2014 (20 601 tonnes) is 213 percent higher than in 2012 (6 579 tonnes) whereas the production of the latter species in 2014 (6 962 tonnes) is 71.7 percent lower than in 2013 (24 642 tonnes) and 65 percent lower than in 2012 (19 907 tonnes). Cambodia produces striped snakehead and the production in 2014 of 12 000 tonnes is an FAO estimate, similar to the data supplied in the previous years (from 2006) which are all FAO estimates. Thailand and the Philippines also produces striped snakehead, and Malaysia produces Indonesian snakehead with 2014 production of over 1000 tonnes. Other countries producing snakeheads with minimal quantities are Bangladesh, Korea and Singapore.

Salmonids (Family Salmonidae) farmed in freshwater

The total production of salmonids in the region in 2014 (41 011 tonnes) is a little higher than in 2012 (39 796 tonnes). Rainbow trout is the major species produced with production of 36 736 tonnes in 2104 and mainly produced in China (28 141 tonnes), Japan (4 796 tonnes) and South Korea (3 300 tonnes). Taiwan POC, Nepal, Uzbekistan, Papua New Guinea, Tajikistan and Australia also produced rainbow trout in 2014 in minimal quantities.

Chinook salmon is the other species produced and mainly in New Zealand with a production of 1 084 tonnes, a little bit lower than in 2012 (1 203 tonnes).

Herbivorous and omnivorous freshwater fishes with low input requirements

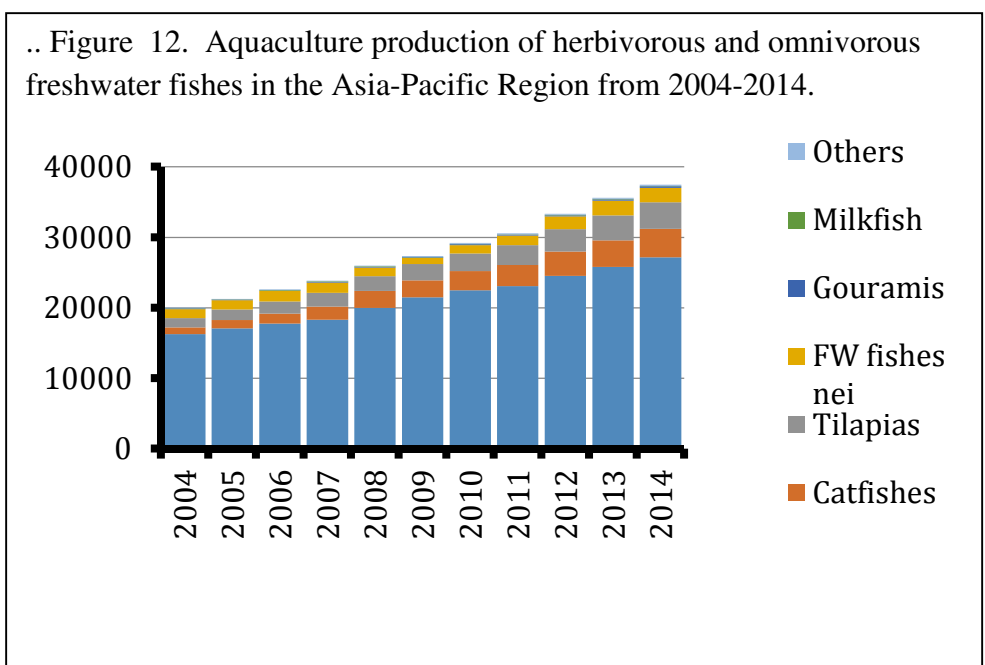
The herbivorous and omnivorous FW fish species constitute the bulk of the aquaculture production in the region. The herbivores rely on the natural productivity of the culture environment when grown using the traditional method of pond culture. As such, they are non-fed species and are therefore cheaper to produce compared to the carnivores. Because of this characteristic, these species are widely grown by farmers in the region and many are still using the traditional pond culture production systems. However, when cultured at higher densities, where the natural productivity of the culture environment cannot fully support optimal growth of the stocks, artificial feeds are given. However, since they are herbivores, macro-nutrient requirements are lower compared to the carnivores, hence the artificial feeds are also cheaper. The trend in the production of this group of fishes between 2004 and 2014 is shown in Figure 12.

Carps and barbs (Family Cyprinidae)

This is the most dominant group of FW fish cultured in the region and particularly in most populous countries like China, India and Bangladesh. Because of its huge production, this group of fish is very important in providing food and income to the millions of people in this part of the world considering that the production is also largely consumed domestically. The production of carps and barbs in 2014 (27.1 million tonnes) is equivalent to 72 percent of the total herbivorous and

omnivorous fish production (37.5 million tonnes) and 41.7 percent of the total aquaculture fish production in the region, demonstrating the importance of this group of fish species to the fish supply in the region and in the world. The production continued to increase as the 2014 figure is 10.7 percent higher than in 2012 (24.5 million tonnes) and 66.8 percent higher than in 2004 (16.3 million tonnes).

The carps dominate this group. In terms of quantity, grass carp (*Ctenopharyngodon idella*) grown in 18 countries in the region, is the top species produced in the region with 2014 production of (5.50 million tonnes) but common carp is the most widely grown with 24 countries in the region culturing the species. Grass carp production continued to increase with the production in 2014 showing a 10.4 percent increase compared to the 2012 level (4.98 million tonnes). The bulk of the production (98.3 percent) comes largely from China (5.38 million tonnes) with sizable production also coming from Bangladesh (45 128 tonnes), Pakistan (24 680 tonnes), Myanmar (18 038 tonnes) and India (18 000 tonnes). The production of grass carp in Bangladesh between 2012 and 2014 posted an increase of 155.5 percent, whereas that of China, the increase is 12.4 percent.



Silver carp (*Hypophthalmichthys molitrix*) is also grown in 18 countries in the region and its 2014 production reached 4.82 million tonnes up by 18.8 percent over that of 2012 level (4.06 million tonnes). China, India and Bangladesh are the top countries producing silver carp with production in 2014 reaching 4 226 009 tonnes, 320 000 tonnes, and 201 009 tonnes, respectively. The combined production of these 3 countries (4.75 million tonnes) is equivalent to 98.4 percent of the total silver carp production in the region. The respective production from these 3 countries in 2014 increased by 14.6 percent (China), 159.6 percent (India) and 11.3 percent (Bangladesh) compared to the 2012 levels.

As stated above, common carp (*Cyprinus carpio*) is grown in 24 countries with significant production in China (3 172 433 tonnes), Indonesia (434 177 tonnes), Viet Nam (103 789 tonnes), Bangladesh (73 579 tonnes) and Myanmar (27 057 tonnes). The production of this carp species in 2014 reached 3 857 897 tonnes, up by 11 percent over the production in 2012 (3 475 697 tonnes). Among the countries in the region, substantial increase in production between 2012 and 2014 is reported in Viet Nam (17.1 percent), Indonesia (16 percent) and China (9.5 percent).

The production of bighead carp (*Hypophthalmichthys nobilis*) in the region in 2014 (3 230 856 tonnes) comes from 13 countries with China (3 202 887 tonnes), Myanmar (11 725 tonnes), Lao (9 000 tonnes), Nepal (4 515 tonnes) and Malaysia (1 299 tonnes) among the top 5 producing countries. The production in 2014 increased by 11.9 percent compared to the 2012 production figure (2 887 970 tonnes).

The other carp species cultured in the region include the crucian carp (*Carassius carassius*), Catla (*Catla catla*) and Rohu labeo (*Labeo rohita*). The crucian carp, with 99.9 percent of the 2014 production (2 768 479 tonnes) coming from China, is grown in 6 countries, whereas Catla and Rohu are grown in 8 and 10 countries, respectively. Catla is largely produced in India with minor production in Bangladesh and Myanmar. The 2014 production of Catla in the region (2 770 020 tonnes) is only 0.3 percent higher than in 2012 (2 761 022 tonnes) but is 133.3 percent higher from the 2004 level (1 187 139 tonnes). Rohu labeo is also largely produced in India, and likewise in Myanmar and Bangladesh. The combined production of Rohu from India (790 000 tonnes), Myanmar (586 241 tonnes) and Bangladesh (233 883 tonnes) is 1 610 124 tonnes and represents 96.4 percent of the total Rohu production in the region (1 670 207 tonnes). The combined production of this species in 2014 is 6.6 percent higher than in 2012 (1 566 034 tonnes).

The production of all the species in this group in 2014 generally increased compared to the 2012 figure, with the lowest increase observed in Catla. Starting 2004, the production of some carp species has started to show signs of slowing down. This may be linked to shifting of efforts by farmers towards producing the higher value species or the more expensive carnivorous FW fishes. With the prices of farm inputs increasing year by year, the slower growth may also be a result of shrinking profit margins for the farmers and shrinking markets for these species.

Catfish (Order Siluriformes)

The total production of catfishes in the region in 2014 reached 4 036 739 tonnes. These include the widely grown species of Pangas catfishes and *Clarias* spp. which includes torpedo-shaped catfishes, hybrid catfish and Philippine catfish. The production of this group of fish in the region showed a steady increase from 2004 until 2014 with an average annual increase of 16.2 percent during the 10-year period. The production in 2014 is 16.5 percent higher than in 2012 (3 465 878 tonnes) and is equivalent to 10.8 percent of the total herbivorous and omnivorous fish production.

Among the catfishes, Pangas catfishes are cultured largely in Southeast Asian (SEA) countries like Viet Nam, Indonesia, Cambodia and Myanmar is the major species produced with a total production in 2014 of 1 627 840 tonnes, and represents 40.3 percent of the total catfish production in the region (4 036 739 tonnes). Viet Nam is the largest producer with its production (1 134 375 tonnes) equivalent to 70.2 percent of the total Pangas production (1 616 215 tonnes) in the region. The productions from Indonesia (418 002 tonnes), Cambodia (45 000 tonnes) and Myanmar (18 038 tonnes) represent 25.9, 2.8 and 1.1 percent of the total Pangas production in the region, respectively. These 4 countries produced all the Pangas catfishes in the region. Indonesia posted a

20.5 percent increase and Myanmar a 9.4 percent increase in their production in 2014 compared to that in 2012. Viet Nam, however, reported a 4.2 percent decrease in their production in the same year period. The production in Viet Nam is largely for the international market.

Among the *Clarias* species, Torpedo-shaped catfishes *nei*, farmed mainly in SEA and produced largely in Indonesia (677 917 tonnes), Malaysia (46 122 tonnes) and Viet Nam (20 000 tonnes) is the most produced species in the group. The production in 2014 (760 192 tonnes) is equivalent to 18.8 percent of the total catfish production in the region and increased by 45.7 percent compared to the 2012 figure (521 688 tonnes) mainly because of the 53.6 percent increase in production in Indonesia. The production in both Malaysia and Viet Nam remained at the same level during the same year period. This species is also produced, albeit in minimal quantities, in the Philippines (3 632 tonnes), Cambodia (3 500 tonnes), Myanmar (9 089 tonnes) and Brunei Darussalam (3 tonnes).

The other species of catfishes with significant production in the region are Amur catfish (455 791 tonnes) grown mainly in China, yellow catfish (333 651 tonnes) and channel catfish (248 608 tonnes) both also from China, and striped catfish farmed largely in Bangladesh (385 735 tonnes) and Thailand (23 996 tonnes).

Tilapia (Family Cichlidae)

Nile tilapia, Mozambique tilapia, blue tilapia, hybrid of blue and Nile tilapia, and tilapias *nei* composed this group of fishes. The production of this group of fishes in 2014 (3 800 137 tonnes) is 10.1 percent of the total herbivorous and omnivorous FW fish production in the region.

Nile tilapia is the dominant species and is grown in 18 countries in the region. The production in 2014 (2 584 395 tonnes) which constitutes 68 percent of the total tilapia production in the region (3 800 137 tonnes), increased by 17.3 percent compared to the production in 2012 (2 202 678 tonnes). China is the dominant producer with a production of 1 278 483 tonnes or about 49.5 percent of the Nile tilapia production in 2014. Indonesia comes next producing 36.6 percent (947 113 tonnes), with Thailand (188 907 tonnes) and the Philippines (164 814 tonnes) coming in far third (7.3 percent) and fourth (6.4 percent), respectively. The largest increase in Nile tilapia production from 2012 to 2014 was reported by Indonesia (43.3 percent), with China and the Philippines posting a modest increase of 9.8 and 2.5 percent, respectively. The production in Thailand decreased by 6.9 percent in the same period.

Thirteen (13) countries in the region reported tilapias *nei* production. In 2014, the production was 760 938 tonnes which is equivalent to 20 percent of the total tilapia production and increased by 37.6 percent over the 2012 level (552 793 tonnes). Sri Lanka, Bangladesh and Viet Nam posted significant increases in tilapias *nei* production between 2012 and 2014, which is 99.5, 129.5 and 24.4 percent, respectively.

Only Indonesia and Thailand reported production of Mozambique tilapia (2 245 tonnes) in 2014, with 99 percent of the production coming from Indonesia. The production of this species of tilapia in Indonesia started in mid-1960s and the peak in production was recorded between the mid-1990s until mid-2000, after which the production started to decline. The production in 2014 is

already 87.6 percent lower compared to the 2012 level. This reflects the shifting of the farmer's choice in growing the more improved strains of tilapia.

China recorded a significant production of tilapia hybrid between Nile and blue tilapia of 420 000 tonnes.

Together with the *Pangassius* catfishes, tilapia is one of the most internationally traded FW fish. In many tilapia-producing countries in the region, the increase in production is driven by demand from the international market more than the demand of the domestic market. Being a commercial commodity that is traded internationally, the production system for tilapia is more regulated and intensive compared to the other herbivorous fish species. Aspects on traceability, quality control and food safety issues are important considerations in the production process.

Gourami (Family Osphronemidae)

Included in this group are the giant gourami (*Osphronemus gourami*), snakeskin gourami (*Trichopodus pectoralis*), kissing gourami (*Helostoma temminckii*), gouramis nei and climbing perch (*Anabas testudineus*). The total production in the region in 2014 is 211 466 tonnes and is 35 percent higher than in 2012 (155 992 tonnes). There is a steady increase in the gourami production in the region from 2004 to 2014, with an average annual increase of 10.1 percent.

Giant gourami comprises the bulk of the production, approximately 57.6 percent (121 822 tonnes) of the total gourami production, which is largely from Indonesia (118 776 tonnes). This is followed by climbing perch (38 058 tonnes), snakeskin gourami (34 649 tonnes) and kissing gourami (7 941 tonnes). The production of giant gourami in Indonesia between 2012 to 2014 has increased by 40 percent. Climbing perch is largely produced in Bangladesh with additional minimal production from Cambodia, Indonesia, Thailand and Malaysia. The production of climbing perch from 2012 to 2014 has increased as well by 13.8 percent. Thailand, Cambodia and Indonesia are the top producers of snakeskin gourami whereas the kissing gourami is grown only in Indonesia. The production of snakeskin gourami in Thailand and Cambodia remained stable between 2012 and 2014. In Indonesia, however, for some reason, there is no report of snakeskin gourami production in 2012 but there are reports before and after 2012.

Milkfish (Genus *Chanos*)

Only a small volume of milkfish is produced in FW in the region since most of the production is done in BW and SW. The Philippines and Taiwan POC are the top 2 countries growing milkfish in FW. The production in 2014 reached 62 163 tonnes with the Philippines contributing 36 894 tonnes and Taiwan POC 25 241 tonnes or 59.3 and 40.6 percent, respectively. The production in 2014 is 12.2 percent lower than in 2012 (70 844 tonnes) since the production in both countries decreased as well.

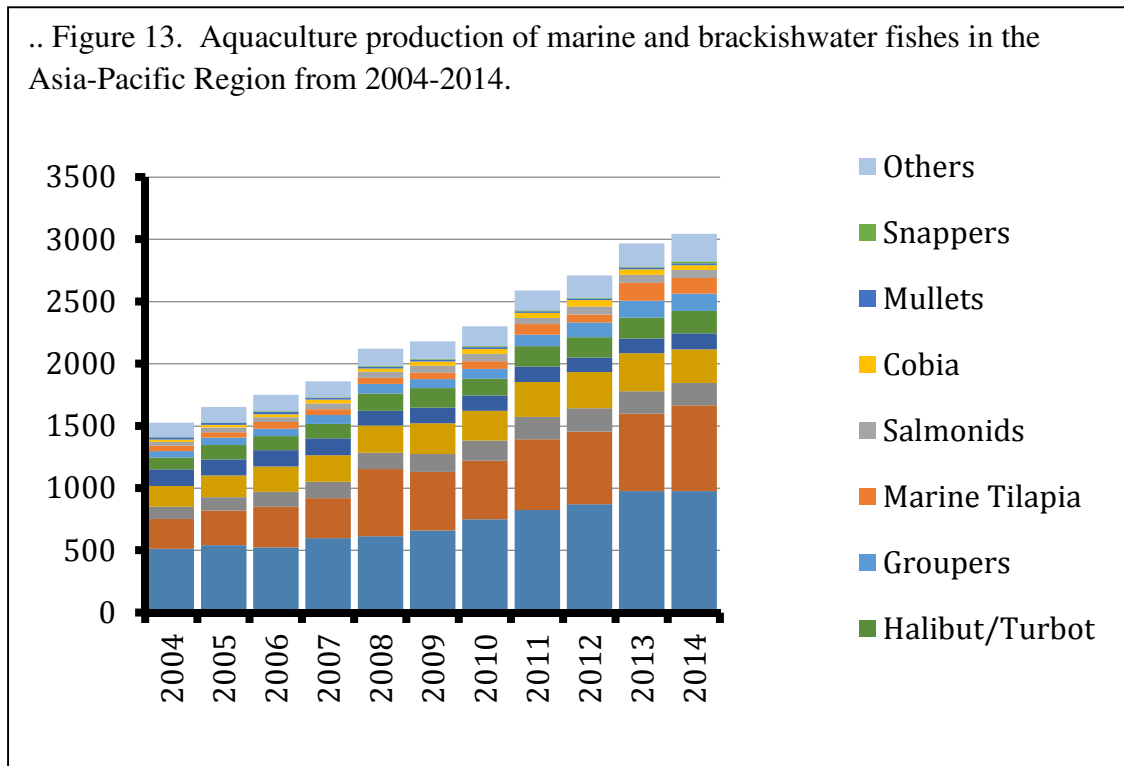
Freshwater fishes nei and other low value freshwater finfish

China, Viet Nam, India, Indonesia, Bangladesh, Myanmar, Thailand, Taiwan POC, Pakistan and South Korea reported production of FW fishes nei in 2014 with a total production of 2 033 230 tonnes, 13.6 percent higher than in 2012 (1 790 354 tonnes). The top 3 countries, however, are China (855 065 tonnes), Viet Nam (527 085 tonnes) and India (495 000 tonnes). Except in China where the production in 2014 decreased by 10 percent over that of the 2012 level, the production

in Viet Nam and India increased by 23.6 and 61.8 percent, respectively. The dominant other low value FW fish species is Pirapatinga (*Piaractus spp.*) which is largely produced in China, Indonesia, Myanmar and Viet Nam.

MARINE AND BRACKISHWATER FISHES

There are several species of marine and brackishwater (BW) fish species being farmed in the region. Except for milkfish and mullets, most of these species like the sea basses, groupers, jacks, seabream and porgies, snappers, cobias and flatfishes are carnivores, requiring high feed inputs. Because their pelleted feeds contain high levels of protein, these are expensive. Furthermore, the main source of animal protein for the feeds is fish meal which is coming mainly from low value fish or fish-by-catch from capture fisheries or the fish-by-catch are directly utilized as feeds for these species. Because of the practice of feeding “fish with fish”, there are concerns regarding the sustainability of growing these high value carnivorous fish species. To address this concern, there are several on-going initiatives to reduce the dependence on low-value fish from capture fisheries as source of protein in the feeds. The use of other animal products and plant-based protein sources for partial replacement of fish meal in the feeds are examples of these initiatives in addition to the use of fish waste from the processing plants as alternative sources of protein. The trend in the annual production of the fish species under this category during 2004-2014 is shown in Figure 13.



Milkfish (Genus *Chanos*)

This is the most widely cultured marine fish, being grown in 14 countries in the region. This species is euryhaline, it can tolerate salinities ranging from FW to full-strength SW. As such, this species is grown in all three environments (FW, BW and SW) in some countries. Reported in this section are the production data from BW and SW only since the FW production is reflected in the section under FW fishes with low input requirements. The total production of milkfish in the region has been increasing over the years from 514 707 tonnes in 2004 to 976 799 tonnes in 2014 or an increase of 89.8 percent over the 10-year period. The production in 2014 is about 32.1 percent of the total marine and BW fish production in the region (3 043 666 tonnes).

Traditionally, the Philippines has been the leading producer for this species but in recent years, the production in Indonesia has surpassed that of the Philippines. The production in Indonesia in 2014 (577, 568 tonnes), which is largely from BW, is 59 percent of the total milkfish production in the region. There was a steady increase in its production in the last decade, from 241 418 tonnes in 2004 to 577 464 tonnes in 2014 or 139 percent increase during these years. The production in the Philippines in 2014 is 353 338 tonnes or 36.2 percent of the total milkfish production in the region. About 65 percent of the production still comes from the BW ponds where the production remained stable in the last 10 years, from 208 975 tonnes in 2004 to 229 091 tonnes in 2014, due to many farmers still using the extensive and semi-intensive methods of milkfish pond production. However, as a result of the milkfish intensification program in the country, approximately 35 percent of the production now comes from the sea cages and this has been increasing over the years from 37 351 tonnes in 2004 to 124 247 tonnes in 2014 or an increase of 232 percent during these years or a share of 15 percent of the total milkfish production in 2004 to 35 percent in 2014.

Taiwan POC, the third largest milkfish producing country in the region, doubled its annual production starting 2012 until 2014. While its production from 2004 until 2011 would range from 20 000–29 000 tonnes, the production from 2012 to 2014 ranged from 41 000–44 000 tonnes. Milkfish is likewise popular in the Pacific Island nations like Guam, Palau, Papua New Guinea, Kiribati, Tuvalu and Nauru.

Japanese Sea bass and Barramundi (Family Centropomidae and Percichthyidae)

The Japanese sea bass (*Lateolabrax japonicus*) and barramundi or the Asian sea bass (*Lates calcarifer*) are the two species being grown in the region. Barramundi is grown in 15 countries whereas the Japanese sea bass in 3 countries. In 2014, the Japanese sea bass is produced in China (113 803 tonnes), Taiwan POC (2 378 tonnes) and South Korea (1 004 tonnes), their combined production is 117 185 tonnes or about 65.7 percent of the total production of this group of fishes (178 322 tonnes). Taiwan POC first reported separate production data for Japanese sea bass in 2014. Prior to this, Taiwan POC may have reported the data together with the other marine fish species.

The total barramundi production in 2014 reached 60 935 tonnes or 34.2 percent of the total production of this group and is 2.1 percent higher than in 2102 (59 701 tonnes). The largest producers are still Malaysia (30 439 tonnes) and Thailand (16 811 tonnes). Countries like Indonesia (5 446 tonnes), Taiwan POC (4 133 tonnes) and Australia (3 440 tonnes) also posted substantial production. The production in Malaysia increased by 51 percent over that in 2012 (20 088 tonnes) whereas that of Thailand and Indonesia remained stable. The production in Taiwan POC in 2014 (4 133 tonnes) is almost half of that in 2012 (9 327 tonnes), and in Australia, the production was steadily increasing from 2004 (1 517 tonnes) to 2012 (4 473 tonnes) after which it started to decrease 3 440 tonnes (2014).

Jacks (Family Carangidae)

The species of fish under this group that are grown in the region include the Japanese amberjack (*Seriola quinqueradiata*), the trevallys and the pompano. Including the data of snubnose pompano from China which is an FAO estimate based on other sources of information, the total production in the region in 2014 (270 836 tonnes) is 7 percent lower than in 2012 (291 344 tonnes). The production showed increasing trend from 2004 until 2013 after which it started to decrease. These species are mostly grown in sea cages.

In terms of volume, the most abundant is the Japanese amberjack that is largely produced in Japan (135 800 tonnes) with minimal production in South Korea (198 tonnes). The total production in 2014 (135 998 tonnes) is 50.2 percent of the total production of Jacks. The production in Japan in 2014 is 15.2 percent lower than in 2012 (160 215 tonnes).

The production data of snubnose pompano from China (an FAO estimate) reached 110 000 tonnes in 2014. Singapore and Hong Kong SAR reported very minimal productions of 137 and 57 tonnes, respectively. China and Taiwan POC reported production of amberjacks nei of 19 272 and 1 237 tonnes. Among the trevallys, the most abundant is the white trevally from Japan with the 2014 production (3 300 tonnes) almost similar to the 2012 (3 131 tonnes). Singapore produced both golden (4 tonnes) and bigeye trevally (2 tonnes). Japanese jack mackerel is also produced in Japan (800 tonnes) and South Korea (4 tonnes).

Seabream and Porgies (Family Sparidae)

The total production in 2014 (127 894 tonnes) largely comes from silver seabream (*Pagrus auratus*) (65 566 tonnes), porgies and seabreams nei (*Sparus* spp.) (61 186 tonnes), and a little from blackhead seabream (*Acanthopagrus schlegeli*) (1 138 tonnes). About 51.3 percent of the total production comes from silver seabream and another 47.8 percent from porgies and seabreams nei. The production of this group is relatively stable from 2004 until 2014 with annual production values ranging from 115 300 to 135 814 tonnes.

Japan is the major producer of silver seabream contributing 93.8 percent (61 500 tonnes) of the total production of this species. The remaining 6.2 percent (4 066 tonnes) is contributed by South Korea. For porgies and seabreams nei, China is the largest producer with its share of the production (59 281 tonnes) equivalent to 96.9 percent of the total production of this species. The rest is contributed by South Korea (1.7 percent or 1 018 tonnes) and Taiwan POC (1.4 percent or 887 tonnes). The blackhead seabream is largely produced in South Korea (929 tonnes or 81.6 percent of the total production of this species) and the rest is from Taiwan POC (209 tonnes or 18.4 percent).

Flatfishes (Genus *Psetta* and *Paralichthys*)

There are 3 species of flatfishes grown in the region, namely the turbot (*Psetta maxima*) and bastard halibut (*Paralichthys olivaceus*) and flounders nei (*Paralichthys* spp.). These 3 species are produced in China, Japan and South Korea.

There is a gradual increase in the total production of flatfishes in the region from an annual total production of 94 533 tonnes in 2004 to 180 759 tonnes in 2014. Of the total flatfish production in 2014, 42 percent (76 026 tonnes) is from flounders nei which is solely produced in China, 33.2 percent (60 000 tonnes) from turbot also produced in China, and 24.7 percent (44 733 tonnes) from bastard halibut which is grown largely in South Korea and minimal production in Japan. The 2014 production is 8.6 percent higher than in 2012 (166 478 tonnes).

Groupers (Subfamily Epinephelinae)

There are a number of grouper species that are grown in the region. The popular species include the tiger grouper (*Epinephelus fuscoguttatus*), the green or the orange-spotted grouper (*E. coioides*), the giant or the king grouper (*E. lanceolatus*) and the hybrid of giant and tiger grouper. The breeding and the seed production technologies of these species are already developed which made the full-cycle aquaculture of these species possible. Only few countries, however, are growing these species because of the scarcity in the availability of seed supply. Unfortunately however, the production data for these species are all reported as groupers nei and not with the particular grouper species.

There is a gradual annual increase in the production of this group of fishes. From a production of 57 171 tonnes in 2004, the annual production in 2014 reached 138 392 tonnes or an average annual increase of 10.1 percent. The 2014 production is 17.8 percent higher than in 2012. The major producing countries are China (88 130 tonnes), Taiwan POC (25 313 tonnes), Indonesia (13 345 tonnes), Malaysia (7 879 tonnes) and Thailand (2 686 tonnes). The combined production of

these 5 countries (137 353 tonnes) constitutes 99.2 percent of the total grouper production in the region in 2014. The production in China is mainly marine and in Indonesia is largely marine whereas that of Taiwan POC, Malaysia and Thailand is largely in BW. The Philippines (341 tonnes), Myanmar (150 tonnes), Singapore (111 tonnes) and South Korea (67 tonnes) contributed minimal production in 2014.

Tilapia cultured in marine environments (Genus *Oreochromis*)

Although tilapia is largely grown in FW, there are species and hybrids that can tolerate BW and some in SW. The major species are Nile tilapia, Mozambique tilapia and tilapias nei. Generally, there is an increasing trend in the annual production from 2004 (44 613 tonnes) until 2013 (143 137 tonnes), the year when the highest production is so far recorded. There is a significant increase (120 percent) in the annual production from 2012 (64 947 tonnes) to 2013 (143 137 tonnes) due mainly to the huge increase (133 percent) in the production in Indonesia. The production in 2014 (125 557 tonnes) is 12.3 percent lower than in 2013 but is 93.3 percent higher than in 2012.

The leading producer is Indonesia with 2014 production of 91 276 tonnes or 72.7 percent of the total BW/SW tilapia production in the region, 52 582 tonnes of which or 57.6 percent is Nile tilapia and 38 694 tonnes or 42.4 percent is Mozambique tilapia. Nile tilapia production from 2012 to 2014 increased by 54 percent. The annual production of Mozambique tilapia between 2004 until 2011 is quite stable with values ranging from 17 000 - 23 000 tonnes. The production drastically dropped to 4 968 tonnes in 2012, after which it again increased.

A far second to Indonesia is the Philippines with a total production of 18 612 tonnes, 75 percent (13 959 tonnes) of which is tilapias nei and the remaining 25 percent (4 653 tonnes) is Nile tilapia. Taiwan POC, Malaysia and Myanmar likewise produced all tilapias nei of 11 219, 3 576 and 800 tonnes, respectively. Malaysia's production increased by 383 percent in 2014 compared to 2012, that of the Philippines and Taiwan POC increased by 28 and 16 percent, respectively. Singapore's production (71 tonnes) is all Mozambique tilapia. Except for minimal production in the marine environment in Singapore (Mozambique) and the Philippines (tilapias nei), the bulk of the tilapia production in the region comes from the BW environment. Some of these are produced in polyculture systems together with shrimps. There are scientific data showing that the green water in tilapia culture has anti-microbial properties which are beneficial to the shrimps.

Salmonids cultured in brackishwater and marine environments (Genus *Salmo* and *Oncorhynchus*)

More than half (64.8 percent) of the total production in 2014 (64 147 tonnes) is Atlantic salmon (*Salmo salar*) from Australia (41 591 tonnes). Coho salmon (*Oncorhynchus kisutch*) from Japan (12 800 tonnes) and chinook salmon (*Oncorhynchus tshawytscha*) from New Zealand (9 756 tonnes) complete the production of salmonids in the region in 2014 which is almost the same as in 2012.

Cobia (Family Rachycentridae)

A highly carnivorous species, the production data for cobia (*Rachycentron canadum*) first appeared in Taiwan POC in the mid-1990s. The total production in the region which is mainly from Taiwan POC has increased gradually from 1995 (3 tonnes) until 2002 (2 395 tonnes). The production increased almost 8 times from 2002 (2 395 tonnes) to 2003 (18 614 tonnes) which coincides with the start of the significant production from China (14 428 tonnes). The production gradually increased in the succeeding years reaching its peak in 2012 (51 142 tonnes), after which the production seems to decline. As a result, the 2014 production of 38 721 tonnes is 32.1 percent lower than in 2012.

The leading producer is China with its 2014 production (35 563 tonnes) equivalent to 91.8 percent of the total cobia production in the region. Viet Nam and Taiwan POC are the other 2 countries that contributed to the production in 2014 with values of 1 761 and 1 396 tonnes, respectively. The production in Taiwan POC is both in marine (62.4 percent) and BW (37.6 percent). While the production in Taiwan POC remained more or less the same between 2012 and 2014, the production in Viet Nam decreased almost 7 times during the same year period and that in China by 6.9 percent.

Except for Taiwan POC where cobia is produced in BW starting in 2011, all the other countries produced cobia in SW.

Mulletts (Genus *Mugil* and *Liza*)

The mullet production in the region in 2014 is 14 722 tonnes and is comprised of flathead grey mullet (*Mugil cephalus*) and mullets nei. The production in the region remained more or less stable during the last 10 years from 16 569 tonnes in 2004 to 14 722 tonnes in 2014.

Flathead grey mullet is grown in South Korea, Taiwan POC and Singapore, and the 2014 production (7 812 tonnes) is 53.1 percent of the total mullet production in the region. South Korea's production (4 839 tonnes) is equivalent to 62 percent of the total flathead grey mullet production while that of Taiwan POC (2 371 tonnes) is 30.3 percent and Singapore (602 tonnes) is 7.7 percent of the total mullet production. The production of mullets nei mainly from Indonesia (6 910 tonnes) is 46.9 percent of the total mullet production. The production of mullets in Indonesia and Taiwan POC is in BW whereas that of South Korea and Singapore is in SW.

Snappers (Family Lutjanidae)

The production of snappers in the region showed increasing trend from 2004 (4 342 tonnes) until 2014 (17 051 tonnes). The production comes from mangrove red snapper (*Lutjanus argentimaculatus*), John's snapper (*Lutjanus johnii*) and snappers nei that are grown both in BW and SW, and are produced in Malaysia, Taiwan POC, Cambodia, Singapore, Hong Kong SAR, the Philippines and Brunei Darusallam.

The bulk of the production is from mangrove red snapper with a production of 10 392 tonnes or 60.9 percent of the total snapper production. This is followed by John's snapper with 5 886 tonnes or 34.5 percent and snappers nei (504 tonnes) with 2.9 percent of the total snapper production in the region.

Malaysia is the leading producer (16 326 tonnes) with mangrove red snapper production of 10 365 tonnes, John's snapper production of 5 873 tonnes, and snappers nei production of 88 tonnes. The share of Malaysia's production to the total snapper production in the region is 95.7 percent. The rest of the production is contributed by Taiwan POC (241 tonnes), Cambodia (200 tonnes), Singapore (142 tonnes), Hong Kong SAR (113 tonnes), the Philippines (24 tonnes) and Brunei Darusallam (4 tonnes), in that order.

It is worth noting that the production doubled from 2013 (8 800 tonnes) to 2014 (17 051 tonnes) due mainly to the significant increases in the production of John's snapper (113 percent) and mangrove red snapper (95 percent) in Malaysia.

Other marine fish species

The total production of this group of fishes in 2014 (220 682 tonnes) is 23.8 percent higher than in 2012 (178 185 tonnes) and is composed mainly of production from large yellow croaker and red drum from China, and tiger pufferfish from both China and Japan. There is a steady increase in the annual production of this group of fishes from 2004 (114 329 tonnes) to 2014.

More than half of the production (58 percent) is from large yellow croaker (127 917 tonnes) with red drum (69 940 tonnes) and tiger pufferfish (22 825 tonnes) contributing 31.7 and 10.3 percent, respectively.

CRUSTACEANS

Because of the relatively high value of this commodity, especially the Penaeid shrimps and prawns, culturing this group of species have generated considerable profit to the farmers and huge revenues to the producing countries as well. The total production of crustaceans in 2014 reached 6 274 601

tonnes and this is composed of the FW crustaceans, crabs, lobsters aside from the highly popular shrimps and prawns. The dominant species are the white leg shrimp and the Chinese mitten crab. The 2014 production is 9.6 percent higher than in 2012 (5 722 117 tonnes). The trend in the annual production of the various species under this category during 2004-2014 is shown in Figure 14.

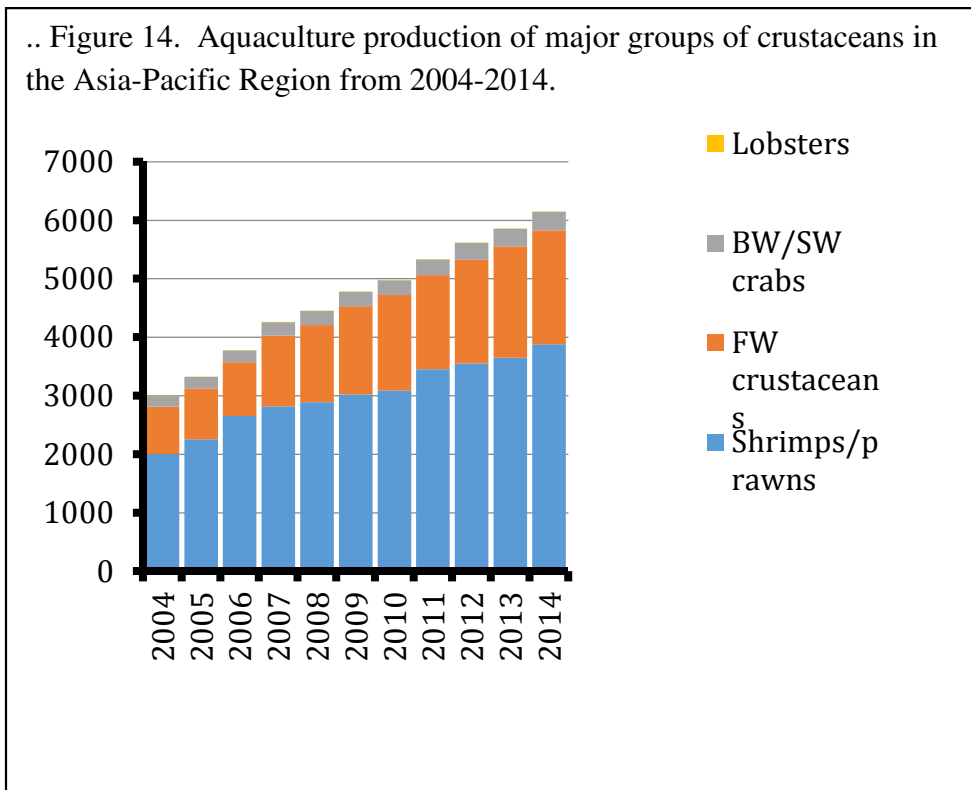
White leg shrimp (*Litopenaeus vannamei*)

Currently, this is one of the important shrimp species grown in the region. This has long been cultured in Latin America but since the early 2000s, countries in the region started to grow them shifting away their production from the more popular giant tiger prawn. The reason being that the white leg shrimps possess some perceived beneficial characteristics over the native giant tiger prawn like better tolerance to low salinity, the ability to intensify production, easier domestication that led to the development and the availability of specific pathogen free stocks.

In 2014, the white leg shrimp production in the region is 47.5 percent of the total crustacean production. The industry was hit by a major disease, Acute Hepatopancreatic Necrosis Disease (AHPND) or earlier popularly known as Early Mortality Syndrome (EMS) which started in China in 2009 and spread across other countries in Asia particularly in SEA like in Viet Nam in 2010, Malaysia in 2011, Thailand in 2012 and the Philippines in 2014. Since the peak of the devastation of the disease was felt in the major white leg shrimp producing countries especially in SEA in 2012, it was speculated that the production will decrease in the succeeding years until effective control measures are put in place. However, despite the industry being hit by the deadly disease that affects the stocks 30-45 days from the start of the culture period, the over-all white leg shrimp production in the region in 2014 (2 980 743 tonnes) still managed to increase by 13.1 percent compared to the 2012 level (2 635 297 tonnes).

Over the years, the total production of white leg shrimp in the region showed consistent increase from 2004 (994 333 tonnes) until 2012 (2 635 297 tonnes) or an increase of 165 percent over the 10-year period (Table 20). The production, more or less, remained the same from 2012 to 2013 (2 634 358 tonnes) with just a very slight reduction equivalent to 0.03 percent, after which it increased again in 2014. Except for the production in Thailand that decreased by 47.2 percent from 2012 (588 370 tonnes) to 2013 (310 705 tonnes) and further reduction of 14.8 percent from 2013 to 2014 (264 709 tonnes), all the other white leg shrimp producing countries including those that were hit by AHPND (EMS) like China, Viet Nam and Malaysia increased their production from 2012 to 2013 and 2014. The biggest increase in production was recorded by Indonesia where the production increased by 57.6 percent from 2012 (238 663 tonnes) to 2013 (376 189 tonnes) and by 14 percent from 2013 to 2014 (428 905 tonnes). It should be noted that Indonesia was not hit by AHPND (EMS) that affected the white leg shrimp production in its neighboring SEA countries; Indonesia remains AHPND (EMS)-free until the present. India, likewise, reported a significant increase of 54.9 percent in its white leg shrimp production from 2012 (136 300 tonnes) to 2013 (211 200 tonnes) and by 44.5 percent from 2013 to 2014 (305 251 tonnes). China remained the

top producing country with production in 2014 (1 576 893 tonnes) equivalent to 52.9 percent of the total white leg shrimp production in the region. China, Indonesia and Taiwan POC grow this species in both BW and FW environments.



Giant tiger prawn (*Penaeus monodon*)

This is another important species of shrimp produced in the region. In 2014, the production of this shrimp species is 10 percent of the total crustacean production in the region. In the last decade, from 2004 until 2014, the production has remained within the range of 559 667–765 397 tonnes. The production in 2014 (629 420 tonnes) is a little lower (10.9 percent) from the 2013 level (706 345 tonnes) and by 5.6 percent from 2012 (666 760 tonnes). The top 2 producing countries for this

species have always been Viet Nam and Indonesia. In 2014, the production in Viet Nam (168 906 tonnes) increased a little, by 2.9 percent compared to the 2012 level (164 189 tonnes). The production in Indonesia in 2014 (129 231 tonnes) increased as well by 11.1 percent over that of the 2012 level (116 311 tonnes). The combined production in these 2 countries in 2014 constitutes 47.4 percent of the total giant tiger prawn production in the region. The other countries in the region that have substantial production of giant tiger prawn in 2014 are China (74 869 tonnes), Bangladesh (71 430 tonnes), India (70 389 tonnes), Philippines (47 843 tonnes) and Myanmar (40 000 tonnes), the combined production of which (304 531 tonnes) is 48.4 percent of the total giant tiger prawn production in the region. Together with the white leg shrimp, this species is highly traded internationally.

Other shrimp and prawn species (Family Caridea)

Included in this group are *Penaeus* shrimps nei, fleshy prawn, kuruma prawn, banana prawn, *Metapenaeus* shrimps nei, speckled shrimp, blue shrimp and Indian white prawn. The total production of this group in 2014 (269 298 tonnes) is a little higher (7.4 percent) than in 2012 (250 617 tonnes) but lower (-13 percent) than in 2004 (309 950 tonnes).

Penaeus shrimps nei is widely grown being cultured in 11 countries in the region. The production in 2014 reached 125 011 tonnes which constitutes 46.4 percent of the total production of this group. China is the leading producer with production (116 200 tonnes) equivalent to 92.9 percent of the total *Penaeus* shrimps nei production. Bangladesh (4 661 tonnes) and Australia (3 774 tonnes) come next with combined production constituting 6.7 percent of the total production. Together with China, the share of the production of these 3 countries is 99.6 percent.

The Kuruma prawn production in 2014 (49 093 tonnes) constitutes 18.2 percent of the total production of other shrimps and prawns in the region. This species is also cultured in China, Japan and Taiwan POC with substantial production in 2014 largely coming from China (47 496 tonnes) and Japan (1 600 tonnes). The 2014 production is slightly lower (-4.1 percent) than in 2012 (51 101 tonnes) and 96.7 percent of this is contributed by China and 3.2 percent by Japan. The production in Japan remained stable from 2004 to 2014 with annual production ranging from 1 596-1 818 tonnes. The production in China, however, showed increasing trend from 2004 towards 2010 and is decreasing thereafter until 2014.

Fleshy prawn is grown in China and South Korea with China contributing 99.9 percent (48 167 tonnes) of the total production in 2014 (48 180 tonnes). The production in China in 2014 increased 16.9 percent over that of 2012 (41 213 tonnes). The share of fleshy prawn production is 17.9 percent of the total production of other shrimps and prawns in the region.

Banana prawn is grown in 10 countries in the region but only 4 countries contributed to its production from 2010 until 2014 and these include Indonesia, Viet Nam, the Philippines and Thailand. Indonesia is the leading producer with 2014 production (15 634 tonnes) equivalent to 59.8 percent of the total production in the region (26 137 tonnes). Thailand comes next with a production of 8 410 tonnes or 32.2 percent, and the Philippines with 1 827 tonnes or 7 percent of the total production in the region. The production in 2014 is 18.3 percent higher than in 2012 (22 088 tonnes) and is equivalent to 9.7 percent of the total production of other shrimps and prawns in the region.

The other shrimp species with substantial production in 2014 is *Metapenaeus shrimps nei* which is grown in 4 SEA countries in the region. The production of this species in 2014 (12 371 tonnes) is equivalent to 4.6 percent of the total production of other shrimps and prawns in the region and is 19.3 percent higher than in 2012. Again, Indonesia (11 031 tonnes) is the leading producer followed by the Philippines (1 151 tonnes). The combined production of these 2 countries constitutes 98.5 percent of the total production of this species with the remaining 1.5 percent contributed by Thailand. The production in Indonesia is peculiar. Its production from 2004 until 2011 is within the range of 14 000-30 000 tonnes but it dropped significantly in 2012 (374 tonnes) after which it again sharply increased in 2013 (54 274 tonnes). For the Philippines, the 2014 production is almost twice over that of 2012 (778 tonnes) and 2013 (757 tonnes). The production from 2004-2013 is very stable from 559-786 tonnes.

The combined production of *Penaeus shrimps nei*, Kuruma prawn, fleshy prawn, banana prawn and *Metapenaeus shrimps nei* constitutes 96.8 percent of the total production of other shrimps and prawns in 2014. The remaining 3.3 percent is contributed by production from speckled shrimp from Bangladesh, Indian white shrimp from India and Bangladesh, and blue shrimp from Brunei Darussalam and the Pacific Island countries of New Caledonia, French Polynesia and Vanuatu.

Freshwater prawns (Genus *Macrobrachium*)

Compared to the marine and BW shrimps and prawns, FW prawns are not that popular with production in 2014 reaching 495 848 tonnes and is 1.6 percent lower than in 2012. The annual production of this group of shrimps/prawns for the last 10 years (2004-2014) ranges from 400 000 – 570 000 tonnes, and is characterized by annual cycles of ups and lows, not a consistent increase or decrease in the production. For instance during the last 10 years, the lowest production was in 2004 (400 000 tonnes) and the highest was in 2013 but the production in 2014 was more or less similar to the production during 2010-2011. Some of the possible reasons why the production of this group of FW prawns did not increase significantly is their territorial habits and divergent growth rates, export markets are much smaller and less developed because consumers in general are less familiar with these species than with BW shrimp, the head-to-tail ratio in these species is also not favorable for markets where the heads of the shrimp are not consumed. As a consequence, farmers have diverted their efforts and resources in growing the more popular BW shrimp species.

In terms of volume, the oriental river prawn (*Macrobrachium nipponense*) that is grown only in China is the most abundant with the production of 257 641 tonnes in 2014 (Table 21) equivalent to 51.9 percent of the total FW prawn production in the region and is 8.5 percent higher than in 2012 (237 431 tonnes). The most widely cultured species, however, that is grown in 17 countries in the region is the giant river prawn (*Macrobrachium rosenbergii*). The production in 2014 (216 336 tonnes) is equivalent to 43.6 percent of the total FW prawn production in the region. The 2014 production is 2.8 percent higher than that of 2012 (210 511 tonnes) and 13.7 percent higher than in 2004 (190 292 tonnes). China (127 204 tonnes), Bangladesh (45 167 tonnes) and Thailand (18 000 tonnes) are the top 3 producing countries with the combined production equivalent to 88 percent of the total giant river prawn production. India (8 680 tonnes), Taiwan POC (8 523 tonnes), Viet Nam (5 674 tonnes), Indonesia (1 809 tonnes), Myanmar (800 tonnes) and Malaysia (398 tonnes) produced minimal quantities as well.

India reported substantial production data for river prawns nei from 2010-2012 but did not report the same in 2013 and 2014. Pakistan reported production data for monsoon river prawn (*Macrobrachium malcomsonii*) from 2012 to 2014 with values ranging from 136-142 tonnes.

Crabs (Infra-order Brachyura)

A number of other decapod crustaceans are grown in the region and they are categorized into crabs, freshwater crayfish & crawfish, and lobster.

The crabs include the Indo-Pacific swamp crab (*Scylla* spp.), blue swimming crab (*Portunus* spp.), Chinese mitten crab (*Eriocheir sinensis*), and marine crabs nei (*Brachyura* spp.). The total production in the region in 2014 was 1 113 465 tonnes and has increased by 10.9 percent over that

of 2012 (1 004 337 tonnes). The production of crabs in the region showed a steady increase over the last 10 years with an average annual increase of 7.6 percent from a production of 537 732 tonnes in 2004 to 847 685 tonnes in 2010 and 1 113 465 tonnes in 2014.

The Chinese mitten crab is the most abundant crab species produced in the region with 2014 production (796 622 tonnes) equivalent to 71.5 percent of the total crab production in the region, and representing an 11.5 percent increase over the 2012 level (714 466 tonnes). This species is produced largely in China (796 535 tonnes or 99.9 percent of the total production) with minimal production in Taiwan POC (74 tonnes) and South Korea (13 tonnes).

The Indo-Pacific swamp crab (*Scylla* spp.) comes next and is widely grown in 17 countries in the region. The production in 2014 (170 692 tonnes) is 6.9 percent higher than in 2012 (159 714 tonnes) and constitutes 15.3 percent of the total crab production in the region. China is still the major producer with its 2014 production (140 738 tonnes) equivalent to 82.4 percent of the total swamp crab production in the region. The Philippines comes a far second with its share of production (16 160 tonnes) equivalent to 9.5 percent of the total swamp crab production in the region. Indonesia's production in 2014 was 15 594 tonnes.

China reported a considerable production of *Portunus* swimming crab *nei* (118 836 tonnes) which is probably the same as the blue swimming crab reported by Singapore (35.7 tonnes) and Taiwan POC (5.6 tonnes). China and Taiwan POC likewise reported production data for marine crabs *nei* of 12 014 and 93.5 tonnes, respectively. Myanmar reported an increasing production of orange mud crab (*Scylla* spp.) (2 000 tonnes) in 2014 which is higher than in 2012 (1 733 tonnes).

Freshwater crayfish and crawfish (Genus *Procambarus* and *Cherax*)

Almost all (99.9 percent) of the total production of this group in 2014 (659 868 tonnes) is due to red swamp crayfish (*Procambarus clarkii*) production from China (659 661 tonnes). The other species in this group are the red claw crayfish (*Cherax quadricarinatus*) produced in Malaysia (76.5 tonnes) and Australia (35.5 tonnes). Malaysia started reporting this species in 2013 with a production figure of 96 tonnes. Australia, however, has been growing this species since the late 1980s and the production has been decreasing starting 2007. Marron crayfish (*Cherax cainii* and *C. tenuimanus*) is also grown in Australia and its production has been stable since 2000 with 2014 production of 59.5 tonnes. The 2014 production of Yabby crayfish (*Cherax destructor*) (35.6 tonnes) is only from Australia since Indonesia did not report production data in 2013 and 2014. The production data for yabby crayfish in Australia is decreasing starting 2007.

Lobsters (Genus *Panulirus*)

This group is valued highly since the production is traded internationally. The total production in 2014 (948 tonnes) is mainly from tropical spiny lobsters from Viet Nam (693 tonnes), Indonesia (202 tonnes) and the Philippines (43 tonnes), and mud spiny lobsters from Singapore (10 tonnes). The total production value is USD 10. 419 M. There is a significant reduction in the production of this commodity in 2014 compared to 2012 (1 338 tonnes) and 2013 (1 684 tonnes) largely because of the decrease in the production in Indonesia by -58.6 percent in 2012 and -77.9 percent in 2013. The production in Viet Nam remained stable in the last 5 years whereas that of the Philippines showed a giant leap from 9 tonnes in 2012 to 52 tonnes in 2013 or an increase of 477.8 percent from 2012 to 2013.

MOLLUSKS AND OTHER SHELLFISHES

In this document, mollusks production is divided into two categories, namely high-value mollusks and low-value mollusks species. Low-value mollusks species are normally produced in extensive culture systems like the production of blood cockle in mudflats or mussel and oyster production in raft or stake culture methods whereas high-value mollusks species are produced in intensive culture systems utilizing additional inputs like feeding and water recirculation system.

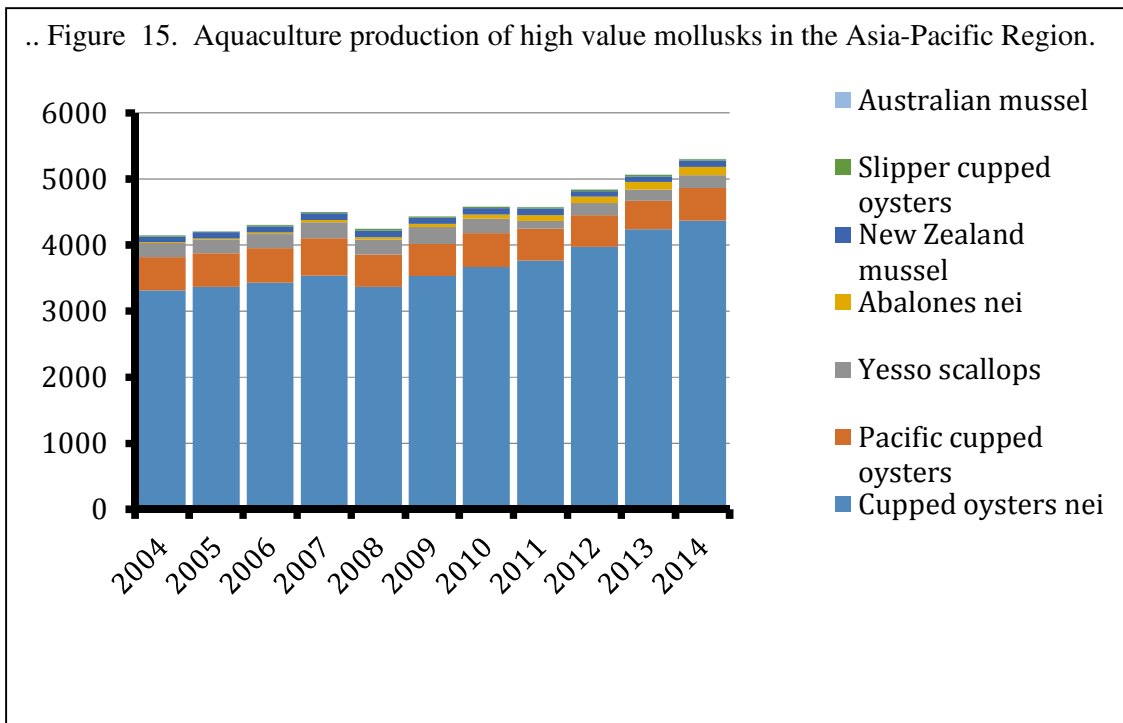
There are 42 kinds of mollusks cultivated in the region, the total production of which in 2014 reached 14 937 707 tonnes. The mollusks production in the region showed a steady increase over the years. During the last 10 years starting 2004, the average annual increase is about 3.4 percent. The production in 2014 is 8.5 percent higher than in 2012 and 3.8 percent higher than in 2013.

High value mollusks species

These are the species produced in more intensive systems in highly selected locations. In this group are the oysters, scallops, abalone and mussels that are produced in high input systems. The production for this group is quite stable during the last 10 years with an average annual increase of just 3.6 percent from 2004 to 2014. The total production in 2014 reached 6 972 321 tonnes which is 11.2 percent higher than in 2012 (6 270 827 tonnes). The trend in the annual production between 2004 and 2014 is shown in Figure 15.

Cupped oysters nei (*Crassostrea* spp.) is the most highly produced among the species in the group with a total production in 2014 of 4 370 661 tonnes. China and Thailand reported the most significant production in 2014 of 4 352 053 and 17 187 tonnes, respectively. China's share in the total production is 99.5 percent. The combined production of these 2 countries (4 369 240 tonnes) is equivalent to 99.9 percent of the total cupped oysters nei production in 2014. The production in Thailand is similar to its production in 2012 whereas that of China increased by 10.2 percent compared to the 2012 figure.

Pacific cupped oyster (*Crassostrea gigas*) is another important species of oysters produced by 5 countries in the region in the last 5 years. The total production of this species of oysters fluctuates yearly but in general remains somewhat stable in the last 10 years. For instance, the production in 2014 (494 118 tonnes) is 4.2 percent higher than in 2012 (474 133 tonnes) but is 1.2 percent lower than in 2004 (500 168 tonnes). As in previous years, the top 3 producing countries in 2014 are South Korea (283 232 tonnes), Japan (184 100 tonnes) and Taiwan POC (25 276 tonnes), the combined production of which constitutes 99.7 percent of the total production in the region in 2014. The production in New Zealand is 1 509 tonnes.



About 99.5 percent of the yesso scallop (*Patinopecten yessoensis*) production in the region (193 256 tonnes) in 2014 comes from Japan (192 300 tonnes) with the remaining 0.5 percent of the production coming from South Korea. This species of scallop is largely popular in Japan with its production already showing signs of decline starting 5 years ago.

Significant productions of abalones nei are reported in China, South Korea, Australia, Taiwan POC and New Zealand, in that order. The production of this species showed a steady increase

over the years. The production in 2014 (125 533 tonnes) increased by 28 percent over that of the 2012 production (98 042 tonnes) and 669 percent over that of 2004 level (16 326 tonnes). Except for New Zealand where its production decreased by 14 percent, all the other abalone-producing countries showed significant increases in their production between 2012 and 2014. Taiwan POC posted the highest increase of 247 percent, Australia with 42percent, South Korea with 37 percent and China with 28 percent.

The New Zealand mussel also posted a modest increase (12.7 percent) in its 2014 (97 438 tonnes) production over that of 2012 (86 447 tonnes) and 2004 (85 000 tonnes) or 14.6 percent.

Low value mollusks species

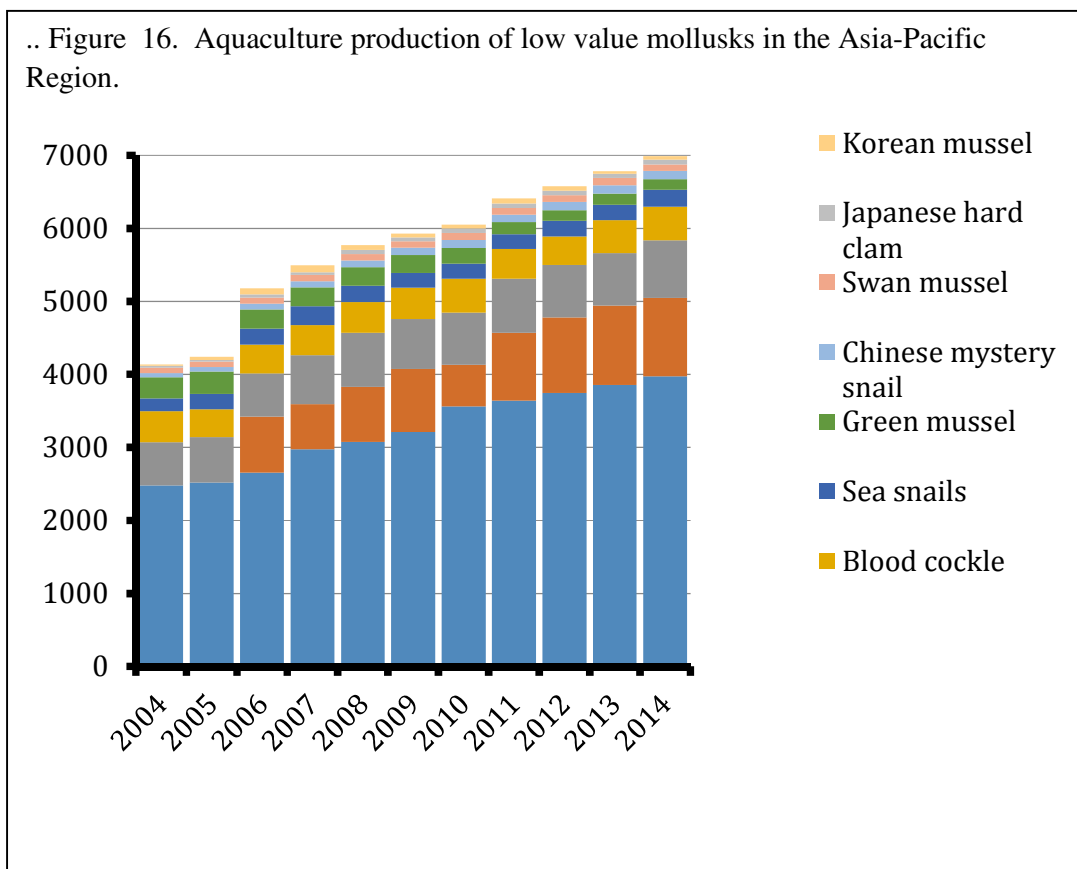
The low-value mollusks species produced in the region include the mussels (*Perna* spp.), Japanese carpet shell (*Ruditapes philippinarum*), blood cockle (*Anadara granosa*), constricted tagellus (*Sinovacula constricta*), among others. The total production of this group of mollusks in 2014 (7 967 366 tonnes) is just half of the total mollusks production in the region. The production of this group of mollusks also showed a consistent slight increase over the years. For instance, the group posted a modest average annual increase in production of 3.2 percent from 2004 to 2014. The production in 2014 is 6.2 percent higher than in 2012 and 3.6 percent higher than in 2013. The trend in the annual production between 2004 and 2014 is shown in Figure 16.

Among the species, the most dominant in terms of production is the Japanese carpet shell that is grown in China, South Korea and Taiwan POC with production in 2014 of 3 974 351 tonnes, about half (49.9 percent) of the total low-value mollusks production. China is the main producer with production of 3 966 953 tonnes which is 99.8 percent of the total production of this species. The remaining production is by South Korea (7 300 tonnes) and Taiwan POC (98 tonnes). The production in China increased by 6.2 percent whereas that of South Korea decreased by 42.2 percent from 2012 to 2014.

The other species, after Japanese carpet shell, are marine mollusks *nei*, sea mussels *nei*, constricted tagellus and blood cockle. The production of marine mollusks *nei* in 2014 is 1 074 412 tonnes and are largely coming from China (885 443 tonnes) and Viet Nam (188 881 tonnes). The production in Viet Nam posted a 40.9 percent increase between 2012 and 2014 whereas that of China decreased a little (-1.3 percent). Constricted tagellus or the Chinese razor clam is grown mainly in China. The production of this marine bivalve in the last 5 years (2010-2014) did not change so much and ranges from 714 434 tonnes in 2010 to 786 828 tonnes in 2014. The blood cockle is also largely produced in China (353 388 tonnes) with substantial production also coming from Thailand (65 350 tonnes) and Malaysia (40 425 tonnes).

The other low-value mollusks with substantial production in 2014 are the sea snails, the green mussel (*Perna viridis*) and the Chinese mystery snail (*Bellamya chinensis*). The sea snails is

mainly produced in China with production in 2014 reaching 232 849 tonnes. China started reporting production data of this species in 2003 and the production remained stable over the years. The production in 2014 is just 8.6 percent higher than in 2012 and -0.5 percent lower than in 2006. Thailand and the Philippines are the main producers of green mussel. Green mussel production in Thailand reached its peak in 2002 (287 250 tonnes). The production in 2014 (126 292 tonnes) is 56 percent lower than in 2002 but is 22.8 percent higher than in 2012. The production in the Philippines did not vary much during the last 10 years (2004-2014) with figures fluctuating up and down every year but within the range of 15 000-25 000 tons. The 2014 production is 18 762 tonnes. The Chinese mystery snail is a FW snail and its production remained stable in the last 5 years with production figure in 2010 of 110 422 tonnes and in 2014 of 110 393 tonnes.



SEAWEEDS AND OTHER AQUATIC PLANTS

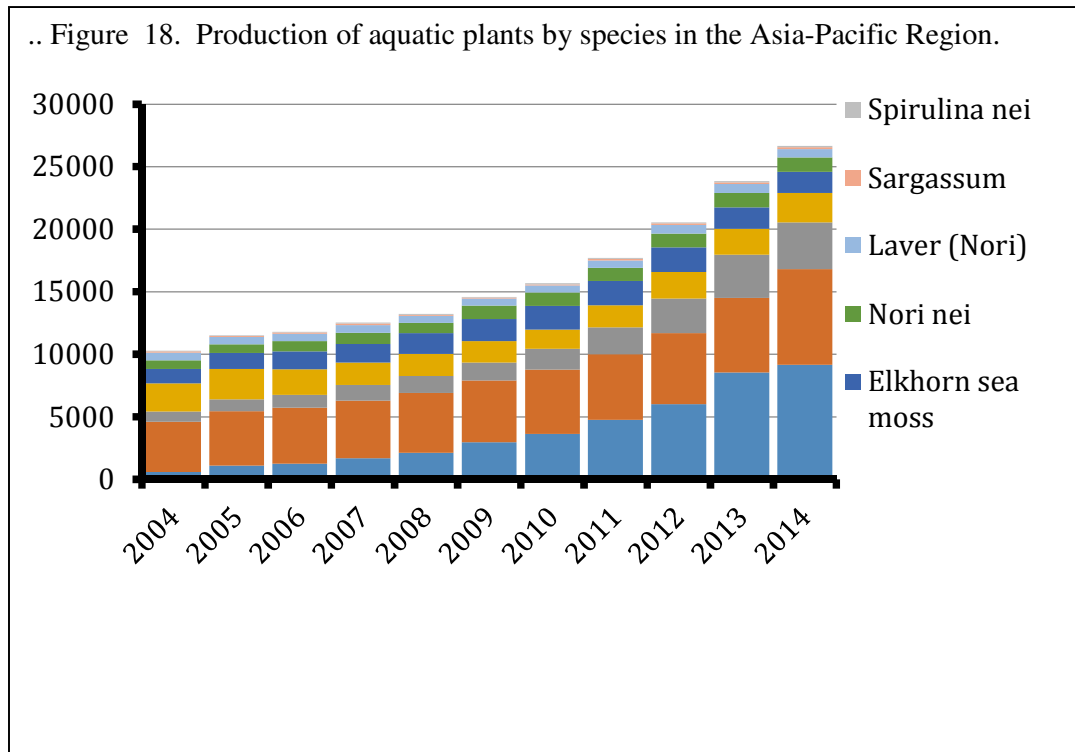
The region produces over 99 percent of the total production of seaweeds and other aquatic plants in the world. Most of the production is from BW and SW with only around 0.3 percent coming from FW aquaculture systems. The trend in the annual production by country and by major species between 2004 and 2014 are shown in Figures 17 and 18.

There is a steady increase in the annual production of seaweeds and other aquatic plants in the region starting 2000 until 2014. The total production in 2014 (27 139 989 tonnes) is 16 percent higher than in 2012 (23 391 510 tonnes) and 116 percent higher than in 2004 (12 546 830 tonnes).

In this report, the production of aquatic plants is categorized into 2 groups: those species that are traditionally used as food and are mostly cold-water species and grown in East Asian countries, and those that are processed largely as source of highly valuable bioactive compounds (carrageenan and agar) and are mostly tropical species produced in SEA countries.

Seaweeds for food purposes

The total production in 2014 of this group of seaweeds reached 12 365 113 tonnes which is a little lower (-1.5 percent) than in 2012 (12 549 270 tonnes). The Japanese kelp (*Laminaria japonica*) remains the most important seaweed species for food with a total production in 2014 of 7 654 586 tonnes higher by 34.7 percent than in 2012 (5 682 078 tonnes). This species is grown in 4 countries in the region such as China, North and South Korea, and Japan, with China being the largest producer with production in 2014 (6 805 175 tonnes) equivalent to 88.9 percent of the total Japanese kelp production in the region. The production in China in 2014 has increased by 39 percent compared to the production in 2012 (4 895 030 tonnes). Likewise, the production in South Korea between 2012 and 2014 has increased by 20.6 percent.



Wakame and Nori nei are the other 2 species of high importance as food. Wakame is cultivated in China, South Korea and Japan with a combined total production in 2014 of 2 358 597 tonnes (Table 25) and which is 10.2 percent higher compared to the 2012 level (2 139 477 tonnes). China is again the largest producer, with its share of production in 2014 (2 030 990 tonnes) equivalent to 86.1 percent of the total in the region and has increased by 16 percent than in 2012 (1 751 210 tonnes). The production of wakame in South Korea and Japan between 2012 and 2014 has decreased by 16.5 and 9.2 percent, respectively.

The combined production of Laver (Nori) from Japan and South Korea, and Nori nei from China is 1 806 173 tonnes which is more or less the same as in 2012.

The other seaweed species that are utilized as food are Caulerpa, Codium, the filamentous green algae (bright green nori) (*Enteromorpha clathrata*) and green algae (laver) (*Monostroma* sp.).

Seaweeds as sources of highly valuable bioactive compounds

The major species in this group are *Kappaphycus*, *Eucheuma* and *Gracilaria*. In addition, there is *Sargassum*, *Gelidium* and brown seaweeds. There is a 36.3 percent increase in the total production of these seaweeds in 2014 (14 774 876 tonnes) relative to the 2012 level (10 842 240 tonnes). This is due to the increased production of *Eucheuma* in Indonesia (56.3 percent), *Gracilaria* in Indonesia (42.4 percent) and China (33.3 percent), and fusiform *sargassum* in China (56.3 percent). While there are increases observed in the production of some species in 2014, there are also notable decline in the production of some species. The productions of *Eucheuma* in China and the Philippines have decreased by 123.7 and 21.6 percent, respectively. *Kappaphycus* productions in Malaysia and the Philippines have also decreased by 35 and 12.1percent, respectively.

CURRENT AND EMERGING ISSUES THAT ARE CURRENTLY AFFECTING AND MAY POSSIBLY AFFECT FUTURE AQUACULTURE PRODUCTION IN THE REGION

The world has benefited from the supply of food fish coming from aquaculture farms. Aside from providing nutritious food to millions of people around the world, it has generated employment to people in the rural areas thereby providing income and thus may have helped improve the living conditions/standards of living of these people. Like any other undertaking, however, there are threats to the sustainability and the continued development of aquaculture industry. Since we have been practicing aquaculture for a long time now, our farmers have experienced various threats that come our way and have successfully overcome some if not all of them. This is one of the reasons that aquaculture production have continued to increase until the present time.

Preventing disease outbreaks in aquaculture farms

The outbreak of diseases at any time during the culture operations will continue to be an important issue that farmers have to be always on guard against. The emergence of a new pathogen or the re-emergence of an old one, most likely happens during intensification of operations. The urge to continue increasing production is driven by the high demand of the commodity and the revenues generated by the product. The more expensive the commodity is

and the more that it is traded internationally, the stronger is the tendency among the farmers to push the limits of the production systems. This has happened with the giant tiger prawn during the 1970s and the white leg shrimp recently. Because of the high price of these species and the very high demand by the world market, farmers responded by increasing production through expansion of production areas and increasing stocking densities beyond the carrying capacities of the culture systems. As a consequence of the excessive increase in biomass, additional production inputs like pelleted feeds, various chemicals to improve the water and soil quality of the culture environment, and the general well-being of the stocks, are added to maintain good growth and optimal conditions of the culture environment. Despite all these, however, the industry was hit by diseases like the MBV, luminous bacteria, WSSV for giant tiger prawn and AHPND (EMS) and EHP, WFD for white leg shrimp, among others. These diseases caused significant losses for the industry during the initial occurrence of the disease until such time that the farmers have discovered new innovations to contain the disease.

Intensive or super-intensive aquatic production systems are indeed prone to disease occurrence because of the uniqueness of these systems compared with terrestrial production systems especially in a closed systems where all the biological and chemical wastes, and the by-products of the decomposition of these wastes are all in the same medium where the aquatic animals live, get their food and all the other substances for them to grow and survive. The current approaches of biofloc technology and the use of other biological organisms to make use of these wastes are approaches in the right direction. These however, require more improvement for their effectiveness and for their applicability to the different commodities presently grown by the farmers.

Maintaining the health of the environment in aquaculture areas

Maintaining the integrity of the environment where the aquaculture activities are happening is key to the continued success of the operations. The intensification of aquaculture operations will generate massive amounts of wastes that will eventually find its way back to the very same environment where the aquaculture commodities are farmed. If not managed properly, with time this practice will negatively impact on the operations itself and eventually destroy the surrounding environment as well. The co-culture of other organisms that will make use of the various waste products of the aquaculture operations in a production system called IMTA or Integrated Multi-Trophic Aquaculture has to be promoted and its effectiveness strengthened by generating more scientific data to improve its over-all performance and thus convince the farmers of its usefulness and make it more attractive for them to adopt the practice. With IMTA, farmers will generate more revenues by way of additional harvests from the secondary stocks used as extractive species, at the same time minimizing the possibility of polluting the environment.

Ensuring the sustainability of the use of pelleted feeds in aquaculture

The current practice of aquaculture has become synonymous with artificial feeds. Except for the seaweeds and filter feeders like the mollusks, most of the other commodities are given feeds when grown in captivity. Even the herbivores that rely mainly on the natural productivity of the

culture environment for growth are provided with supplemental feeds when cultured in high stocking densities. The provision of artificial feeds in aquaculture operations has indeed resulted in the tremendous increase in aquaculture productions because it allowed the farmers to increase the biomass during operations.

Although this is clearly beneficial, the sustainability of this practice has long been questioned. Central to the issue is the use largely of fish meal and fish oils as the main source of protein and lipids in fish feeds. Currently, the fish meal is sourced mainly from the low-value fish or fish-by-catch from capture fisheries that are also considered food by many people especially the low-income people living in the rural coastal communities around the world. This practice of “feeding fish with fish” is also the reason behind the negative image of growing the high value carnivorous fish species that are given directly low-value fish or fish-bycatch as feeds.

For fed aquaculture to be sustainable, other sources of protein for the fish feeds have long been sought. Scientific data on the use of plant-based protein from various kinds of terrestrial plants as partial replacement of fish meal are already available. For these identified sources of plant-based proteins, however, the issue has shifted to the availability of supply of the raw materials to be used by the feed manufacturers. In addition to the terrestrial plants, there are thousands of kinds of seaweeds that are potential sources of protein. These vast resources have just been tapped recently to help address this issue. Furthermore, there are on-going initiatives to make use of the wastes (head and tail) in fish processing plants as additional sources of protein.

Another matter of concern with the use of artificial feeds is the feed quality and the continuing increase in its price brought about mainly by the increasing prices of the raw materials that are becoming scarce in supply. The steady increase in the price of the feeds has made it difficult for the farmers to realize reasonable profit margins in their harvest considering that in “fed aquaculture” about 70% of the production costs is due mainly to the cost of the feeds. This problem is true when farmers grow the low value fish species that do not command high price in the market.

Preparing the aquaculture sector in a future warmer global climate

It has become clear that the earth is warming and there is strong agreement that the cause of the warming is partly human-driven activities that resulted in increased greenhouse gas emissions. Although the increase in the temperature is generally discussed as global average, this is not evenly distributed spatially, with a tendency for higher than global average increase above land masses and differences regionally and seasonally. The warming of the planet has caused associated changes in the climate and the global weather pattern. There is considerable agreement as well that these changes in the climate will affect aquaculture operations since they are generally dependent on local climate and environmental conditions. Specifically, aquaculture will be impacted with the changes in the temperature of inland waters and sea surface, wind, current and wave variables, sea level rise and the associated inland salinization, solar radiation, availability of FW, frequency and intensity of extreme events (typhoons, drought, floods) since these may bring physiological changes that will affect growth, development, reproduction and disease occurrence, among others.

In a recent study by Handyside et al. (2016), the aquaculture operations in many countries in the AP region are vulnerable to climate-related issues. Except for Uganda, 9 of the top 10 most vulnerable countries for FW aquaculture are in the AP region and these include Viet Nam, Laos, Bangladesh, Myanmar, China, Taiwan POC, Cambodia, Thailand, India and Indonesia, in that order. For BW aquaculture, Viet Nam, Taiwan POC, Thailand, Philippines, and Indonesia are in the top 10 vulnerable countries. Although not the most vulnerable in SW production but China, Viet Nam, the Philippines and South Korea ranked high as they belong to the top 10 vulnerable countries for SW aquaculture production.

Indeed, the aquaculture sector in the Region will be highly affected in the future scenario described here. Countries in the region where aquaculture is prominent in their economies have to prepare and be ready for this eventuality if they wish to continue reaping the benefits that are derived from robust aquaculture sector.

Developing inclusive aquaculture value chain for equitable benefit sharing

The aquaculture industry provides employment and income to millions of people in the rural areas either directly as fish farmers or fish producers or indirectly through secondary jobs in the industry like trading, processing and other jobs. In 2014, about 33 percent of the 56.6 million people engaged in the primary sector of capture fisheries and aquaculture are engaged in aquaculture, and of the 18 million people engaged in fish farming, 94 percent are in Asia (FAO 2016). Through their involvement in the various activities in the aquaculture value chain, aquaculture can help reduce poverty and hunger in our people. Specifically, fish farm workers and those involved in aquaculture often have better income and consequently have better chances of providing the basic needs of their household than others. Involvement in the aquaculture industry either as producers or employees is indeed one of the ways to help alleviate poverty and hunger among the poor people in the rural areas.

The problem, however, is that there is no equitable sharing of benefits among the various players in the industries value chain. A case in point is the seaweed industry (Kappaphycus/Eucheuma farming) where there is inequitable sharing of benefits among the players involved. Because of the high demand of the bio-active compounds from the seaweeds (Kappaphycus/Eucheuma), and the ease and the minimal capitalization involved in starting a seaweed farm, seaweed farming is indeed ideal for a family-type of aquaculture activity. The sad fact, however, is that the seaweed farmers/producers get the least benefit of their products. In most cases, the seaweed traders, who buy the raw materials (seaweeds harvest) from the seaweed farmers and sell these to the seaweed processing plants, are the ones getting the bulk of the benefit of the industry since they dictate the price of the raw materials that they buy. This picture where the traders reap more benefits than the fish producers or the fish farmers is very common in the aquaculture industry and has to change to make sure there is equitable sharing of benefits and ensure sustainability in the long run. Without the fish producers/fish farmers, the other players in the value chain will not exist.

Appendix A Geographical scope of the review

This review covers the states, entities and areas of Asia and the Pacific region that report fisheries and aquaculture statistics to FAO, and which are within the area of competence of the Asia-Pacific Fishery Commission. They are sub-divided into the following subregions;

| Regions | Country |
|----------------|---|
| Oceania | American Samoa Australia the Cook Islands Republic of Fiji Islands (Fiji) French Polynesia Guam Republic of Kiribati (Kiribati) the Marshall Islands the Federated States of Micronesia (Micronesia) Republic of Nauru (Nauru) New Caledonia New Zealand Republic of Niue (Niue) Norfolk Island Commonwealth of the Northern Mariana Islands (Northern Mariana Islands) Republic of Palau (Palau) Papua New Guinea Pitcairn Island Independent State of Samoa (Samoa) Solomon Islands Tokelau Kingdom of Tonga (Tonga) Tuvalu Republic of Vanuatu (Vanuatu) Wallis and Futuna Islands |
| South Asia | The People's Republic of Bangladesh (Bangladesh) the Kingdom of Bhutan (Bhutan) the Republic of India (India) the Republic of Maldives (Maldives) Federal Democratic Republic of Nepal (Nepal) Islamic Republic of Pakistan (Pakistan) the Democratic Socialist Republic of Sri Lanka (Sri Lanka) |
| Southeast Asia | Brunei Darussalam the Kingdom of Cambodia (Cambodia) the Republic of Indonesia (Indonesia) Lao People's Democratic Republic (Lao PDR) Malaysia the Union of Myanmar (Myanmar) the Republic of the Philippines (Philippines) the Republic of Singapore (Singapore) the Kingdom of Thailand (Thailand) the Democratic Republic of Timor-Leste (Timor-Leste) the Socialist Republic of Viet Nam (Viet Nam). |

| | |
|-------------------------------|--|
| China | People's Republic of China (China) Hong Kong SAR Special Administrative Region of China (Hong Kong SAR) Macao Special Administrative Region of China (Macao SAR) Taiwan Province of China (Taiwan POC) |
| Other Asia (East and central) | Islamic Republic of Iran (Iran) Japan the Republic of Kazakhstan (Kazakhstan) Democratic People's Republic of Korea (DPR Korea) Mongolia Republic of Korea (RO Korea) the Republic of Tajikistan (Tajikistan) the Republic of Uzbekistan (Uzbekistan) |

APFIC member countries are Australia, Bangladesh, Cambodia, China, France, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Sri Lanka, Timor-Leste, Thailand, United Kingdom, United States of America and Viet Nam.

FAO member countries in Asia and the Pacific. Asia: Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, DPR Korea, India, Indonesia, Iran, Japan, Kazakhstan, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Russian Federation*, Singapore, Sri Lanka, Thailand, Timor-Leste, Uzbekistan, and Viet Nam. Pacific: Australia, Cook Islands, Fiji, France*, Kiribati, Marshall Islands, Micronesia, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, United States of America*, and Vanuatu. * Denotes an FAO member country that has administrative territory in the Asia-Pacific region and participates in the biennial FAO Regional Conference for Asia and the Pacific.

Production areas

All catches made outside the subregional areas mentioned above are excluded from this review. The subregional areas cover the FAO major fishing areas (MFAs) as follows:

| | | |
|----------------|--|-------------------------|
| Inland waters: | Asia — Inland waters | (MFA 04) |
| | Oceania — Inland waters | (MFA 06) |
| Marine waters: | Western/Eastern Indian Ocean | (MFA 51 and 57) |
| | Northwest, Western/Eastern Central and Southwest Pacific Ocean | (MFA 61, 71, 77 and 81) |

| | |
|-----------------------------|--|
| China sub-region | China (People's Republic of), Hong Kong SAR (Special Administrative Region of China) and Taiwan (Province of China) |
| Southeast Asia sub-region | Brunei Darussalam, Cambodia (the Kingdom of), Indonesia (the Republic of), Lao PDR (People's Democratic Republic), Malaysia, Myanmar (the Union of), Philippines (the Republic of the), Singapore (the Republic of), Thailand (the Kingdom of), Timor-Leste (the Democratic Republic of) and Viet Nam (the Socialist Republic of) |
| South Asia sub-region | Bangladesh (the People's Republic of), Bhutan (the Kingdom of), India (the Republic of), Maldives (the Republic of), Nepal (Federal Democratic Republic of), Pakistan (Islamic Republic of) and Sri Lanka (the Democratic Socialist Republic of) |
| The Rest of Asia sub-region | Japan, Kazakhstan (the Republic of), Korea DPR (Democratic People's Republic of), Korea (Republic of), Tajikistan (the Republic of) and Uzbekistan (the Republic of) |
| Oceania sub-region | American Samoa, Australia, the Cook Islands, Fiji Islands (the Republic of the), French Polynesia, Guam, Kiribati (the Republic of), the Marshall Islands, the Federated States of Micronesia (FSM), Nauru (the Republic of), New Caledonia, New Zealand, Northern Mariana Islands (the Commonwealth of the), Palau (the Republic of), Papua New Guinea (PNG), Samoa (the Independent State of), Solomon Islands, Tonga (the Kingdom of), Tuvalu, Vanuatu (the Republic of) |

Appendix B

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Appendix C (Aquaculture Annex tables: 01-15)

Annex 1. China sub-region: Aquaculture production by major groups from 2004-2014 (x 1000 Tonnes).

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Diadromous fishes | 291 | 289 | 318 | 362 | 352 | 365 | 377 | 391 | 434 | 440 | 451 |
| Freshwater fishes | 14 804 | 15 691 | 16 671 | 17 329 | 18 189 | 19 365 | 20 427 | 21 620 | 23 087 | 24 550 | 25 737 |
| Marine fishes | 538 | 603 | 654 | 721 | 774 | 822 | 829 | 988 | 1 063 | 1 163 | 1232 |
| Crustaceans | 1 713 | 1 866 | 2 105 | 2 61 | 2 736 | 2 994 | 3 215 | 3 308. | 3 614 | 3 790 | 4 015 |
| Mollusks | 9 193 | 9 582 | 10 028 | 10 225 | 10 413 | 10 852 | 11 441 | 11 906 | 12 449 | 13 083 | 13 516 |
| Misc aquatic animals | 346 | 396 | 398 | 482 | 591 | 669 | 755 | 720 | 805 | 859 | 843 |
| Misc aquatic animal products | 0.03 | 0.03 | 4.9 | 5.2 | 4.6 | 3.4 | 3.1 | 2.3 | 2.6 | 2.0 | 2.0 |
| Aquatic plants | 9 383 | 9 497 | 9 508 | 9 762 | 9 941 | 10 500 | 11 097 | 11 554 | 12 836 | 13 565 | 13 327 |

| | | | | | | | | | | | |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total | 36 270 | 37 923 | 39 686 | 41 499 | 43 000 | 45 571 | 48 145 | 50 490 | 54 289 | 57 453 | 59 124 |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|

Annex 2. Southeast Asia sub-region: Aquaculture production by major groups from 2004-2014 (x 1000 Tonnes).

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Diadromous fishes | 540 | 567 | 553 | 637 | 663 | 719 | 816 | 883 | 916 | 1 021 | 1 026 |
| Freshwater fishes | 2 459 | 2 867 | 3 258 | 3 766 | 4 421 | 4 717 | 5 139 | 5 499 | 6 021 | 7 101 | 7 562 |
| Marine fishes | 32 | 31 | 32 | 31 | 62 | 49 | 168 | 191 | 161 | 138 | 135 |
| Crustaceans | 1 023 | 1 179 | 1 356 | 1 416 | 1 516 | 1 559 | 1 527 | 1 607 | 1 552 | 1 616 | 1 601 |
| Mollusks | 621 | 598 | 557 | 575 | 572 | 596 | 513 | 419 | 424 | 498 | 496 |
| Misc aquatic | 4.8 | 4.5 | 3.8 | 4.0 | 4.9 | 33.4 | 34.6 | 9.8 | 10.6 | 11.9 | 25.5 |

animals

| | | | | | | | | | | | |
|-------------------------------------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| Misc aquatic animal products | 13.0 | 16.3 | 16.3 | 16.0 | 19.7 | 15.9 | 58.1 | 48.4 | 17.2 | 29.1 | 44.4 |
| Aquatic plants | 1 678 | 2 322 | 2 721 | 3 339 | 3 939 | 4 860 | 5 946 | 7 268 | 8 621 | 11 143 | 11 890 |
| Total | 6 370 | 7 585 | 8 497 | 9 785 | 11 198 | 12 549 | 14 201 | 15 925 | 17 723 | 21 559 | 22 780 |

Annex 3. South Asia sub-region: Aquaculture production by major groups from 2004-2014 (x 1000 Tonnes)

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Diadromous fishes | 0.07 | 0.14 | 0.19 | 0.16 | 0.15 | 0.10 | 0.12 | 0.17 | 0.26 | 0.38 | 0.39 |
| Freshwater fishes | 3 512.9 | 3 622.1 | 3 830.1 | 3 898.9 | 4 587.1 | 4 616.1 | 4 934.3 | 4 844.7 | 5 520.5 | 6 006.1 | 6 344.4 |
| Marine fishes nei | 47.49 | 55.05 | 117.41 | 84.42 | 227.71 | 175.62 | 92.52 | 113.10 | 147.38 | 162.62 | 183.66 |
| Crustaceans | 249.60 | 274.24 | 266.58 | 229.56 | 192.33 | 216.96 | 225.76 | 409.75 | 440.74 | 442.32 | 521.41 |

| | | | | | | | | | | | |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Mollusks | 4.05 | 5.40 | 11.56 | 10.05 | 19.19 | 19.88 | 18.02 | 14.02 | 12.91 | 14.11 | 14.20 |
| Aquatic plants | 5.68 | 5.75 | 1.95 | 2.52 | 4.71 | 6.92 | 4.24 | 4.50 | 4.52 | 4.53 | 3.01 |
| Total | 3 819.8 | 3 962.6 | 4 227.9 | 4 225.6 | 5 031.2 | 5 035.6 | 5 274.9 | 5 386.3 | 6 126.2 | 6 630.0 | 7 067.0 |

Annex 4. The Rest of Asia sub-region: Aquaculture production by major groups from 2004-2014 (x 1000 Tonnes).

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Diadromous fishes | 59.9 | 60.0 | 62.3 | 67.2 | 59.4 | 63.2 | 61.1 | 46.2 | 48.1 | 48.9 | 52.7 |
| Freshwater fishes | 21.9 | 17.8 | 17.2 | 16.0 | 17.9 | 18.9 | 22.1 | 26.2 | 31.1 | 36.9 | 40.0 |
| Marine fishes | 317.7 | 337.0 | 334.9 | 344.9 | 345.9 | 358.5 | 311.1 | 302.4 | 317.0 | 303.7 | 309.3 |

| | | | | | | | | | | | |
|-------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Crustaceans | 4.3 | 3.2 | 3.4 | 3.0 | 3.5 | 3.6 | 4.4 | 4.5 | 4.4 | 5.4 | 6.1 |
| Mollusks | 820.8 | 807.3 | 875.7 | 993.1 | 826.3 | 857.6 | 840.7 | 739.6 | 779.6 | 686.4 | 796.3 |
| Misc aquatic animals | 24.7 | 25.2 | 21.9 | 20.3 | 19.4 | 28.0 | 25.9 | 20.4 | 18.9 | 17.6 | 22.1 |
| Misc aquatic animal products | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Aquatic plants | 1 475.8 | 1 573.2 | 1 700.0 | 1 751.2 | 1 821.7 | 1 759.4 | 1 778.8 | 1 786.3 | 1 907.4 | 1 994.0 | 1 894.7 |
| Total | 2 725.2 | 2 823.9 | 3 015.5 | 3 195.8 | 3 094.1 | 3 089.1 | 3 044.1 | 2 925.6 | 3 106.8 | 3 092.7 | 3 121.2 |

Annex 5. Oceania sub-region: Aquaculture production by major groups from 2004-2014 (x 1000 Tonnes).

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Diadromous fishes | 23.3 | 26.4 | 31.0 | 37.6 | 38.4 | 45.4 | 48.5 | 55.2 | 61.1 | 58.4 | 56.0 |
| Freshwater fishes | 2.6 | 3.6 | 4.2 | 3.8 | 1.9 | 2.5 | 2.8 | 2.6 | 2.8 | 3.1 | 3.3 |

| | | | | | | | | | | | |
|-------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Marine fishes | 4.5 | 2.2 | 3.6 | 2.1 | 6.6 | 7.3 | 11.6 | 9.6 | 8.8 | 8.5 | 8.3 |
| Crustaceans | 6.3 | 6.1 | 6.2 | 5.5 | 5.5 | 6.2 | 6.8 | 5.8 | 5.9 | 5.6 | 5.7 |
| Mollusks | 102.7 | 113.0 | 115.6 | 120.6 | 120.7 | 110.9 | 118.1 | 120.8 | 105.6 | 102.0 | 114.5 |
| Misc aquatic animals | --- | --- | --- | 1.1 | 1.9 | 1.5 | 1.8 | 3.1 | 2.8 | 3.6 | 1.3 |
| Misc aquatic animal products | 1.8 | 2.9 | 2.4 | 2.2 | 1.9 | 1.9 | 2.1 | 2.9 | 2.6 | 2.6 | 2.0 |
| Aquatic plants | 6.5 | 8.8 | 11.7 | 2.8 | 3.5 | 7.6 | 13.7 | 13.3 | 23.4 | 21.9 | 25.1 |
| Total | 147.8 | 163.1 | 174.9 | 176.0 | 180.4 | 183.3 | 205.4 | 213.4 | 212.0 | 205.9 | 216.3 |

Annex 6. Aquaculture production of carnivorous freshwater fishes in the Asia-Pacific region from 2004-2014
(x 1000 Tonnes).

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|

| | | | | | | | | | | | |
|--------------------------|-----|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Perch-like fishes | 267 | 295 | 344 | 376 | 404 | 427 | 452 | 496 | 542 | 652 | 666 |
| Eels | 333 | 349 | 411 | 461 | 470 | 506 | 537 | 541 | 557 | 573 | 603 |
| Snakeheads | 252 | 299 | 301 | 373 | 354 | 395 | 421 | 487 | 525 | 565 | 559 |
| Salmonids | 27 | 28 | 27 | 29 | 31 | 30 | 30 | 32 | 40 | 42 | 41 |
| Others | 11 | 14 | 17 | 23 | 24 | 33 | 39 | 50 | 61 | 71 | 82 |
| Total | 890 | 985 | 1 100 | 1 262 | 1 283 | 1 391 | 1 479 | 1 606 | 1 725 | 1 903 | 1 951 |

Annex 7. Aquaculture production of herbivorous and omnivorous freshwater fishes in the Asia-Pacific region from 2004-2014 (x 1000 Tonnes).

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|

| | | | | | | | | | | | |
|------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Carp and Barbs | 16 275 | 17 097 | 17 745 | 18 289 | 19 981 | 21 481 | 22 471 | 23 095 | 24 525 | 25 791 | 27 154 |
| Catfishes | 936 | 1 155 | 1 429 | 1 892 | 2 421 | 2 429 | 2 752 | 2 978 | 3 466 | 3 763 | 4 037 |
| Tilapias | 1 341 | 1 506 | 1 709 | 1 947 | 2 083 | 2 300 | 2 494 | 2 830 | 3 191 | 3 563 | 3 800 |
| Freshwater fishes nei | 1 262 | 1 309 | 1 489 | 1 465 | 1 247 | 857 | 1 185 | 1 337 | 1 790 | 2 099 | 2 033 |
| Gouramis | 77 | 77 | 80 | 83 | 81 | 99 | 107 | 129 | 156 | 184 | 211 |
| Milkfish | 59 | 52 | 61 | 67 | 63 | 58 | 58 | 68 | 71 | 67 | 62 |
| Others | 77 | 78 | 98 | 98 | 103 | 115 | 130 | 120 | 162 | 164 | 201 |
| Total | 20 027 | 21 274 | 22 611 | 23 841 | 25 979 | 27 339 | 29 197 | 30 557 | 33 361 | 35 631 | 37 498 |

Annex 8. Aquaculture production of brackishwater and marine fishes in the Asia-Pacific region
from 2004-2014 (x 1000 Tonnes)

| Groups | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Milkfish | 515 | 543 | 524 | 600 | 613 | 660 | 750 | 824 | 872 | 977 | 977 |

| | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Marine fishes nei | 238 | 278 | 328 | 321 | 540 | 470 | 472 | 569 | 583 | 621 | 690 |
| Barramundi /Sea bass | 98 | 106 | 120 | 130 | 133 | 146 | 160 | 180 | 187 | 182 | 178 |
| Jacks | 167 | 176 | 202 | 213 | 217 | 246 | 240 | 280 | 291 | 304 | 271 |
| Seabream / Porgies | 134 | 128 | 132 | 136 | 120 | 125 | 123 | 124 | 115 | 119 | 128 |
| Halibuts/Turbots/ Flatfishes | 94 | 117 | 113 | 118 | 137 | 157 | 135 | 164 | 166 | 168 | 181 |
| Groupers | 52 | 57 | 59 | 70 | 77 | 74 | 80 | 94 | 117 | 136 | 138 |
| Marine tilapia | 45 | 46 | 54 | 46 | 51 | 49 | 60 | 84 | 65 | 143 | 126 |
| Salmonids | 31 | 37 | 40 | 48 | 48 | 58 | 59 | 50 | 65 | 66 | 64 |
| Cobia | 18 | 20 | 23 | 30 | 26 | 33 | 39 | 39 | 51 | 43 | 39 |
| Mullets | 16 | 18 | 19 | 13 | 16 | 16 | 16 | 13 | 14 | 15 | 15 |
| Snappers | 4 | 4 | 5 | 5 | 7 | 8 | 8 | 9 | 7 | 9 | 17 |
| Others | 114 | 122 | 131 | 130 | 136 | 139 | 159 | 160 | 178 | 184 | 221 |
| Total | 1 526 | 1 652 | 1 750 | 1 860 | 2 121 | 2 181 | 2 301 | 2 590 | 2 711 | 2 967 | 3 045 |

Annex 9. Aquaculture production of crustaceans by major groups in the Asia-Pacific region from 2004-2014

(x 1000 Tonnes).

| Crustacean group | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Shrimps/prawns | 2 004 | 2 254 | 2 655 | 2 817 | 2 891 | 3 024 | 3 088 | 3 456 | 3 553 | 3 652 | 3 879 |
| Freshwater crustaceans | 812 | 872 | 921 | 1 213 | 1 320 | 1 506 | 1 633 | 1 607 | 1 771 | 1 903 | 1 952 |
| BW and SW crabs/sea spiders | 179 | 196 | 199 | 231 | 241 | 246 | 254 | 270 | 290 | 302 | 317 |
| Lobsters | 0.04 | 0.03 | 0.04 | 0.07 | 1.1 | 1.4 | 1.0 | 1.0 | 1.3 | 1.7 | 0.9 |
| Total | 2 995 | 3 322 | 3 775 | 3 048 | 4 453 | 4 777 | 4 976 | 5 334 | 5 615 | 5 859 | 6 149 |

Annex 10. Aquaculture production of brackishwater and seawater shrimps and prawns in the Asia-Pacific region from 2004-2014 (x 1000 Tonnes).

| Species | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| White leg shrimp | 994 | 1 293 | 1 701 | 1 902 | 1 825 | 1 964 | 2 175 | 2 517 | 2 635 | 2 634 | 2 981 |
| Giant tiger prawn | 700 | 657 | 632 | 584 | 711 | 765 | 560 | 685 | 667 | 706 | 629 |
| <i>Penaeus shrimps nei</i> | 98 | 110 | 99 | 113 | 125 | 73 | 176 | 89 | 105 | 124 | 125 |
| Kuruma prawn | 41 | 38 | 46 | 52 | 49 | 52 | 56 | 53 | 51 | 48 | 49 |
| Fleshy prawn | 50 | 45 | 46 | 43 | 43 | 44 | 45 | 42 | 41 | 42 | 48 |
| Banana prawn | 82 | 81 | 97 | 87 | 80 | 64 | 27 | 21 | 22 | 29 | 26 |
| Speckled shrimp | --- | --- | --- | --- | --- | 11 | 5 | 18 | 13 | 7 | 3 |
| <i>Metapenaeus shrimp nei</i> | 21 | 14 | 15 | 16 | 33 | 29 | 40 | 26 | 10 | 55 | 12 |
| Indian white prawn | 15 | 11 | 10 | 17 | 21 | 18 | 0.8 | 3 | 6 | 3 | 3 |
| Total | 2 001 | 2 254 | 2 652 | 2 821 | 2 895 | 3 029 | 3 095 | 3 465 | 3 562 | 3 661 | 3 890 |

Annex 11. Aquaculture production of freshwater crustaceans in the Asia-Pacific region from 2004-2014
(x 1000 Tonnes).

| Crustacean group | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Chinese mitten crab | 359 | 378 | 410 | 489 | 518 | 574 | 593 | 649 | 714 | 730 | 797 |
| Red swamp crawfish | 54 | 76 | 113 | 265 | 365 | 479 | 563 | 486 | 555 | 603 | 660 |
| Oriental river prawn | 184 | 177 | 180 | 192 | 205 | 209 | 226 | 230 | 237 | 251 | 258 |
| Giant river prawn | 191 | 195 | 198 | 226 | 219 | 223 | 197 | 202 | 211 | 203 | 216 |
| River prawns nei | --- | --- | --- | --- | --- | --- | 33 | 22 | 30 | --- | -- |
| Freshwater prawns/ shrimps nei | 24 | 46 | 20 | 41 | 13 | 21 | 21 | 18 | 25 | 116 | 21 |
| Total | 812 | 872 | 921 | 1 213 | 1 320 | 1 506 | 1 633 | 1 607 | 1 772 | 1 903 | 1 952 |

Annex 12. Aquaculture production of high value mollusks in the Asia-Pacific region from 2004-2014
(x 1000 Tonnes)

| Species | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Cupped oysters nei | 3 313 | 3 371 | 3 428 | 3 540 | 3 371 | 3 532 | 3 672 | 3 765 | 3 976 | 4 237 | 4 370 |
| Pacific cupped oysters | 501 | 505 | 526 | 561 | 487 | 485 | 507 | 484 | 475 | 433 | 494 |
| Yesso scallops | 215 | 203 | 212 | 248 | 226 | 257 | 220 | 119 | 185 | 168 | 193 |
| Abalones nei | 16 | 18 | 23 | 30 | 38 | 49 | 63 | 84 | 97 | 119 | 125 |
| New Zealand mussel | 85 | 95 | 97 | 99 | 100 | 90 | 95 | 101 | 86 | 83 | 97 |
| Slipper cupped oysters | 16 | 16 | 17 | 20 | 20 | 20 | 22 | 21 | 21 | 22 | 22 |
| Australian mussel | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Scallops nei | 0.8 | 0.9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Total | 4 150 | 4 212 | 4 307 | 4 502 | 4 246 | 4 437 | 4 583 | 4 578 | 4 844 | 5 067 | 5 306 |

Annex 13. Aquaculture production of low value mollusks in the Asia-Pacific region from 2004-2014 (x 1000 Tonnes).

| Species | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Japanese carpet shell | 2 477 | 2 517 | 2 654 | 2 976 | 3 075 | 3 210 | 3 562 | 3 639 | 3 748 | 3 858 | 3 974 |
| Marine mollusks nei | --- | --- | 768 | 618 | 753 | 867 | 570 | 930 | 1 031 | 1 084 | 1 074 |
| Constricted tagellus | 592 | 624 | 594 | 667 | 742 | 684 | 714 | 745 | 720 | 721 | 787 |
| Blood cockle | 428 | 385 | 393 | 413 | 419 | 427 | 466 | 405 | 391 | 450 | 460 |
| Sea snails | 177 | 208 | 218 | 259 | 225 | 204 | 208 | 203 | 214 | 213 | 233 |
| Green mussel | 288 | 303 | 266 | 260 | 253 | 244 | 214 | 163 | 145 | 152 | 148 |
| Chinese mystery snail | 57 | 64 | 78 | 84 | 94 | 99 | 110 | 105 | 112 | 110 | 110 |
| Swan mussel | 73 | 74 | 80 | 84 | 89 | 89 | 95 | 91 | 92 | 105 | 92 |
| Japanese hard clam | 26 | 23 | 48 | 36 | 52 | 52 | 60 | 60 | 63 | 57 | 61 |
| Korean mussel | 20 | 44 | 82 | 98 | 67 | 55 | 54 | 70 | 61 | 34 | 51 |
| Pen shells nei | 5 | 8 | 16 | 12 | 11 | 15 | 31 | 30 | 15 | 17 | 18 |
| Total | 4 143 | 4 250 | 5 197 | 5 507 | 5 780 | 5 946 | 6 084 | 6 441 | 6 592 | 6 801 | 7 008 |

Annex 14. Aquaculture production of aquatic plants by country in the Asia-Pacific region from 2004-2014
(x 1000 Tonnes).

| Country | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| China | 9 374 | 9 495 | 9 744 | 9 745 | 9 934 | 10 496 | 11 092 | 11 550 | 12 832 | 13 561 | 13 326 |
| Indonesia | 411 | 911 | 1 170 | 1 728 | 2 145 | 2 964 | 3 915 | 5 170 | 6 515 | 9 298 | 10 077 |
| Philippines | 1 205 | 1 339 | 1 469 | 1 505 | 1 667 | 1 740 | 1 801 | 1 841 | 1 751 | 1 558 | 1 549 |
| South Korea | 547 | 621 | 766 | 793 | 921 | 859 | 902 | 992 | 1 022 | 1 131 | 1 087 |
| Japan | 484 | 508 | 490 | 514 | 456 | 456 | 433 | 350 | 441 | 418 | 363 |
| Malaysia | 31 | 40 | 60 | 80 | 111 | 139 | 208 | 239 | 331 | 269 | 245 |
| Viet Nam | 15 | 15 | 15 | 15 | 15 | 15 | 18 | 14 | 18 | 13 | 14 |
| India | 5.7 | 5.7 | 1.9 | 2.5 | 4.7 | 6.9 | 4.2 | 4.5 | 4.5 | 4.5 | 3.0 |
| Taiwan POC | 9.2 | 2.4 | 5.9 | 9.4 | 6.9 | 4.4 | 4.9 | 4.9 | 3.5 | 3.2 | 0.1 |
| Timor Leste | --- | --- | --- | 0.4 | 1.0 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Myanmar | --- | --- | --- | --- | 0.3 | 1.2 | 2.1 | 2.3 | 3.2 | 1.6 | 2.1 |

| | | | | | | | | | | | |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total | 12 082 | 12 937 | 13 722 | 14 392 | 15 262 | 16 683 | 18 382 | 20 169 | 22 923 | 26 259 | 26 668 |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|

Annex 15. Aquaculture production of major aquatic plants by species in the Asia-Pacific region from 2004-2014
(x 1000 Tonnes).

| Country | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <i>Eucheuma</i> | 594 | 1 088 | 1 232 | 1 679 | 2 118 | 2 984 | 3 612 | 4 752 | 5 995 | 8 561 | 9 151 |
| Japanese kelp | 4 019 | 4 371 | 4 497 | 4 613 | 4 765 | 4 931 | 5 147 | 5 257 | 5 682 | 5 942 | 7 655 |
| <i>Gracilaria</i> | 810 | 920 | 1 026 | 1 258 | 1 371 | 1 442 | 1 683 | 2 161 | 2 762 | 3 451 | 3 739 |
| Wakame | 2 245 | 2 440 | 2 028 | 1 766 | 1 756 | 1 694 | 1 537 | 1 754 | 2 139 | 2 079 | 2 358 |
| Elkhorn sea moss (<i>Kappaphycus</i>) | 1 150 | 1 277 | 1 449 | 1 493 | 1 672 | 1 768 | 1 880 | 1 948 | 1 954 | 1 711 | 1 692 |
| Nori nei | 709 | 703 | 822 | 904 | 815 | 1 075 | 1 072 | 1 027 | 1 123 | 1 139 | 1 142 |
| Laver (Nori) | 599 | 585 | 586 | 607 | 571 | 560 | 569 | 615 | 697 | 727 | 670 |
| Fusiform sargassum | 115 | 85 | 114 | 136 | 87 | 79 | 78 | 111 | 112 | 151 | 175 |
| <i>Spirulina nei</i> | 36 | 48 | 56 | 67 | 62 | 71 | 97 | 73 | 80 | 82 | 85 |
| Total | 10 277 | 11 517 | 11 810 | 12 523 | 13 217 | 14 604 | 15 675 | 17 698 | 20 544 | 23 843 | 26 667 |

