Aquacult Int (2016) 24:1657–1668
DOI 10.1007/s10499-016-0066-1



# Trends in import and export of fishery products in the Czech Republic during 2010–2015

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Received: 15 April 2016 / Accepted: 1 September 2016 / Published online: 10 September 2016


**Abstract** There has been a worldwide increase in consumption of fish from open waters and aquaculture during the last decades. In 2013, the Czech Republic was the sixth largest producer of fish within the EU, with annual production of 20,135 tonnes. However, during the period 2010–2015 import of fishery products to the Czech Republic increased from 39,098 to 43,399 tonnes. The monetary value of import increased by 81 % from 90.2 million EUR in 2010 to 169.9 million EUR in 2015. In 2010, the major imported fishery product was frozen fillets of sutchi catfish (*Pangasianodon hypophthalmus*) from Vietnam (8872 tonnes). In 2015, the most imported fishery product was whole chilled salmon (*Salmo salar*) from Norway (6897 tonnes). During 2010–2015, the export of fishery products increased from 18,167 to 22,134 tonnes, which is an increase by 21.8 %. The value of export has increased by 80 % from 54.5 million EUR in 2010 to 98.1 million EUR in 2015. The major exported fish was live common carp (*Cyprinus carpio*) at volume of 7545–9075 tonnes. This study looks at changes in market, volume and value of fish imported and exported during the last 6 years.

**Keywords** Czech · Domestic · Foreign · Market · Seafood · Trade

## Introduction

Freshwater and marine fish, molluscs and crustaceans are important food resources (Usydus et al. 2011). The nutritional value and nutritional benefits are well known (Karl et al. 2014). Fish and other aquatic products represent almost 20 % of animal protein

Guest editors: Zuzana Linhartová and Jan Mráz/Carp pond aquaculture, product processing and quality.

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consumed by humans. They contain essential fatty acids and micronutrients and play an important role in global food security (FAO 2014; Sampels et al. 2015, Marine Harvest 2015). They are rich in minerals and microelements, such as calcium, phosphorus, fluorine, selenium, zinc and copper (Rebole et al. 2015), and vitamins: vitamin D, niacin, B6 and B12 (Oehlenschlager 2012; Sampels et al. 2015). The US National Institute of Health, the UK National Health Service, the Norwegian Directorate of Health and several other national health organizations recommend eating fish at least twice a week (Marine Harvest 2015). Fishery products are commodities traded on a global market through a complex series of distribution routes (Toner 2015). Consumption of fishery products depends on the level of local supplies and availability from imports. Consumption of fish and other fishery products in the Czech Republic and in other countries of Central Europe is relatively low (5.5 kg $cap^{-1}$ $year^{-1}$) (EUMOFA 2015; FEAP 2015; Ženíšková and Gall 2015). In 2012, the world and EU fish consumption per capita was 16 and 23.9 kg $cap^{-1}$ $year^{-1}$, respectively. The highest consumption of fish within the EU has Portugal, with 56.8 kg $cap^{-1}$ $year^{-1}$ (EUMOFA 2015). Czech fish market is characterized by its seasonality, with common carp being major fish species produced and consumed. During the Christmas Eve, 80 % of annual common carp consumption is eaten (Adámek and Kouřil 2000). Czech retail supermarkets do not have facilities for selling fresh fish. Thus, frozen fish products are widely marketed and preferred by consumers. Retailers provide a large range of species, product forms, packaging and labels daily (Bronnmann and Asche 2016).

This study looks at the volume, the value and product structure of imported and exported fish in the Czech Republic, showing trends and fluctuations in fishery imports and exports over the 2010–2015 period.

## Materials and methods

Statistics on annual import and export for the Czech Republic period 2010–2015, of seven commodity categories, have been obtained from the External Trade Database of Czech Statistical Office (Czech Statistical Office 2016) and Annual report of Ministry of Agriculture of the Czech Republic (Ženíšková and Gall 2015). These cover live fish (CN code 0301), fresh and chilled fish (CN code 0302), frozen fish (CN code 0303), fish fillets (CN code 0304), dried, smoked and salted fish (CN code 0305), crustaceans (CN code 0306) and mollusc (CN code 0307). The total volume and value of import and export of the fishery products for the above-mentioned commodity categories (CN codes 0301-0307) are compared. Volume and value of the most imported and exported fishery products in each category were assessed for their Czech market preferences. Country of origin of the major imported fishery products and the major importing countries of Czech fishery products were identified. All parameters are reported as volume (tonnes) and monetary value (million EUR). Statistical analysis was performed using the Combined Nomenclature (CN) codes 0301-0307 (Table 1). The Combined Nomenclature was established by Regulation (EEC) No. 2658/87 for goods classification. The 8-digit subheadings in the nomenclature are used in export declarations and in statistical declarations on internal trade. It is also used by Directorate General "Taxation and Customs Union" of the European Commission for customs duty purposes (EUROSTAT 2016).

This study does not include ornamental fish species within CN code 0301—live fish.

**Table 1** Combined Nomenclature (CN) codes for the major commodities (FAO 2002)

| CN code | Name of group | Description |
|---|---|---|
| 0301 | Live fish | Live fish |
| 0302 | Chilled fish | Fish fresh or chilled (excluding fish fillets and other fish meat of heading 0304) |
| 0303 | Frozen fish | Frozen fish (excluding fish fillets and other fish meat of heading 0304) |
| 0304 | Fish fillets | Fish fillets and other fish meat, whether or not minced, fresh, chilled or frozen |
| 0305 | Dried, salted and smoked fish | Fish fit for human consumption, dried, salted or in brine; smoked fish, fit for human consumption, whether or not cooked before or during the smoking process; flours, meals and pellets of fish, fit for human consumption |
| 0306 | Crustaceans | Crustaceans whether in shell or not, live, fresh, chilled, frozen, dried, salted or in brine, including crustaceans in shell, cooked by steaming or by boiling in water |
| 0307 | Molluscs | Molluscs fit for human consumption, whether in shell or not, live, fresh, chilled, frozen, dried, salted or in brine, including aquatic invertebrates other than crustaceans and molluscs; flours, meals and pellets of aquatic invertebrates other than crust |

## Results

### Total import and export of fishery products (Fig. 1)

The Czech Republic is importer of fishery products, with 39,098–43,399 tonnes imported during the period 2010–2015 annually. The value of import increased by 81 %, from 90.2 million EUR in 2010 to 169.9 million EUR in 2015. Export has grown from 18,167 to 22,134 tonnes, representing an increase by 21.8 % in volume during 2010–2015 (Fig. 1). The value of export increased by 80 % from 54.5 million EUR (2010) to 98.1 million EUR (2015).

In 2010, the major imported fishery product was frozen fillets of sutchi catfish from Vietnam at volume of 8872 tonnes and with the value of 14.9 million EUR. In 2015, the

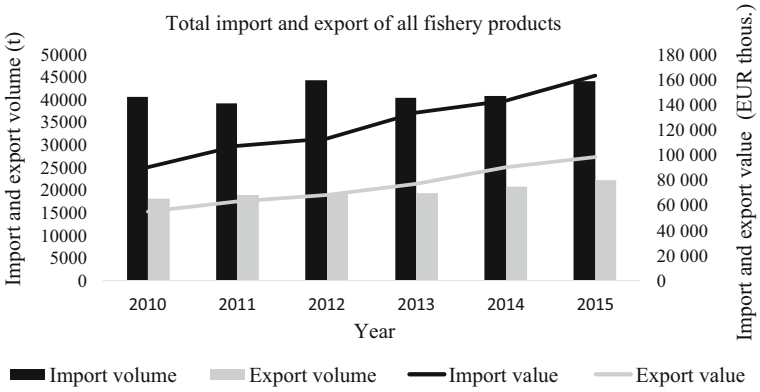


**Fig. 1** Total import and export of all fishery products in the Czech Republic

major imported fishery product was whole chilled Atlantic salmon from Norway at volume of 6897 tonnes worth 35.2 million EUR. The other most imported fishery products to Czech market during the last 6 years were pelagic fish (e.g. herring (*Clupea harengus*), mackerel (*Scomber scombrus*)) and demersal fish (e.g. Alaska pollock (*Theragra chalcogramma*)). The export from the Czech Republic focused on live common carp at volumes from 7545 to 9075 tonnes, representing 36.5–42.6 % of the total export of fishery products. The monetary value of exported live common carp was 14.0 to 16.6 million EUR, representing 15.6–26.9 % of the total value of exported fishery products from the Czech Republic.

## Import and export of live fish (Fig. 2)

Imported live fish represented only 0.7–4.0 % of total import of fishery products. Rainbow trout (*Oncorhynchus mykiss*) formed 37–76 % of the total import of live fish. The import of rainbow trout increased from 140 tonnes (2010) to 664.2 tonnes (2015) with a value of 0.4 million EUR and 1.86 million EUR, respectively. This represented a 474 % increase in value over the 6-year period. Average price of rainbow trout fluctuated from 2.61 to 3.00 EUR $kg^{-1}$. In 2010 and 2011, Slovakia imported 72 and 108 tonnes, respectively, and in 2012 Italy became the largest importer with a rise from 198 to 458 tonnes. The import to the Czech Republic of live common carp and other fish was only minor (Fig. 2). Live fish is the most important commodity produced and sold by Czech aquaculture producers. They represent 41.0–49.0 % of the total export of all fishery products, ranging from 8394 to 10,096 tonnes in volume and 16.34–19.01 million EUR in value during the period 2010–2015. Common carp represented 89–91 % of export of live fish, and Germany was the largest importer of live common carp from the Czech Republic, taking 27.6–35.6 % of the total export of this fish. This was followed by Slovakia and Poland. Other live fish for export produced mainly by the Czech pond aquaculture were tench (*Tinca tinca*) and grass carp (*Ctenopharyngodon idella*), with volumes of 682–1125 tonnes and values 1.96–2.63

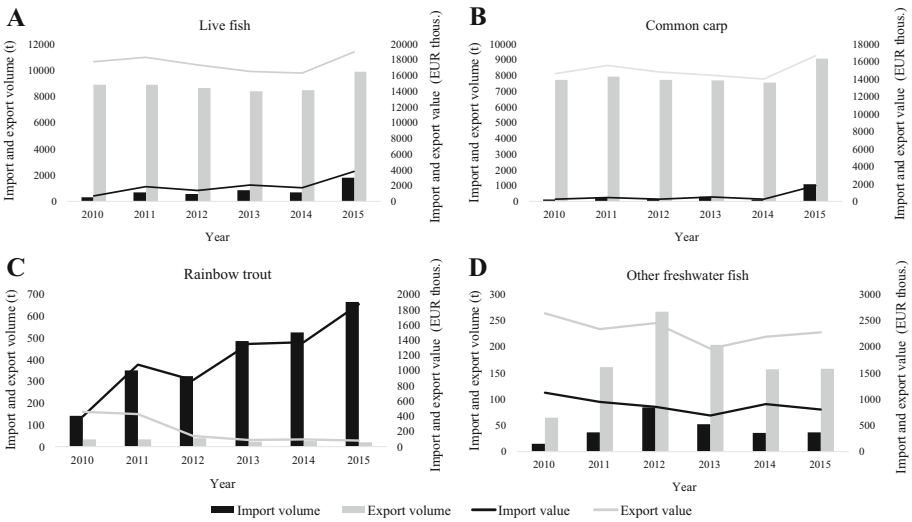


**Fig. 2** Import and export of live fish with the focus on the most important species in the Czech Republic during 2010–2015

million EUR. This fish were imported mainly by Germany and Poland. Only small quantities of live rainbow trout were exported (20–31 tonnes per year).

### Import and export of chilled fish (Fig. 3)

The total import of chilled fish during the period 2010–2015 increased from 2524 to 8431 tonnes and 12.9–45.9 million EUR. This represents a 300 % increase by volume peaking in 2015 (Fig. 3). Whole chilled salmon represented 76–94 % of the total import of chilled fish to the Czech Republic. In 2015, 6900 tonnes with a value of 35.2 million EUR were imported. The import price of salmon ranged from 3.96 to 5.39 EUR $kg^{-1}$. Norway, the largest supplier of salmon to the EU and also to the Czech Republic, provided 83.9–98.2 % of the total import. Salmon also dominates the exports from the Czech Republic. The total volume and value of export of chilled fish increased from 440.1 tonnes and 2.5 million EUR in 2010 to 4495.3 tonnes and 24.3 million EUR in 2015 (Fig. 3). Germany was a major importing country of chilled rainbow trout from the Czech Republic, with volume and value of 8–53 tonnes and 0.03–0.3 million EUR (2010–2015). However, the export of chilled rainbow trout from the Czech Republic was minor. Chilled common carp dominated among the chilled fish product export, with 134–273 tonnes and 0.33–0.75 million EUR per year.

### Import and export of frozen fish (Fig. 4)

Over last 6 years, the total import of frozen fish has been steady with 6843–8080 tonnes. The value of import was 12.31–15.17 million EUR. The major frozen product was mackerel, with 48–60 % of the total import of the frozen fish to the Czech Republic. Most mackerel came from the Netherlands (45.5 % of the total import mackerel). In 2010, mackerel reached peak in volume with 4839 tonnes with a value of 5.34 million EUR at a price of 1.10 EUR $kg^{-1}$ per kg. Other major frozen fish imported were rainbow trout

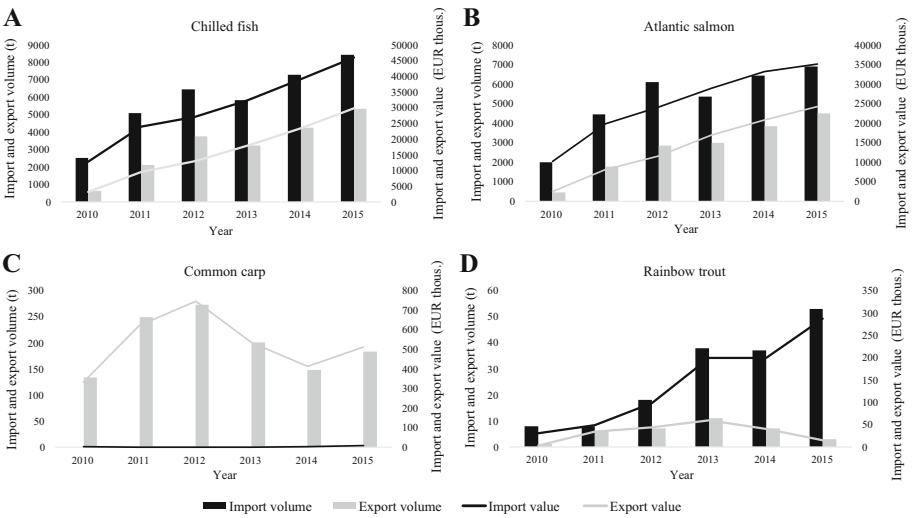


**Fig. 3** Import and export of chilled fish with the focus on the most important species in the Czech Republic during 2010–2015

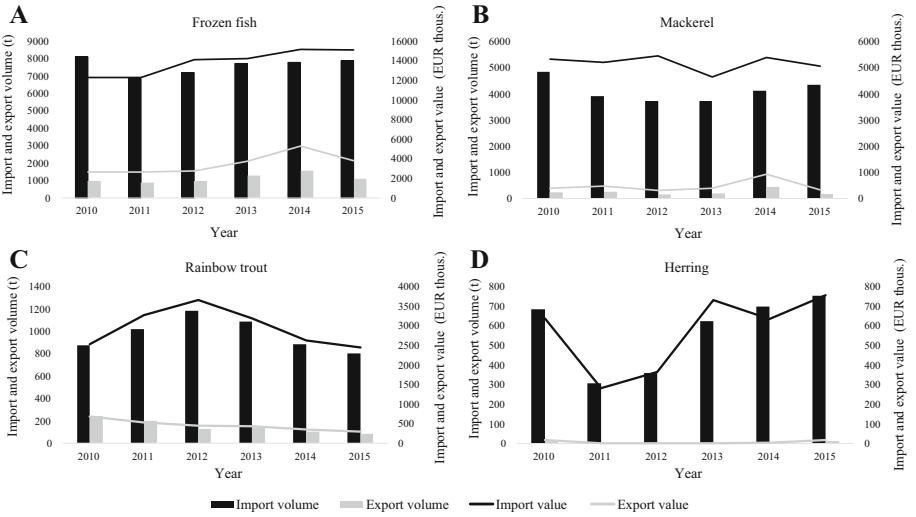


**Fig. 4** Import and export of frozen fish with the focus on the most important species in the Czech Republic during 2010–2015

(801–1185 tonnes, value 2.52–3.66 million EUR) and herring (*Clupea harengus*) (307–753 tonnes, value 0.30–0.75 million EUR). These products covered 9–16 % and 4–10 % of the total import of the frozen fish to the Czech Republic. Most rainbow trout and herring came from Turkey and the Netherlands. Frozen mackerel formed 15.4–29.7 % (172–435 tonnes and 0.33–0.92 million EUR) of the total export of frozen fish from the Czech Republic. Exported frozen rainbow trout represented 82–243 tonnes and 0.29–0.68 million EUR. Export of herring was minor. Germany was the main importing country from the Czech Republic for mackerel, rainbow trout and herring. During the period 2010–2014, frozen common carp export ranged from 104 to 190 tonnes. In 2015, export of frozen common carp decreased to 34 tonnes, with exports largely to Germany and Slovakia.

## Import and export of fish fillets (Fig. 5)

Fish fillets (fresh, chilled, frozen) form the largest volume of fishery products imported to the Czech Republic. Over the last 6 years, the volume of the import has been slightly decreasing, averaging 22,000 tonnes per year. The highest import of 27,007 tonnes in volume and 51.5 million EUR in value was in 2010. It represented 66.6 % of the total import of fishery products to the Czech Republic. In 2015, 22,071 tonnes fish fillets were imported worth 73.9 million EUR. This represented 50.1 % of the total import. The average price of fish fillets increased from 1.91 EUR $kg^{-1}$ in 2010 to 3.35 EUR $kg^{-1}$ in 2015. During 2010 and 2011, frozen fillets of sutchi catfish from Vietnam dominated the import, with 8872 and 7887 tonnes, with a value of 14.9 and 14.8 million EUR, respectively. In 2012, sutchi catfish was replaced by frozen fillets from Alaska pollock imported from China, with total weight of 3764 tonnes and value 8.7 million EUR. The import of sutchi catfish decreased to 1465 tonnes in 2015, and from 14.9 million EUR in 2010 it declined to 3.1 million EUR in 2015. Imports of Alaska pollock frozen fillets reached their peak in 2015, with 5082 tonnes worth 13.1 million EUR. The volume and the value of the import of frozen herring fillets have fluctuated from 4586 tonnes and 4.22 million EUR in

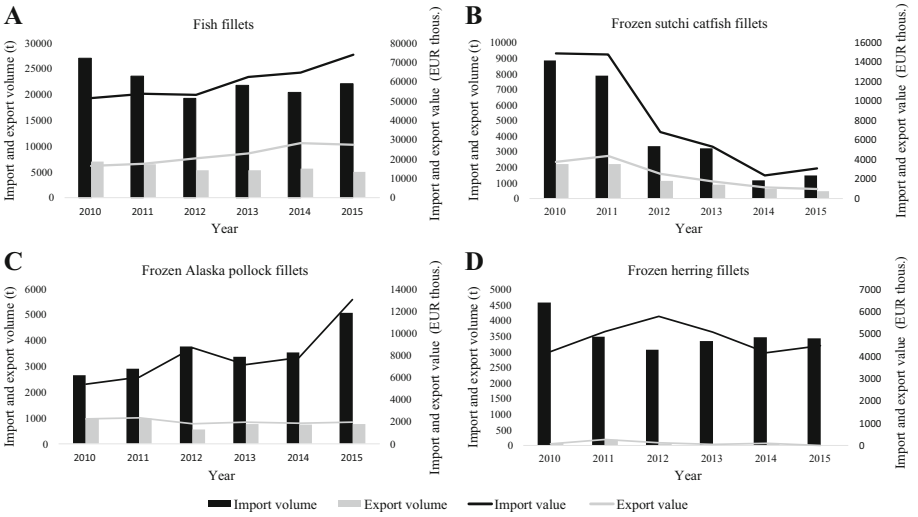


**Fig. 5** Import and export of fish fillets with the focus on the most important kind of product and species in the Czech Republic during 2010–2015

2010 to 3445 tonnes and 4.48 million EUR in 2015. In 2012, the import of herring fillets was the highest, with a value of 5.79 million EUR, but the volume was at its lowest level, with 3072 tonnes. It came mostly from the Netherlands. The total volume of exported fish fillets was slightly decreasing from 6923 tonnes in 2010 to 5005 tonnes in 2015, but the value of export had risen from 16.2 to 27.2 million EUR, and the average price increased from 2.35 to 5.43 EUR $kg^{-1}$. Until 2011, mostly frozen sutchi catfish fillets were exported. In 2012, the export was dominated by frozen and fresh chilled salmon fillets. The export of sutchi catfish fillets continued to decline, with 2190 tonnes in 2010 to 442 tonnes in 2015. The export of Alaska pollock declined from 966 tonnes in 2010 to 753 tonnes in 2015. The value of exported Alaska pollock frozen fillets decreased from 2.25 to 1.96 million EUR. Slovakia, the main country of destination, purchased 452 to 954 tonnes of Alaska pollock fillets. The export of herring fillets was only of minor importance.

## Import and export of dried, salted and smoked fish (Fig. 6)

The import of dried, salted and smoked fish was relatively low, fluctuating between 1210 and 1974 tonnes, with values of 4.38 to 9.98 million EUR. In 2012, an unusual import of an unspecified commodity (CN code 03053990) in volume of 7940 tonnes caused a sudden increase in the import in this category. The value of this import from Poland was only 0.09 million EUR, with a price of 0.01 EUR $kg^{-1}$. The imported product was dominated by smoked mackerel with volume ranging from 306 to 526 tonnes, and with values 0.87 to 1.45 million EUR. Most smoked mackerel came from Poland, i.e. 73.3–96.9 %. This was followed by smoked herring (volume 105–285 tonnes and value 0.19–0.49 million EUR) and smoked salmon (volume 148 to 476 tonnes and value 1.70–5.74 million EUR). The main country of origin of smoked herring and smoked salmon was Poland. The export volume and value of dried, salted and smoked fish was relatively stable and ranged from 321 to 425 tonnes and 1.39–1.89 million EUR. Smoked mackerel was the most exported fishery product, with volume ranging from 267 to 365 tonnes and 0.98–1.15 million EUR.

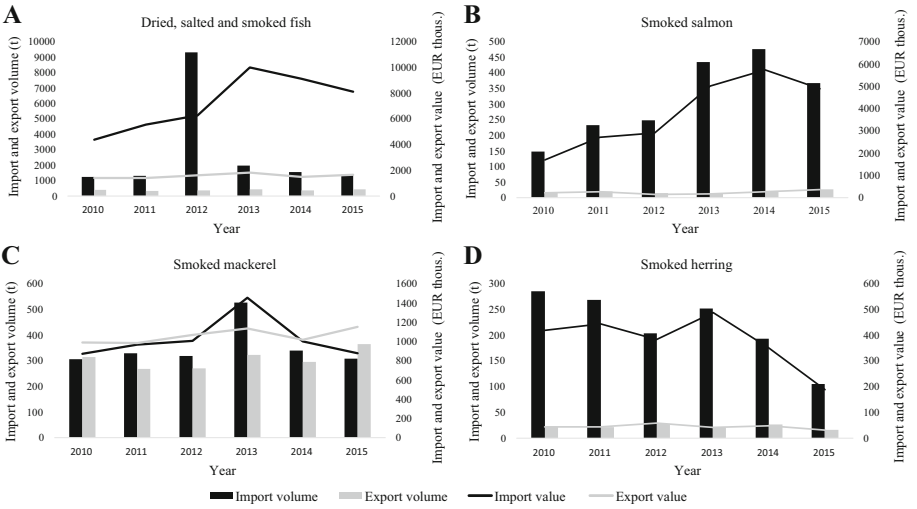


**Fig. 6** Import and export of dried, salted and smoked fish with the focus on the most important kind of product and species in the Czech Republic during 2010–2015

Slovakia and Austria purchased most of the smoked mackerel, from 268 to 314 tonnes per year and with 75.5–83.7 % of the total export of dried, salted and smoked fish from the Czech Republic. The export of smoked herring and smoked salmon were of minor importance.

## Import and export of crustaceans (Fig. 7)

The total import of crustaceans has shown a major increase, with the total volume and the value of the import rising from 553 to 2101 tonnes, this corresponding to an increase in its value from 3.51 to 7.66 million EUR. This represented a 214 % increase in value. Frozen prawns and shrimps from Vietnam dominated the imported crustaceans products with 44–68 % of the total crustaceans imports to the Czech Republic. Their volume and value fluctuated from 261 to 542 tonnes and 1.47–2.47 million EUR. The import of frozen prawns (*Penaeus* sp.) fluctuated from 73 to 1222 tonnes and 0.51–2.90 million EUR. Small amount of live lobster (*Homarus americanus*) was imported from Canada and UK. In 2011, it was 43 tonnes and 0.70 million EUR and in 2015 11 tonnes and 0.25 million EUR. Its unit price increased from 15.84 to 22.55 EUR $kg^{-1}$. The export of live lobster ranged from 1 to 7 tonnes. The total export of crustaceans fluctuated from 30 to 302 tonnes and 0.36–1.20 million EUR. Slovakia and Ukraine were the largest importers of crustaceans from the Czech Republic. Prawns of the genus *Penaeus* dominated the export with 8–30 tonnes and 0.06–0.27 million EUR. The export of miscellaneous shrimps and prawns was 16–25 tonnes.

## Import and export of mollusc (Fig. 8)

The import of mollusc peaked in 2015, amounting to 1533 tonnes, worth 5.36 million EUR based on average price of 3.47 EUR $kg^{-1}$. The import fluctuated from 902 to 1533 tonnes and from 2.62 to 5.36 million EUR. The most imported products were snails (*Helix*

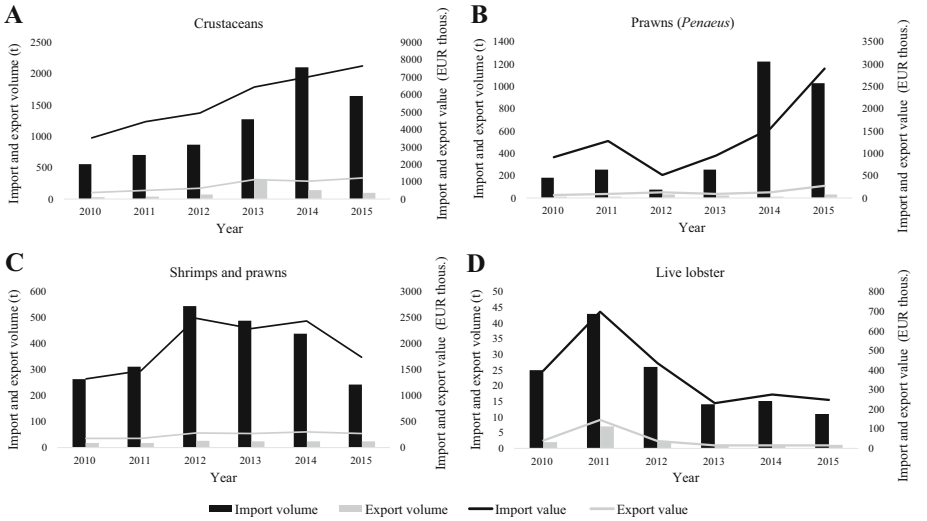


**Fig. 7** Import and export of crustaceans with the focus on the most important kind of product and species in the Czech Republic during 2010–2015

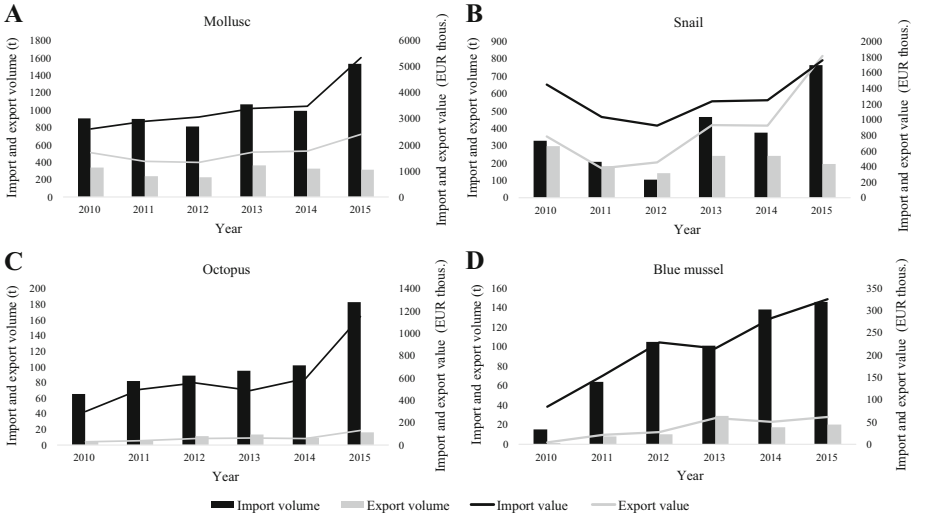


**Fig. 8** Import and export of mollusc with the focus on the most important species to or from the Czech Republic during 2010–2015

*pomatia*), blue mussels (*Mytilus* sp.) and octopus (*Octopus* sp.). Poland, Denmark and France were the main importers to the Czech Republic. The most imported product was snails from Poland and Lithuania. Import of snails has fluctuated from 102 to 763 tonnes and 0.45–1.82 million EUR. Import of blue mussel increased from 15 tonnes in 2010 to 183 tonnes in 2015, with values of 0.08–0.33 million EUR. Denmark was the larger importer of blue mussel to the Czech Republic. The import of octopus fluctuated from 65 to 183 tonnes (value 0.30–1.15 million EUR). Main countries of origin were Morocco,

Madagascar and Mexico. The export of molluscs from the Czech Republic was 226 tonnes in 2012 and 360 tonnes in 2013 (Fig. 8). The export of snails, mainly to France, fluctuated from 140 to 296 tonnes (value 0.92–1.76 million EUR). The export of blue mussel and octopus was insignificant.

## Discussion

The Czech Republic is a member of the EU, which is the largest trader of fishery and aquaculture products in the world in terms of value (EUMOFA 2015). In 2013, the Czech aquaculture was the sixth important producer of freshwater fish within the EU (FEAP 2015), of which 88 % formed marketable common carp (Adámek et al. 2012; Czech Fish Farmers Association 2015). Common carp production has strong seasonal character with harvest seasons in late autumn for Christmas market and in early spring for Easter market (Adámek et al. 2012). Approximately 50 % of marketable common carp are exported to Germany (21.8–31.0 %) and Slovakia (9.9–13.2 %). An increase in consumption of domestically produced fish requires better and diversified processing of common carp and to expanding the range of fish species offered (Bondarenko et al. 2015). Some customers are also demanding organic products or carp with an increased content of unsaturated fatty acids known as Omega 3 carp. According to FEAP (2015), organic aquaculture represents around 1 % of European fish farm production. While the Czech aquaculture produces nearly 20,000 tonnes of fish per year, the Czech market is not self-sufficient and depends largely on imported fishery products. The volume of imported fishery products is twice that of coming from domestic aquaculture production (Ženíšková and Gall 2015; Czech Fish Farmers Association 2016). Current European fish market is undersupplied in most European countries, and to satisfy the demand, it depends on the import of marketable fish, mainly from the Asia–Pacific region (Policar and Adámek 2013). EU consumption is dominated by captured fish, which represents 3/4 of the total. Czech aquaculture and that of some other European countries needs further innovation, an increase in the proportion of high-value fish and other aquatic organisms, to be able to provide an all-year-around supply to consumers. Further improvements are needed in marketing (Bondarenko et al. 2015). In 2013, the total EU market for fishery products was 11.7 million tonnes, of which 8.8 million tonnes (75 %) came from import. In 2013, the Czech market imported 40,480 tonnes of fishery products, only 19,358 tonnes came from domestic aquaculture (FEAP 2015; Czech Fish Farmers Association 2016). Norway and China are the main countries from which fish products are imported to EU countries (FEAP 2015). Norway's exports to the EU have increased by 70 % since 2009. China confirmed its leading role as a processing country for cod and Alaska pollock (EUMOFA 2015). Norway is the largest exporter of chilled and frozen salmon and China the largest exporter of Alaska pollock frozen fillets to the Czech Republic. Salmon dominates the fish (by volume) consumed in the EU. It is interesting to note the increasing consumption of salmon and herring in the EU, and the stabilization of sutchi catfish imports (EUMOFA 2015). Our result confirmed these trends, excluding sutchi catfish, of which import to the Czech Republic has decreased by 85 % during last 6 years (Czech Statistical Office 2016). This decline was caused by the changes in customer preferences (Czech Fish Farmers Association 2016). Salmon is popular with retailers as it is produced under controlled environment and is stable in supply throughout the year (not subject to seasons) (Marine Harvest 2015). Smoked Atlantic salmon is the most common secondary processed product. The European market for

smoked salmon was estimated at 175,000 tonnes in 2014, with Germany and France being the largest markets. The ten largest producers of smoked salmon in Europe have a market share of more than 60 %. Salmon is smoked mainly in Poland, France, UK, Baltic states and the Netherlands. The import of smoked salmon to the Czech Republic was 476 tonnes in 2014, of which Poland provided 180 tonnes (Marine Harvest 2015; Czech Statistical Office 2016). Herring has been one of the most traded species in EU since 2006 (EUMOFA 2015). Herring-made products are very popular by Czech consumers and are imported from the Netherlands and Poland (Czech Statistical Office 2016). Crustaceans have become the main EU imports in terms of value since 2012 (EUMOFA 2015). EU imports of crustaceans, especially tropical prawns from southeast Asia, were high in 2014, with 77,000 tonnes and a value of 683 million EUR. In 2014, import of crustaceans to the Czech Republic reached 2101 tonnes and a value 7 million EUR (EUMOFA 2015; FEAP 2015; Czech Statistical Office 2016). The import of mollusc to the Czech Republic is steadily increasing with peak in 2015, amounting to 1533 tonnes and a value of 5.36 million EUR (Czech Statistical Office 2016). These figures show growing demand in EU countries for higher-value fishery products. There is a growing number of customers preferring better-quality fishery products and able to afford them.

## Conclusions

Import of fishery products to the Czech Republic since 2010 was relatively stable by volume but growing in value. The export of fishery products has been growing. Customers favour frozen products, which are more widely available than fresh and chilled fish, for which most Czech retail supermarkets do not have a fresh fish section. The import of higher-value commodities, such as chilled salmon and frozen crustaceans, has been increasing, and this is seen in an increasing purchasing power of customers, who are becoming more selective and choosy.

**Acknowledgments** This study was supported by the Ministry of Education, Youth and Sports of the Czech Republic: projects CENAKVA (No. CZ.1.05/2.1.00/01.0024) and CENAKVA II (No. LO1205 under the NPU I Program), and by the other following projects: GAJU (060/2016/Z) and EU project TRAFOON (No. 289045). The authors wish to thank Dr. Tomislav Petr for assisting with the English.

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