

# THE BUSINESS OF SEAFOOD 2017

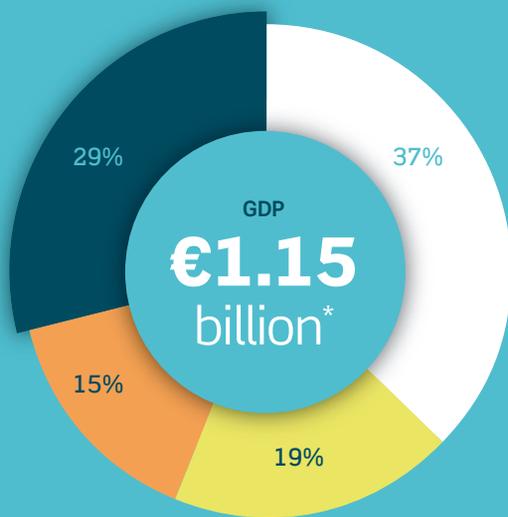
A Snapshot of Ireland's Seafood Sector



# The Business of Seafood 2017

# €1.15 billion

## The Irish Seafood Economy 2017



DOMESTIC CONSUMPTION

**€429M**

+4% YOY

GOVERNMENT INVESTMENT

**€170M**

+29% YOY

EXPORTS - IMPORTS

**€331M**

+12% YOY

PRIVATE INVESTMENT

**€216M**

-8% YOY

\*Actual total €1,146M

## Our Biggest Fishing Ports (Value of Landings)

**€125M**

Killybegs

**€108M**

Castletownbere

**€401M**

of seafood was landed by Irish and non-Irish vessels into our ports in 2017;

**Irish landings €283M**  
**Non-Irish €118M**



**€208M**

Value of Aquaculture

**24%**  
growth



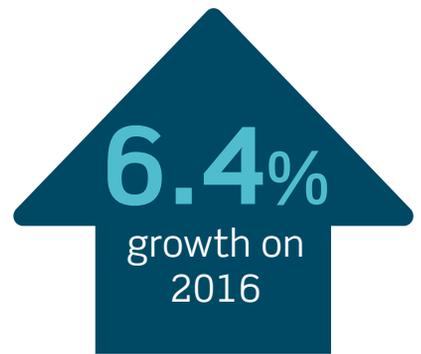
**€609M**

Value of Wild and Farmed Seafood

**12%**  
growth

# ion

## Estimated GDP value of the Irish Seafood industry



**2,050**

Number of registered fishing vessels in 2017



**284**

Number of aquaculture production units



**163**

Number of seafood processors



**14,638**

people are employed around our coast (direct and indirect employment)

### Domestic Sales Value

**€429M**



**€249M**

Retail Value



**€180M**

Food Service Value

### Top Selling Species



Salmon  
**€96M** (Up 1%)



Cod  
**€48M** (Up 2%)



**€335M**

worth of seafood was imported into Ireland in 2017

**€228M**

worth of seafood was imported from UK (68%)



**€666M**

Export Value

**10%**

growth on 2016



### Ireland's Main Export Markets



UK

**€85M**



EU  
(excl. UK)

**€392M**



Asia

**€79M**

# RISING TIDE

## THE RISING TIDE OF SEAFOOD

2017 was another successful year for Ireland's Seafood Sector, contributing €1.15 billion to the Irish economy, a substantial increase of 6.4% year-on-year. Among the many highlights for Irish seafood in 2017 was the value of trade surpassing €1 billion for the first time, a 29% increase in public investment to €170 million and an impressive 24% value growth in Ireland's Aquaculture Industry predominantly driven by the higher value of Irish Organic Salmon.

### IRELAND'S SEAFOOD AMBITION

Ireland has the ambition to position itself as an international leader in the global seafood industry. Building on its natural advantages, including access to some of the most productive fishing grounds in the EU, a commitment to sustainable fishing and the development of a high-quality aquaculture sector, the industry is committed to meeting the ambitious targets set out in the Food Wise 2025 strategy.

BIM, Ireland's Seafood Development Agency, is working closely with Industry to channel this investment through the European Maritime Fisheries Fund (EMFF) to deliver optimum results for the sector, the economy and the coastal communities that rely on this industry for revenue and employment.

### SUSTAINING COASTAL COMMUNITIES

With seafood landings to our main fishing ports delivering €401 million and our aquaculture sector achieving 24% growth to €208 million in 2017; our seafood industry is a key natural resource. All around the coast, over 14,000 people are employed, directly and indirectly, in the seafood sector. In Donegal alone, the sector accounts for 12% of total coastal employment. As well as employment, seafood is a key driver in economic activity and in many cases is at the heart of the community. Seafood processing companies are growing in number and now account for half of the total employment in the Irish seafood sector.

In some coastal communities, such as Donegal, seafood accounts for up to **12%** of total coastal employment.



## IRELAND, FAMOUSLY GREEN

The growth of Irish seafood in 2017 was predominantly export-led with the value of our exports reaching €666 million, a 10% increase year-on-year. The EU is our biggest export market with France leading the way as our largest individual market followed by the UK, Spain and Italy.

Irish seafood has a growing positive reputation for quality and sustainability with increasing consumer demand for responsibly sourced produce continuing to gain traction. The success of Origin Green clearly demonstrates this commitment to sustainability with the entire seafood value chain from fishermen to fish farmers to processors achieving their green credentials through BIM's Sustainability programmes.

## BREXIT CHALLENGES AHEAD

The decision by the United Kingdom to withdraw from the European Union in March 2019 poses many challenges for the seafood sector. Future access to fishing grounds, quota allocation, and regulatory divergence are but some of the issues, unique to seafood, that remain unresolved. Each of these has the potential to unsettle the stability provided by the Common Fisheries Policy which has allowed the catching sector operate with a degree of certainty for almost forty years.

Alongside these, are other challenges shared with the wider economy: how will Brexit impact future trade, our route to market, supply chains, and transport logistics? BIM has discussed these issues with a wide cross section of the industry, the Minister and Department of Agriculture, Food and Marine and our sister agencies to ensure that as the situation evolves, the seafood sector remains informed, advised, and positioned to respond to new scenarios.

## OUR OWN TABLES

There was a 4% increase in seafood consumed in Ireland, now valued at €429 million. Domestic consumption comprises of sales in supermarkets and shops as well as in restaurants, cafes and canteens. Salmon, cod and prawns continue to be in favour with Irish consumers with salmon valued at €96 million and cod at €48 million. Growing demand from species such as pollack and hake are contributing new growth up 19% in 2017.

## PURE SOURCE

Irish wild caught fish increased by 12% in 2017 largely driven by pelagic fish species such as mackerel, horse mackerel and blue whiting. Killybegs port recorded the highest value of landings at €125 million with Castletownbere a close second at €108 million.

Wild caught fish, farmed finfish and shellfish contributed an overall value of €609 million with wild caught increasing by 7% year-on-year to €401 million while the value of farmed fish rose by 34% to €149 million. There was also good news for farmed shellfish which grew by 5% to €59 million.

The growth of Irish seafood in 2017 was largely export-led reaching **€666 million**, a 10% increase year-on-year.

Landings have increased in all main fishing ports with Killybegs recording the highest value of **€125 million.**

### THE FUTURE OF SEAFOOD

While there are significant challenges ahead for Irish seafood, there are also good reasons to be optimistic. The world now eats more fish than ever before. This is forecast to increase to 30 kilos per person by 2030. Demand is particularly high in Asia, where preference for seafood dominates. Awareness of the health and wellness benefits of seafood is growing all the time and BIM will continue to enable seafood producers to innovate and take advantage of the positive trajectory for Irish seafood.

Dynamic, positive and inventive, the Irish seafood industry is thriving today and is preparing for tomorrow.



## BREAKDOWN OF SEAFOOD GROSS DOMESTIC PRODUCT

GDP components	2016 Value €M	2017 Value €M	Growth Rate 2016-2017	Share of seafood economy
Domestic Consumption	€413	<b>€429</b>	+3.8%	37%
Private Investment	€237	<b>€216</b>	-8.4%	19%
Government Investment	€132	<b>€170</b>	+29.0%	15%
Exports - Imports	€296	<b>€331</b>	+11.6%	29%
Gross Domestic Product	€1,078	<b>€1,146</b>	+6.4%	100%



## EMPLOYMENT IN THE IRISH SEAFOOD SECTOR



**14,638**

**DIRECT AND INDIRECT  
TOTAL EMPLOYEES**

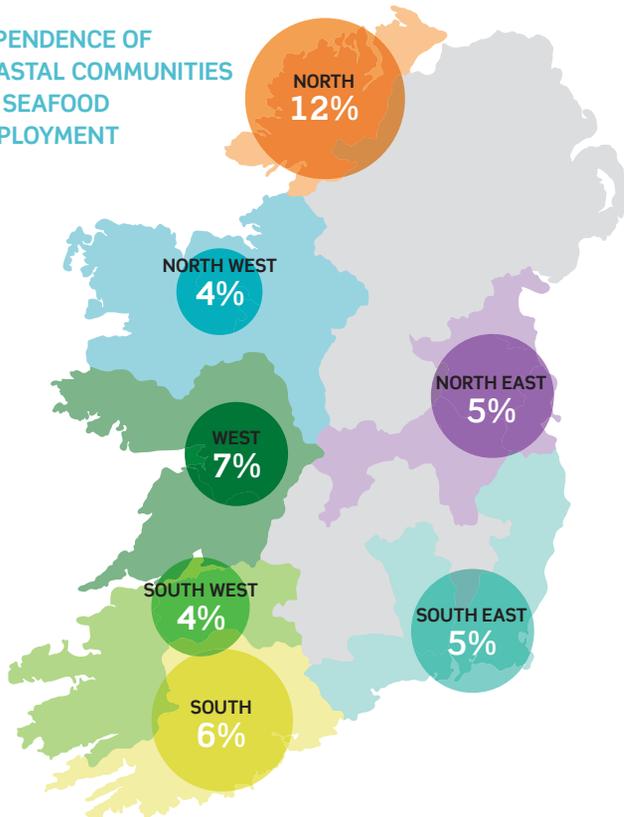
**5,367**

**INDIRECT TOTAL  
EMPLOYEES**

**9,271**

**DIRECT TOTAL EMPLOYEES**

**DEPENDENCE OF  
COASTAL COMMUNITIES  
ON SEAFOOD  
EMPLOYMENT**



**FISHERIES**

**3,361**

**TOTAL EMPLOYED**



**AQUACULTURE**

**1,912**

**TOTAL EMPLOYED**



**PROCESSING**

**3,998**

**TOTAL EMPLOYED**

## BREAKDOWN OF EMPLOYMENT BY REGION

REGION	Total Population	Coastal Population	Coastal Employed	Direct Seafood Employment	Direct and Indirect Seafood Employment	Share of Coastal Employment
North	159,192	74,989	27,488	2,089	3,318	12%
North West	292,630	64,059	25,328	660	1,068	4%
West	376,875	64,704	27,034	1,111	1,760	7%
South West	342,606	90,323	36,718	999	1,606	4%
South	542,868	115,533	49,815	1,893	2,976	6%
South East	808,737	91,681	36,467	1,274	1,968	5%
North East	2,238,957	83,775	36,139	1,244	1,941	5%
Republic of Ireland	4,761,865	585,064	238,989	9,271	14,638	6%

# SOURCE

## WHERE DOES IRISH SEAFOOD COME FROM?

The value of seafood landed and cultivated in Ireland in 2017 increased by 12% to €609 million, while the volume of seafood increased by 11% to 361,000 tonnes. This performance was largely attributable to a strong increase in the volume and price of Organic Salmon and an increase of pelagic species including Mackerel, Horse Mackerel and Blue Whiting landed into Irish ports.

WILD AND  
FARMED SEAFOOD

**€609M**

+12%

TONNES

**361,000**

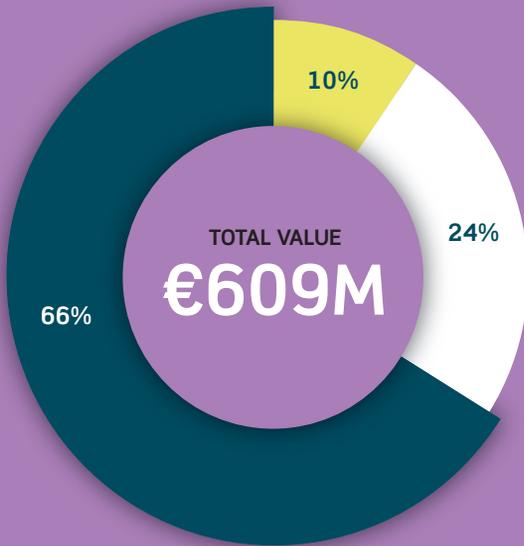
+11%





## THE SOURCE OF IRISH SEAFOOD

BY VALUE (€M)



WILD-CAUGHT FISH

**€401M**

Irish €283M | Non-Irish €118M

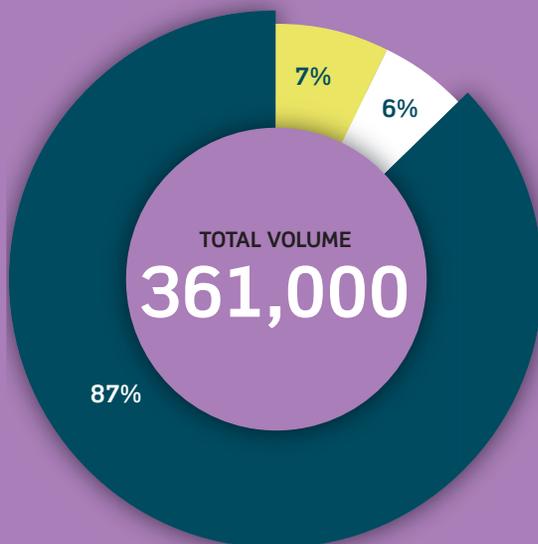
FARMED FINFISH

**€149M**

FARMED SHELLFISH

**€59M**

BY VOLUME (TONNES)



WILD-CAUGHT FISH

**314,000 tonnes**

Irish 244,000 | Non-Irish 70,000

FARMED FINFISH

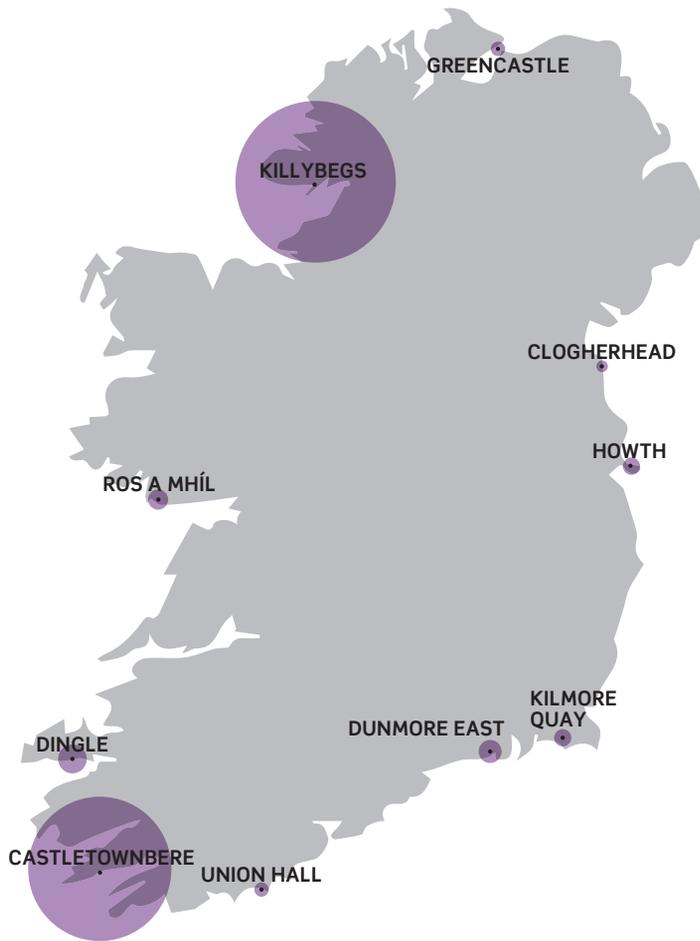
**20,600 tonnes**

FARMED SHELLFISH

**26,400 tonnes**

## REGIONAL VALUE OF LANDINGS

### ALL LANDINGS BY IRISH AND NON-IRISH FLEETS



TOTAL

**€401M** (+7%)

314,000 tonnes (+12%)



**24%**

INCREASE IN VOLUME OF LANDINGS INTO KILLYBEGS

**45%**

OF THE VALUE OF NON-IRISH LANDINGS ARE BY THE FRENCH FLEET

**78%**

OF THE VALUE OF NON-IRISH LANDINGS COMPRISE HAKE, MONKFISH AND MEGRIM

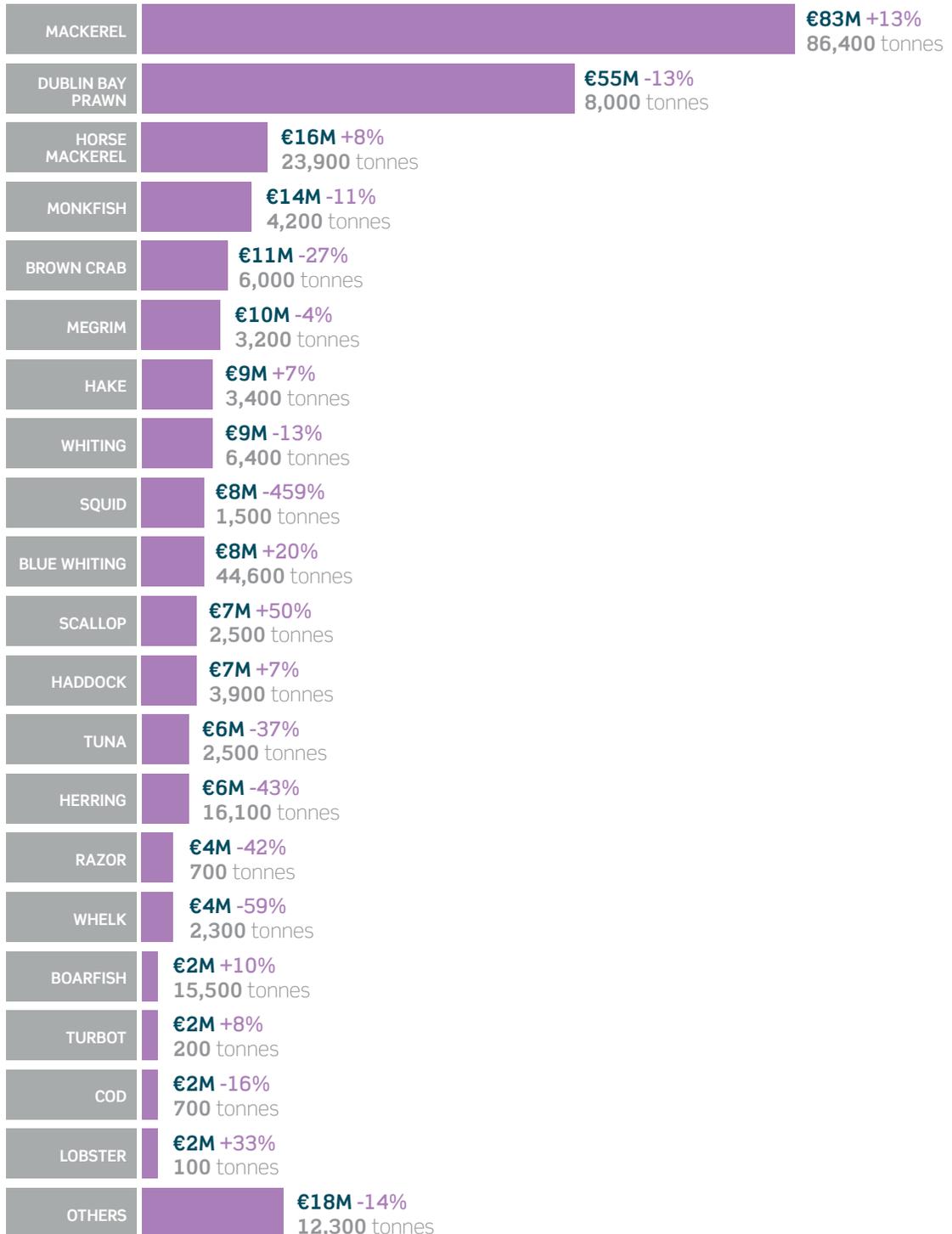
Port	Value of Landings €M				Volume of Landings Tonnes			
	Irish	Non-Irish	Total	Share of Non-Irish	Irish	Non-Irish	Total	Share of Non-Irish
Killybegs	105	20	125	16%	149,800	42,400	192,200	22%
Castletownbere	31	77	108	72%	9,000	21,500	30,500	70%
Dingle	7	13	20	67%	4,700	3,500	8,200	42%
Dunmore East	15	1	16	5%	7,500	200	7,700	3%
Ros A Mhil	11	1	12	7%	2,600	100	2,700	4%
Howth	11	0.3	11.3	3%	4,100	100	4,200	2%
Kilmore Quay	11	0	11	0%	4,300	0	4,300	0%
Greencastle	9	0.4	9.4	4%	3,700	100	3,800	3%
Union Hall	8	1	9	13%	2,000	400	2,400	17%
Clogherhead	8	0	8	0%	1,500	0	1,500	0%
Other Ports	67	4	71	5%	54,800	1,700	56,500	3%
<b>Total</b>	<b>283</b>	<b>118</b>	<b>401</b>	<b>29%</b>	<b>244,000</b>	<b>70,000</b>	<b>314,000</b>	<b>22%</b>

VALUE OF TOTAL SEAFOOD LANDINGS BY IRISH FLEET

# €283 million in 2017

8% Value Growth

TOP 20 LANDED SPECIES BY VALUE

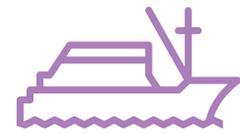


## IRISH FISHING FLEET

Segment	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Polyvalent General</b>	1,276	1,305	1,356	1,401	1,434	1,466	1,431	1,411	1,421	1,380
<b>Polyvalent Potting</b>	493	491	492	488	487	490	489	477	440	395
<b>Specific</b>	132	147	156	149	150	148	139	134	146	142
<b>Aquaculture</b>	33	67	81	87	96	106	107	109	102	97
<b>Pelagic</b>	23	23	23	24	23	23	23	23	23	23
<b>Beamer</b>	15	11	11	12	12	13	13	13	14	13
<b>Grand Total</b>	<b>1,972</b>	<b>2,044</b>	<b>2,119</b>	<b>2,161</b>	<b>2,202</b>	<b>2,246</b>	<b>2,202</b>	<b>2,167</b>	<b>2,146</b>	<b>2,050</b>

# 2,050

TOTAL IRISH FISHING VESSELS



### POLYVALENT FLEET

These segments represent the vast majority of the fleet. They are multi-purpose and include small inshore vessels (netters and potters) and medium to large offshore vessels targeting whitefish, pelagic fish and bivalve molluscs.

### SPECIFIC FLEET

Vessels that are permitted to fish for bivalve molluscs and aquaculture species.

### AQUACULTURE FLEET

These vessels must be exclusively used in the management, development and servicing of aquaculture areas and can collect spat from wild mussel stocks as part of a service to aquaculture installations.

### REFRIGERATED SEAWATER (RSW) PELAGIC FLEET

Vessels engaged predominantly in fishing for pelagic species (herring, mackerel, horse mackerel and blue whiting).

### BEAM TRAWLER FLEET

Vessels dedicated to beam trawling, a simple trawling method used in some Irish Inshore waters where it is used to catch flatfish such as sole and plaice.

## AQUACULTURE PRODUCTION

- 2017 saw the value of aquaculture increase by **24%** to **€208 million**.
- Irish Organic Salmon increased **40%** year-on-year.
- Seabed mussels increased in value by **53%**.

## AQUACULTURE PRODUCTION BY VALUE/VOLUME

BY VALUE (€M)



**SALMON**  
**€147M**  
40% growth

**ROPE MUSSELS**  
**€6M**  
-18% growth

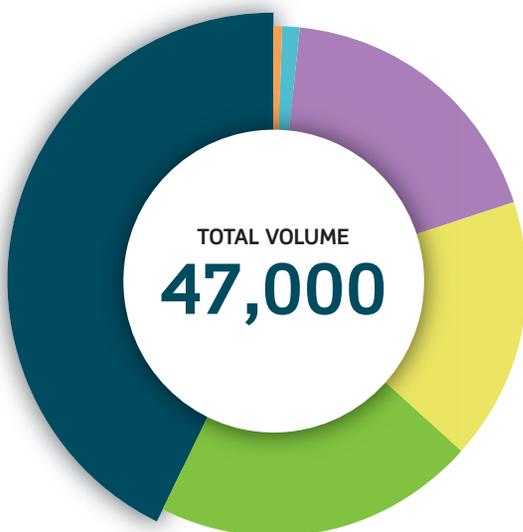
**IRISH ROCK OYSTERS**  
**€42M**  
4% growth

**OTHER FINFISH**  
**€2M**

**SEABED CULTURED MUSSELS**  
**€9M**  
53% growth

**OTHER SHELLFISH**  
**€2M**

BY VOLUME (TONNES)



**SALMON**  
**20,000 tonnes**  
25% growth

**ROPE MUSSELS**  
**8,600 tonnes**  
-13% growth

**IRISH ROCK OYSTERS**  
**9,700 tonnes**

**OTHER FINFISH**  
**600 tonnes**

**SEABED CULTURED MUSSELS**  
**7,800 tonnes**  
22% growth

**OTHER SHELLFISH**  
**300 tonnes**



# PROCESSING

## IRISH SEAFOOD PROCESSING

There were 3,998 people employed in Irish seafood processing companies in 2017. The number of companies increased by 4% to 163. Around one third of these companies generate a turnover between €1 million and €10 million per annum. Growth has mainly occurred in companies with a turnover of less than €1 million.



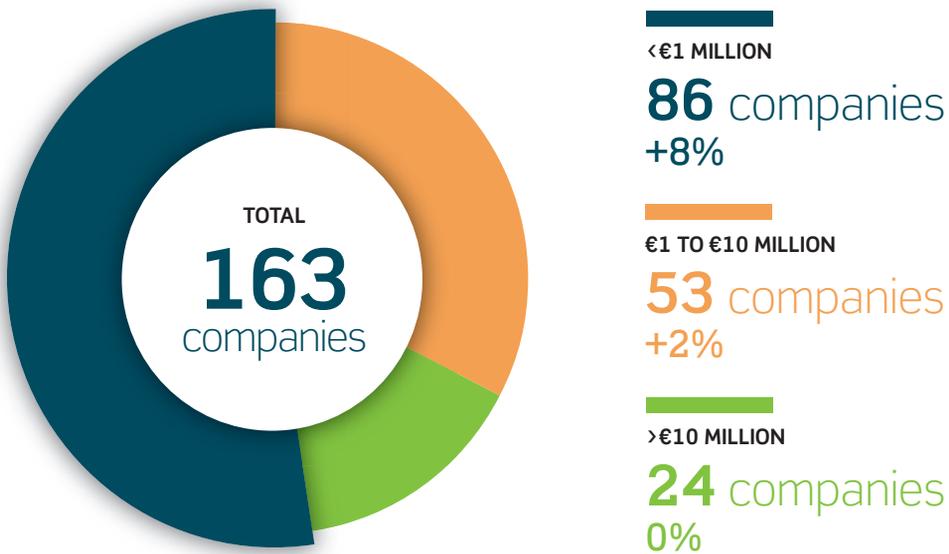
PEOPLE EMPLOYED

**3,998**



## NUMBER OF SEAFOOD PROCESSING COMPANIES

### BREAKDOWN BY REVENUE

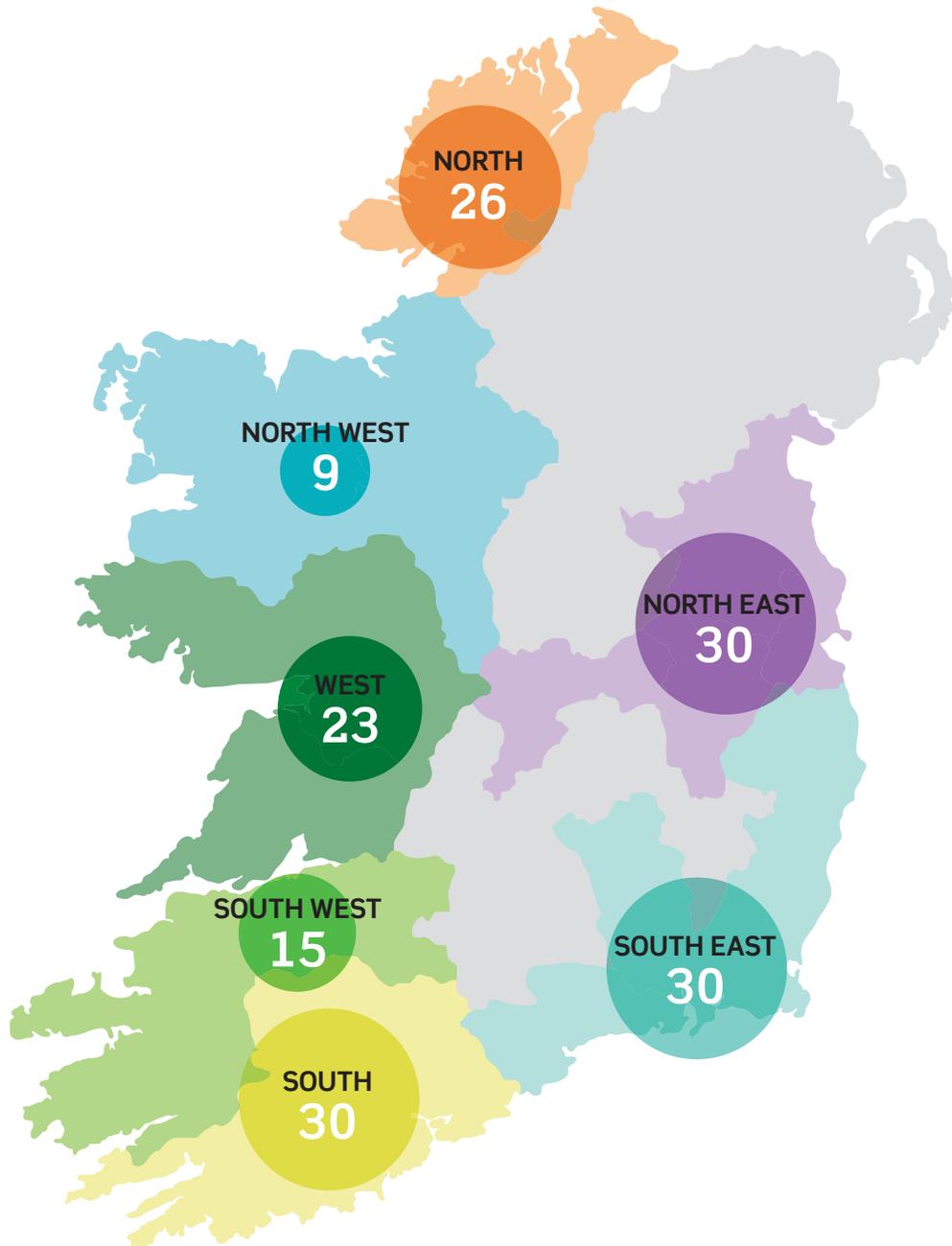


### BREAKDOWN BY REVENUE AND BY MAIN SEAFOOD CATEGORY

Category	< €1M	€1M - €10M	> €10M	Total	Annual Growth
Whitefish	39	24	9	72	4%
Shellfish	25	12	5	42	8%
Salmonids	18	13	3	34	3%
Pelagic	4	4	7	15	0%
<b>Total</b>	<b>86</b>	<b>53</b>	<b>24</b>	<b>163</b>	<b>4%</b>
Breakdown of Industry	<b>53%</b>	<b>32%</b>	<b>15%</b>		

\* Salmonids (Salmon and Trout)

### IRISH SEAFOOD PROCESSING COMPANIES BY REGION



# RETAIL

## IRISH SEAFOOD RETAIL

Irish Seafood Retail Sales were valued at €249M in 2017. This increase has been supported by supported by a growing consumer focus on the health and convenience benefits of seafood protein. This is reflected by the increase in prepacked sales, as loose sales decline. This is driving market growth by attracting new shoppers to the category with discounters performing particularly well in this sector.

The value of seafood in the foodservice sector has grown by 4% to €180M driven by overall value growth the foodservice sector in Ireland.

The market includes a diverse range of consumers and operators, including quick service, hotels, institutional catering and fine dining.

Top selling species include salmon, hake, prawns and cod.

Recent trends in the sector include a rise in customer interest in seafood provenance, greater awareness of sustainability and a willingness to purchase new, lesser known species.

# €429M

estimated value of  
seafood consumption  
in Ireland





WILD IRISH  
WHOLE  
PRAWNS  
PRE-FROZEN  
€ 25 KG

WILD  
IRISH →  
JOHN DORY  
ON BONE  
€ 18.95

WILD  
WHOLE  
ATLANTIC  
HERRINGS  
€ 7.95  
Pkg 25 KG

WILD  
ATLANTIC  
MACKEREL  
ON BONE  
€ 6 KG  
Pkg 25

WILD IRISH  
WHOLE  
WHITE  
SOLE  
€ 5.95  
Pkg 25

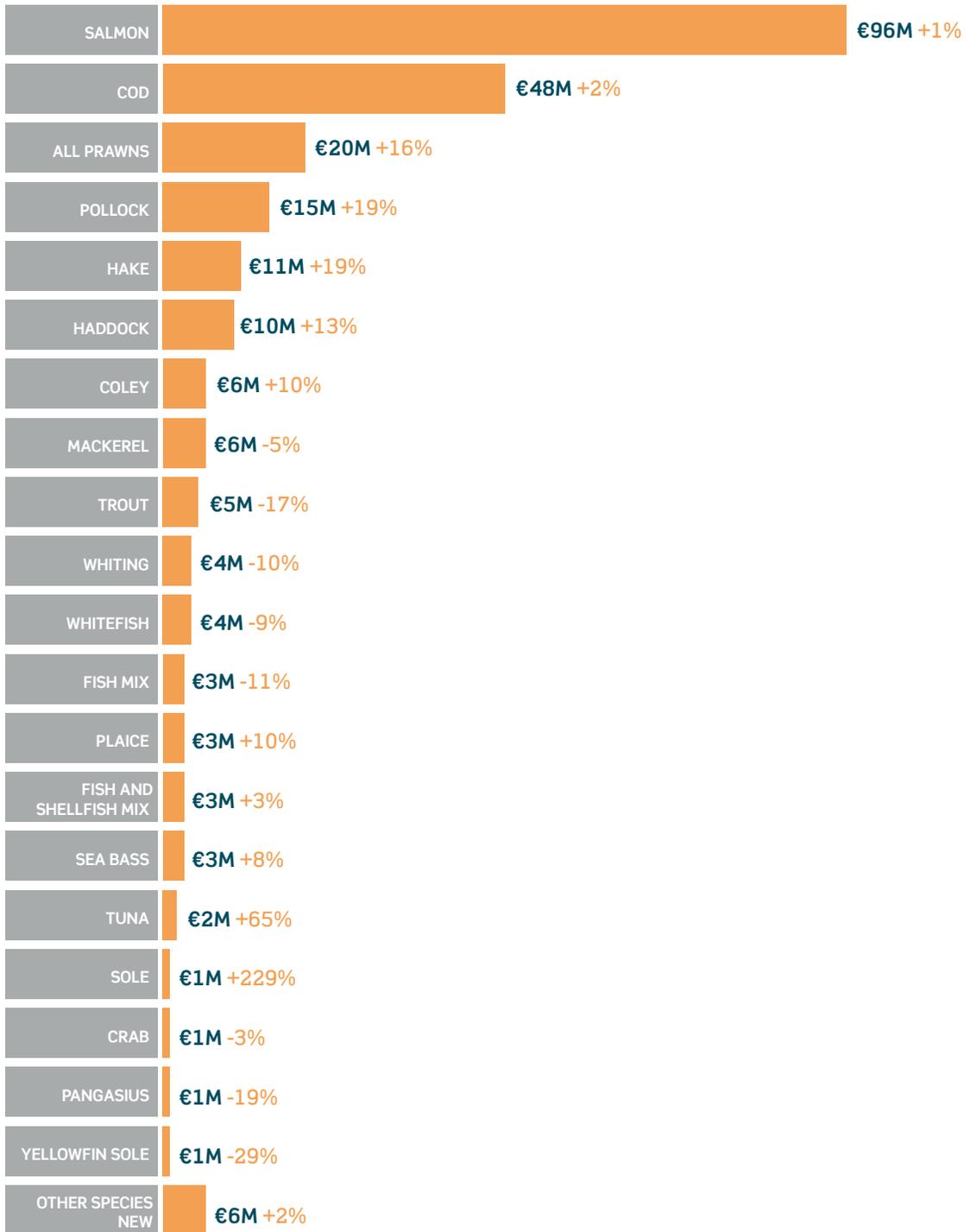
WHOLE  
SEA  
BASS  
FA  
€

VALUE OF SEAFOOD IN IRISH RETAIL SECTOR

# €249 million in 2017

4% Value Growth

TOP 20 RETAIL SPECIES BY VALUE 2017



## AVERAGE NUMBER OF PURCHASES BY SPECIES IN 2017



SPECIES	2017
Salmon	<b>13.4</b>
Cod	<b>8.6</b>
All Prawns	<b>6.3</b>
Pollock	<b>5.2</b>
Hake	<b>5.1</b>
Whiting	<b>4.5</b>
Sole	<b>4.3</b>
Coley	<b>4.0</b>
Haddock	<b>4.0</b>
Mackerel	<b>4.0</b>
Trout	<b>3.6</b>
Sea Bass	<b>3.4</b>
Fish and Shellfish Mix	<b>3.3</b>
Plaice	<b>3.2</b>
Tuna	<b>3.2</b>
Whitefish	<b>3.1</b>
Yellowfin Sole	<b>2.8</b>
Pangasius	<b>2.7</b>
Fish Mix	<b>2.6</b>
Crab	<b>2.1</b>

# TRADE

## IMPORTS AND EXPORTS OF SEAFOOD

The value of trade surpassed €1 billion for the first time in 2017 with exports valued at €666 million and imports increasing to €335 million. The main driver of export growth was Irish Organic Salmon increasing in value by 69% from €71 million to €121 million. Other export products such as seaweed, shrimp, prawn and whiting experienced strong growth. France is the most important market for exports accounting for over one quarter of the total value. The UK and Spain are the other top export partners both accounting for over 10% of total export value. Growth in imports was driven by cod and pelagic species such as tuna.



VALUE OF TRADE  
**€1 billion**



Irish Seafood Imports valued at

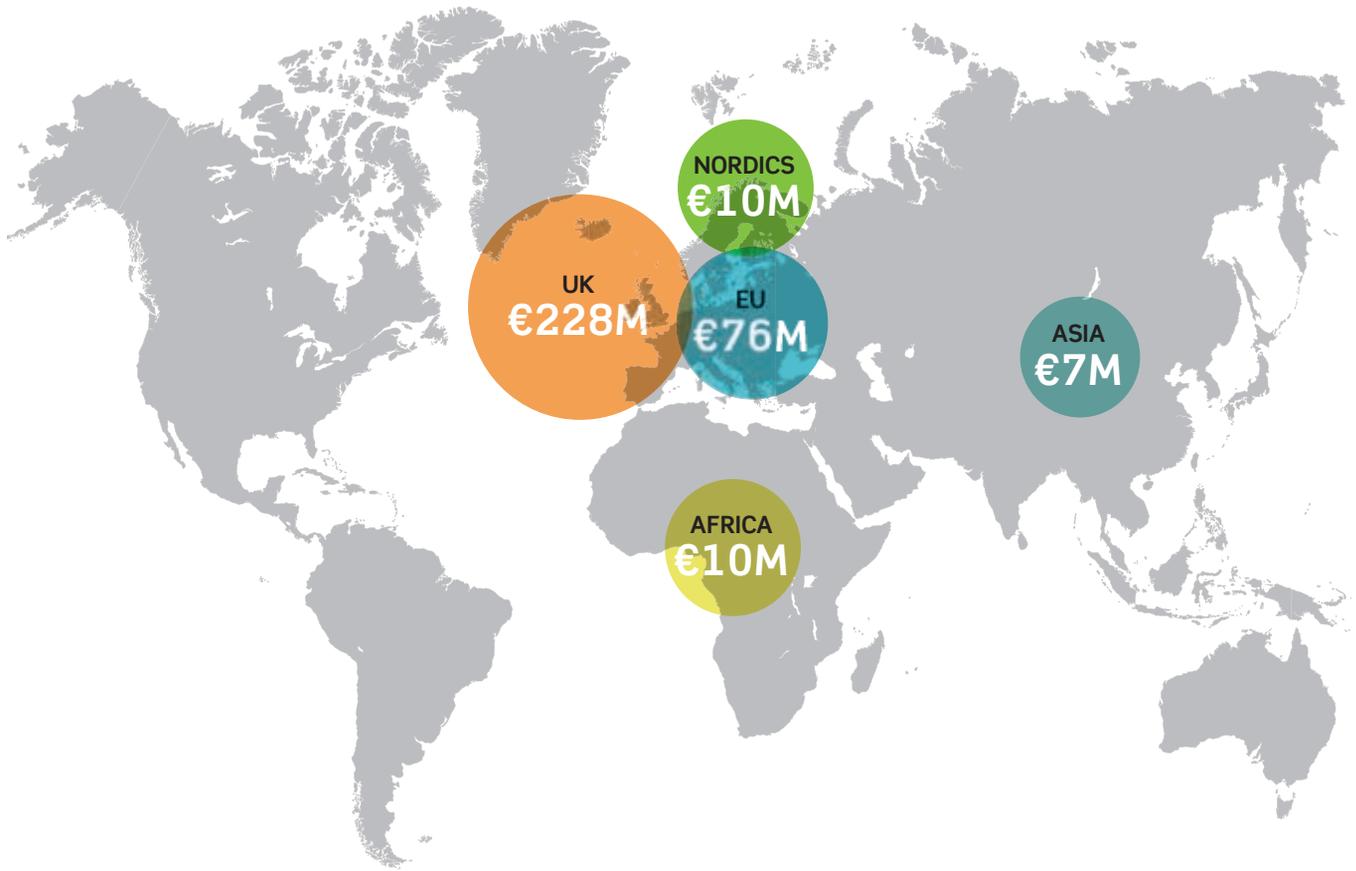
# €335 million in 2017

9% Value growth

## BREAKDOWN OF TOP 20 IMPORTED SPECIES BY VALUE

SALMON	€68M +5%	8,800 tonnes
COD	€40M +61%	7,700 tonnes
SHRIMP AND PRAWN	€35M +5%	3,500 tonnes
TUNA	€33M +14%	10,700 tonnes
MARINE ANIMAL FEED INGREDIENTS	€28M -9%	11,500 tonnes
HERRING	€13M +7%	7,500 tonnes
DUBLIN BAY PRAWN	€11M +22%	1,500 tonnes
MACKEREL	€10M +36%	5,200 tonnes
BREADED WHITEFISH	€8M -3%	2,300 tonnes
SEAWEEDS AND OTHER ALGAE	€8M +21%	52,900 tonnes
WHITEFISH	€6M -22%	1,200 tonnes
SALTWATER FISH	€6M -22%	900 tonnes
TROUT	€5M +83%	1,000 tonnes
FLOURS, MEALS AND PELLETS	€5M +63%	8,700 tonnes
HAKE	€5M +19%	1,000 tonnes
CRAB	€4M +36%	1,400 tonnes
OYSTER	€4M +19%	700 tonnes
SEA BASS	€4M -18%	400 tonnes
TURBOT	€4M -13%	500 tonnes
LOBSTER	€4M +35%	400 tonnes
OTHERS	€34M -15%	16,000 tonnes

## MAIN IMPORT MARKETS



## IMPORT MARKETS

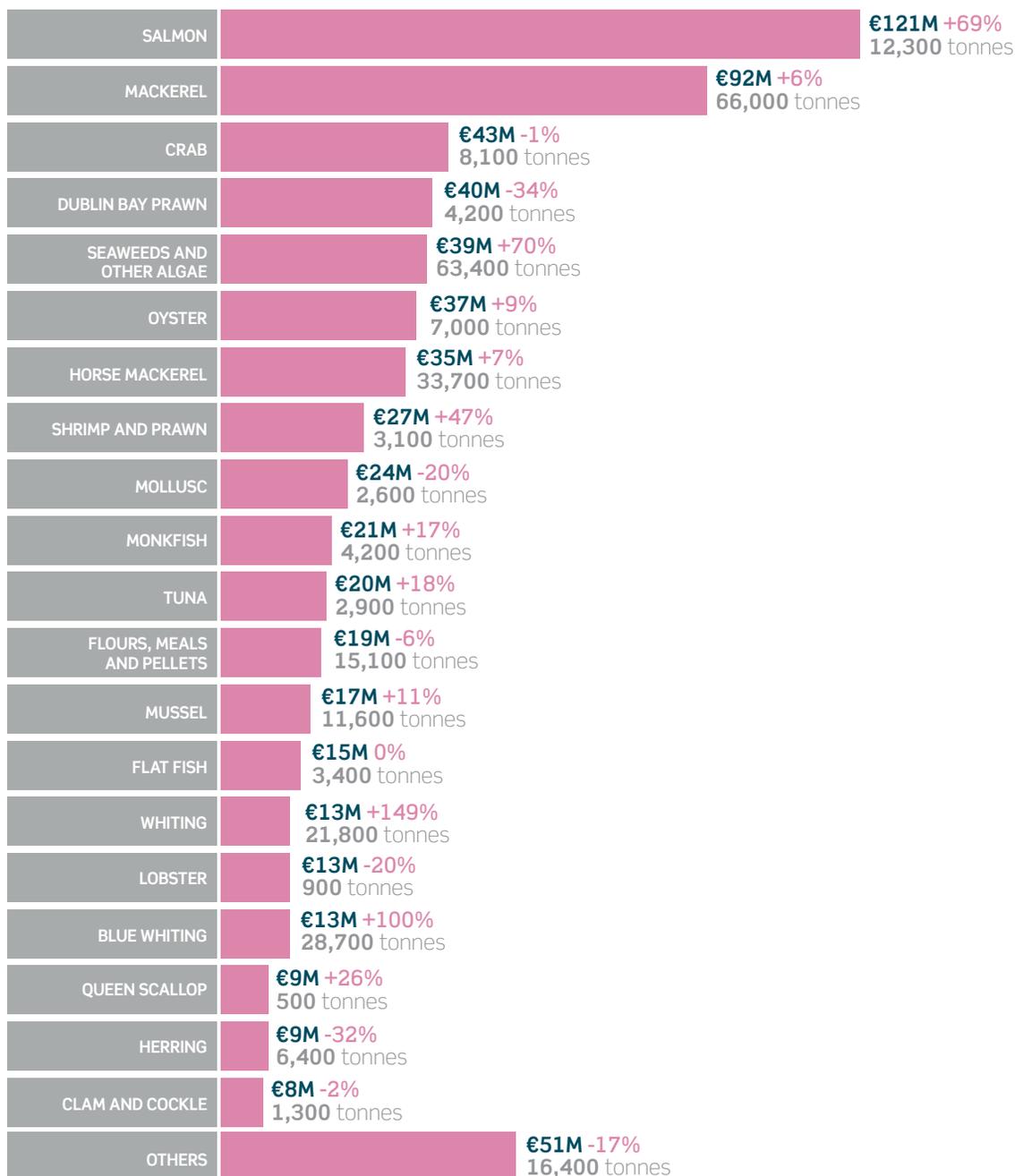
Main Markets	Value €M			Volume Tonnes	
	2016	2017	Value growth in 2017	2016	2017
United Kingdom	208	<b>228</b>	+10%	53,800	<b>64,400</b>
European Union (excl. UK)	69	<b>76</b>	+9%	15,500	<b>21,900</b>
Africa	9	<b>10</b>	+16%	2,000	<b>2,200</b>
Nordics (non-EU)	9	<b>10</b>	+14%	45,400	<b>53,300</b>
Asia	9	<b>7</b>	-24%	2,000	<b>1,400</b>
Rest of World	4	<b>4</b>	-17%	700	<b>600</b>
<b>Grand Total</b>	<b>308</b>	<b>335</b>	<b>+9%</b>	<b>119,400</b>	<b>143,800</b>

Irish Seafood Exports valued at

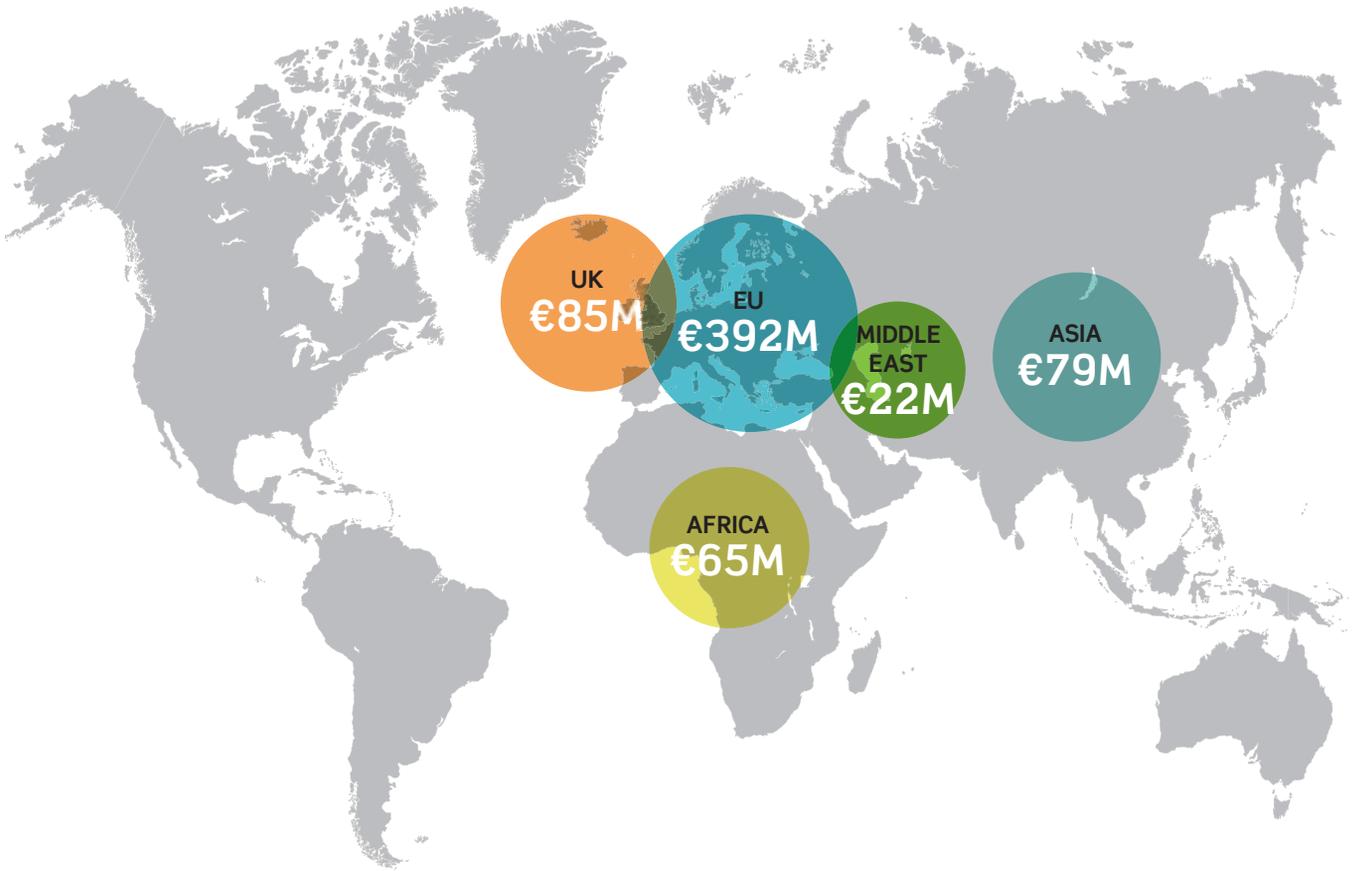
# €666 million in 2017

10% Value growth

## BREAKDOWN OF TOP EXPORTED SPECIES BY VALUE



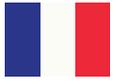
## MAIN EXPORT MARKETS



## EXPORT MARKETS

Main Markets	Value €M			Volume Tonnes	
	2016	2017	Value growth in 2017	2016	2017
European Union (excl. UK)	360	<b>392</b>	+9%	115,100	<b>114,600</b>
United Kingdom	92	<b>85</b>	-7%	46,800	<b>43,800</b>
Asia	72	<b>79</b>	+10%	26,700	<b>34,600</b>
Africa	44	<b>65</b>	+47%	42,800	<b>82,800</b>
Middle East	19	<b>22</b>	+21%	18,400	<b>17,300</b>
Rest of World	18	<b>23</b>	+23%	16,500	<b>20,500</b>
<b>Grand Total</b>	<b>605</b>	<b>666</b>	<b>+10%</b>	<b>266,300</b>	<b>313,600</b>

## MAIN EXPORT PARTNERS



FRANCE

**€170M**  
↑15%

Salmon  
**34%**

Oysters  
**16%**

Crab  
**12%**



UNITED KINGDOM

**€85M**  
↓7%

Flours, Meals  
and Pellets  
**21%**

Tuna  
**15%**

Dublin Bay Prawn  
**7%**



SPAIN

**€75M**  
↓5%

Monkfish  
**20%**

Flat fish  
**18%**

Dublin Bay Prawn  
**12%**



ITALY

**€41M**  
↓11%

Dublin Bay Prawn  
**53%**

Shrimps and  
Prawns  
**23%**

Cuttlefish  
**5%**



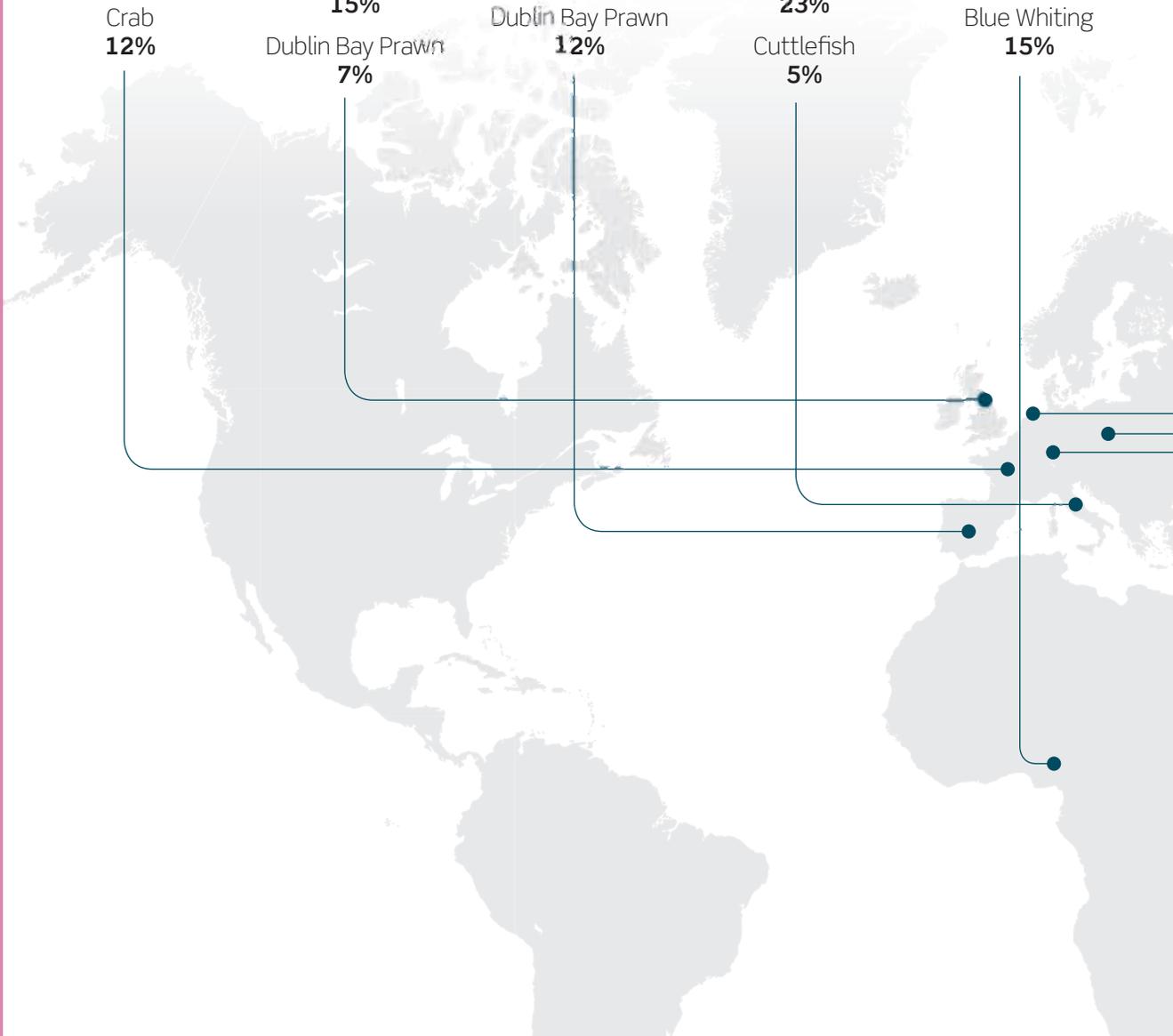
NIGERIA

**€31M**  
↓5%

Mackerel  
**51%**

Whiting  
**21%**

Blue Whiting  
**15%**





CHINA

**€28M**  
↑11%

Molluscs  
**23%**

Crab  
**22%**

Mackerel  
**18%**



POLAND

**€27M**  
↑239%

Salmon  
**83%**

Mackerel  
**9%**

Herring  
**6%**



NETHERLANDS

**€24M**  
↑45%

Salmon  
**29%**

Mussels  
**25%**

Mackerel  
**14%**



GERMANY

**€24M**  
↓2%

Salmon  
**67%**

Mackerel  
**14%**

Herring  
**9%**



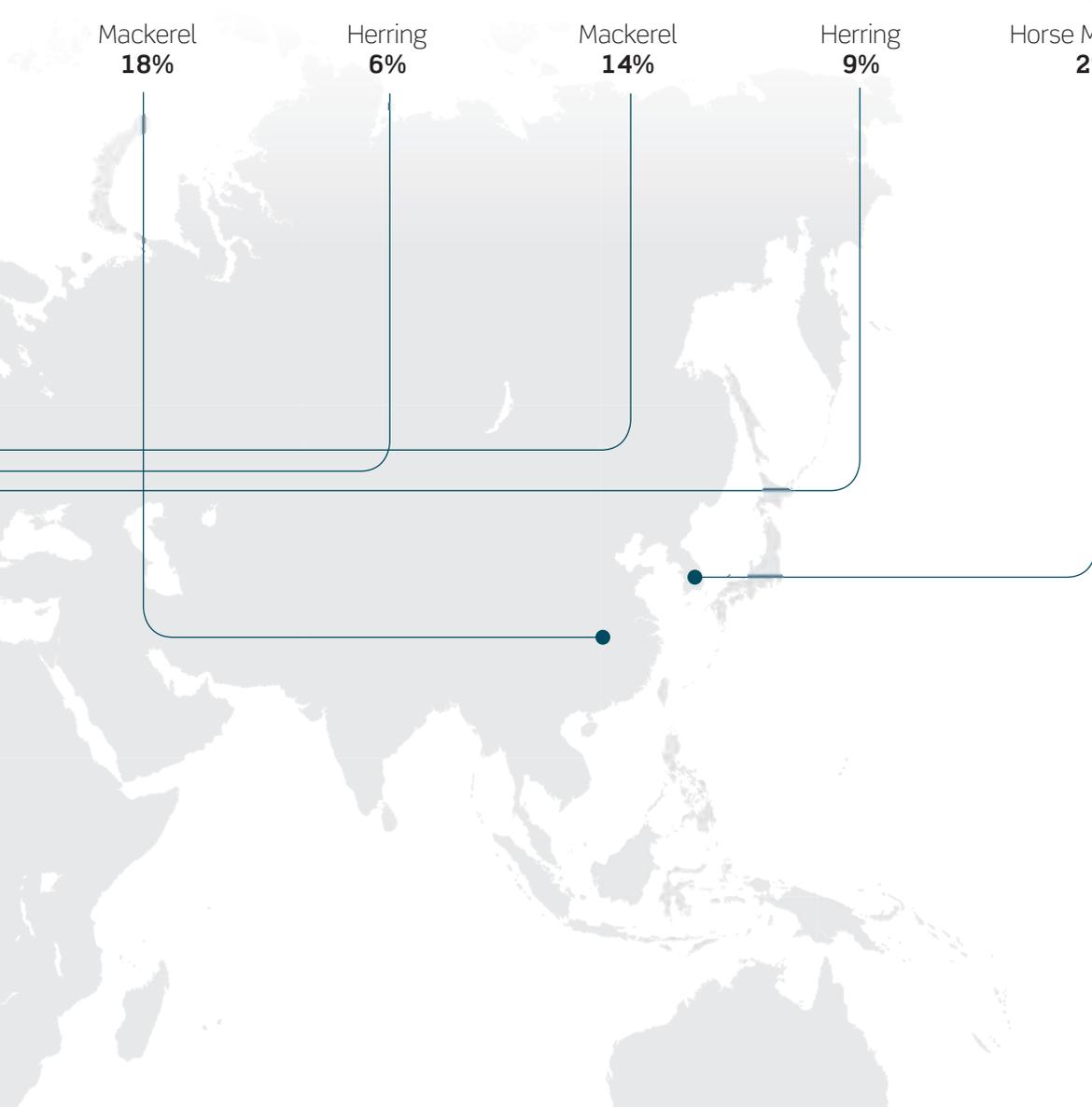
SOUTH KOREA

**€17M**  
↑3%

Molluscs  
**85%**

Whiting  
**10%**

Horse Mackerel  
**2%**



# TERMS OF REFERENCE

## PELAGIC FISH

Pelagic fish swim in mid-waters or near the surface. Oil rich fish such as mackerel, herring, boarfish and tuna are common examples.

## DEMERSAL FISH

Demersal fish are those which live on or near the sea bed. Round and flat white fish fall into this category and include cod, hake, haddock and flatfish such as flounder, sole, turbot, plaice and halibut.

## REGIONS BY COUNTY

**North:** Donegal

**North West:** Mayo, Sligo and Leitrim

**West:** Galway and Clare

**South West:** Kerry and Limerick

**South:** Cork

**South East:** Wicklow, Wexford and Waterford

**North East:** Louth, Meath and Dublin

## DATA SOURCES

Landings data are supplied by the Sea Fisheries Protection Authority (SFPA), [www.sfpa.ie](http://www.sfpa.ie).

Value of landings are estimated by BIM.

Aquaculture data is collected through the BIM Annual Aquaculture Survey.

Population data is sourced from the CSO Census 2016, [www.cso.ie](http://www.cso.ie).

Seafood population and employment statistics estimated by BIM using Census 2016 data.

Employment data in seafood sector collected through the Data Collection Framework by BIM.

Retail data is supplied by Kantar World Panel.

Foodservice consumption estimated by BIM using Bord Bia 'Irish Foodservice Channel Insights' data.

The total fisheries employment on page 7 also includes wild seaweed harvesters.

Import and Export data supplied by EUROSTAT.

Please note some figures have been rounded for the purposes of this publication.

Please consult data sources above for original data.



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