The Economic Contribution of the Aquaculture Sector Across Ireland's Bay Areas

Bord Iascaigh Mhara

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BIM Ireland's Seafood Development Agency

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Executive Summary

The Irish aquaculture sector is an important component of the Irish seafood economy. This is particularly the case in some of the country's more peripheral coastal economies (e.g., rural Donegal).

The long running annual aquaculture survey, part of BIMs suite of National Seafood Surveys (NSS) provides a measure of the Irish industry's performance trends. To shed new light on the economic contribution of Irish aquaculture at both local and national level, Bord Iascaigh Mhara (BIM) commissioned Oxford Economics and Perceptive Insight to assess the economic impact of the aquaculture sector at 11 of Ireland's most representative bay areas. These ranged from Dingle - the largest of these bay economies - to Mulroy Bay in County Donegal, the smallest and most northerly of the bays assessed.

As well as providing true insight on the impact of aquaculture upon the economies of the selected bays, the study also provides the secondary benefit of having both independently and professionally generated an alternative dataset and resultant estimates that can be used to compare with those in-house to ultimately improve BIM's measurement of the sectors performance.

For each bay, the analysis considers:

- Finfish farming;
- Oyster farming; and
- Mussel and other shellfish farming.

This executive summary sets out the key findings in terms of total contributions to GDP, jobs, wages and tax revenues in 2020. The analysis includes the estimated impact of economic activity in the aquaculture sector's supply chain (indirect impact), and wage-related spending in the wider consumer economy (induced impact).

This report highlights the economic impact associated with a subset of Ireland's overall aquaculture industry. BIM's national seafood survey data shows that the **11 bay areas (which form the focus of this report) represent close to half of Ireland's total aquaculture production by value.**

The analysis gives a snapshot of the local aquaculture industry across the studied bays in 2020. However, it is recognised that this period coincided with the Coronavirus pandemic, which is likely to have presented unique challenges for businesses throughout the industry and may under estimate the contribution of aquaculture to the local and national economies.

TOTAL EMPLOYMENT SUSTAINED ACROSS IRELAND RESULTING FROM AQUACULTURE ACTIVITY AT THE 11 BAYS

The direct values of aquaculture derived in this study contrasts with those derived from the National Seafood Survey (NSS) for 2020. The NSS and this study varied slightly in survey design and their resulting data sets contrast in: Response rates, use of category versus variable data and turnover versus farm-gate sales value, among other points. The data resulting from the NSS reports have the most up-to-date estimates of the sectors direct value. Any discrepancies in direct value between the two data sets do not affect the economic multipliers derived by the study.

€73 MILLION

THE ECONOMIC BENEFITS ASSOCIATED WITH THE BAYS' AQUACULTURE SECTOR WERE ESTIMATED TO BE LARGEST IN THE SOUTH-WEST AND BORDER REGIONS

€34 MILLION

TOTAL EARNING BENEFITS WERE LARGEST IN THE SOUTH-WEST AND BORDER REGIONS

THE AQUACULTURE SECTOR'S CONTRIBUTION TO THE NATIONAL ECONOMY

The analysis carried out by BIM shows that the farming of finfish, oysters, mussels and other shellfish across the 11 bay areas bring substantial economic benefits to the Irish economy. When the direct, indirect and induced impacts are combined, the bay-based aquaculture activity sustained a total of 1,385 jobs throughout Ireland in 2020, paying wages worth €34 million.

This activity generated a total contribution to Ireland's Gross Domestic Product (GDP) (i.e. Gross Value Added, GVA)[1] of €73 million and provided fiscal benefits estimated at €13 million. Table 1 shows how this is divided between the direct, indirect, and induced impacts.

Table 1. Total economic benefits associated with aquaculture, 11 bay areas, 2020

Aquaculture Total	Ireland		
	GVA (€m)	Employment	Wages (€m)
Direct	42.9	913	15.5
Indirect	18.8	305	12.8
Induced	11.6	168	6.0
Total	**73.4**	**1,385**	**34.4**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

THE LOCAL AQUACULTURE SECTOR'S CONTRIBUTION TO IRELAND'S REGIONAL ECONOMIES

In terms of GVA, employment, and wages, based on the analysis, BIM estimates that the bay areas' aquaculture sector makes an economic contribution in all eight regions of Ireland - even those with no direct bay presence[2]. None of the 11 bays included within this study fell within the Midlands, Dublin or Mid-West, but these regions still receive some economic benefits from aquaculture via supply chain and subsequent consumer spending impacts.

The South-West and Border regions (see Tabe 2) benefit most from aquaculture. Between them, these regions are home to seven of the 11 bay areas analysed, including two of the largest bay areas in terms of aquaculture sector activity: Bantry Bay (South-West) and Donegal Bay (Border). As a result, the Border and South-West regions account for close to two thirds of the aquaculture related turnover generated across the 11 bay areas.

1. GVA (or Gross Value Added) is a measure of the contribution an individual producer, industry, or sector makes to national GDP (which is equal to GVA plus taxes, minus subsides).

2. There are eight regions at NUTS3 level in Ireland which came into existence in 1994, under the terms of the Local Government Act 1991, each is governed by an associated Regional Authority.

Table 2. Estimated benefits of the bays' aquaculture sector by NUTS3 regions, 2020

Aquaculture Total	Ireland		
	GVA (€m)	Employment	Wages (€m)
Border	14.2	315	7.6
West	14.3	219	6.5
Mid-West	2.3	34	1.4
Mid-East	6.2	118	3.1
South-West	26.6	543	10.5
South-East	5.9	100	2.7
Dublin	2.5	28	1.5
Midlands	1.3	28	1.0
Total	**73.4**	**1,385**	**34.4**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

"THE AQUACULTURE SECTOR REPRESENTS A SIGNIFICANT SOURCE OF EMPLOYMENT OPPORTUNITY WHICH IS MORE CLOSELY ALIGNED WITH THE SKILLS OF LOCAL PEOPLE"

Aquaculture is a relatively large and resilient employer in the bay economies. It offers accessible jobs to local people, flexible employment opportunities, and has established access to external markets. Therefore, a vibrant and growing local aquaculture sector remains important for the economic and demographic health of these areas. This is particularly important given that employment opportunities in these areas is weak and relatively high rates of economic inactivity. Additionally, the outlook for the bay area economies is likely to be challenging given their sectoral structure, demographic trends, and stock of skills..

However, breaking down the total impact of the aquaculture sector across the 11 bays into each of its sub-sectors, the analysis shows:

- The bays' **finfish** activity is estimated to have sustained 381 jobs, €16 million in earnings and €35 million in GVA in 2020.
- The bays' based **oyster farming** activity is estimated to have sustained 687 jobs, €13 million in earnings and €27 million in GVA.
- **Mussel and other shellfish** farming activity is estimated to have sustained 317 jobs, €5.9 million in earnings and €12 million in GVA.

1. Introduction

1.1 ABOUT THE STUDY

The Irish aquaculture sector is an important component of the Irish economy. It is, however, more important to coastal communities around the country given its concentration at Ireland's bay areas and the relatively lower level of alternative economic activity in these economies. In addition, as economic and employment growth is increasingly driven by office-based activity which favours urban areas, the aquaculture sector's role in providing labour market opportunities, wages and local demand in these coastal areas is arguably rising. Against this backdrop, Bord Iascaigh Mhara (BIM) commissioned Oxford Economics and Perceptive Insight to estimate the economic contribution of the aquaculture sector in selected bay areas across Ireland.

1.2 THE BAYS

This report concentrates on the aquaculture sector within 11 of Ireland's most representative bays and goes on to show the economic benefit this sector supports within the Irish economy.[3] Although these bays vary in a number of respects (see section 2.2), the local aquaculture sector remains a mainstay of their local economies. The bay economies are widely dispersed throughout the island and are found in five of Ireland's eight regional authority areas.[4] Our analysis will lay out how the aquaculture sector at the bays impacts each of these 'local' regional areas, in addition to the country as a whole.

Table 3. Bay areas included within the analysis

Bay Area	Regional Area
Trawenagh Bay	Border
Mulroy Bay	Border
Donegal Bay	Border
Clew Bay	West
Kilkieran Bay	West
Dingle Bay	South-West
Kenmare Bay	South-West
Bantry Bay	South-West
Roaringwater Bay	South-West
Dungarvan Bay	South-East
Carlingford Lough	Mid-East

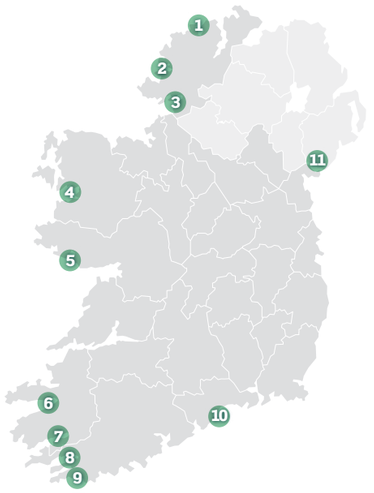
Source: CSO
Note: There are eight regions at NUTS3 level in Ireland.

3. A bay area is defined as the District Electoral Division areas (DEDs) encompassing the bay and its aquaculture producers (informed via consultation with BIM) - see Figure 4.

4. All references to 'Ireland' and aquaculture's economic benefits are attributable to the Republic of Ireland i.e. excludes Northern Ireland.

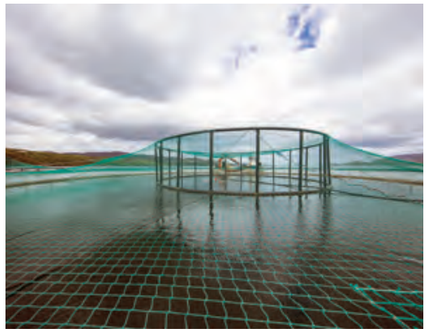
To inform the analysis, a comprehensive aquaculture-related survey exercise was carried out across the selected bay areas. We worked closely with BIM in order to, firstly, understand the aquaculture population at each of the 11 bays. Following this, the market research firm Perceptive Insight collected information concerning the characteristics of the local aquaculture sector through both telephone and online surveys.

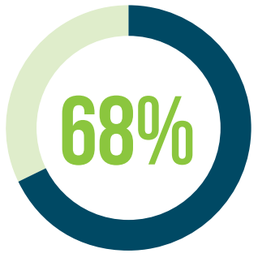
Figure 1. Bay areas covered within the study



1. Mulroy Bay, Border
2. Trawenagh Bay, Border
3. Donegal Bay, Border
4. Clew Bay, West
5. Kilkieran Bay, West
6. Dingle Bay, South-West
7. Kenmare Bay, South-West
8. Bantry Bay, South-West
9. Roaringwater Bay, South-West
10. Dungarvan Bay, South-East
11. Carlingford Lough, Mid-East

In total there were 89 individual responses from aquaculture-related businesses spread across the bay areas. This represented a relatively high overall response rate of 68 percent relative to the known aquaculture business population at the bays. Response rates were also broadly consistent across sub-sectors (finfish/oyster/mussel and other shellfish) ranging between 65 – 70 percent participation in the survey exercise. A relatively small proportion of the survey respondents (6 percent) indicated they had revenue originating from more than one of the 11 bay areas. However, a slightly larger share (14 percent) noted they had additional operations in bay areas outside the 11 highlighted within this study.





SURVEY RESPONSE RATE

The aquaculture survey captured a relatively high proportion of the sector within the bay areas.

Table 4. Survey participation by locality and sub-element, 2021

Bay Area	Finfish farming	Oyster farming	Mussel and other shellfish farming	Total
Bantry Bay	1	0	6	7
Kilkieran Bay	0	0	2	2
Donegal Bay	1	6	0	7
Kenmare Bay	0	2	10	12
Clew Bay	0	9	1	10
Dingle Bay	0	20	0	20
Mulroy Bay	0	1	3	4
Carlingford Lough	0	2	2	4
Dungarvan Bay	0	4	0	4
Trawenagh Bay	0	8	0	8
Roaringwater Bay	0	2	9	11
Total responses	2	54	33	89
BIM population	3	77	51	131
Response rate	**67%**	**70%**	**65%**	**68%**

Source: Perceptive Insight, BIM
Note: Responses represent unique businesses and are allocated to their main bay of operations. May not sum due to rounding.

1.3 THE AQUACULTURE SECTOR'S 'DIRECT' CHARACTERISITCS

In order to quantify the aquaculture sector's contribution to both the regional and national economies, we first need to understand its unique characteristics. Our analysis therefore estimates the direct activity associated with each of the sector's sub-elements (finfish farming, oyster farming and mussel and other shellfish farming) at each of the bays by drawing on the survey findings and information held by BIM. We then estimate their wider impacts within their local NUTS3 regions and the broader Irish economy. These wider impacts include those associated with the aquaculture sector's supply chain and the consumer spending of those employed as a result of the direct and indirect activity - see Introducing Economic Impact Analysis (next) and Figure 2 for more detail concerning our methodology.

INTRODUCING ECONOMIC IMPACT ANALYSIS

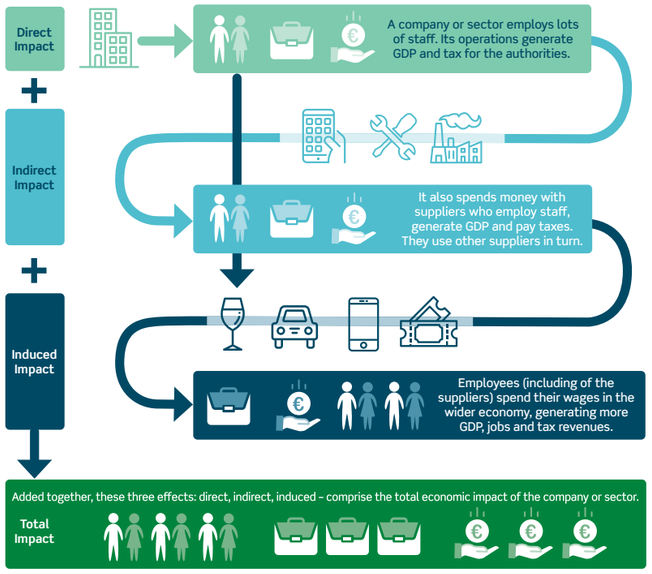
The economic impact of a sector is measured using a standard means of analysis called an economic impact assessment. This report quantifies the three 'core' channels of impact that comprise an organisation/sector's 'economic footprint':

- Direct impact, which is the economic activity the aquaculture sector generates because of its operations;
- Indirect impact, or supply chain impact, that occurs because the sector buys inputs of goods and services from Irish businesses; and the
- Induced impact, which relates to the wider economic benefits that arise when employees of the local aquaculture sector and its supply chain spend their wages in the consumer economy, for example in local retail establishments.

We analyse these channels of impact using three core metrics:

- Employment, measured on an employee job basis;
- Wages, the total value of remuneration offered to the workers associated with these activities (in current prices);
- Gross value added contribution to GDP (in current prices); and,
- Tax receipts generated by the Irish activity and employment supported by the aquaculture sector. Figure 2. Economic impact assessment.

Figure 2. Economic Impact Assessment



1.4 REPORT STRUCTURE

This study breaks down the characteristics of the aquaculture sector within the key bay areas of interest. It then goes on to show the economic impact this activity creates across the Irish economy.

The report takes the following structure:

- An analysis of aquaculture activity across the 11 bay economies;
- A breakdown of the economic benefits associated with the finfish farming sub-sector at the national and regional level;
- A breakdown of the economic benefits associated with the oyster farming sub-sector at the national and regional level;
- A breakdown of the economic benefits associated with the mussel and other shellfish sub-sector at the national and regional level;
- A summary of the economic benefits associated with the bays' collective aquaculture sector at the national and regional level; and
- Finally, we present the report's conclusions.

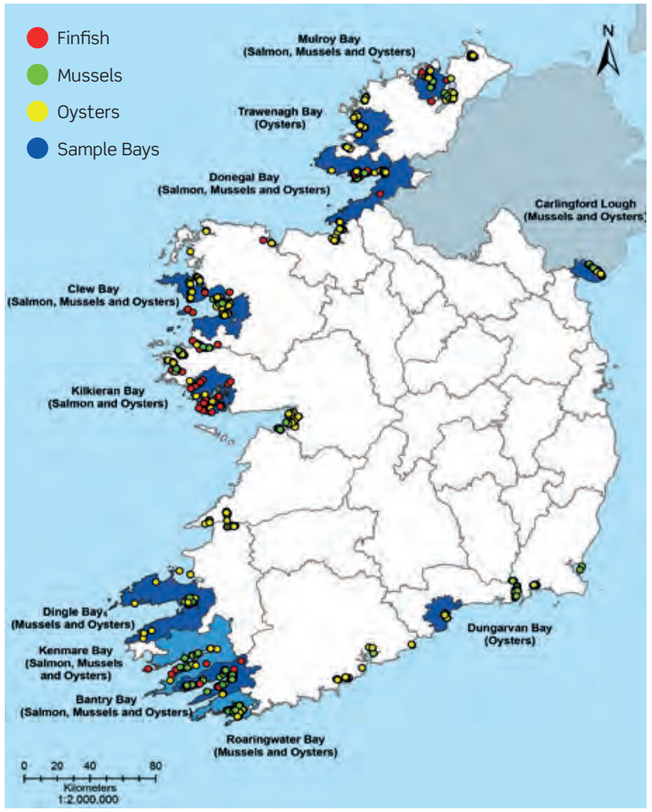
This report is accompanied by a further 11 reports that provide analysis for each individual bay covered in the study.

2. Irish Aquaculture and the Bay Economies

2.1 THE IRISH AQUACULTURE INDUSTRY

The aquaculture sector is a significant component within Ireland's seafood industry. BIM's latest data shows that the aquaculture sector averages over 250 active producers operating across Ireland, generating close to €180 million in sales annually. These same businesses together directly supported over 1,900 jobs nationwide. The sector therefore offers a significant economic footprint across the Irish economy - especially along the Irish coastline were much of this activity takes place.

Figure 3. Aquaculture sites throughout ROI



Source: BIM

This study concentrates on the economic contribution of aquaculture across a selection of some of Ireland's most representative coastal/bay area economies. These bay areas' form a subset of the overall aquaculture industry in Ireland and were selected for inclusion in the study based on a range of criteria (including sectoral revenues, employment, sectoral diversity, geographic spread, and community characteristics).[5]

THE STUDIED BAYS ARE KEY IRISH AQUACULTURE SITES

Close to half of Ireland's aquaculture sales originate from the 11 bay areas.

5. See appendix 1 for more information.

€2.6 BILLION

SIZE OF THE COMBINED BAY ECONOMIES (GVA TERMS)

The Dingle and Bantry Bay economies were the largest of the eleven.

We estimate that close to half of Ireland's aquaculture related businesses have a presence within these 11 bay areas. Furthermore, a similar proportion of Ireland's total aquaculture related turnover and direct employment was based within these bay economies. A particular high share of Ireland's Finfish and Mussel and other Shellfish output belonged to these areas, relative to the number of aquaculture producers/businesses based there.

Table 5. Aquaculture activity across the 11 bay areas studied

Bay areas' aquaculture as a share of the national total	Sales value	Direct jobs	Aquaculture related businesses
Finfish	40%	47%	17%
Oysters	63%	41%	51%
Mussel and other shellfish	89%	66%	61%
Aquaculture total (11 bays)	49%	47%	52%

Source: Oxford Economics, Perceptive Insight, BIM
Note: May not sum due to rounding.

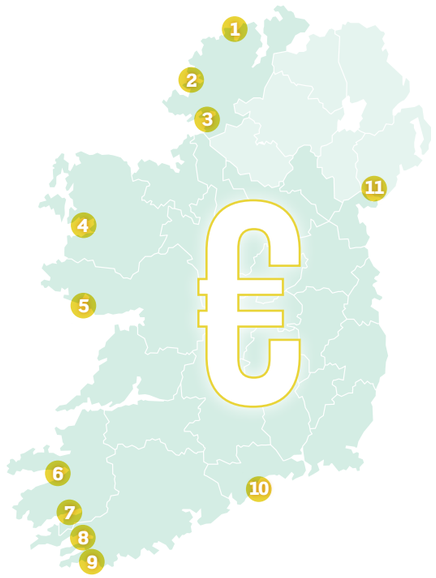
2.2 THE BAY AREA ECONOMIES

The aim of this chapter is to first understand the size and characteristics of the bay area economies. This will provide the added context required from which to understand the importance of the aquaculture industry locally. The latest Census (2016) provides workplace employment data at a sectoral level for small area workplace zones across Ireland. By combining this employment data with our regional productivity estimates we can quantify the economic footprint of the bay economies.

Our analysis shows that the combined bay area economies made a GVA contribution to GDP of €2.6 billion in 2020.[6] The individual bays vary greatly in terms of the overall size of their economies. The Dingle, Bantry and Dungarvan bays were by far the largest of the bay area economies in GVA terms due in part to the comparative large levels of employment they support. Dingle bay's economy is estimated to support employment for over 7,400 people and generate an estimated €444 million in GVA. The only other bay economies which were similar to Dingle in absolute size terms were Bantry and Dungarvan - with total economy GVA of €383 million and €341 million respectively (see Figure 4).

6. When estimating the size of the bay area economies we use the most recent workplace sectoral employment data from the 2016 census. This employment data relates to workplace zones, which are slightly smaller than DEDs. The workplace zones are therefore mapped across to closely represent the DEDs which cover the bay areas. We then supplement this data with the current snapshot of the local aquaculture sector as estimated through the survey exercise. Finally, we subtract the aquaculture activity from the broader 'Agriculture, forestry and fishing' sector to get an indication of its prominence locally.

Figure 4. Bay economy size comparisons, GVA, 2020

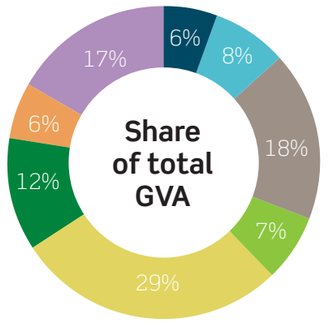


1. Mulroy Bay - **£80 Million**
2. Trawenagh Bay - **£90 Million**
3. Donegal Bay - **£200 Million**
4. Clew Bay - **£316 Million**
5. Kiljeran Bay - **£150 Million**
6. Dingle Bay - **£444 Million**
7. Kenmare Bay - **£169 Million**
8. Bantry Bay - **£383 Million**
9. Roaringwater Bay - **£217 Million**
10. Dungarvan Bay - **£341 Million**
11. Carlingford Lough - **£169 Million**

Source: Oxford Economics, CSO

The agriculture, forestry and fishing sector represents a relatively large share of the local economy within each bay area. In GVA terms, this broad industry sector accounts for 8 percent of economic activity across the bays (compared to just 1 percent across the Irish economy as a whole). Evidently, aquaculture is a sub-component of this sector and itself makes a significant contribution locally. We estimate that the aquaculture sector directly generated €43 million in GVA in 2020 (see Figure 5).

Figure 5. All bay areas' economic structure, 2020



- Agri, forestry and fishing **(6%)**
- Manufacturing, mining and quarrying **(8%)**
- Construction **18%)**
- Trade, hospitality and transport **(7%)**
- Professional services **(29%)**
- Public admin and defence **(12%)**
- Education health and social work **(6%)**
- Arts. entertainment and other services **(17%)**

Source: Oxford Economics, Perceptive Insight, CSO

900 JOBS

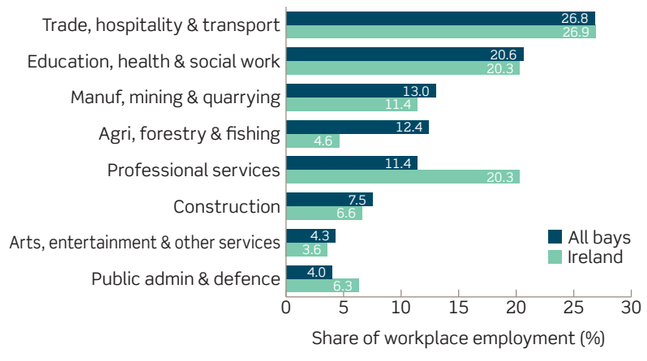
DIRECT AQUACULTURE EMPLOYMENT ACROSS THE BAYS IN 2020

The equivalent to 1 in every 50 local jobs across the bay areas.

AQUACULTURE - ALONGSIDE THE WIDER AGRICULTURE, FORESTRY AND FISHING SECTOR - IS A RELATIVELY LARGE EMPLOYER WITHIN THE BAY AREAS

In employment terms, the agriculture, forestry and fishing, construction and arts, entertainment and other service sectors are all relatively large in the bay economies (see Figure 6). This is particularly the case for agriculture, forestry and fishing, were this sector's share of local workplace employment (12 percent) is over double that of the national average (5 percent). The aquaculture sector is estimated to directly sustain over 900 jobs throughout the bay areas in 2020.[7] These findings suggest that local aquaculture activity is relatively more productive than the rest of the agriculture, forestry and fishing sector at the bays.

Figure 6. Main employment sectors across the bays, 2020



Source: Source: Oxford Economics, Perceptive Insight, CSO, BIM

2.3 AQUACULTURE'S SUPPORTING ROLE AT THE BAYS

The analysis has already shown that the aquaculture sector is a significant component of the bay economies. This section of the report provides further context by examining the socio-economic characteristics of the collective bay economies.[8] A large part of the subsequent analysis draws on Census Small Area Population Statistics published by the Central Statistics Office (CSO).[9]

Our analysis shows that the bay areas' unique characteristics bring with them specific challenges. Although unemployment is broadly comparable with the national average across the bay economies, employment rates are low and economic inactivity is relatively high. Approximately 50 percent of all bay area residents aged 15 and over were in employment at the time of the last

[7] The latest available sectoral employment data for the bay area economies was for 2016. Therefore, both the GVA and employment estimates shown for the bay economies combine this data with the current snapshot of the aquaculture sector.

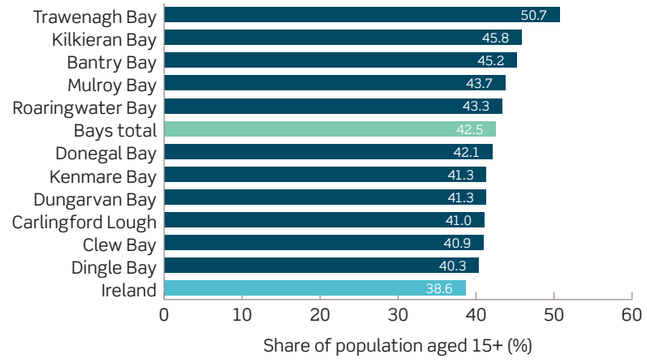
[8] The local bay economies are defined as the district electoral divisions (DEDs) which surround the bay itself and encompass the aquaculture related business sites covered in the study.

[9] The most recent Census was carried out in 2016.

Census 0 over three percentage points below the national average of 53 percent.

Economic inactivity is a term used to describe the section of the population which is not in employment and is not actively seeking employment. This catch-all definition can include a broad range of people including students, carers, the retired and the long-term sick. Almost 43 percent of bay area residents aged 15 and above were classified as economically inactive as of the latest Census - four percentage points above the state average. Inactivity was highest within the Trawenagh and Kilkieran bay economies.

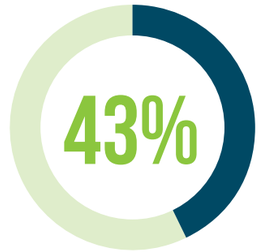
Figure 7. Economic inactivity, Bay areas, 2016



Source: CSO Ireland

A breakdown of the reasons for inactivity shows that all 11 bay areas exhibit above average shares of retirees within the overall total. The Kenmare bay area had the highest share, with 53 percent of all those inactive being classified as retired. Carlingford Lough recorded the lowest retiree representation within its inactive population (39.8 percent) - however this remained over two percentage points higher than the national average. Furthermore, carers make up a relatively large share of the inactive population within Carlingford Lough (25 percent compared to 21 percent across Ireland).

Many of these factors are influenced by demographic trends. Population growth has been relatively weak across the bay areas - with the working age cohort shrinking between the last two census rounds. Older people therefore account for an above average share of the local population within the bay areas. Those aged 65 and over, represented 18 percent of the total across the bay economies in 2016 - compared to the national average of just 13 percent.



INACTIVITY RATE

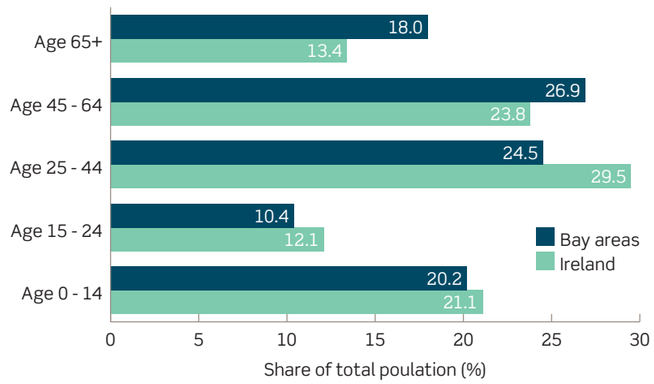
BAY AREAS' RESIDENTS AGED 15+

The above average inactivity rate is partly influenced by local demographic trends.

THE BAY AREAS' SECTORAL STRUCTURE, ALONGSIDE NET OUT COMMUTING PATTERNS, SUGGEST THAT EMPLOYMENT OPPORTUNITIES ARE RELATIVELY LIMITED LOCALLY

These trends have significant implications for the local economies. Not only is there less labour to fuel business growth, but there is likely to be less households with children. Consequently, local areas could face slowing or indeed declining population levels which could be exacerbated further by a weakening in the local economy.

Figure 8. Age structure comparisons, Bay areas vs, Ireland, 2016



Source: CSO Ireland

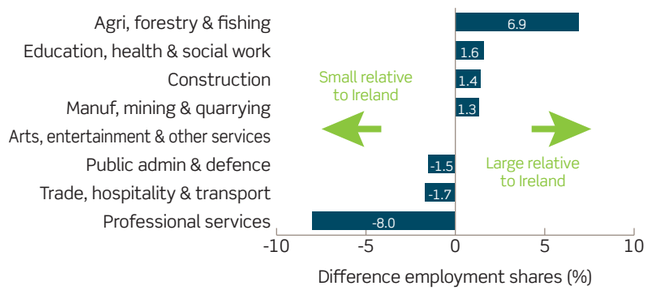
Equally, the economic structure of the bay economies themselves contribute towards the challenging outlook. Workplace data show that there is significant net out-commuting from the bay areas.[10] This suggests that employment opportunities could be limited locally or that better paid opportunities can be found elsewhere. National trends show that employment creation has been driven by higher value-added private service sectors of the economy. Unfortunately, these growth sectors tend to favour more urban areas, with access to a strong pool of labour and a constant stream of skilled labour entrants (e.g. from higher education).

In the absence of these growth sectors, aquaculture related employment offers significant opportunities for local people. An analysis of sectoral employment shows that both the agriculture, forestry and fishing and the education, health and social work sectors are strongly concentrated locally and account for an above average share of local workplace employment.[11] Agriculture, forestry and fishing alone accounted for 12 percent of local workplace-based employment within the bay economies - over twice that of the national average (5 percent).

10. Census 2016 was the first for which data on the 'daytime population' of areas has been published. The daytime population includes persons who indicated they worked or studied in the area, along with the usual residents of that area who do not work or study. This data is presented as workplace zones which can be combined to approximately match the Small Areas output from the Census

11. 'Aquaculture' falls within 'Agriculture, forestry and fishing' NACE sectoral definition.

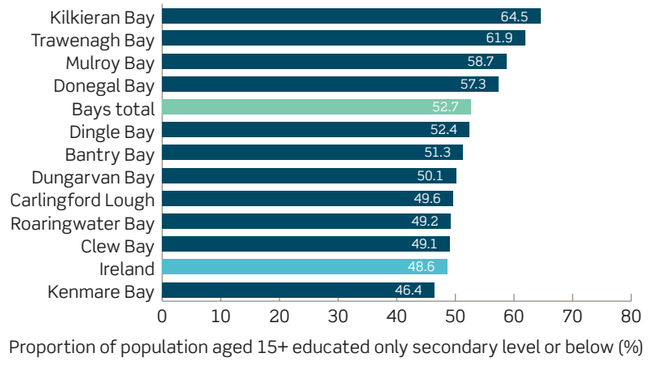
Figure 9. Sectoral structure, bay areas vs national average, 2015



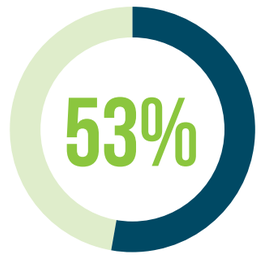
Source: Oxford Economics, CSO Ireland

Not only are the primary industries important from an employment perspective but they are also likely to be better matched to the skill levels of local people. An above average proportion of residents within the bay areas have either low or no formal education. Published data shows that 53 percent of the collective bay areas' population aged 15 and over were educated to secondary level or below (four percentage points higher than the overall Irish average). Again, given that future growth will be driven by higher skilled activity as the economy becomes increasingly skills hungry, the economic outlook for the bay areas is a challenging one.

Figure 10. Education attainment secondary level or below, Bay areas, 2016



Source: CSO Ireland



BAY AREAS' EDUCATIONAL ATTAINMENT AT SECONDARY LEVEL OR BELOW

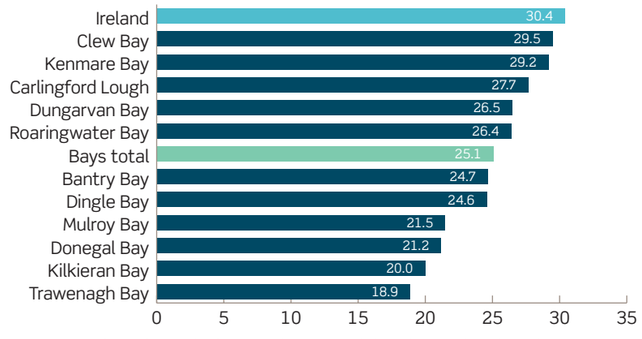
The aquaculture industry offers opportunities which are more aligned with the skill sets of local people.

"AQUACULTURE HELPS TO DIVERSIFY THE BAY ECONOMIES, PROVIDES A SOURCE FOR PART TIME EMPLOYMENT, AND SUPPORTS THE LOCAL TOURISM AND HOSPITALITY SECTORS"

Given the above trends, the local aquaculture sector is not just important in terms of providing employment opportunities, it provides employment for those with low levels of education attainment. Published Census data shows that approximately two thirds of those within the Agriculture, forestry and fishing sector's labour force ceased full time education by the age of 18, compared to just 39 percent across the whole economy. Equally, just over 60 percent of those employed within the fishing and aquaculture sector recorded secondary level or below as their highest level of education - compared to just 34 percent share across the entire labour force.

Likewise, a below average share of local people within the bay area economies have higher level qualifications. A quarter of the local people over the age of 15 across the bay areas are educated to degree level or above - compared to 30 percent throughout Ireland. As the economy becomes increasingly 'skills-hungry', local communities can be left behind as their skills become increasingly mismatched with what employer's demand. Once again, the aquaculture sector typically offers employment opportunities which more closely align with the skills of local people at the bays. The fishing and aquaculture sector's has a below average requirement for higher level qualifications generally. Less than 10 percent of the sector's labour force were educated to degree level or above in 2016, compared to 32 percent across the economy.

Figure 11. Third level degree or above attainment, Bay areas, 2016



Source: CSO Ireland

The aquaculture sector therefore provides significant employment opportunities to local people within the bay areas, who would otherwise be vulnerable to long-term unemployment and the associated social exclusion which can result. Economic deprivation within peripheral economies can become entrenched where economic opportunity is generally more limited. The 2016 Pobal Deprivation Index provides a score which provides a measurement of the affluence/deprivation of a given area relative to the national average.[12] Collectively, the 11 bay areas rank below the national average.

In addition to the above, the local aquaculture sector can help create additional 'catalytic' benefits which are often more difficult to quantify. They include softer benefits such as diversifying the economy, providing a source for part-time employment, and supporting the local tourism and hospitality sectors.

2.4 ANALYSING AQUACULTURE'S SUB-SECTORS

All three of aquaculture's sub-sectors make a significant contribution within the bay economies. Using the results from the survey exercise and published sectoral data, we estimate that aquaculture producers directly provided 913 jobs (accounting for close to half of the sector's total in Ireland), €16 million in wages and generated €88 million in turnover across the bay economies in 2020 - see Table 6. The below table highlights the sector's direct impact within the bay areas. Evidently, the total economic impact - after accounting for supply chain and consumer spending impacts - will be larger still. The overall economic contribution is laid out in sections 3 to 6 of this report.

Table 6. Aquaculture's sub-sectors across the bays, 2020

Farming sector	Turnover (€m)	Jobs	Wages (€m)
Oyster farming	28	543	7.3
Finfish farming	47	116	4.9
Mussel and other shellfish farming	12	254	3.3
Total	**88**	**913**	**15.5**

Source: Oxford Economics, Perceptive Insight, BIM
Note: May not sum due to rounding.

Bantry bay has the largest aquaculture sector in turnover terms. The sector is estimated to have generated €15 million in sales in 2020. This turnover figure represented close to one fifth of total sales across the bays. In addition, both the Kilkieran and Donegal bay aquaculture sectors ranked strongly with sales totals for each estimated around €11 million.

€47 MILLION

FINFISH TURNOVER BASED ACROSS THE 11 BAY AREAS

The above average inactivity rate is partly influenced by local demographic trends.

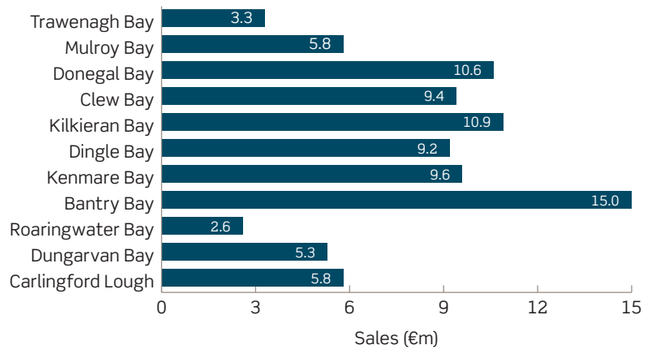
12. T. Hasse and J. Pratschke, 'The 2016 Pobal HP Deprivation Index for Small Areas (SA)', 2017

€15 MILLION

BANTRY BAY'S AQUACULTURE RELATED TURNOVER

Bantry bay was estimated to have the largest aquaculture sector in turnover terms.

Figure 12. Aquaculture sales across the bay areas, 2020

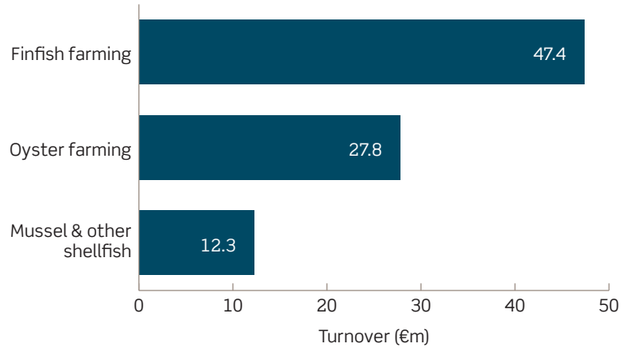


Source: Oxford Economics, Perceptive Insight, BIM

2.4.1 FINFISH FARMING

In turnover terms, finfish farming is easily the largest sub-sector of aquaculture across the 11 bay areas. Finfish producers are estimated to account for close to 55 percent (€47 million) of the overall sector's sales across the bays, more than the combined total of both oyster and mussel and other shellfish producers (€28 million and €12 million respectively).

Figure 13. Bays' aquaculture's turnover by sub-sector, 2020



Source: Oxford Economics, Perceptive Insight, BIM

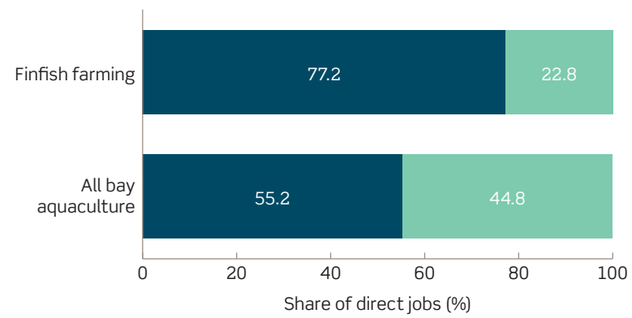
In comparison to the other components of aquaculture, finfish farming tends to be carried out by a relatively small number of producers at the bays (three unique companies). Together these businesses have production activities across six of the bay areas included within the analysis (specifically, the Kenmare, Bantry, Clew, Kilkieran, Mulroy and Donegal bays). Therefore, the regions of Border, West and the South-West benefit disproportionately from this relatively large component of the overall bays' based aquaculture sector.

Finfish farming tends to be a relatively productive sub-set of the bays' aquaculture sector. Average sales per producer (€15 million) was significantly higher than that of both oysters and mussel producers - potentially reflecting increased capital intensity and value-added intra-company processing activities.

This is also reflected in average wage levels across the bays' finfish sector. The average annual wage received by finfish employees was estimated at €42,000 in 2020, significantly larger than the oyster and mussel equivalents of €13,400 and €13,000. Again, this is a reflection of the sector's unique characteristics, where larger revenues are accompanied with higher instances of full-time working relative to the wider aquaculture sector (see Figure 14).

"FINFISH PRODUCERS TYPICALLY OFFER HIGHER WAGES THAN THE REST OF THE AQUACULTURE SECTOR - A CONSEQUENCE OF ITS VALUE ADDED OPERATIONS AND HIGHER INSTANCES OF FULL-TIME EMPLOYMENT"

Figure 14. Employment status within bays' aquaculture, 2020



Source: Perceptive Insight, Oxford Economics, CSO

2.4.2 OYSTER FARMING

In comparison to the finfish segment, oyster farming is much more prevalent across the bay areas. All but one of the bays areas (Kilkieran bay) had oyster producers operating in their local economies. Oyster farming is the largest employer within the bays' aquaculture sector. We estimate that oyster producers directly provided 543 jobs across the collective bay areas in 2020. There were close to 80 oyster farming units spread across the 11 bays. By far the largest share of these were found in the Dingle and Clew bay areas which together hosted nearly 60 percent of the bays' total production units.

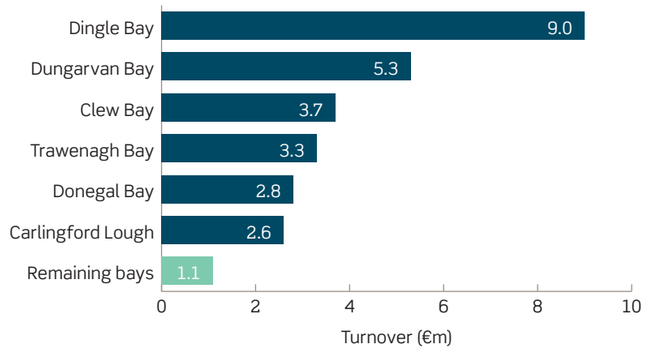
While Dingle bay's oyster producers generated the largest sales (€9 million in 2020), Clew bay was beaten into third place behind Dungarvan's oyster sector (generating turnover of €3.7 million and €5.3 million respectively). Although Dungarvan's oyster producers were less in number - their sales per producer was the strongest across the bays. Dungarvan bay's oyster producers generated average sales of €66,000 compared to €34,000 across the collective bay areas.

€9 MILLION

DINGLE BAY'S OYSTER FARMING RELATED TURNOVER

Dingle Bay was estimated to have the largest oyster subsector in turnover terms.

Figure 15. Oyster farming sales across the bay areas, 2020 [13]



Source: Oxford Economics, Perceptive Insight, BIM

Oyster farming's productivity and average wages tend to be significantly weaker than that of finfish element. The average wage in the sub-sector across the bays was estimated at just €13,400 and was strongly impacted by a greater prevalence of part-time/ casual working patterns. The survey findings show that just over half of local oyster farming employment was on a part-time basis in 2020.

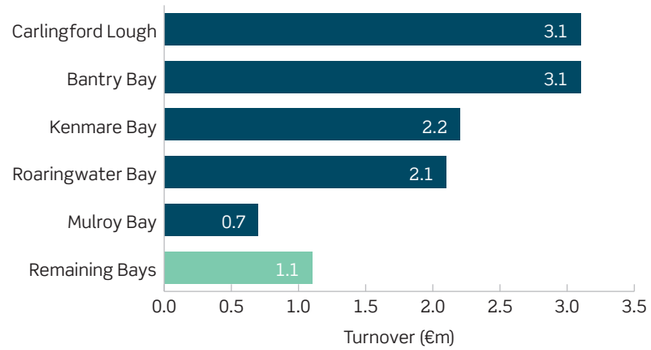
2.4.3 MUSSEL AND OTHER SHELLFISH FARMING

Mussel and other shellfish farming is the smallest aquaculture related sub-sector across the bay areas in turnover terms. Despite this, across the bay areas it supports over twice the number of direct jobs relative to the finfish sub-sector. However, like the oyster segment, mussel production tends to exhibit lower productivity and wage levels in comparison to the finfish sub-sector.

Mussel and other shellfish farming activity takes place in 8 of the 11 bay areas. The Kenmare, Bantry and Roaringwater bays had the largest number of mussel producers in their local areas. These three areas alone accounted for over two thirds of direct mussel producer employment across the bays. However, it was the Carlingford Lough area which recorded the highest mussel farming related turnover in 2020. This bay's mussel producers were estimated to have generated €3.1 million in sales, marginally outperforming that of Bantry bay. Carlingford Lough's outperformance was strongly influenced by its local mussel farmers generating relatively strong sales levels.14 Our estimates show the average mussel producer's turnover in Carlingford Lough was typically over twice that of the bays' average.

13. Smaller bays and those deemed vulnerable to disclosure issues are combined under the 'remaining bays' label.

Figure 16. Mussel farming sales across the bay areas, 2020



Source: Oxford Economics, Perceptive Insight, BIM

> "OVER HALF OF THE BAYS' COLLECTIVE MUSSELS AND OTHER SHELLFISH RELATED TURNOVER BELONGED TO THE CARLINGFORD LOUGH AND BANTRY BAY AREAS"

> "THE SURVEY FINDINGS SUGGEST A HIGH PROPORTION OF THE SECTOR'S EMPLOYEES LIVE WITHIN THE BAY AREAS - WITH THEIR INCOMES SUPPORTING OTHER LOCAL BUSINESSES AND INDUSTRIES"

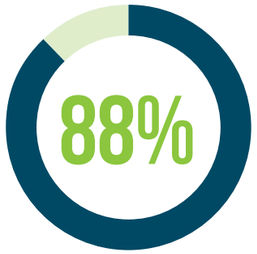
2.5 UNDERSTANDING THE LOCAL AQUACULTURE SECTOR

2.5.1 INDUSTRY CHARACTERISTICS

In 2020, there were close to 130 unique aquaculture related businesses operating across the bay areas. Although finfish producers are relatively small in number, they accounted for 54 percent of aquaculture's sales across the 11 bays. Their scale and processing capability facilitates increased output per head and an ability to offer higher wages in comparisons to other elements of local aquaculture.

However, oyster farming and mussel and other shellfish producers remain important - together accounting for almost 90 percent of employment in the sector and over two thirds of direct wages. All three sub-sectors therefore make an important contribution to the local economy. Furthermore, the survey exercise found that nearly 90 percent of those directly employed in the sector tend to live within 10km from their place of work. This suggests that income derived from aquaculture activity is more likely to be spent within the bay areas - helping to support other local businesses and industries.

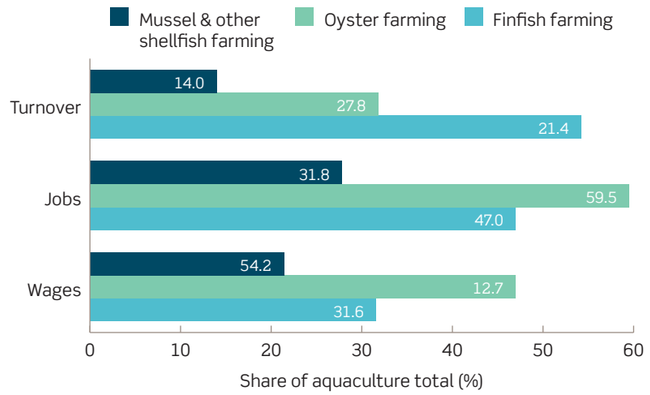
14. Higher average sales value in Carlingford is partly attributable to its bottom grown mussel product - whereas rope grown product is more prevalent in the remaining bay areas included within the study. Therefore, Carlingford's mussel market in distinguishable from the other bays, primarily because it feeds the Dutch market, rather than the French and other EU markets, as is the case across the remaining bay areas covered within the study.



SHARE OF RESPONDENT BUSINESSES ACTIVE FOR MORE THAN 10 YEARS

Aquaculture is a mature industry across the bay areas.

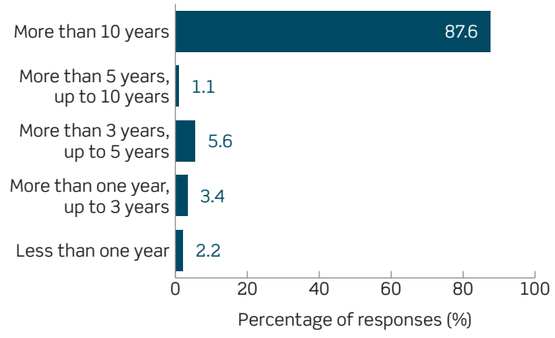
Figure 17. Bay areas' aquaculture by sub-sector, 2020



Source: Oxford Economics, Perceptive Insight, BIM

The survey results suggest that the bay area aquaculture businesses tend to be relatively mature with few new entrants overall. A significant majority (88%) of bay area respondents identified as operating in the sector locally for more than 10 years. This was a common characteristic across all three sub-sectors of aquaculture. Oyster producers tended to have a slightly younger business demographic. Close to one fifth of those surveyed said they had been trading for less than 10 years in the bays, compared to just 6 percent and none of mussel and other shellfish and finfish producers respectively.

Figure 18. Bay areas' aquaculture producer maturity, 2020



Source: Perceptive Insights, Oxford Economics

2.5.2 PERFORMANCE AND OUTLOOK

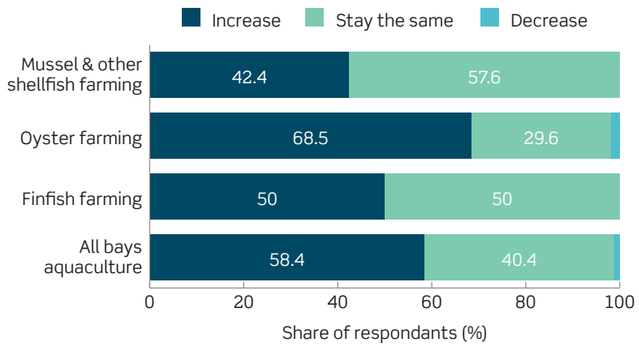
Both businesses and households have faced significant challenges during the recent pandemic. The aquaculture survey provides an opportunity to understand how the sector has fared throughout and how optimistic it is concerning a recovery.

When aquaculture respondents at the bays were asked how their sales performed in 2020 compared to 2019 (pre-pandemic), over half noted a decrease in sales and a quarter declared no change. This trend was evident across the sub-sectors, with a similar share of respondents from each grouping noting a fall in sales. However, the survey results suggest that the local sector is broadly optimistic regarding a post pandemic bounce back. Hardly any of the businesses surveyed expected a decrease in sales in the next year, whereas 58 percent of the entire sample were expecting an increase. Furthermore, over a quarter of respondents expected to expand their workforce over the coming year.

"OVER HALF OF BAY AREA AQUACULTURE RESPONDENTS EXPERIENCED A FALL IN SALES IN 2020 (RELATIVE TO THEIR PRE-PANDEMIC TURNOVER)"

"HOWEVER, THE MAJORITY OF RESPONDENTS WERE POSITIVE ABOUT SALES RECOVERING THIS YEAR - WITH A SIGNIFICANT PROPORTION ALSO PLANNING TO EXPAND THEIR WORKFORCE"

Figure 19. Expectation on future sales, Bays' sub-sectors, 2020



Source: Oxford Economics, Perceptive Insight

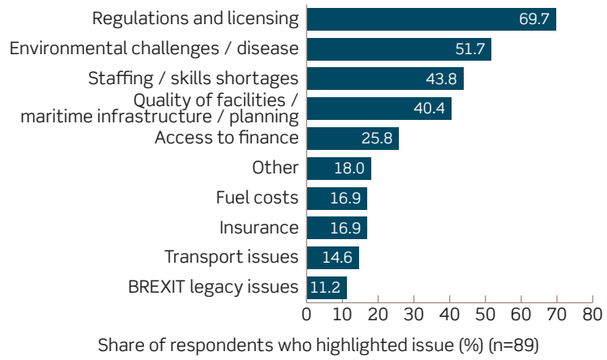
Linked to the above, respondents were asked to identify the main constraints to growth. By far the most common factor was the impact of regulation and licencing on their ability to grow their businesses. Over two thirds (70 percent) of bay respondents listed this issue among the most significant constraints to growth, followed by environmental challenges/disease (52 percent) and staffing/skills shortages. (44 percent). Some of the 'other' issues raised included a lack of local seed supply, feed quality and market related constraints.

When asked as a follow up question concerning the most important outcome required in order for their business to achieve its fully potential - 38 percent highlighted an 'improved regulatory and licencing framework', whilst 'environmental improvements' ranked as the second most common response, representing just 16 percent of the total.

SHARE OF AQUACULTURE RESPONDENTS

Put forward 'regulation and licensing' as a prominent challenge to growth in the sector.

Figure 20. Main constraints to growth across bays' aquaculture, 2020



Source: Perceptive Insight, Oxford Economics

Opinions are broadly consistent across aquaculture's sub-sectors. 'Regulations and licencing' concerns remained the most widely referenced constraint to growth across finfish, oyster and mussel and other shellfish respondents, this issue was particularly prevalent with the oyster farming element, with other three quarters of participants highlighting this issue.

Whilst 'environmental challenges/disease' was the second most referenced constraint among oyster producers, this issue fell behind that of 'staffing/skills shortages' and the 'quality of facilities/maritime infrastructure/planning' for mussel and other shellfish producers.

2.5.3 INVESTMENT

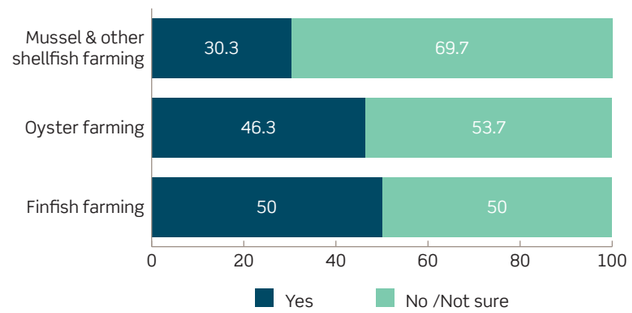
Close to two fifths (40 percent) of bay aquaculture respondents claimed to have made capital investments throughout 2020. This share was smallest among respondents belonging to the mussel and other shellfish category, with just 30 percent of their sample investing in the previous year. Meanwhile, investment was more common among oyster and finfish producers, with 46 percent and 50 percent respectively feeling confident enough to invest in their businesses throughout 2020.

The survey also reveals that the average value of investment made by each of these producers was close to €95,000 in 2020. The average for oyster producers was estimated at €91,000, whilst mussel and other shellfish farming was significantly lower at €62,000.[15] However, the survey findings indicate that mussel and other shellfish producers tend to retain a relatively large share of investment spend in the regional economy.

[15] Average finfish investment was of a higher magnitude than both the oyster and mussel farming components. However, the sample was small and therefore we have refrained from detailing for potential disclosure reasons.

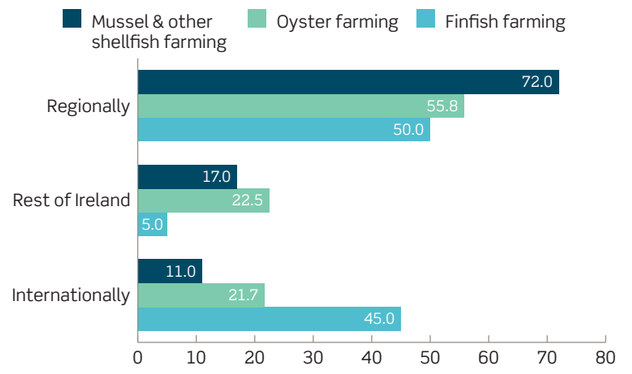
Close to three quarters (72 percent) of the local mussel producer capital investment spend was retained within the wider region - see Figure 22. Whereas the equivalent share for oyster and finfish producers was just 56 percent and 50 percent respectively. The finfish segment recorded the highest levels of investment spend leakage, with 45 percent of investment spending destined for suppliers originating from outside the country.

Figure 21. Capital investment made throughout 2020, Bays' aquaculture (%)



Source: Oxford Economics, Perceptive Insight

Figure 22. Investment by procurement location, Bays' aquaculture, 2020 (%)

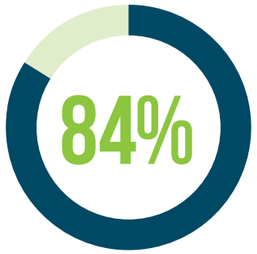


Source: Oxford Economics, Perceptive Insight

2 OUT OF EVERY 5

AQUACULTURE RESPONDENTS MADE CAPITAL INVESTMENTS IN 2020

The average value of these investments was €95,000 across the survey respondents.



EXPORTS SHARE OF THE BAY AREAS' AQUACULTURE SALES

The oyster segment is estimated to enjoy the largest exposure to external markets.

2.5.4 AQUACULTURE'S MARKETS

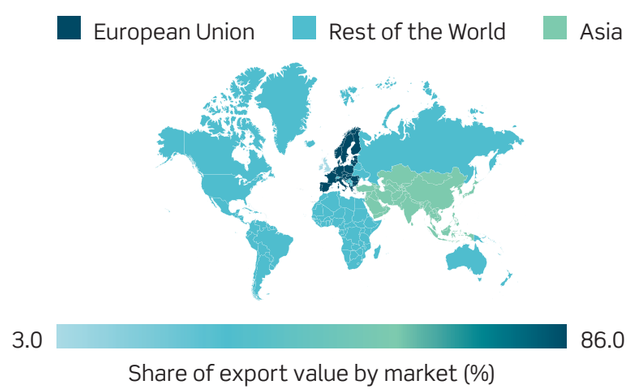
The aquaculture sector exports a significant amount of its products. Export markets typically account for 84 percent of aquaculture's total sales. Exports accounted for the largest share of sales in the oyster farming sub-sector (87 percent), whereas mussel and other shellfish producers have a slightly stronger domestic market for their produce (74 percent of sales go to external markets).

Figure 23. Export sales across bays' aquaculture, 2020

Source: Oxford Economics, Perceptive Insight

A more granular analysis of export sales show that local aquaculture is heavily concentrated within the EU marketplace. EU based export sales represent an estimated 86 percent of the sector's total in 2020. Asian markets were the next largest, yet only represented 6 percent of the total. A lack of market diversity was common across aquaculture sub-sectors, except for oyster farming which had close to a quarter of export sales belonging to Asia and the UK.

Figure 24. Bay aquaculture export markets, 2020



Source: Oxford Economics, Perceptive Insight

3. The impact of finfish farming

3.1 IRELAND WIDE ESTIMATES

The bays' finfish farming sector is represented by a relatively small number of businesses - however they account for a significant share of total aquaculture output locally. To avoid disclosure of individual business information the analysis in this chapter is deliberately kept at a national level.

Using the combination of both the aquaculture survey and BIM's own industry data, we estimate that finfish farming at the bays directly provided 116 jobs, €4.9 million of wages and €19 million of GVA to the Irish economy (see Table 7).

Table 7. Estimated benefits of bays' finfish farming, Ireland, 2020

Finfish	Ireland		
	GVA (€m)	Employment	Wages (€m)
Direct	18.9	116	4.9
Indirect	11.6	196	8.2
Induced	4.8	69	2.5
Total	**35.4**	**381**	**15.6**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

The next stage of the analysis drew on the information gleaned from the survey exercise to understand how much finfish producers spend on procurement and where this takes place across the economy. The sector's supply chain spend was estimated at €28 million in 2020 - with close to three quarters of this spend residing within the Irish economy (see Table 8). The results show that the seafood sector is a prominent component of the finfish sector's own supply chain. We estimate that 35 percent of total finfish procurement spend was seafood related raw materials and therefore attributable to the agricultural, forestry and fishing sector (€10 million). Business services related sectors benefited the most from the remaining procurement spend, with professional and financial services estimated to benefit to the tune of €6.6 million and €4.2 million respectively.

381 JOBS

FINFISH SUB-SECTOR'S TOTAL EMPLOYMENT IMPACT IN 2020

This total includes the direct jobs at the bays, plus the wider indirect and induced employment supported nationally.

"FINFISH FARMING IS ESTIMATED TO HAVE THE STRONGEST ECONOMIC MULTIPLIER WITHIN THE BAY AREAS' AQUACULTURE SECTOR"

Table 8. Procurement spend by bays' finfish sub-sector, Ireland, 2020

Receiving sector	Procurement by source (€m)		Total
	Domestic	Imported	
Agriculture, forestry and fishing	6.4	3.7	10.1
Manufacturing	1.1	0.1	1.2
Electricity, gas and water	0.8	0.0	0.8
Wholesale and retail	0.5	0.0	0.5
Transportation and storage	1.8	0.1	1.9
Information and communication	1.9	0.7	2.6
Financial and insurance	3.0	1.2	4.2
Professional, scientific and technical	4.8	1.8	6.6
Administrative and support	0.4	0.1	0.5
Real estate activities	0.0	0.0	0.0
Total	**20.7**	**7.8**	**28.5**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

This spending will in turn create additional demand further down the supply chain and create further 'rounds' of economic impacts throughout the Irish economy - otherwise known as the multiplier effect. Using the published Input- Output tables we estimate that these indirect benefits are enough to support a further 196 jobs, €8.2 million in wages and €12 million in GVA.

Finally, as those both directly and indirectly employed spend their wages this will support additional induced benefits across the economy. These benefits tend to be more geared towards the hospitality and wholesale and retail sector due to consumer spending patterns. Our model shows the resulting induced benefits were enough to support an additional 69 jobs, €2.5 million in wages and a further €4.8 million GVA contribution to GDP. Consequently, the finfish sector within the 11 bays is estimated to have sustained 381 jobs, €16 million in wages and €35 million in GVA.

Finfish farming has some of the strongest economic multipliers across the bays' aquaculture sector. It is estimated that for every €1 that finfish directly generated within the bay areas an additional €0.9 is generated throughout the rest of the national economy via indirect and induced impacts (see Table 9). Equally, the sub-sector has a relatively strong employment multiplier of 3.3 - meaning that for every direct finfish job at the bays an additional 2.3 jobs are sustained throughout the rest of the Irish economy.

Table 9. Bay aquaculture multipliers by sub-sector, Ireland, 2020

Farming sector	GVA	Employment	Wages
Oyster farming	1.6	1.3	1.8
Mussel and other shellfish farming	1.6	1.2	1.8
Finfish farming	1.9	3.3	3.2
All aquaculture	**1.7**	**1.5**	**2.2**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

A sectoral breakdown of these headline impacts show that the agricultural, forestry and fishing and the professional services sectors account for a significant share of the overall benefits (see Table 10). This is somewhat unsurprising given that finfish itself is classified within the broader agriculture, forestry and fishing sector and seafood producers are the most prominent supplier to the sector.

Outside of these two sectors, the finfish sector's employment impacts are estimated to be strongest within the wholesale and retail sector and transportation and storage sectors, together supporting over 50 jobs, alongside €1.9 million in wages and €3.2 million in GVA.

175 JOBS

TOTAL AGRI, FORESTRY AND FISHING RELATED EMPLOYMENT SUPPORTED

Not only does finfish's direct employment fall into this sector, but so does a significant proportion of its procurement (indirect impacts).

Table 10. Sectoral benefits of bays' finfish farming, Ireland, 2020

Finfish farming	Ireland		
	GVA (€m)	Employment	Wages (€m)
Agriculture, forestry and fishing	20.9	175	6.4
Mining and quarrying	0.0	0	0.0
Manufacturing	0.9	11	0.5
Electricity, gas and water	0.8	11	0.5
Construction	0.1	2	0.1
Wholesale and retail	2.0	29	0.9
Transportation and storage	1.2	22	1.0
Accommodation and food	0.4	16	0.3
Information and communication	0.8	7	0.5
Financial and insurance	1.7	12	0.7
Real estate activities	1.6	3	0.2
Professional, scientific and technical	3.3	56	3.0
Administrative and support	0.6	15	0.5
Public admin and defence	0.1	1	0.1
Education	0.3	6	0.3
Human health and social work	0.4	6	0.3
Arts, enter and recreation	0.2	6	0.2
Other service activities	0.1	4	0.1
Total	**35.4**	**381**	**15.6**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

3.2 REGIONAL ESTIMATES

> **THE BAY AREAS' FINFISH FARMING IMPACTS ARE ESTIMATED TO BE FELT MOST STRONGLY IN THE BORDER, WEST AND SOUTH-WEST REGIONS**

The bays' peripheral locations around the Irish coastline help to ensure that the resulting economic benefits are widely spread across Ireland's NUTS3 regions. While only five of Ireland's eight regions have one or more of the studied bays based within their boundaries - finfish producers are only present within three of these (South-West, West and the Border regions). That said, the remaining regions will still benefit indirectly from this activity via supply chain and consumer spending effects. The finfish sector accounted for over half the bays' aquaculture related turnover in 2020, this was despite only consisting of a relatively small number of producers. As mentioned previously, to avoid instances of disclosure for individual businesses we have restricted the granularity of the sub-sectors impacts to the totals for each region.

Overall GVA, employment and wage benefits are highest in Border, West and the South-West, due in a strong part to the presence of finfish's direct activity at bays based in these regions. The South-West experienced that largest GVA related benefits resulting from finfish activity at the bays. In total (combined direct, indirect, and induced), the sub-sector contributed €11 million in GVA to the regional economy. However, employment benefits were larger in both the Border and West region with 106 and 97 jobs supported respectively.

Table 11. Total benefits of bays' finfish farming, Regions, 2020

Finfish farming	Regional summary		
	GVA (€m)	Employment	Wages (€m)
Border	8.1	106	4.2
West	10.1	97	4.3
Mid-West	1.6	24	1.0
Mid-East	1.0	14	0.7
South-West	11.1	89	3.3
South-East	0.9	13	0.5
Dublin	1.8	20	1.0
Midlands	0.9	18	0.7
Total	**35.4**	**381**	**15.6**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

€4.9 MILLION

FISCAL BENEFITS IN 2020

Finfish farming across the bays also provides a significant benefit to the public accounts.

3.3 FISCAL BENEFITS

Finfish farming activity at the bays will provide further benefits through the generation of tax income towards the Revenue Commissioners. These fiscal impacts can again be split into their direct, indirect and induced components depending on what channel of activity they originate. We estimate that finfish's direct tax contribution equated to €1.3 million in 2020, consisting of labourbased tax paid by the sector's employees (income tax, PRSI etc), taxes on consumption and corporation tax receipts.

The indirect fiscal benefits represent the same taxation components as above but are generated within the wider supply chain, in addition to net taxes on input purchases and sectoral taxation on production less subsidies. Combined these represent an additional €2.4 million in revenue towards public services. Furthermore, as those employed in the sector and within its supply chain spend their wages, this supports further jobs and activity within the Irish economy. We estimate this induced activity supported a further €1.2 million in tax revenue.

Therefore, the finfish element of the aquaculture sector is estimated to have generated €4.9 million in total fiscal benefits in 2020. This total was made up of €2.7 million in employment/labour related tax, €7 million in corporation tax, €1.6 million in taxation associated with the spending of wages and a small net tax receipt of €0.3 million through taxation on inputs and production.[16]

Table 12. Tax benefits by category, Ireland, 2020

Tax estimates (€m)	Tax estimates (€m)			
	Direct	Indirect	Induced	Total
Net tax on inputs	N/A	0.5	0.1	0.7
Consumption tax	0.5	0.8	0.3	1.6
Taxes on production	N/A	-1.1	0.1	-1.0
Corporation tax	0.3	0.5	0.1	0.9
Labour tax	0.5	1.6	0.6	2.7
Total	**1.3**	**2.4**	**1.2**	**4.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

[16] Net tax position refers to taxes less subsidies.

4. The impact of oyster farming

4.1 IRELAND WIDE ESTIMATES

Oyster farming represented a smaller share of the sector's overall sales relative to finfish in 2020. However, it was the largest of the three aquaculture subsectors in terms of both employment and wages. By combining BIM's own industry census data with the findings from the aquaculture survey we estimate that oyster farming at the bay economies generated close to €28 million in turnover in 2020.

We estimate that oyster farming at the bays directly provided 543 jobs, €7.3 million of associated earnings and €17 million in GVA contributions to GDP (Table 12).

Table 13. Estimated benefits of bays' oyster farming, Ireland, 2020

Oyster farming	Ireland		
	GVA (€m)	Employment	Wages (€m)
Direct	16.9	543	7.3
Indirect	4.9	77	3.2
Induced	4.7	68	2.4
Total	**26.5**	**687**	**12.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

687 JOBS

BAY OYSTER SUB-SECTOR'S TOTAL EMPLOYMENT IMPACT IN 2020

This total includes the direct jobs at the bays, plus the wider indirect and induced employment supported nationally.

The supply chain analysis shows that local oyster farming businesses spent €11 million procuring goods and services as part of their operations in 2020. Close to €8 million of this spend (76 percent) was retained within the Irish economy - a share which was slightly larger than that of the finfish sub-sector of bay aquaculture (73 percent).

Close to one third (30 percent) of oyster farming's total procurement spend was used purchasing seafood related produce - therefore, the agricultural, forestry and fishing sector was the largest beneficiary of this spend. After this, oyster producers spent most within the manufacturing, wholesale and retail and transportation and storage sectors, €2.0 million, €1.7 million and €1.6 million respectively. Domestic spend in the Irish economy was however highest in the manufacturing and transportation and storage sectors due to reduced leakage from the Irish economy - via a much lower reliance on imports.

BAY AREA OYSTER PRODUCERS SPENT AN ESTIMATED €8.3 MILLION PROCURING GOODS AND SERVICES ACROSS THE WIDER IRISH ECONOMY IN 2020

Table 14. Procurement spend by bays' oyster farming, 2020

Receiving sector	Procurement by source (€m)		Total
	Domestic	Imported	
Agriculture, forestry and fishing	1.4	1.9	3.3
Manufacturing	1.8	0.2	2.0
Electricity, gas and water	1.0	0.0	1.0
Wholesale and retail	1.3	0.3	1.7
Transportation and storage	1.5	0.1	1.6
Information and communication	0.2	0.0	0.2
Financial and insurance	0.3	0.0	0.4
Professional, scientific and technical	0.5	0.0	0.6
Administrative and support	0.0	0.0	0.0
Real estate activities	0.1	0.0	0.1
Total	**8.3**	**2.6**	**10.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

By modelling the supply chain spending through the input-output tables we estimate that oyster farming indirect impacts sustained 77 jobs, €3.2 million in wages and a GVA contribution to GDP of €4.9 million in 2020.

In addition to the above, a further round of benefits is sustained via the consumer spending of those employed in oyster farming related activity at the bays and within the broader supply chain of these businesses. These induced impacts are estimated to support a further 68 jobs across Ireland, with an associated €2.4 million in earnings and €4.7 million in GVA. Overall, oyster farming-based activity across the 11 bays is estimated to sustain 687 jobs, €13 million in wages and €27 million of GVA.

These benefits are spread across several industry sectors. In overall terms, the agricultural, forestry and fishing sector is estimated to enjoy the majority of the resulting economic benefits. These include 557 jobs, €7.7 million in wages and €17 million in GVA. Following this, the wholesale and retail sector benefited most from oyster production across the bays. We estimate that oyster farming supported 29 wholesale and retail jobs throughout Ireland, with an associated €0.9 million in wages and €2 million contribution to GDP.

Table 15. Sectoral benefits of bays' oyster farming, Ireland, 2020

Oyster farming	Ireland		
	GVA (€m)	Employment	Wages (€m)
Agriculture, forestry and fishing	17.4	557	7.7
Mining and quarrying	0.0	0	0.0
Manufacturing	1.0	12	0.6
Electricity, gas and water	0.8	11	0.5
Construction	0.1	1	0.1
Wholesale and retail	2.0	29	0.9
Transportation and storage	0.9	18	0.8
Accommodation and food	0.4	15	0.3
Information and communication	0.2	2	0.1
Financial and insurance	0.4	3	0.2
Real estate activities	1.5	3	0.2
Professional, scientific and technical	0.6	10	0.5
Administrative and support	0.3	6	0.2
Public admin and defence	0.1	1	0.1
Education	0.2	5	0.2
Human health and social work	0.3	6	0.2
Arts, enter and recreation	0.1	5	0.1
Other service activities	0.1	3	0.1
Total	**27**	**687**	**13**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

4.2 REGIONAL ESTIMATES

Bay oyster farming activity is most strongly concentrated within the South-West and Border regions. Nearly two thirds of bays' total oyster producers were concentrated within these areas - with Dingle bay alone accounting for roughly a third of the sub-sector's total turnover across the 11 bays. The South-East also records a significant oyster production presence, chiefly due to the contribution of oyster producers at Dungarvan bay, which are estimated to have the second largest oyster farming turnover after Dingle Bay. These three regions combined represent 72 percent of bay oyster producers and over 77 percent of the sector's bay-based sales.

"THE BAY AREAS' OYSTER FARMING IMPACTS ARE ESTIMATED TO BE FELT MOST STRONGLY IN THE SOUTH-WEST AND BORDER REGIONS"

Table 16. Bays' oyster farming producers by region, 2020

Region	Producers	Turnover (€m)
Border	17	6.2
West	19	3.7
Mid-West	0	0.0
Mid-East	4	2.6
South-West	33	10.0
South-East	8	5.3
Dublin	0	0.0
Midlands	0	0.0
Ireland	**81**	**27.8**

Source: Oxford Economics, Perceptive Insight
Note: Production unit presence rather than unique producers. May not sum due to rounding.

It follows therefore, that the economic impact of the oyster farming element is strongest in the South-West and the Border regions. In total, our model shows that oyster related activity at the bays has the strongest impact within the South West region, with a direct GVA contribution to GDP of €6.2 million in 2020. However, this increases to €9 million after we consider the supply chain and consumer spending related activity the sector supports elsewhere across the Irish economy. These indirect and induced impacts are not only associated with the employment and spending of oyster producers within the South West region itself. They will also include economic spill over impacts originating from the remaining bays located in other regions.

Table 17. GVA benefits of bays' oyster farming, Regions, 2020

Oyster farming	GVA (€m)			
	Direct	Indirect	Induced	Total
Border	3.7	1.0	0.7	5.3
West	2.0	0.6	0.7	3.3
Mid-West	0.0	0.2	0.2	0.5
Mid-East	1.7	0.4	0.5	2.6
South-West	6.2	1.5	1.3	9.0
South-East	3.3	0.8	0.8	4.9
Dublin	0.0	0.2	0.3	0.6
Midlands	0.0	0.2	0.2	0.4
ROI	**16.9**	**4.9**	**4.7**	**26.5**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

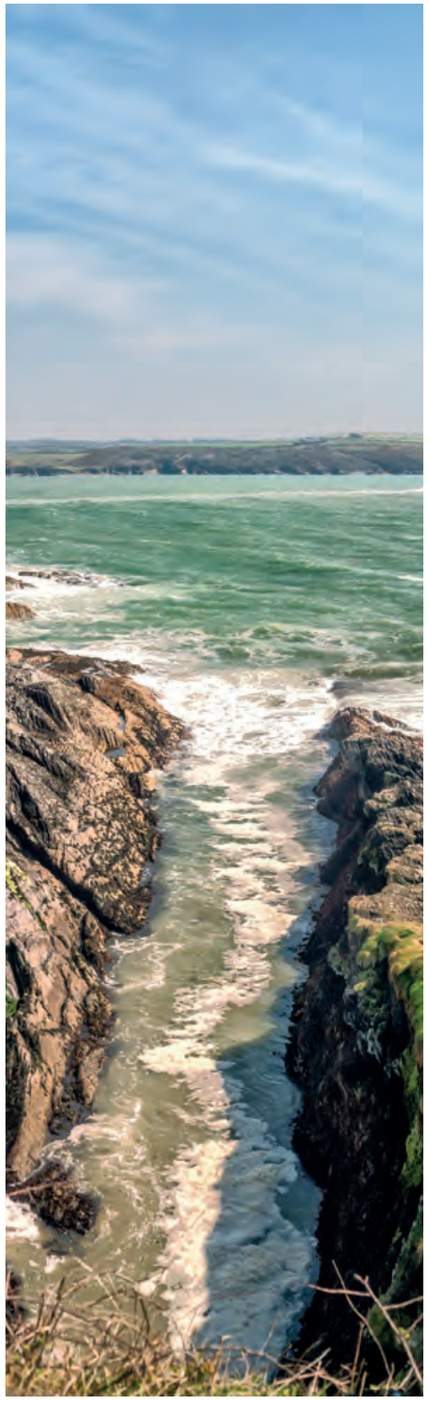
The South-West region also enjoys the strongest employment benefits associated with oyster farming activity across the 11 bays. Direct oyster-based employment is estimated to represent 191 jobs throughout the region. However, this increases due to supply chain and consumer spending. Collectively, these sustain an additional 37 jobs across the South-West region. In total, oyster farming related activity across the 11 bays is estimated to support 227 jobs within the South-West region. This total is estimated to be larger than that of both the Border and West regions, where bay oyster production supported a total of 187 and 100 jobs respectively.

Table 18. Employment benefits of bays' oyster farming, Regions, 2020

Oyster farming	Employment			
	Direct	Indirect	Induced	Total
Border	153	20	14	187
West	82	9	9	100
Mid-West	0	3	4	7
Mid-East	55	6	7	68
South-West	191	20	17	227
South-East	63	12	10	85
Dublin	0	3	3	6
Midlands	0	4	3	7
ROI	**543**	**77**	**68**	**687**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

The South-West region also enjoys the strongest wage benefits resulting from oyster related activity at the bays. Oyster farming employees within the South- West region's four bays received €2.4 million in wages in 2020. This total increased to €3.9 million after we consider the earnings for those employed within the regional supply chain and the consumer spending this supports. The Border region enjoyed the second largest earnings total associated with the bay oyster farming activity with an estimated €2.9 million.



€5.8 MILLION

FISCAL BENEFITS IN 2020

Oyster farming across the bays also provides a significant benefit to thepublic accounts.

Table 19. Wage benefits of bays' oyster farming, Region, 2020

Oyster farming	Wages (€m)			
	Direct	Indirect	Induced	Total
Border	1.8	0.7	0.5	2.9
West	1.0	0.4	0.3	1.7
Mid-West	0.0	0.1	0.1	0.3
Mid-East	0.8	0.3	0.3	1.4
South-West	2.4	0.9	0.6	3.9
South-East	1.3	0.5	0.4	2.2
Dublin	0.0	0.1	0.2	0.3
Midlands	0.0	0.2	0.1	0.3
ROI	**7.3**	**3.2**	**2.4**	**12.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

4.3 FISCAL BENEFITS

Oyster producers at the bays provide further benefits through the generation of tax income towards the Revenue Commissioners. These fiscal impacts can again be split into their direct, indirect and induced components depending on what channel of activity they originate from. We estimate that the oyster farming direct tax contribution equated to €3.5 million in 2020, consisting of both the labour-based tax paid by the sector's employees (income tax, PRSI etc), taxes on consumption and corporation tax receipts.

The indirect fiscal benefits represent the same taxation components as above but are generated within the sub-sector's wider supply chain, in addition to net taxes on input purchases and sectoral taxation on production less subsidies. Combined these represent a positive contribution of €1.1 million. Furthermore, as those employed in the sector and within its supply chain spend their wages, this supports further jobs and activity within the Irish economy. We estimate this induced activity supported a further €1.1 million in tax revenue.

Therefore, in total the oyster farming element of the aquaculture sector is estimated to have generated €5.8 million in fiscal benefits in 2020. This total was made up of €3.6 million in employment/ labour related tax, €0.6 million in corporation tax, €1.3 million in taxation associated with the spending of wages, and a net contribution of €0.3 million accrued through the taxation on inputs and production.[17]

Table 20. Tax benefits by category, Ireland, 2020

Oyster farming	Tax estimates (€m)			
	Direct	Indirect	Induced	Total
Net tax on inputs	N/A	0.2	0.1	0.4
Consumption tax	0.7	0.3	0.2	1.3
Taxes on production	N/A	-0.2	0.1	-0.1
Corporation tax	0.3	0.2	0.1	0.6
Labour tax	2.5	0.6	0.6	3.6
Total	**3.5**	**1.1**	**1.1**	**5.8**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

[17] Net tax position refers to taxes less subsidies.

5. The impact of mussels and other shellfish farming

317 JOBS

MUSSEL SUB-SECTOR'S TOTAL EMPLOYMENT IMPACT IN 2020

This total includes the direct jobs at the bays, plus the wider indirect and induced employment supported nationally.

5.1 IRELAND WIDE ESTIMATES

The mussels and other shellfish farming sector (hereafter 'mussel farming') consists of 51 unique businesses across the 11 bays. The number of producers in this segment is therefore relatively large in comparison to that of finfish and comparable to that of the oyster segment. However, mussel producers tend to be smaller - with average turnover levels ranking below that of the finfish and oyster elements. As a result, the economic benefits associated within this subsector tend to be among the smallest across the bays' aquaculture sector. Using the combination of both the aquaculture survey and BIM's own industry data, we estimate that mussel farming within the bay economies generated close to €12 million in sales in 2020.

We estimate that this level of activity was enough to directly sustain 254 jobs, €3.3 million of wages and €7.1 million in GVA contributions to GDP in Ireland (Table 21).

Table 21. Estimated benefits of bays' mussel farming, Ireland, 2020

Mussel and other shellfish farming	Ireland		
	GVA (€m)	Employment	Wages (€m)
Direct	7.1	254	3.3
Indirect	2.3	32	1.5
Induced	2.1	31	1.1
Total	**11.5**	**317**	**5.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

The supply chain analysis shows that mussel producers spent €5.2 million procuring goods and services as part of their operations in 2020. Close to €4 million of this spend (75 percent) was retained within the Irish economy - a share which was larger than that of the finfish sub-sector but smaller that that of oyster farming (73 percent and 76 percent respectively).

Procurement spending was most concentrated in the manufacturing, agriculture, forestry and fishing, and transportation and storage sectors. Together, these three sectors accounted for nearly 60 percent of mussel producers' total supply chain spending. Although the bays' mussel farmers purchased an estimated €1 million in seafood related materials from the wider sector, very little was sourced from the domestic market (€0.2 million or 16 percent). Leakage was much less significant within the remaining procurement sectors, with the Irish manufacturing and transportation and storage sectors remaining the main beneficiaries (€1.3 and €0.6 million respectively).

Table 22. Procurement spend by bays' mussel farming, 2020

Receiving sector	Procurement by source (€m)		Total
	Domestic	Imported	
Agriculture, forestry and fishing	0.2	0.8	1.0
Manufacturing	1.3	0.0	1.3
Electricity, gas and water	0.5	0.1	0.6
Wholesale and retail	0.4	0.1	0.5
Transportation and storage	0.6	0.1	0.7
Information and communication	0.2	0.0	0.2
Financial and insurance	0.2	0.0	0.3
Professional, scientific and technical	0.4	0.1	0.5
Administrative and support	0.0	0.0	0.0
Real estate activities	0.1	0.0	0.1
Total	**3.9**	**1.3**	**5.2**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

"BAY AREA MUSSEL PRODUCERS SPENT ANESTIMATED €3.9 MILLION PROCURING GOODS AND SERVICES ACROSS THE WIDER IRISH ECONOMY IN 2020"

By modelling the supply chain spending through the input-output tables we estimate that mussel farming's indirect impacts sustained 32 jobs, €1.5 million in wages and a GVA contribution to GDP of €2.3 million in 2020.

In addition to the above, a further round of benefits is sustained via the consumer spending of those employed in mussel farming related activity at the bays and within the broader supply chain of these businesses. These induced impacts are estimated to support a further 31 jobs across Ireland, with an associated €1.1 million in earnings and €2.1 million in GVA. Overall, mussel farming across the 11 bays is estimated to sustain 317 jobs, €5.9 million in wages and €12 million of GVA.

These benefits are spread across several industry sectors. In overall terms, the agricultural, forestry and fishing sector is estimated to enjoy the majority of the resulting economic benefits - with mussel producers themselves accounting for a significant share. These total to 256 jobs, €3.4 million in wages and €7.2 million in GVA. Following this, the wholesale and retail sector benefited most from mussel farming activity across the bays. We estimate that this element of aquaculture supported 11 wholesale and retail jobs throughout Ireland, with an associated €0.4 million in wages and €0.8 million contribution to GDP.

256 JOBS

TOTAL AGRICULTURE, FORESTRY AND FISHING RELATED EMPLOYMENT SUPPORTED

A significant proportion of the sub-sector's total benefits belong to this sector. This is largely due to procurement relationships and the fact that direct bay activity is included.

Table 23. Sectoral benefits of bays' mussels farming, Ireland, 2020

Mussel and other shellfish farming	Ireland		
	GVA (€m)	Employment	Wages (€m)
Agriculture, forestry and fishing	7.2	256	3.4
Mining and quarrying	0.0	0	0.0
Manufacturing	0.6	7	0.4
Electricity, gas and water	0.4	5	0.3
Construction	0.0	1	0.0
Wholesale and retail	0.8	11	0.4
Transportation and storage	0.4	7	0.3
Accommodation and food	0.2	7	0.1
Information and communication	0.1	1	0.1
Financial and insurance	0.2	1	0.1
Real estate activities	0.7	1	0.1
Professional, scientific and technical	0.4	6	0.3
Administrative and support	0.1	3	0.1
Public admin and defence	0.0	0	0.0
Education	0.1	2	0.1
Human health and social work	0.2	3	0.1
Arts, enter and recreation	0.1	2	0.1
Other service activities	0.1	1	0.0
Total	**11.5**	**317**	**5.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

5.2 REGIONAL ESTIMATES

Mussel farming activity is most strongly concentrated within the bays which reside within the South West region of Ireland. BIM estimates indicate that there were 51 mussel production sites across the 11 bay economies and over three quarter of these are spread across just four bays within the South-West region. Kenmare bay, Bantry bay and Roaringwater Bay are estimated to have a largest number of producers, which combined generated revenues of €7.4 million in 2020. They therefore account for close to 60 percent of mussel production sales across the 11 bay economies.

Outside of these the mussel farming sector is most significant in the Mid-East (Carlingford Lough) where a relatively small number of producers generated a quarter of the bays' mussel related sales in 2020.

Table 24. Bays' mussel farming producers by region, 2020

Region	Producers	Turnover (€m)
Border	3	0.7
West	4	0.9
Mid-West	0	0.0
Mid-East	5	3.1
South-West	39	7.5
South-East	0	0.0
Dublin	0	0.0
Midlands	0	0.0
Ireland	**51**	**12.3**

Source: Oxford Economics, Perceptive Insight
Note: May not sum due to rounding.

"THE BAY AREAS' MUSSEL AND OTHER SHELLFISH FARMING IMPACTS ARE ESTIMATED TO BE FELT MOST STRONGLY IN THE SOUTH-WEST REGION"

It follows therefore, that the economic impact of the mussel farming segment is strongest in the South-West and Mid-East regions. In total, our model shows that mussel related activity at the bays has the strongest impact within the South-West region, with a direct GVA contribution to GDP of €4.2 million in 2020. However, this increases to €6.5 million after we consider the supply chain and consumer spending related activity the sector supports elsewhere across the Irish economy. Again, these indirect and induced impacts are not solely associated with the employment and spending of mussel producers within the South-West region itself. They will also include economic spill over impacts originating from the remaining bays located in other regions.

Table 25. GVA benefits of bays' mussel farming, Regions, 2020

Mussel and other shellfish farming	Tax estimates (€m)			
	Direct	Indirect	Induced	Total
Border	0.5	0.1	0.1	0.8
West	0.5	0.2	0.2	0.9
Mid-West	0.0	0.1	0.1	0.2
Mid-East	1.9	0.5	0.3	2.7
South-West	4.2	1.3	1.1	6.5
South-East	0.0	0.1	0.1	0.1
Dublin	0.0	0.1	0.1	0.2
Midlands	0.0	0.1	0.1	0.1
ROI	**7.1**	**2.3**	**2.1**	**11.5**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

The South-West region also enjoys the strongest employment benefits associated with mussel farming activity across the 11 bays. Direct musselsbased employment is estimated to represent 196 jobs throughout the region. However, this increases due to supply chain and consumer spending. Collectively, these sustain an additional 31 jobs across the South-West region. In total, mussel related activity across the 11 bays is estimated to support 228 jobs within the South-West region.

This regional total is estimated to be significantly larger than the next strongest beneficiary, the Mid-East region, where mussel production supported a total of 37 jobs.

Table 26. Employment benefits of bays' mussel farming, Regions, 2020

Mussel and other shellfish farming	Employment			
	Direct	Indirect	Induced	Total
Border	15	3	3	20
West	16	3	3	22
Mid-West	0	1	2	3
Mid-East	27	6	4	37
South-West	196	17	14	228
South-East	0	1	1	2
Dublin	0	1	1	2
Midlands	0	1	1	3
ROI	**254**	**32**	**31**	**317**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

Linked to the above, the South-West region also enjoys the strongest wage benefits resulting from mussel related activity at the bays. Mussel producers' employees within the South-West region's four bays received €2.1 million in wages in 2020. This total increased to €3.4 million after we consider the earnings for those employed within the regional supply chain and the consumer spending this supports. The Mid-East enjoyed the second largest earnings total associated with the bay mussel farming activity with an estimated €1 million.

Table 27. Wage benefits of bays' mussel farming, Regions, 2020

Mussel and other shellfish farming	Wages (€m)			
	Direct	Indirect	Induced	Total
Border	0.3	0.1	0.1	0.5
West	0.3	0.1	0.1	0.5
Mid-West	0.0	0.0	0.1	0.1
Mid-East	0.6	0.3	0.2	1.0
South-West	2.1	0.8	0.5	3.4
South-East	0.0	0.0	0.0	0.1
Dublin	0.0	0.0	0.1	0.1
Midlands	0.0	0.1	0.1	0.1
ROI	**3.3**	**1.5**	**1.1**	**5.9**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

5.3 FISCAL BENEFITS

Mussel farming at the bays provides further benefits through the generation of tax income towards the Revenue Commissioners. These fiscal impacts can again be split into their direct, indirect and induced components depending on what channel of activity they originate from. We estimate that the mussels producers direct tax contribution equated to €1.6 million in 2020, consisting of both the labour-based tax paid by the sector's employees (income tax, PRSI etc), taxes on consumption and corporation tax receipts.

The indirect fiscal benefits represent the same taxation components as above but are generated within the sub-sector's wider supply chain, in addition to net taxes on input purchases and sectoral taxation on production less subsidies. Combined these represent a contribution of €0.6 million. Furthermore, as those employed in the sector and within its supply chain spend their wages, this supports further jobs and activity within the Irish economy. We estimate this induced activity supported a further €0.5 million in tax revenue.

Therefore, in total the mussel farming element of the aquaculture sector is estimated to have generated €2.7 million in fiscal benefits in 2020. This total was made up of €1.7 million in employment/ labour related tax, €0.2 million in corporation tax, €0.6 million in taxation associated with the spending of wages, and a net contribution of €0.2 million accrued through the taxation on inputs and production.[18]

€2.7 MILLION

FISCAL BENEFITS IN 2020

Mussel farming across the bays also provides a significant benefit to the public accounts.

[18] Net tax position refers to taxes less subsidies.

Table 28. Tax benefits by category, Ireland, 2020

Mussel and other shellfish farming	Tax estimates (€m)			
	Direct	Indirect	Induced	Total
Net tax on inputs	N/A	0.1	0.1	0.2
Consumption tax	0.3	0.1	0.1	0.6
Taxes on production	N/A	0.0	0.0	0.0
Corporation tax	0.1	0.1	0.1	0.2
Labour tax	1.2	0.3	0.3	1.7
Total	**1.6**	**0.6**	**0.5**	**2.7**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

6. Total impact of aquacutlure across the bay areas

6.1 AQUACULTURE SECTOR ACTIVITY WITHIN THE BAYS

This section takes the estimates presented in the preceding sections of the report and calculates the total economic impact resulting from the activities of the aquaculture sector within the bay areas.

6.2 IRELAND WIDE ESTIMATES

We estimate the aquaculture activity within the 11 bays produced total direct impacts of 913 jobs, with €16 million of associated wages and €43 million of GVA. Through supply chain spending, the bays aquaculture activity is estimated to create 305 additional indirect jobs, alongside €13 million in wages and €19 million of GVA. This level of indirect benefits combines with our direct estimates, to induce a further 168 jobs, €6 million in wages and €12 million in GVA across the Irish economy.

Overall, the aquaculture sector at the bays is estimated to have sustained 1,385 jobs, €34 million of wages and €73 million of GVA across the Irish economy from direct, indirect and induced effects.

Table 29. Estimated benefits of the bays' aquaculture sector, Ireland, 2020

Aquaculture total	Ireland		
	GVA (€m)	Employment	Wages (€m)
Direct	43	913	16
Indirect	19	305	13
Induced	12	168	6
Total	**73**	**1,385**	**34**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

Unsurprisingly, the agriculture, forestry and fishing sector is the main beneficiary of the bays' aquaculture activity. In total, the sector benefits to the tune of almost 990 jobs, €17 million in wages and €45 million in GVA. After this the wholesale and retail and professional service sectors enjoyed the largest benefit - with 140 jobs sustained across both industries, alongside €6.1 million in earnings and €9 million in GVA.

Equally, the transportation and storage sector enjoys a significant share of the employment benefits, accounting for 48 jobs and generating €2.5 million in GVA contributions. The remaining benefits are more broadly spread throughout the rest of the Irish economy.

€73 MILLION

TOTAL GVA IMPACT IN 2020

This total includes the direct GVA contribution at the bays, plus the wider indirect and induced GVA generated throughout the national economy.

"THE BAYS' AQUACULTURE RELATED EMPLOYMENT IMPACTS ARE ESTIMATED TO BE LARGEST WITHIN THE AGRI, FORESTRY AND FISHING, PROFESSIONAL SERVICES AND THE WHOLESALE AND RETAIL SECTORS"

Table 30. Sectoral benefits of bays' aquaculture sector, Ireland, 2020

Aquaculture total	Ireland		
	GVA (€m)	Employment	Wages (€m)
Agriculture, forestry and fishing	45.5	989	17
Mining and quarrying	0.0	0	0.0
Manufacturing	2.6	30	1.4
Electricity, gas and water	2.0	28	1.4
Construction	0.2	4	0.2
Wholesale and retail	4.7	68	2.2
Transportation and storage	2.5	48	2.2
Accommodation and food	1.1	37	0.8
Information and communication	1.1	10	0.7
Financial and insurance	2.3	16	1.0
Real estate activities	3.8	7	0.4
Professional, scientific and technical	4.3	72	3.8
Administrative and support	1.0	24	0.8
Public admin and defence	0.2	3	0.1
Education	0.7	14	0.6
Human health and social work	0.8	15	0.6
Arts, enter and recreation	0.4	13	0.3
Other service activities	0.3	9	0.2
Total	**73.4**	**1,385**	**34**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

An analysis of the bays' economic multipliers show that finfish farming has the strongest ability to generate additional economic activity via its procurement and the subsequent consumer spending impacts it generates across the Irish economy. We estimate that for every €1 of GVA generated directly by the aquaculture sector within the bays, a further €0.7 is supporting across Ireland.

Table 40. Multipliers by sub-sector, Ireland, 2020

Farming sector	National multiplier		
	GVA	Employment	Wages
Oyster farming	1.6	1.3	1.8
Finfish farming	1.9	3.3	3.2
Mussel and other shellfish farming	1.6	1.2	1.8
All aquaculture	**1.7**	**1.5**	**2.2**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

STUDY MULTIPLIERS AND THE WIDER SECTOR

The above analysis gives an indication of how aquaculture activity can support additional economic benefits throughout the Irish economy via procurement and consumer spending patterns - the multiplier effect. The resulting multipliers calculated are unique to aquaculture in the bay economies studied. However, if we assume that aquaculture throughout the rest of Ireland is broadly homogeneous to that within the bays, we can form an estimate for the economic contribution of Irish aquaculture throughout the national economy.

BIM holds national seafood survey data for the aquaculture industry across Ireland. By applying bay area multipliers to the appropriate national aquaculture sub-sectors, we estimate that the Irish aquaculture sector could support €144 million in GVA contributions to GDP and over 2,900 jobs throughout the Irish economy in 2020.[19] Again, these benefits account for direct aquaculture activity, in addition to the indirect and induced impacts.

6.3 REGIONAL ESTIMATES

Table 41 shows our estimated regional multipliers for GVA, employment and wages. The GVA multipliers range from 1.5 in the South-West region to 1.8 in the South-East. A higher multiplier is generally a reflection of the local sector's ability to retain a relatively large share of indirect and induced impacts within the region. In the case of the South-East (1.8), this means that our total GVA impact estimate for the region is nearly twice that of the direct aquaculture related GVA taking place in the region's bay economies. The employment multipliers tend to be slightly weaker than their GVA equivalents, except for the West region which recorded the highest employment multiplier of 1.7. This means that for every 1 direct aquaculture related job present in Kilkieran or Clew Bay (both located in the West), 0.7 jobs are sustained elsewhere in the region through the indirect and induced effects.

[19] This total Irish aquaculture economic contribution estimate is for illustrative purposes. This estimate assumes that the wider sector has the same economic leakages as those demonstrated by surveyed producers in the selected bay areas. In reality, aquaculture businesses located outside these bay areas are likely to exhibit distinguishable differences in procurement patterns, which would in turn vary the degree to which wider aquaculture activity impacts the national economy. Furthermore, instances of aquaculture producers supplying other aquaculture related businesses nationally would inevitably introduce a degree of 'double counting' within this estimate.

FOR EVERY TWO DIRECT AQUACULTURE JOB AT THE BAYS, A FURTHER ONE JOB IS SUPPORTED ELSEWHERE WITHIN THE IRISH ECONOMY

On average, the wage multipliers tend to be stronger than the of both the GVA and employment multipliers. Of the five regions hosting our studied bay areas, the West and Mid-East recorded the strongest wage multipliers (both 2.2), closely followed by the South-East (2.1).

Table 41. Regional multipliers associated with bays' aquaculture, 2020

Bays' aquaculture	Ireland summary		
	GVA	Employment	Wages
Border	1.6	1.5	1.9
West	1.6	1.7	2.2
Mid-East	1.7	1.5	2.2
South-West	1.5	1.3	1.8
South-East	1.8	1.6	2.1
ROI	**1.7**	**1.5**	**2.2**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

The Bantry, Kilkieran and Donegal bays are the largest of the 11 bays in aquaculture turnover terms. Combined they account for over 40 percent of total aquaculture turnover across the 11 bay areas. However, this dominance is strongly associated with the concentration of finfish activity locally, a sub-sector which represents over half of aquaculture sales across the bays. Accordingly, overall aquaculture activity was found to be most concentrated in the South- West, Border and West regions; with these regions recording the highest levels of direct GVA (Fig 57).

Through the supply chain and induced expenditure, we estimate that the South-West (€27 million) region experienced the greatest levels of total GVA associated with the bays' aquaculture sector. This was a result of both the level of direct activity taken place in the first instance, procurement patterns and the sectoral employment compositions of their local economies. The below figure also shows that the economic benefits were not solely isolated to those economies which contain the bays themselves. None of the 11 bays were located within the Midlands, Mid-West or Dublin regions - yet these areas generated €6.2 million in GVA as a result of aquaculture related activity at the bays. These impacts originate from both the supply chain spending of the bays' aquaculture businesses and the consumer spending patterns of those employed either directly or indirectly as a result.

Table 42. GVA benefits associated with bays' aquaculture, Regions, 2020

Aquaculture total	GVA (€m)			
	Direct	Indirect	Induced	Total
Border	9.1	3.4	1.8	14.2
West	8.7	3.4	2.1	14.3
Mid-West	0.0	1.6	0.7	2.3
Mid-East	3.6	1.6	1.0	6.2
South-West	18	5.0	3.4	26.6
South-East	3.3	1.4	1.1	5.9
Dublin	0.0	1.6	0.9	2.5
Midlands	0.0	0.9	0.4	1.3
ROI	**42.9**	**18.8**	**11.6**	**73.4**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

THE BAY AREAS' AQUACULTURE IMPACTS ARE ESTIMATED TO BE FELT MOST STRONGLY IN THE SOUTH-WEST, BORDER AND WEST REGIONS

Table 43 shows that the South-West and Border regions accounted for the greatest levels of both direct and total employment benefits. Over 630 jobs were directly sustained within aquaculture at bays across these regions, accounting for close to two thirds of the total across all 11 bays.

Table 43. Employment benefits associated with bays' aquaculture, Regions, 2020

Aquaculture total	Employment			
	Direct	Indirect	Induced	Total
Border	208	72	36	315
West	133	58	29	219
Mid-West	0	23	11	34
Mid-East	81	22	15	118
South-West	428	71	44	543
South-East	63	22	15	100
Dublin	0	18	10	28
Midlands	0	19	9	28
ROI	**913**	**305**	**168**	**1,385**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

€13 MILLION

FISCAL BENEFITS IN 2020

Aquaculture activity across the 11 bays provides a significant benefit to the public purse.

The South-West and Border regions enjoyed the highest levels of direct and total wages resulting from aquaculture activity across the bays. The South- West enjoys a stronger wage benefit from the oyster and mussel and other shellfish farming elements, whereas the Border based bays experience a relatively larger share of direct wages from the finfish sub-sector. Overall differences reflect not only the amount of activity in the local aquaculture sector but average wage levels in the local economies concerned. In total, the collective aquaculture sector supported €11 million and €7.6 million in wages in these regions respectively.

Table 44. Wage benefits associated with bays' aquaculture, Regions, 2020

Aquaculture total	Wages (€m)			
	Direct	Indirect	Induced	Total
Border	4.0	2.5	1.1	7.6
West	3.0	2.4	1.1	6.5
Mid-West	0.0	1.0	0.4	1.4
Mid-East	1.4	1.1	0.6	3.1
South-West	5.7	3.2	1.6	10.5
South-East	1.3	0.9	0.5	2.7
Dublin	0.0	1.0	0.4	1.5
Midlands	0.0	0.7	0.3	1.0
ROI	**15.5**	**12.8**	**6.0**	**34.4**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

6.4 FISCAL BENEFITS

Aquaculture activity at the bays provide further benefits through the generation of tax revenues to the Revenue Commissioners. These fiscal impacts can again be split into their direct, indirect and induced components depending on what channel of activity they originate from. We estimate that aquaculture's direct tax contribution equated to €6.5 million in 2020, consisting of both the labour-based tax paid by the sector's employees (income tax, PRSI etc), taxes on consumption and corporation tax receipts.

The indirect fiscal benefits represent the same taxation components as above but are generated within the sub-sector's wider supply chain, in addition to net taxes on input purchases and sectoral taxation on production less subsidies. Combined these represent a net fiscal benefit of €4.1 million. As those employed in the sector and within its supply chain spend their wages, this supports further jobs and activity within the Irish economy. We estimate this induced activity supported a further €2.8 million in tax revenue.

Therefore, in total the aquaculture sector across the bays is estimated to have supported €13 million in fiscal benefits in 2020. This total was made up of €8 million in employment/labour related tax, €1.7 million in corporation tax, €3.5 million in taxation associated with the spending of wages and a net tax contribution of €0.1 million through taxation on inputs and production.

Table 45. Tax benefits by category, Ireland, 2020

Aquaculture total	Tax estimates (€m)			
	Direct	Indirect	Induced	Total
Net tax on inputs	N/A	0.9	0.4	1.2
Consumption tax	1.6	1.3	0.6	3.5
Taxes on production	N/A	-1.2	0.2	-1.1
Corporation tax	0.7	0.7	0.3	1.7
Labour tax	4.2	2.5	1.4	8.0
Total	**6.5**	**4.1**	**2.8**	**13.4**

Source: Oxford Economics, Perceptive Insight, CSO
Note: May not sum due to rounding.

7. Conclusions

7.1 AQUACULTURE THROUGHOUT THE 11 BAYS

Our analysis has shown that the bay level aquaculture sector provides significant economic benefit both locally and throughout the wider national economy.

Overall, aquaculture sector activity throughout the bays is estimated to have sustained 1,385 jobs, €34 million in wages and €73 million in GVA across Ireland from the direct, indirect and induced effects. Over 910 of these jobs were provided directly by the local aquaculture sector within the 11 bay economies. This direct employment commanded an estimated €16 million in wages and supported €43 million in GVA.

7.2 THE AQUACULTURE SECTOR'S ROLE WITHIN COASTAL ECONOMIES

Aquaculture's important role in the bay area economies is only further emphasised when we examine their socio-economic makeup. The sectoral structure of the bay economies is not geared towards faster growing office based employment which tends to locate in more urban locations. Therefore, net-out commuting is commonplace across the bay areas, the working age population has been in decline and economic inactivity rates are relatively high.

However, our analysis shows that aquaculture - and the wider agriculture, forestry and fishing industry - is a relatively large component of the bay economies. In the absence of office-based growth sectors, aquaculture related employment offers significant opportunities for local people. Indeed, the survey findings show a significant majority of those working in the industry reside within the bays themselves. Furthermore, the employment offered by the sector tends to be a better match to the skill levels of local people. Localised deprivation is often associated with the absence of employment opportunities; therefore, aquaculture's presence locally helps to protect those vulnerable to long-term unemployment and the associated social exclusion which can result.

The survey exercise has also shown that the local aquaculture industry is both a mature and resilient part of the bay economies. Most producers surveyed indicated that they have been established in the bays for over a decade in most instances. Finally, aquaculture has shown itself to be an industry which invests locally, offers the local community flexible employment options, whilst also exposing the wider economy to faster growing export markets.

> **"LOCAL AQUACULTURE'S WIDER ECONOMIC IMPACT IS FELT MUCH FURTHER THAN THE BAY AREAS THEMSELVES"**

> **"AQUACULTURE IS ARGUABLY BECOMING AN INCREASINGLY IMPORTANT INDUSTRY WITHIN THE BAY ECONOMIES"**

APPENDIX 1
Model Approach

UNDERSTANDING ECONOMIC IMPACT ASSESSMENTS

A sector can generate benefits through four different channels. The first three are the standard channels through which economic impact is usually quantified: direct operational effects, supply chain effects, and the impact of employees spending their wages in the wider consumer economy. These are the focus of this study. The fourth channel, known as 'catalytic' or 'dynamic' benefits represent the wider benefits that society and/or other industries derive from the original economic activity. Catalytic benefits are often difficult to quantify. They include softer benefits such as diversifying an economy, providing a source for part-time employment and source for jobs outside of growth sectors.

Our report uses three main metrics to quantify each of the channels by which the aquaculture sector could contribute to the regional[20] and national economy:

- **Gross value-added** contribution to Gross Domestic Product (GDP)[21]: this measured the value of goods and services produced in an area, industry or sector of an economy and is equal to output minus intermediate consumption;
- **Employment:** Employment is presented in terms of employee jobs, the combination of workplace employment by full time and part time status;

  and
- **Wages** is the total value of remuneration offered to the workers associated with the local aquaculture sector.

All the data used was either provided by BIM (for example recent industry registration data), the aquaculture sector survey carried out by Perceptive Insight or published government website data and industry standards from the likes of CSO Ireland and Oxford's own economic databases. Finally, in the absence of data, reasonable assumptions based on best judgement are clearly rationalised in the study. For example, in the absence of bay specific data we will use published sources for comparator geographies as a proxy estimate were appropriate.

ESTIMATING THE DIRECT ECONOMIC CONTRIBUTION

The first step was to understand the direct activity associated with the local aquaculture sector at each of the 11 bays in 2020.

THE SURVEY

The industry survey was designed to provide the evidence base from which to estimate the local aquaculture sector's contribution to the regional/national economy. Responses from the sector were analysed according to common characteristics and cross-referenced with the most recent full snapshot of the local aquaculture sector population.[22]

Sample estimates were then 'grossed' up to that of the total population. This was done by drawing on BIM records of the sector population in each bay which contained fields on sub-sector and turnover bands. Knowing indicative turnover levels for the businesses not captured in the survey, we were then able to apply the average ratio of jobs to turnover levels for specific sub-sectors and apply average sectoral wages, etc. In other words, we utilised the industry survey sample and the business specific characteristics of the missing firms to estimate the direct activity not captured during the survey exercise. The resulting aquaculture related turnover estimate is designated to a broad industry sector of the economy ('Agri, forestry and fishing') for modelling later in the analysis.

This turnover figure is essentially the value of output within the local aquaculture sector and encompasses intermediary demand, wages and profits. By utilizing the survey results we were able to devise operating expenses/cost of bought in goods and services (excl. employee costs) for each business within the sector population. By subtracting this from the previous turnover figures we arrived at an estimate of the direct sectoral GVA contributions to GDP in the local economy. Both direct employment and gross wages paid within the local bay aquaculture sector are again informed by the survey findings and grossed to the population total based on shared characteristics.

With our estimate of direct output and wages, we then applied sectoral taxation assumptions informed by the CSO's Input-Output framework and calculated the resulting fiscal benefits that would likely be collected by the Revenue Commissioners.

ESTIMATING INDIRECT AND INDUCED IMPACTS

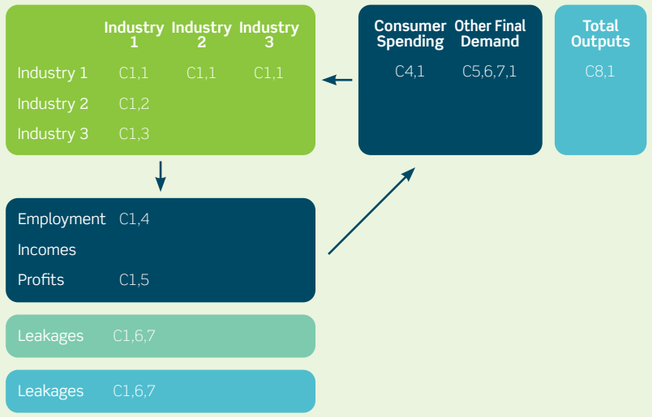
To estimate the indirect and induced impacts we have built an Input-Output model. Figure 25 presents a stylised version (showing just three sectors for presentation purposes) of our Input-Output model which is a model that traces how economic activity flows through an economy as one sector makes purchases from another sector.

20. Ideally, we would quantify the impacts of the aquaculture sector on the bay area specifically, however there is not enough published sectoral employment, GDP and wage data. Sufficient data is only available at regional level to produce sub-national impacts.

21. GDP is the main summary indicator of economic activity in Ireland. GDP can be defined as GVA plus taxes on products less subsidies on products. References to economic growth (or when the economy enters recession) typically relate to the rate of change of GDP. All references in this report relate to GVA; also known as GDP at 'basic prices'; and they exclude taxes and subsidies.

22. Originally provided by BIM (via registration and industry census data) but further refined/updated during the survey phase of the analysis. Turnover bands were also assigned to the known aquaculture population based on returns information where available, and when not, estimated by BIM based on shared characteristics.

Figure 25. Stylised input-output model



We have used the latest Irish input-output tables for the analysis, but have adjusted these in line with academic guidelines (Flegg, A. T. and Tohmo, T. (2013) "Regional input-output tables and the FLQ formula: A case study of Finland") to account for the size and structure of the local economy.[23] The technique involves constructing sub-national input-output models by applying Location Quotients (LQs) and sub-national size adjustments to the standard Ireland Input-Output tables. The result is that geographies with higher concentrations of industries receiving procurement or household expenditure have larger impacts. In addition, we have used information gathered from the survey to further isolate the procurement spend locally, thereby strengthening the overall modelling assumptions.

MODELLING SUPPLY CHAIN IMPACTS

The survey provided us with information on the size of supply chain spending relative to turnover, its allocation to specific parts of the economy/goods/services and its location (local/national/international). Using this information, we were able to construct a more detailed picture of the first round of supply chain spending than the published input-output tables would otherwise provide.[24]

We then used the impact model to estimate all the subsequent rounds of supply chain or indirect spending associated with the local aquaculture sector. The input-output tables provide us with an estimate of indirect output by sector. We then convert this output back into sectoral GVA and into sectoral jobs to provide a range of sectoral impact measurements. Applying average sectoral earnings allowed us to estimate the income effect.

The induced impact is economic activity and employment supported by those directly or indirectly employed spending their income on goods and services in the wider economy. This helps to support jobs in the industries that supply these purchases, and typically includes jobs in retail and leisure outlets, companies producing consumer goods and in a range of service industries. Again, our Input-Output model was used to estimate these induced impacts.

BAY SELECTION METHOD FOR INCLUSION WITHIN THE STUDY

Irish aquaculture is primarily marine based, within the intertidal or inshore marine zones. In addition, the industry is predominantly located along the western seaboard but also in certain Bays of the east coast. A small number of land-based units operate inland, producing salmon smolt and Rainbow Trout.

This first study therefore of the economic effects of aquaculture, focused on the bays where most of Irish aquaculture is based. 11 bays were chosen by BIM as a representative sample of all aquaculture bays to measure the economic effects of the industry upon its host community and the surrounding region. The bays were chosen according to the following criteria: turnover, employment, community population, geographic location and proportion of aquaculture segments represented.

Turnover: Bay aquaculture turnover (2020) had to be from a minimum €1 million to score 1.

Employment: a minimum level of 30 directly employed, full time equivalents must be met to score 1.

Community population: level of community strata; how does the level of urbanisation, competing stakeholders, presence of alternative industries etc potentially reduce the proportion of economic effects of aquaculture within a bay area. The presence of a town or group of towns around the bay with a population greater than 100,000 scored that bay '0'.

Geographic location: As far as possible, all 7 FLAG areas were sampled. The bay with the greatest turnover, employment and segment representation for a given FLAG region, was scored '1' as the chief regional representative bay.

Proportion of Segment: There are 4 major segments of Irish marine aquaculture; Penned salmon, farmed oyster, Rope grown and Seabed cultured mussel. A Bay was scored '1' if two or more segments are represented in the bay.

23. Due to data availability, the local aquaculture sector's economic impact can only be localised to the regional level (NUTS 3).

24. Survey respondents with food processing components where asked where they source the inputs for these operations. All noted their own internal aquaculture produce. In the absence of additional information, we have assumed minimal cross over in supply chains between bay producers.

The bays were scored according to the above criteria. Relatively high turnover bays scored for turnover but this had to be tempered against the likely effect of this economic driver against population density of the community and the dampening effect of other industries present. Similarly, relatively high employment ranked most within less densely populated bay communities with relatively fewer competing alternative employments.

The number of bays chosen to sample was limited by timescale and budget. Wexford Harbour, located within the Southeast electoral or FLAG region, is a significant location of the Seabed cultured mussel segment. It nevertheless failed to score sufficiently to be included within the chosen group, according to the criteria outlined above.

In conclusion, BIM's bay selection methodology generated a list of 11 aquaculture sample bays that were deemed to be representative of the overall sector. An 'in depth' analysis of the wider economic influence of aquaculture related activity of this sample will have relevance for the entire aquaculture sector.

OXFORD ECONOMICS

ABOUT OXFORD ECONOMICS

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