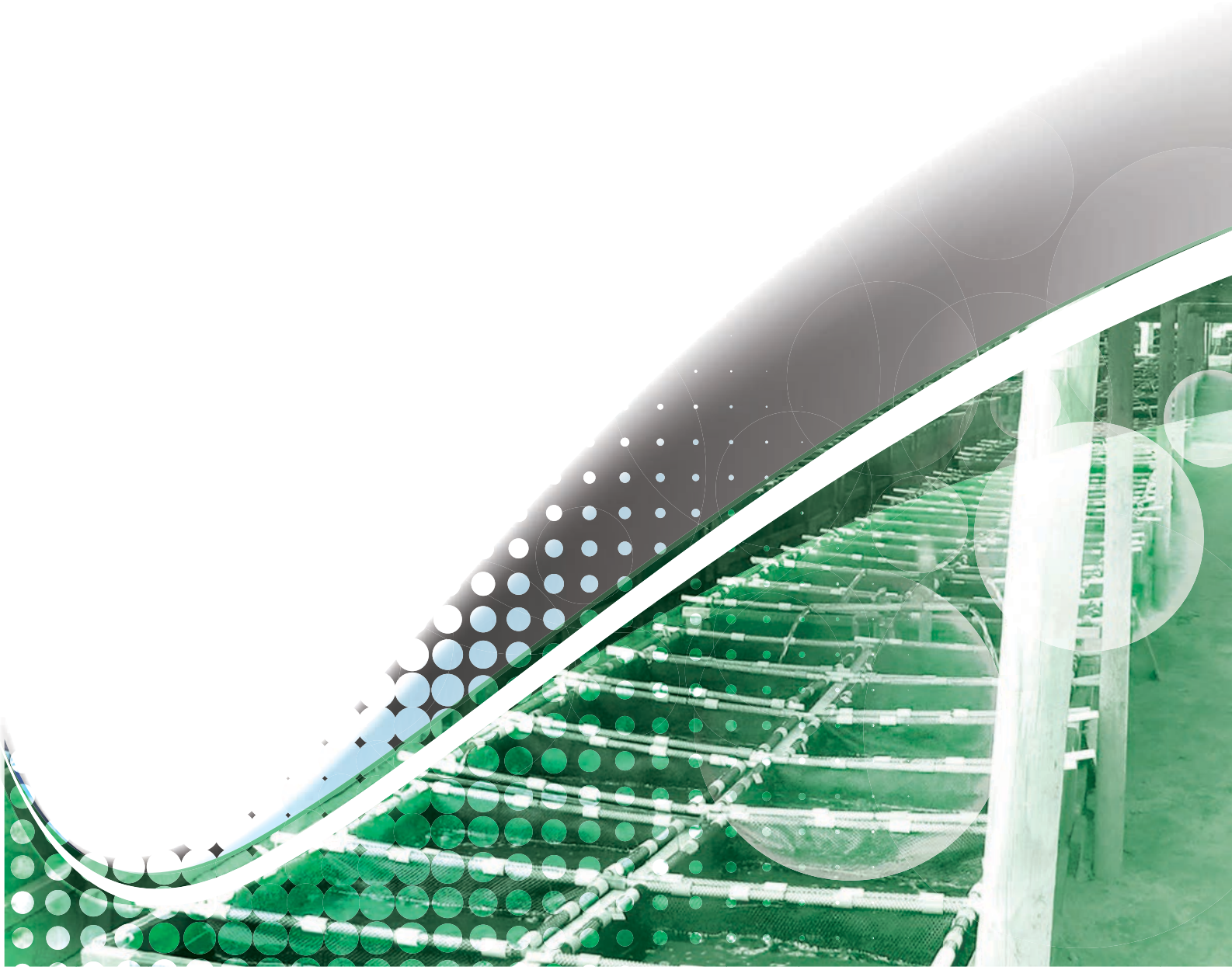
AQUACULTURE YEARBOOK 2018 SOUTH AFRICA



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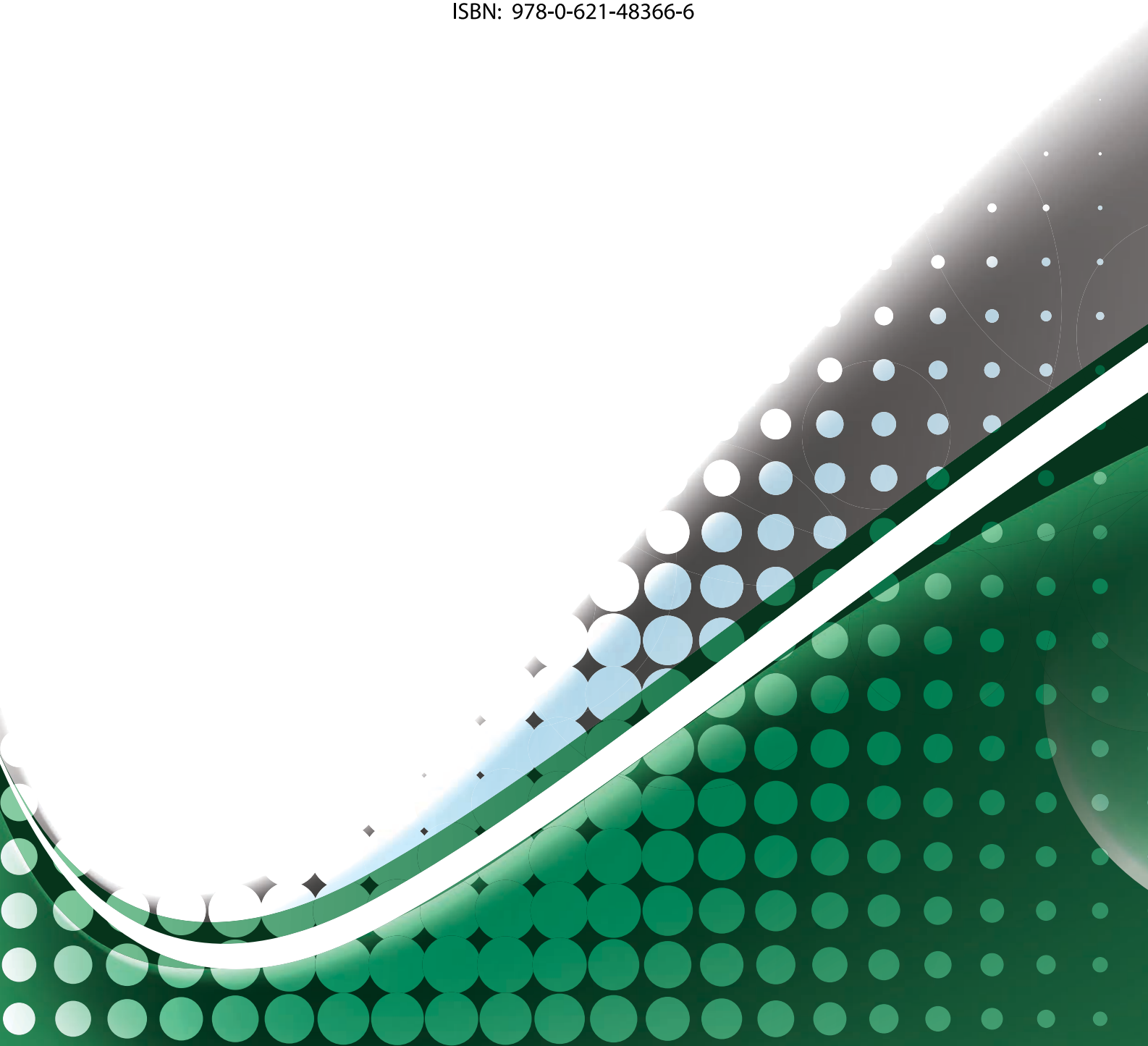

PREPARED BY

The Department of the Environment, Forestry and Fisheries
Branch: Fisheries Management
Chief Directorate: Aquaculture and Economic Development
Directorate: Aquaculture Technical Services
Private Bag X2 Roggebaai Cape Town 8012
Email: www.environment.gov.za
Tel: 021 402 3911
Published: 2020

FOR ENQUIRIES CONTACT

The Department of the Environment, Forestry and Fisheries
Branch: Fisheries Management
Chief Directorate: Aquaculture and Economic Development
Directorate: Aquaculture Technical Services
Private Bag X2 Vlaeberg
8018
Email: callcentre@environment.gov.za

OR

Ms Khumo Morake - Makhalemele
Director: Aquaculture Technical Services
Email: KMorake@environment.gov.za
Tel: 012 309 5727
Published: June 2020.

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Aquaculture sector development in South Africa has been a collective effort between Government and its entities together with the industry. The Department of the Environment, Forestry and Fisheries (DEFF) as the lead Department acknowledges the contribution of all stakeholders towards this development. Special acknowledgement is extended to the aquaculture industry in providing information and images fundamental to the 2018 Aquaculture Yearbook.

A further acknowledgement is extended to key Directorates that contributed to the compilation of the 2018 publication, within the DEFF, the Directorate: Aquaculture Technical Services (D: ATS) under the leadership of Ms Khumo Morake-Makhalemele, Directorate: Aquaculture Research and Development (D: ARD) under the leadership of Ms Fatima Daya, Directorate: Sustainable Aquaculture Management (D: SAM) under the leadership of Ms Zimasa Jika and the Operation Phakisa Delivery Unit under the leadership of Ms Andrea Bernatzeder, Operations Manager. The continuous support and guidance provided by the Chief Director of Aquaculture and Economic Development (CD: AED), Mr Belemane Semoli is hereby highly acknowledged.

EXECUTIVE SUMMARY

The Department of the Environment, Forestry and Fisheries (DEFF) gathers aquaculture production data on an annual basis with the intention of providing stakeholders with the status of the aquaculture sector in the country. The gathered production data is analysed, interpreted and presented in the Aquaculture Yearbook. The Aquaculture Yearbook 2018 presents data collected in 2017 from aquaculture stakeholders. In 2017, species cultivated in the marine sector included abalone (Haliotis midae), pacific oyster (Crassostrea gigas), mussels (Mytilus galloprovincialis, Chromomytilus meridionalis), dusky kob (Argyrosomus japonicus), salmon (Salmo salar), east coast rock lobster (Panulirus homarus) and seaweed (Ulva spp, Gracilaria spp). Species cultured during 2017 in the freshwater sector, were trout (Onchorynchus mykiss, Salmo trutta), tilapia (Oreochromis mossambicus, Oreochromis niloticus,), catfish (Clarias gariepinus), carp (Cyprinus carpio), and marron crayfish (Cherax tenuimanus).

A total of 210 aquaculture farms were reported to be operational in 2017, with 38 of the farms cultivating marine species and 172 farms cultivating freshwater species. There has been a decrease of six (6) farms, when compared to the 216 farms that were reported to be operational in 2016.

The total annual production of the country's aquaculture industry in 2017 was 5588.46 tons. This figure excludes seaweed production due to the inconsistent reporting of the sub-sector. The marine sector contributed 3907.76 tons while the freshwater sector 1680.7 tons. When compared to what was recorded in 2016, the aquaculture sector showed a 7.05% decrease in production during 2017, representing a production decrease of 424.08 tons (232.42 tons in the marine sector and 191.66 tons in the freshwater sector). In the marine sector, mussels represents the highest production output, followed by abalone then oysters. Finfish contributed the least to production in the marine sector. In the freshwater sector, trout contributed most to production, followed by tilapia, ornamentals, koi carp, carp, marron crayfish, and lastly, catfish.

In 2017, an investment of approximately R677.5 million was attained into the aquaculture sector, representing an increase of 30% from R474 million that was recorded in 2016. The total value of the aquaculture sector in 2017, was estimated at R 1 010 592 680. The marine sector contributed R881 042 000, representing 87% to the overall aquaculture value. The freshwater sector contributed R129 550 000 representing 12.8% to the overall aquaculture value. The sector also created a further 481 jobs during 2017 primarily due to the continuous increase in number of farm expansions, number of farms and increased support from the government. In terms of aquaculture research and development in South Africa, numerous research projects were undertaken in 2017. The fish species that were under research were the dusky kob (Arygyrosomus japonicus), tilapia mossambicus (Oreochromis mossambicus), spotted grunter (Pomadasys commersonni) and the white stumpnose (Rhabdosargus globiceps). The researches were focused on the reproduction, nutrition and growth performance of the aforementioned species.

The positive Environmental Authorisation (EA) that was awarded to the Qolora land-based Aquaculture Development Zone (ADZ) was extended to the 29th September 2020. The Department is in the process of initiating the second phase which includes securing of funds for the construction phase of basic infrastructure. Regarding the Algoa Sea-based ADZ, following appeal processes, the DEFF conducted comparative studies to further assess the Algoa 5 and Algoa 1 sites. A new Basic Assessment process was reinstated with the EIA process to be conducted in 2018. Furthermore, the Department is currently conducting an Environmental Impact Assessment (EIA) for the establishment of a land-based ADZ at Amatikulu, Kwa-Zulu Natal. Specifications for undertaking this work were advertised in August 2016 and an Environmental Assessment Practitioner (EAP) was appointed in 2017 and the project is estimated to be completed by April 2019. Regarding the Saldanha Bay ADZ, an EAP was appointed in May 2016 to conduct an EIA. The EIA application and the Basic Assessment Report were submitted to the Department of Environmental Affairs on the 30th September 2017 and a response is expected from DEA in January 2018.

During 2016, legislation applicable to the aquaculture industry were developed by Government institutions such as the Aquaculture Development Bill, National Freshwater (Inland) Fisheries Policy, Marine Spatial Planning Bill, 22 Proposed Marine Protected Areas Regulations, and Coastal Waters Discharge Authorisations.

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ABBREVIATIONS

ADEP	Aquaculture Developmental and Enhancement Programme
ADZ's	Aquaculture Development Zones
AIF	Aquaculture Intergovernmental Forum
ASP	Amnesic Shellfish Poisoning
ATDC	Agricultural Technology Demonstration Centre
AU-IBAR	The African Bureau for Animal Resource
AVCRT	Aquaculture Value Chain Roundtable
CD: AED	Chief Directorate: Aquaculture and Economic Development
CD: MCS	Chief Directorate: Monitoring, Control and Surveillance
CLAR	Central Laboratory for Aquaculture Research
CSIR	Council for Scientific and Industrial Research
D: ARD	Directorate: Aquaculture Research and Development
D: ATS	Directorate: Aquaculture Technical Services
D: SAM	Directorate: Sustainable Aquaculture Management
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DFI	Development Funding Institutions
DSP	Diarrhetic Shellfish Poisoning
DWS	Department of Water and Sanitation
EA	Environmental Authorisations
EAP	Environmental Authorisations Practitioner
ECDC	Eastern Cape Development Cooperation
EIA	Environmental Impact Assessment
EUS	Epizootic Ulcerative Syndrome
FAO	Food and Agriculture Organisation of the United Nations
FPE	Fish Processing Establishment
FSO	Food Safety Office
GDP	Gross Domestic Product
GEP	Gauteng Entrepreneur Propeller
HAB	Harmful Algal Blooms

HPLC	High-performance liquid chromatography
IDC	Industrial Development Cooperation
LC-FLD	Liquid Chromatography–Fluorescence Detector
LC-MS/MS	Liquid Chromatography–Mass Spectrometry
MAIL	Marine Aquaculture Industry Liaison
MAWG	Marine Aquaculture Working Group
MEGA	Mpumalanga Economic Growth Agency
MLRA	Marine Living Resources Act No. 18 of 1998
MoA	Chinese Ministry of Agriculture
MOFCOM	People's Republic of China Ministry of Commerce
NEDLAC	National Economic Development and Labour Council
NEF	National Empowerment Fund
NEM: BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NPCA	NEPAD planning and coordination agency
NRCS	National Regulator for Compulsory Specifications
OIE	World organization for animal health
PAIF	Provincial Aquaculture Intergovernmental Forum
PCB	Polychlorinated Biphenyls
PCR	Polymerase Chain Reaction
PSP	Paralytic Shellfish Poisoning
SABS	South African Bureau of Standards
SAMSM&CP	South African Molluscan Shellfish Monitoring and Control Programme
SANAS	South African National Accreditation System
SD: AAH&EI	Sub-Directorate: Aquaculture Animal Health and Environmental Interactions
SEA	Strategic Environmental Assessment
SOE	State-Owned Entities
TCP	Technical Cooperation Program
The dti	Department of Trade and Industry
VPN	Veterinary Procedural Notice

DEFINITION OF TERMS

Active surveillance Referred as stock inspection, include (as amended from EU regulation (Reg. 2006/88/EC):

a) Routine inspection by the Department or by other qualified health services provider on behalf of the Department;

b) Examination of the aquaculture animals on the farm for clinical disease; and

c) Diagnostic analysis of samples collected on a suspicion of a disease or observed increased mortality during inspection.

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Commercial Scale Status at which project is producing a product for sale primarily for widespread distributions and consumption.

Disease Any condition whereby the normal functions of any organ or the body of an animal is impaired or disturbed by any bacterium, virus, parasite, fungus or other organisms or agent in a culturing environment (as amended from Animal Disease Act, 1998).

East Coast East of Cape Point to border of Mozambique.

Farm closure A period where shellfish farms are temporally not allowed to market and or sell products due to microbiological contamination, detection of bio-toxins and as well as other hazardous substances such as heavy metals, pesticides, polychlorinated biphenyls (PCBs) or radionuclides.

Pilot scale Pilot scale Status at which a project is testing or conducting trial in order to demonstrate the effectiveness i.e. technical and economic

Production Amount of organisms produced from a farm.

West Coast West of Cape Point to boarder of Namibia.

FOREWORD

Aquaculture has become an important growth sector and a priority for the Department of the Environment, Forestry and Fisheries (DEFF). Built on the foundation of the National Development Plan (NDP), which recognized the potential for developing South Africa's ocean economy, the aquaculture sector has demonstrated a significant growth/improvement over the past 10 years. Aquaculture operations can now be found across all the nine provinces of South Africa producing different species under a variety of production systems. The Aquaculture Development Zones, areas earmarked exclusively for aquaculture development, have also significantly contributed to the growing production within the sector.

The National Aquaculture Policy Framework, a central part of the National Development Plan, supported by the National Aquaculture Strategy and Action Plan are essential/core aquaculture strategies that give element to the development of commercial scale aquaculture. The above mentioned strategies are supported by the Industrial Policy Action Plan through investment incentives and grants offered by the Department of Trade and Industry such as the Aquaculture Development and Enhancement Programme. In addition to these policies and programmes, Operation Phakisa initiative has had a great impact in stimulating the "oceans economy" through their initiatives that were developed to fast-track aquaculture development in South Africa.

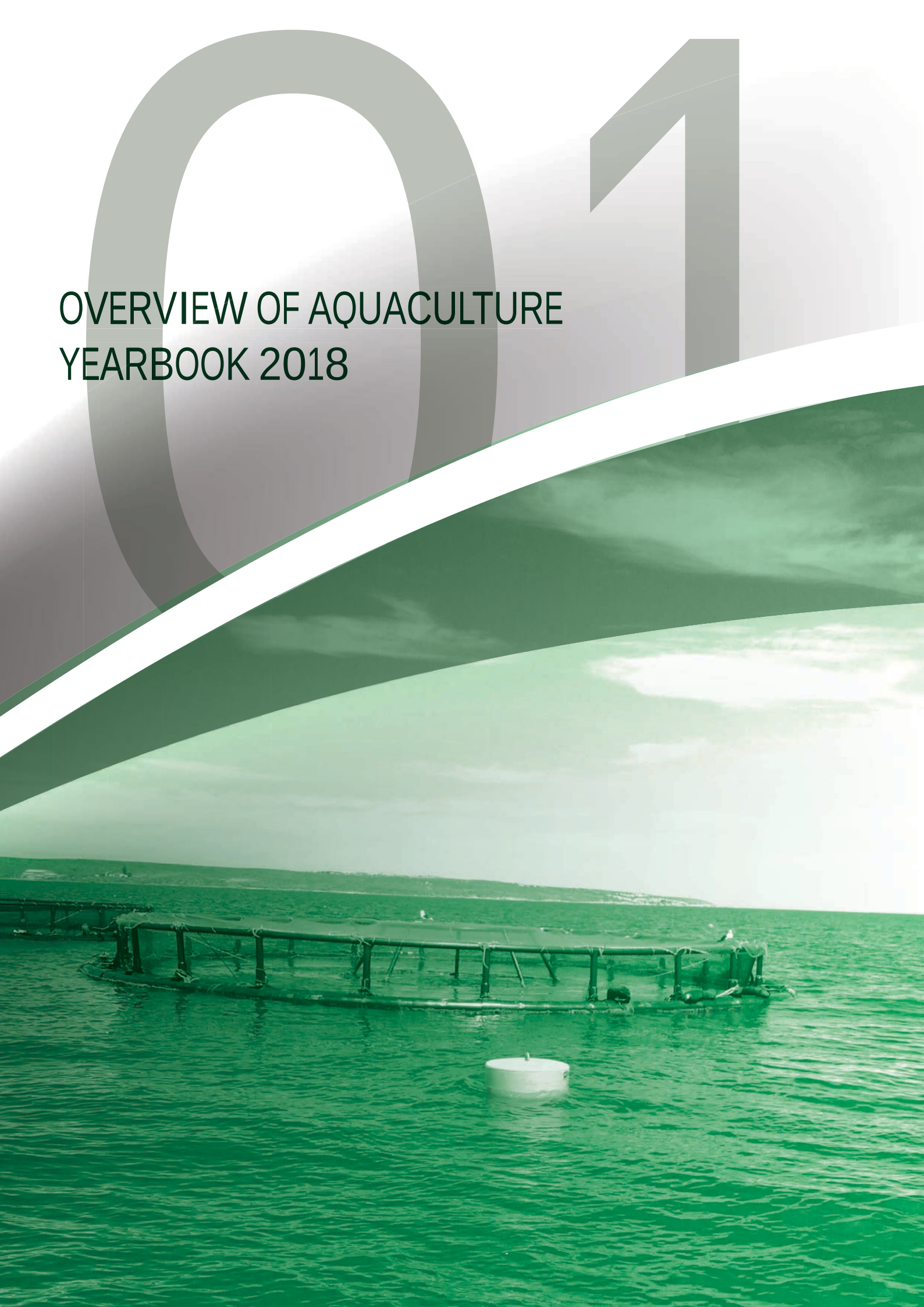
The 2018 Aquaculture yearbook publication is a treasured reference tool and it unfolds the enhancement of an understanding of the vital role that aquaculture plays in alleviating poverty, unemployment and enhancing food security. Since the establishment of the aquaculture yearbook we have been able to track the status of aquaculture in South Africa as a result of a close working relationship with the industry and a dedicated Aquaculture and Economic Development team.

Among the many individuals who made efforts to participate in the compilation of this edition of South Africa's Aquaculture Yearbook, the following officials are individually acknowledged for providing support and ensuring that this book is published: Mr Belemane Semoli (Chief Director: Aquaculture and Economic Development), Ms Khumo Morake-Makhalemele (Director: Aquaculture Technical Services); Mr Asanda Njobeni (Director: Sustainable Aquaculture Management), Ms Fatima Daya (Acting Director: Aquaculture Research and Development) and Ms Andrea Bernatzeder (Operations Manager for the Operation Phakisa Delivery Unit).

The efforts made by officials in compiling the "South Africa's Aquaculture Yearbook 2018" are highly appreciated and acknowledged. The Directorate: Aquaculture Technical Services team is acknowledged for compiling the "South Africa's Aquaculture Yearbook 2018" through the collection and analysis of socio-economic and production data. Information pertaining to research activities was provided by the Directorate: Aquaculture Research while the Directorate: Sustainable Aquaculture Management provided information on aquaculture authorisation and environmental interaction. A continued provision of support to the three Directorates.

01

OVERVIEW OF AQUACULTURE YEARBOOK 2018



1.1. History of the Aquaculture Yearbook

The Aquaculture Yearbook was initiated in 2009 under the then Department of Environmental Affairs and Tourism (DEAT). Its initial focus was marine aquaculture as the DEAT's mandated was limited to management of marine aquaculture and not freshwater aquaculture. The publication was called South Africa's Marine Aquaculture Industry Annual Report 2009. Due to the restructuring and reprioritisation of government mandates, the management of aquaculture was reassigned to the Department of Agriculture, Forestry and Fisheries (DAFF), which resulted in reviewing of the publication name in 2010 to the Marine Aquaculture Annual Report 2010. The 2010 publication covered broader aspects of marine aquaculture.

During 2010, the integration of marine and freshwater aquaculture took place, redefining of the government roles and responsibility towards the aquaculture sector as a whole. The inclusion of the freshwater aspects into the report took place, resulting in revision of the publication name in 2011 to South Africa's Aquaculture Annual Report. The last revision of the publication took place in 2012 to align with the overall fisheries sector. The name was revised to South Africa's Aquaculture Yearbook – 2012. The following publications took place prior to this edition:

- South Africa's Marine Aquaculture Industry Annual Report 2009
- Marine Aquaculture Annual Report 2010
- South Africa's Aquaculture Annual Report 2011
- South Africa's Aquaculture Yearbook 2012
- South Africa's Aquaculture Yearbook 2013
- South Africa's Aquaculture Yearbook 2014
- South Africa's Aquaculture Yearbook 2015
- South Africa's Aquaculture Yearbook 2016
- South Africa's Aquaculture Yearbook 2017
- South Africa's Aquaculture Yearbook 2018 – current publication.

1.2. Purpose of the Aquaculture Yearbook 2018

The main purpose of the Aquaculture Yearbook 2018 is to provide access to information and ensure transparency related to the status of aquaculture sector in South Africa from 2017 activities. Its aim is to create awareness, promote the sector, make provision of information to decision makers, potential investors and general public. The objective of the South Africa's Aquaculture Yearbook includes recording and monitoring progress of the sector; to ensure availability of official aquaculture statistics and information to stakeholders; facilitate public awareness; identify deficiencies in development and management systems; and made a business case for future developmental initiatives of the sector.

1.3. Aquaculture Yearbook 2018 compilation process

A consistent approach was taken towards the compilation of previous editions of the South Africa's Aquaculture Yearbooks. The same approach was used to compile the South Africa's Aquaculture Yearbook 2018 based on the information collected from different aspects of the sector ranging from research, socio-economic and economic information, production statistics, to existing publications and other developmental aspects. Key component of this publication is the production data and socio-economic data. It was compiled based on data collected during 2017, from both freshwater and marine aquaculture sectors.

Data collected from the marine aquaculture sector was from legislated and legally operating farmers, importers and exporters in terms of the Marine Living Resources Act, 1998 (Act No.18 of 1998) (the MLRA). The submission of such data was guided by 2017 permits conditions of several sub-sectors and permits issued under several sections of the MLRA

Collection of the freshwater aquaculture data continues to pose a challenge for the Department as it is currently voluntary for industry to submit. It was collected through questionnaires, telephonic interviews and through industry associations. The data in this report for freshwater aquaculture may not be a true reflection due to limitations resulting from gaps in legislation governing this process.

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STATUS OF AQUACULTURE IN SOUTH AFRICA 2017

2.1 Overview of aquaculture in South Africa in 2017

South Africa as a country is blessed to have both freshwater and marine aquaculture sectors. The overall sector continues to grow fast, operating from a total of 210 farms recorded in 2017 for the two mentioned subsectors (Table 1). Most freshwater farms utilise recirculating systems, race ways and earth ponds for cultivation of the species above while marine molluscs are cultivated on rafts or long lines, and abalone is cultured in tanks with tank pump ashore technology. The sector operated with six (6) farms less, three (3) freshwater and three (3) marine, compared to the 216 farms operated last year.

Table 1: Total number of farms recorded for South Africa's aquaculture sector in 2017.

Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Abalone	2	0	0	0	0	0	5	0	11	18
Finfish	2	0	0	2	0	0	0	0	1	5
Mussels	0	0	0	0	0	0	0	0	11*(10)	11*(10)
Oysters	2	0	0	0	0	0	1	0	3*(2)	6*(5)
Total Marine	6	0	0	2	0	0	6	0	24	38
Tilapia	3	0	24	5	18	12	1	16	2	81
Trout	0	0	1	5	0	12	0	0	24	42
Catfish	2	4	1	0	4	1	0	3	0	15
Marron Crayfish	1	0	0	0	0	0	0	0	0	1
Carp	0	0	1	0	1	0	1	0	1	4
Koi Carp	0	2	5	2	0	1	0	0	1	11
Ornamental species	2	2	4	5	1	2	0	0	2	18
Total Freshwater	8	8	36	17	24	28	2	19	30	172
Total Marine and Freshwater	14	8	36	19	24	28	8	19	54	210

The sector operated from a range of eleven (11) species farmed at various production levels. These included seven (7) freshwater and four (4) marine species with the latter noted to be the main driver of the sector. The freshwater species cultured included trout (Onchorynchus mykiss and Salmo trutta), tilapia (Oreochromis mossambicus, Oreochromis niloticus and Tilapia rendalli), catfish (Clarias gariepinus), carp (Cyprinus carpio and Ctenopharygodon idella), marron crayfish (Cherax tenuimanus), Koi-carp (Cyprinus carpio) and a number of ornamental species (e.g., Koi-carp). Although freshwater aquaculture is operated in all the nine (9) provinces, the most important areas of production for freshwater species include Eastern Cape, Kwa-Zulu Natal, Mpumalanga and Western Cape provinces.

Marine species farmed, on the other hand, included abalone (Haliotis midae), pacific oyster (Crassostrea gigas), mussels (Mytilus galloprovincialis and Choromytilus meridionalis), dusky kob (Argyrosomus japonicas), Salmon (Salmo salar), dusky kob (Argyrosomus japonicus). The above mentioned species are farmed in the coastal provinces of the Eastern Cape, Kwa-Zulu Natal, Northern Cape and Western Cape provinces.

The total production of South Africa's aquaculture industry recorded during 2017 was 5588.46 tons. The sector has shown continuous growth since 2006 to date (Figure 1), with a decrease of 424.08 tons from a production of 6012.54 tons in 2016 to 2017. This decrease in volume represents a decrease of 7.05%.

The freshwater aquaculture contributed 1680.70 tons (30.07%) towards the total production volume. This industry experienced a decrease of 191.66 tons (10.24%) from 2016 (Figure 2, Table 2). Marine aquaculture, on the other hand, contributed 3907.76 tons towards the total production volume, accounting 69.93% of the total production volume. This industry experienced a decrease of 232.42 tons (5.61%) from 2016 (Figure 2, Table 2). The leading sub-sector in terms of production was mussels with a production volume of 2083.52 tons, followed by abalone with a production of 1276.06 and then trout with a production of 1249.80 (Table 2).

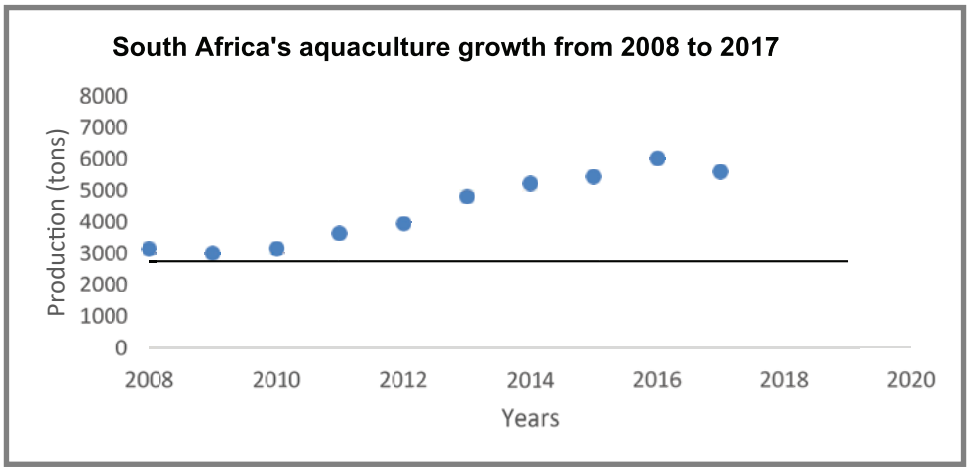


Figure 1: South Africa's aquaculture production growth from 2008 to 2017.

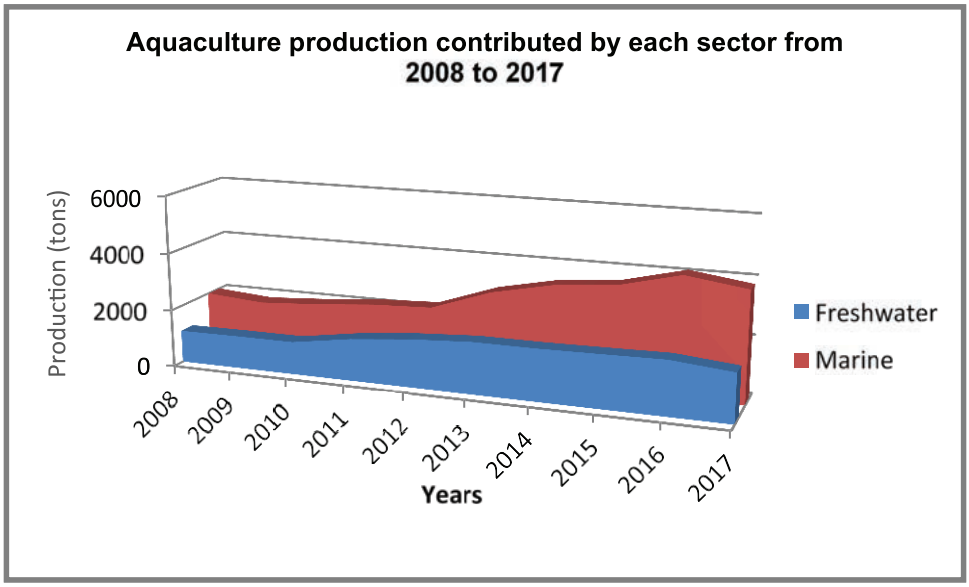


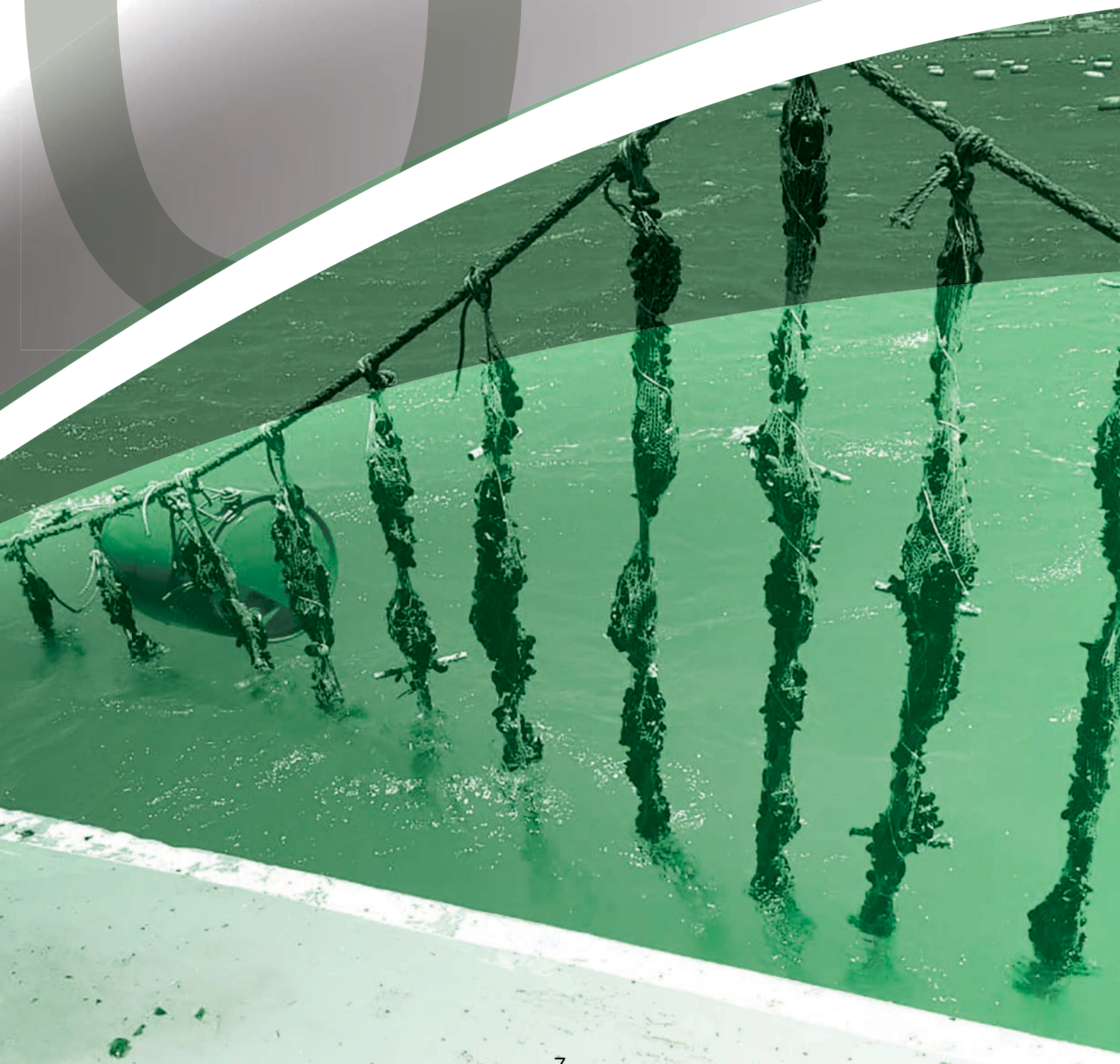
Figure 2: South Africa's production growth per sector from 2008 to 2017.

Table 2: Total production (tons) recorded for South Africa's aquaculture sector in 2017.

Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Abalone	136.46	0	0	0	0	0	50.01	0	1089.59	1276.06
Finfish	83.51	0	0	32.01	0	0	0	0	0	115.52
Mussels	0	0	0	0	0	0	0	0	2083.52	2083.52
Oysters	159.73	0	0	0	0	0	0	0	272.93	432.66
Total Marine	379.7	0	0	32.01	0	0	50.01	0.00	3446.04	3907.76
Tilapia	21.5	0	89.8	6.50	146.52	43	3.00	87	5.00	402.32
Trout	0	0	21	378.70	0	138.0	0	0	712.10	1249.80
Catfish	3.3	0	0	0	0	0	0	0	0	3.30
Marron Crayfish	4.0	0	0	0	0	0	0	0	0	4.00
Carp	0	0	1.60	0	2.50	0	0.60	0	0.60	5.3
Koi Carp	0	0.80	3.70	1.40	0	0.60	0	0	0.50	7.00
Ornamental species	1.70	1.20	0	3.10	0.80	1.30	0	0	0.90	9.00
Total Freshwater	**30.5**	**2.00**	**116.10**	**389.7**	**149.82**	**182.90**	**3.60**	**87**	**719.10**	**1680.7**
Total aquaculture production volume	**410.20**	**2.00**	**116.10**	**421.71**	**149.82**	**182.9**	**53.61**	**87**	**4165.14**	**5588.46**

02

STATUS OF MARINE AQUACULTURE IN 2017



3.1 Marine aquaculture farms operating during 2017

In 2017, a total of 38 marine aquaculture farms were operational in South Africa. There was a decrease in the total number of marine aquaculture farms compared to the total of 41 marine aquaculture farms operational in 2016. The Western Cape (WP) Province had the highest number of operating marine fish farms in 2017, amounting to twenty four (24) and comprising of four (4) sub-sectors namely abalone (11), finfish (1), oysters (2) and mussels (10).In the Eastern Cape (EC) Province six (6) farms were in operation and comprised of three (3) sub-sectors namely abalone (2), finfish (2) and oysters (2). The Northern Cape (NC) Province had five (5) abalone farms and one (1) oyster farm. Kwa-Zulu Natal (KZN) Province had the least number of farms with only two (2) finfish farms in operation. The total number of farms operating in Eastern Cape and Northern Cape include the abalone ranching operations, two (2) of them being situated in Northern Cape (NC) and one (1) in Eastern Cape. There was no commercial marine aquaculture in the inland provinces. The distributions of the farms are presented in Table 3.

Table 3: Total number of marine aquaculture farms operating in South Africa by sub-sector and province in 2017.

Operational per species and province					
Species	WC	EC	NC	KZN	Total
Abalone	11	2	5	0	18
Finfish	1	2	0	2	5
Mussels	11*(10)	0	0	0	11*(10)
Oysters	3*(2)	2	1	0	6*(5)
Total	**24**	**6**	**6**	**2**	**38**

*(2) two farms cultured mussels and oysters; however the farms have been captured under the primary species cultured respectively.

3.2. Marine aquaculture species farmed during 2017

A number of aquaculture species were kept on farm premises for conditioning and research purposes, outlined in Table 4 below. These species included mangrove snapper (Lutjanus argentimaculatus) and spotted grunter (Pomadasys commersonnii). The DAFF conducted research on potential species during 2017; these species where held at the DAFF Aquaculture Research Facility in Sea Point (Cape Town) and included the following species, white stumpnose (Rhabdosargus globiceps), south coast sea urchin (Tripneustes gratilla) and the South African clam (Pecten sulcicostatus). Marine aquaculture species cultured on commercial scale included abalone (Haliotis midae), pacific oyster (Crassostrea gigas), mussels (Mytilus galloprovincialis and Choromytilus meridionalis), dusky kob (Argyrosomus japonicas), Salmon (Salmo salar), East Coast Rock Lobster (Panulirus Homarus) and seaweed, (Ulva spp and Gracilaria spp).

Table 4: Marine aquaculture species and their operational scale in South Africa during 2017

Marine Aquaculture species in South Africa 2017		
Common Name	**Scientific Name**	**Operational Scale**
Abalone	Haliotis midae	Commercial
Pacific oyster	Crassostrea gigas	Commercial
Mediterranean mussel	Mytilus galloprovincialis	Commercial
Black mussel	Choromytilus meridionalis	Commercial
Seaweed	Ulva spp	Commercial
Seaweed	Gracilaria spp	Commercial
Dusky kob	Argyrosomus japonicas	Commercial
Salmon	Salmo salar	Pilot
East Coast Rock Lobster	Panulirus Homarus	Pilot
White stumpnose	Rhabdosargus globiceps	Research
Spotted grunter	Pomadasys commersonnii	Research
Mangrove snapper	Lutjanus argentimaculatus	Research
South Coast Sea Urchin	Tripneustes gratilla	Research
South African Clam	Pecten sulcicostatus	Research
Bloodworm	Arenicola loveni	Research

3.3. Marine aquaculture production

3.3.1 Marine aquaculture production in 2017

In the South Africa's Aquaculture yearbook 2018, production is defined as the quantity of organisms produced from a farm specifically for human consumption and is expressed in tonnage. This definition excludes seaweed which in South Africa is used as abalone feed. South Africa's total marine aquaculture production in 2017 was 3907.76 tons. Table 5 below illustrates the total production per sub-sector in each province. In 2017 the Western Cape Province recorded a production of 3446.04 tons and was the main contributor of South Africa's total marine aquaculture production followed by the Eastern Cape and Northern Cape with a production of 379.70 and 50.01 tons respectively. Kwa-Zulu Natal Province was the lowest contributor, recording a production of 32.01 tons.

Table 5: 2017 Marine Aquaculture total productions for human consumption per sub-sector and province

Production (tons) per species and province					
Species	**WC**	**EC**	**NC**	**KZN**	**Total**
Abalone	1089.59	136.46	50.01	0.00	1276.06
Finfish	0.00	83.51	0.00	32.01	115.52
Mussels	2083.52	0.00	0.00	0.00	2083.52
Oysters	272.93	159.73	0.00	0.00	432.66
Total	3446.04	379.7	50.01	32.01	3907.76

South Africa's total marine aquaculture production decreased by 232.42 tons from 4140.18 tons recorded in 2016, representing a decrease of 5.61%. The marine sector contributed 69.93% to the overall aquaculture production of 5588.46.

In terms of the subsectors production analysis, as outlined in Table 5 above, mussel sub-sector contributed 53.32% to the total marine aquaculture production. It recorded an increase in production by 122.57 tons (6.25%) from 2016. The abalone sub-sector contributed 32.65% towards the overall marine aquaculture production, and has decreased by 427.26 tons (25.08%) from 2016. The finfish sub-sector contributed 2.96% towards the overall marine aquaculture production and demonstrated a decrease of 3.12 tons (2.63%) from 2016. The oyster sub-sector contributed 11.07% towards the overall marine aquaculture production and demonstrated an increase of 75.39 tons (21.10%) from 2016 (Figures 3 and 4 below). Seaweed, which has been excluded in the total production recorded 862.07 tons in 2017, due to inconsistent recording of this subsector, the growth rate between 2016 and 2017 cannot be determined.

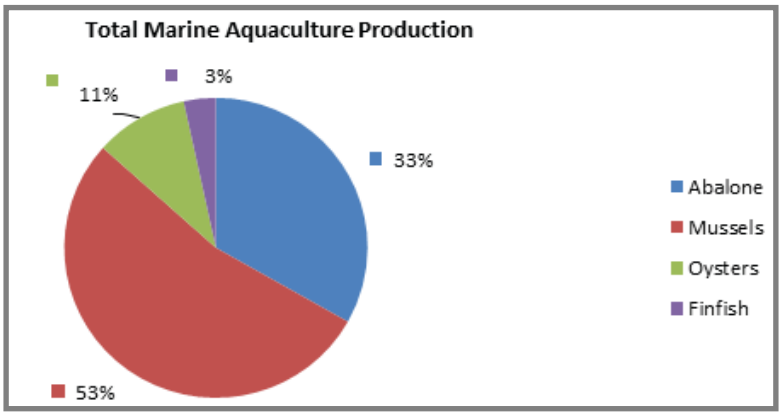


Figure 3: Contribution of each sub-sector to total marine aquaculture production in 2017.

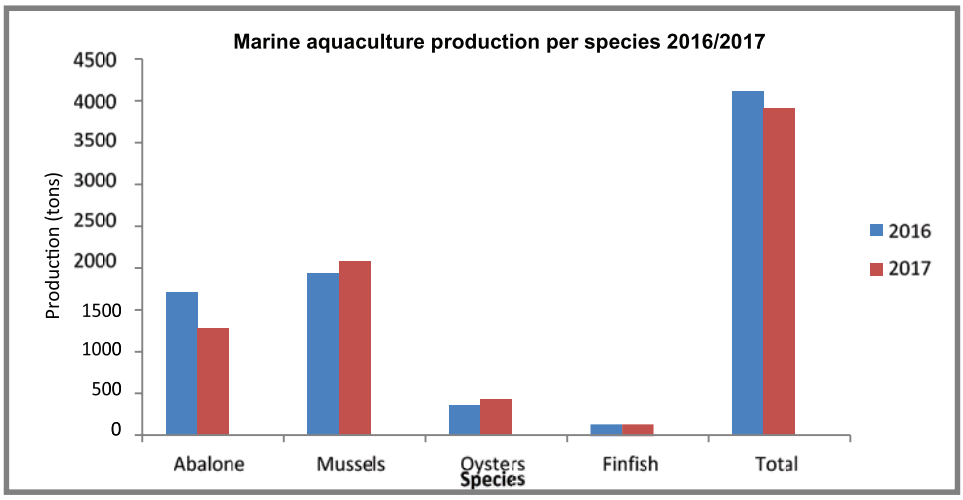


Figure 4: Marine aquaculture production per species for 2016 and 2017.

3.3.2. Marine aquaculture production trend from 2008 to 2017

Marine aquaculture production has been growing rapidly (exponential growth) since the year 2008 (figure 5 below). Over the ten (10) year period, the lowest production volume was 1860.2 tons recorded in the year 2009 and the highest production volume was 4140.18 tons recorded in the year 2016, table 6 below.

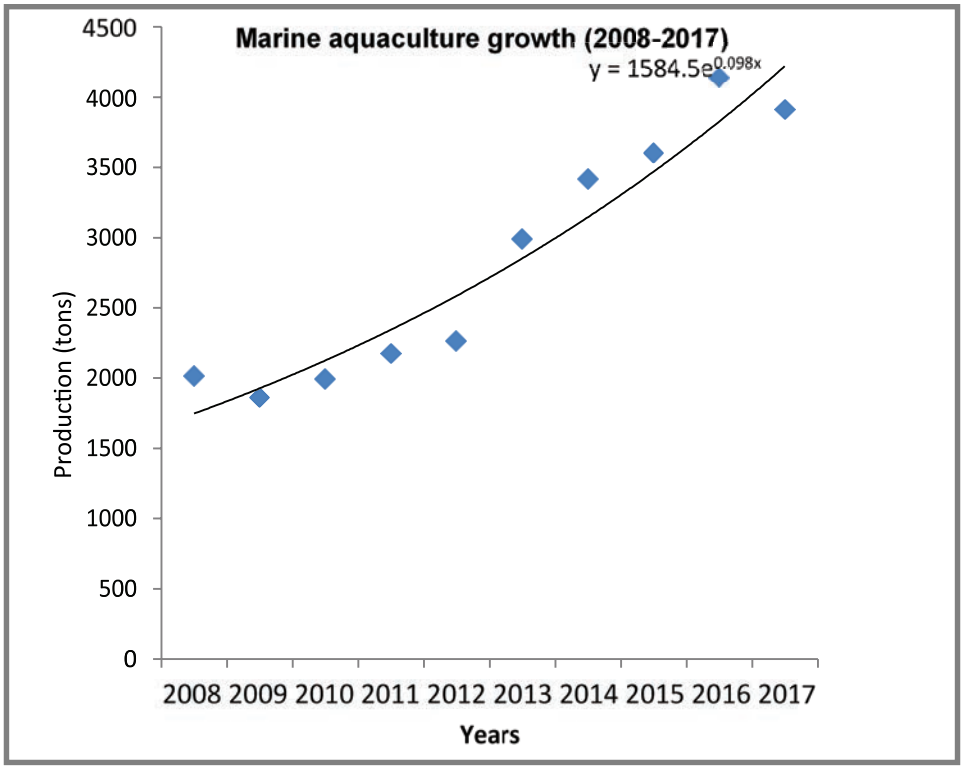


Figure 5: Growth rate of the marine aquaculture industry from 2008 to 2017.

Table 6: South Africa's marine aquaculture production 2008-2017 (*Totals exclude seaweed)

Sub- sector	Year and Production (tons)										Total production (2008-2017)
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Abalone	1037.1	913.6	1015.4	1036.0	1111.4	1469.8	1306.8	1488.7	1703.32	1276.06	12358.18
Finfish	2.7	22.8	0.0	8.0	48.5	122.5	161.9	77.3	118.64	115.52	677.86
Mussels	736.7	682.4	700.1	859.8	859.8	1116.1	1682.5	1758.5	1960.95	2083.52	12440.37
Oysters	226.6	223.5	276.6	269.3	241.6	277.2	266.4	276.8	357.27	432.66	2847.93
Prawns	11.4	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	29.30
Seaweed	1833.5	1900.2	2015.0	2884.6	2000.0	0.0	1643.6	0.0	1114.4	862.07	14253.37
Totals*	**2014.5**	**1860.2**	**1992.1**	**2173.1**	**2261.3**	**2985.6**	**3417.6**	**3601.3**	**4140.18**	**3907.76**	**28353.64**

3.4. Marine aquaculture analysis per sub-sector

3.4.1 Abalone sub-sector

The abalone species currently being cultivated in South Africa is Haliotis midae. In 2017, the abalone sub-sector contributed 32.65% to South Africa's total marine aquaculture production recording a total of 1276.06 tons (Figure 6). The abalone sub sector has decreased by 427.26 (25.08%) from 2016 (Figure 3) due algal boom (red tide).

The abalone sub-sector comprised of eighteen (18) farms in 2017 compared to nineteen (19) farms which were operational in 2016. The abalone sub-sector distribution range stretches from the Northern Cape and Western Cape to the Eastern Cape provinces. Five (5) farms were operating in the Northern Cape, two (2) in Eastern Cape and eleven (11) in Western Cape. There were no abalone farms operating in Kwa-Zulu Natal.

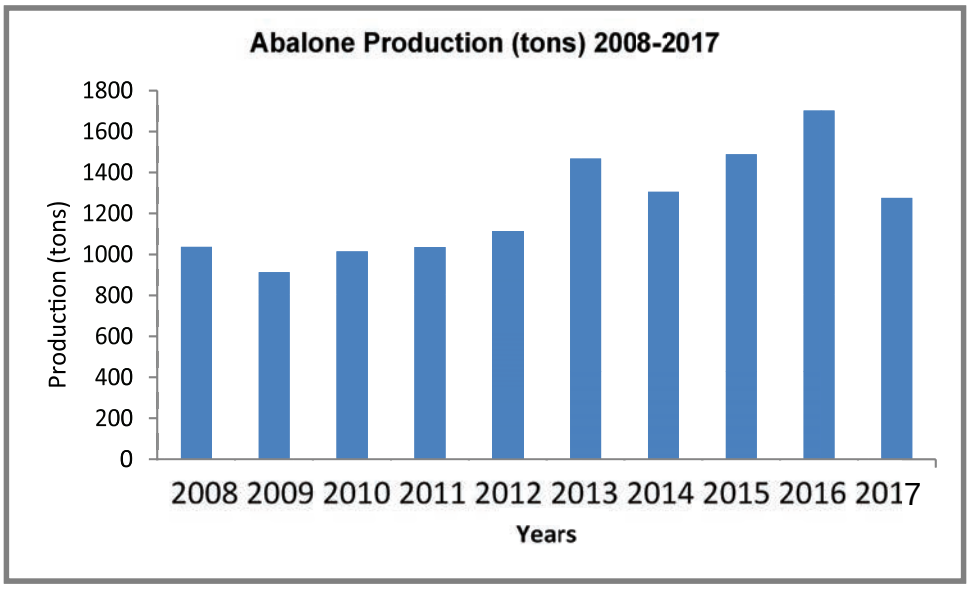


Figure 6: Abalone production in South Africa from 2008-2017.

3.4.2 Finfish sub-sector

The finfish sub-sector in South Africa is an emerging industry and it is showing great potential in terms of production. Over the years a number of species have been piloted to assess the feasibility and market access. In 2017 the sub-sector recorded a production of 115.52 tons which is 2.96 % of the total marine aquaculture production (Figure 7). The finfish sub-sector has decreased by 3.12 tons (2.63%) from 2016.

A total of five (5) finfish aquaculture farms were operational in 2017, recording a decrease from the six (6) farms operating in 2016. Finfish farming in the Western Cape is represented by one (1) cage culture system situated in Saldanha Bay, two (2) pond culture facilities in Kwa-Zulu Natal and two (2) recirculation facilities in the Eastern Cape.

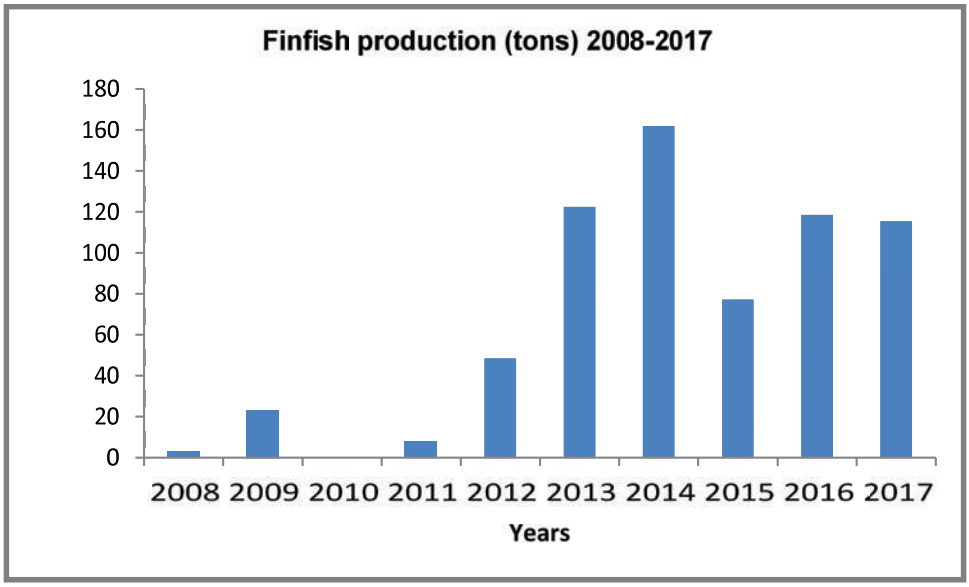


Figure 7: Finfish production in South Africa from 2008-2017.

3.4.3 Mussel sub-sector

Mussel farming in South Africa is situated in Saldanha Bay in the Western Cape, and in 2017 there were ten (10) farms in operation recording an increase from the eight (8) farms operating in 2016. The species cultured in South Africa are the exotic Mediterranean mussel (Mytilus galloprovincialis) and the indigenous black mussel (Choromytilus meridionalis). In 2017 the mussels sub-sector recorded production of 2083.52 tons recording an increase of 122.57 tons (6.25%) from the 1960.95 tons of mussels produced in 2016 (Figure 8). The mussel sub-sector contributed 53.32% (Figure 3), to the total marine aquaculture production in 2017 and is currently the highest contributor to aquaculture in South Africa.

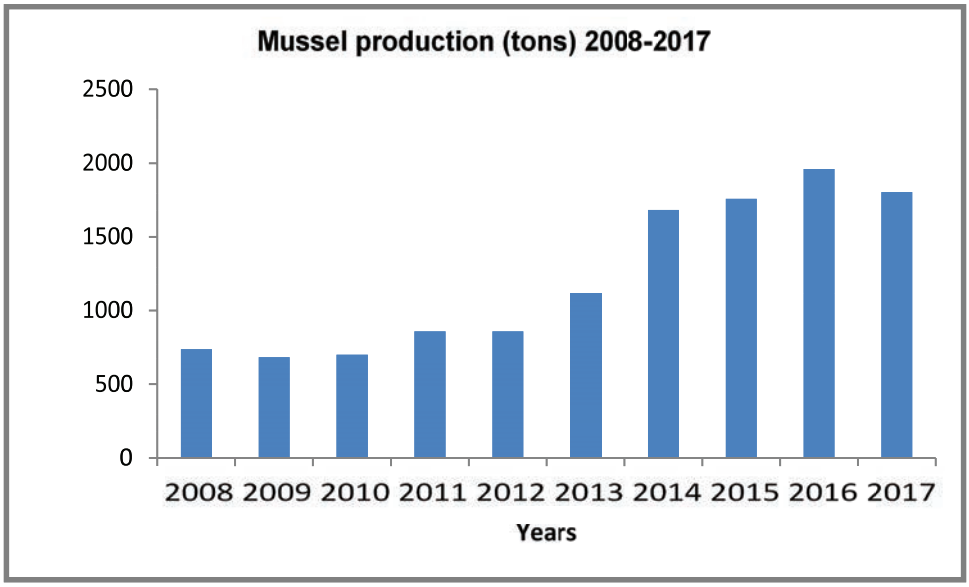


Figure 8: Mussel production in South Africa from 2008-2017.

3.4.4 Oyster sub-sector

The species cultivated in South Africa is the exotic Pacific Oyster (Crassostrea gigas). In 2017 the sub-sector recorded a production of 432.66 tons and contributed 11.07% (Figure 9 and Figure 3) towards the overall marine aquaculture production and demonstrated an increase of 75.39 tons (21.10%) from 2016. A total of five (5) oyster aquaculture farms were operational in 2017. There were two (2) Oyster farms situated in the Western Cape, two (2) in the Eastern Cape and one (1) Northern Cape.

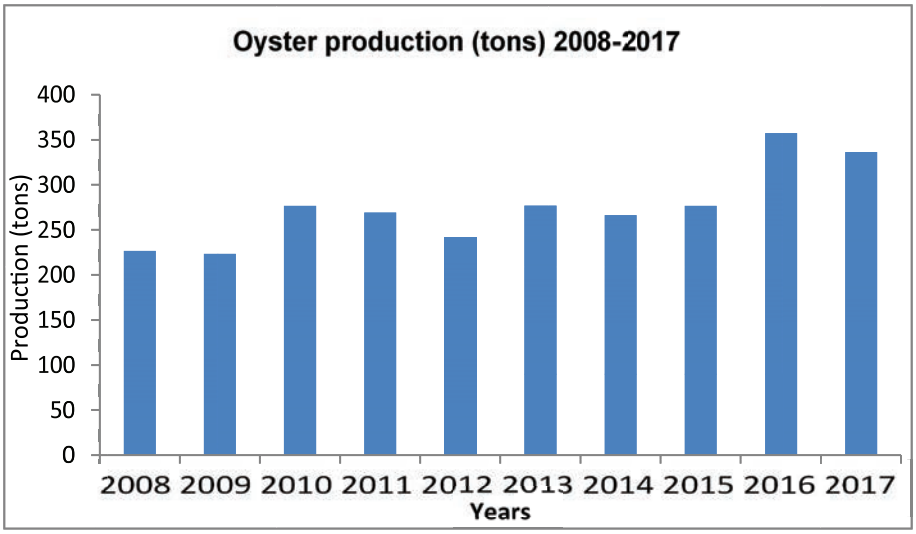


Figure 9: Oyster production in South Africa from 2008-2017.

3.5. Marine Aquaculture Authorisations in 2017

The Department of the Environment, Forestry and Fisheries (DEFF), Branch: Fisheries Management is the responsible Department for the granting of Rights, Exemptions, and permits for the marine aquaculture sector in South Africa. Marine Aquaculture continues to be managed under the Marine Living Resources Act, 1998 (Act 18 of 1998) (MLRA). The MLRA created regulatory framework for the conservation of ecosystems, the sustainable utilization of marine living resources and the orderly access to exploitation, utilization and the protection of certain marine living resources. Even though Marine Aquaculture is more development focus, it forms part of the activities that are regulated in terms of the MLRA due to its utilisation of marine space and species. Aquaculture legislation is currently fragment, which is a challenge being faced by the aquaculture sector in South Africa. The Department has embarked on a process of developing aquaculture legislation since 2014, through the development of the Aquaculture Bill. This will provide for the streamlining of authorisations and the development of a permitting framework for the regulation of both the marine and freshwater aquaculture sectors in South Africa.

3.5.1. Marine Aquaculture Rights

Marine Aquaculture Rights are granted in terms of Section 18 (1) of the MLRA, which states that:
"No person shall undertake commercial fishing or subsistence fishing, engage in mariculture or operate a fish processing establishment unless a right to undertake or engage in such an activity or to operate such an establishment has been granted to such a person by the Minister".

The Marine Aquaculture Policy, gazetted in September 2007, provides for the Department to grant Marine Aquaculture long-term Rights which are valid for a period not exceeding fifteen (15) years. On the 27th March 2009, the Minister gazetted a General Notice No. 313 of 2009 inviting applications for long term Rights.

In 2017, the Department embarked on a Rights re-application process for existing Marine Aquaculture Rights. Seventeen (17) marine aquaculture rights were granted in the Northern Cape, Western Cape and Eastern Cape (Table 7) during the Marine Aquaculture Right renewal process for existing marine aquaculture operations in the sector.

Applications for new marine aquaculture Rights can be submitted to the DEFF on a continuous basis. The application process is open to any individual or registered business entity that has shown interest in undertaking an aquaculture activity. The applicant must meet the criteria as set out in the application form and provide the relevant supporting documentation as required.

Table 7: Rights renewed in 2017 to engage in marine aquaculture activity.

Company Name	Operational Area	Species	Duration of Right
Abagold (Pty) Ltd (previously Hermanus Abalone (Pty) Ltd)	Lot 6A (Erf 248), Erf 37/7994, Lot 36, Erf 11000, Hermanus, Western Cape	Abalone: Haliotis midae Seaweed: Ulva lactuca, Gracilaria; Porphyra capensis	30/06/2017 – 30/06/2032
Aqunion (Pty) Ltd (previously Aquafarm Development (Pty) Ltd)	Plot 9A, New Harbour, Hermanus, Western Cape	Abalone: Haliotis midae	30/06/2017 – 30/06/2032
Aqunion (Pty) Ltd (previously Roman Bay Sea Farm (Pty) Ltd)	Prtn. 2 of Farm Klipfontein 711, Gansbaai, Western Cape	Abalone: Haliotis midae	30/06/2017 – 30/06/2032
Blue Cap General Trading (Pty) Ltd	Erf 26, Paternoster, Western Cape	Abalone: Haliotis midae Dusky kob: Argyrosomus japonicus Yellowtail: Seriola lalandii	30/06/2017 – 30/06/2032
Blue Ocean Mussels (Pty) Ltd (previously Blue Bay Aqua-farm (Pty) Ltd)	Sea water area in "Inner Bay", Port of Saldanha, Western Cape	Mussels: Mytilus galloprovincialis; Choromytilus meridionalis Oysters: Crassostrea gigas	30/06/2017 - 30/06/2032
Blue Ocean Mussels (Pty) Ltd (previously La Vie Seafood Products (Pty) Ltd)	Plot 770, Velddrift, Western Cape	Abalone: Haliotis midae Mussels: Mytilus galloprovincialis; Choromytilus meridionalis	30/06/2017 - 30/06/2032
HIK Abalone (Pty) Ltd (previously Farmprops 56 (Pty) Ltd)	Prtn. 2 of Farm 308; Prtn 8 of Farm 339, Bredasdorp, Buffeljagtsbaai, Western Cape	Abalone: Haliotis midae Seaweed: Ulva lactuca	30/06/2017 – 30/06/2032
HIK Abalone Farm (Pty)Ltd	Erf 7993, Hermanus, Western Cape	Abalone: Haliotis midae	30/06/2017 – 30/06/2032
Irvin & Johnson Ltd	Prtn. Remainder of Farm Klipfontein No. 711; Danger Point; Seawater in Gansbaai Harbour, Western Cape	Abalone: Haliotis midae Seaweed: Gracilaria sp.; Ulva sp.	30/06/2017 – 30/06/2032
Jacobsbaai Sea Products (Pty) Ltd	Prtn. 18 of Farm 108, Jacobsbaai, Western Cape	Abalone: Haliotis midae	30/06/2017 – 30/06/2032
Jaymat Enviro Solutions CC (previously Mbasa Sea Farms CC)	Keiskamma River Mouth, Hamburg, Eastern Cape	Oysters: Crassostrea gigas Dusky kob: Argyrosomus japonicas	30/06/2017 – 30/06/2032
Kleinzee Mariculture CC (previously De Beers Ltd)	Prtn. of Prtn. 5 of Farm Kleinzee, Western Cape	Oysters: Crassostrea gigas	30/06/2017 – 30/06/2032
Marine Growers (Pty) Ltd (previously Premier Fishing SA (Pty) Ltd)	Erf 1727, Gansbaai, Western Cape	Abalone: Haliotis midae	30/06/2017 – 30/06/2032
Diamond Coast Aquaculture (Pty) Ltd (previously Really Useful Investments No. 72 (Pty) Ltd)	Prtn. Of Prtn. 5 of Farm Kleinzee 193, Northern Cape	Abalone: Haliotis midae Seaweed: Gracilaria sp.	30/06/2017 – 30/06/2032
Relmar Investments (Pty) Ltd	Lot 45 over Erf 248, New Harbour, Hermanus, Western Cape	Abalone: Haliotis midae	30/06/2017 – 30/06/2032
West Coast Abalone (Pty) Ltd (previously J H Abalone Trust)	Prtn. 21 of Farm Duyker Eiland No. 6	Abalone: Haliotis midae	30/06/2017 – 30/06/2032

Zwembesi Farms (Pty) Ltd (previously South Cape Oysters)	Sea area in Port of Port Elizabeth	Oysters: Crassostrea gigas; Striostrea margaritacea Mussels: Mytilus galloprovincialis	30/06/2017 – 30/06/2032
		Perna perna; Choromytilus meridionalis Scallops: Pecten sulcicostatus	

3.5.2. Exemptions

Exemptions are granted in terms of Section 81 of the MLRA, which states that:
"If in the opinion of the Minister there are sound reasons for doing so, he or she may, subject to the conditions that he or she may determine, in writing exempt any person or group of persons or organ of state from a provision of this Act."

Most marine aquaculture Fish Processing Establishments (FPEs) operate under an Exemption due to institutional challenges in the granting of Marine Aquaculture Fish Processing Establishment (FPE) Rights. Exemptions for "the possession and sale of undersized abalone and kob" (herein referred to as "local sales permits") are granted to allow for the local sales of the products due to the implementation of wild caught fish size limitations on farmed products. The Exemption process is a legislative process that is used as a mechanism to allow for the processing and local sale of undersized cultured products sold locally on the market in retailers and restaurants.

3.5.3. Permits

To activate a Right or Exemption, a Permit is issued in accordance with Section 13 of the MLRA which states that:

(1) "No person shall exercise any right granted in terms of section 18 or perform any other activity in terms of this Act unless a permit has been issued by the Minster to such a person to exercise that Right or perform that activity:

(2) Any permit contemplated in subsection (1) shall-
(a) be issued for specific period not exceeding one year;
(b) Be issued subject to the conditions determined by the Minister in the permit; and
(c) Be issued against payment of any fees determined by the Minister in terms of section 25(1).

(3) The holder of a permit shall at all times have that permit available for inspection at the location where the right or activity in respect of which the permit has been issued, is exercised.

(4) A permit to exercise an existing right in terms of the Act may be refused if the conditions of a previously issued permit had not been adhered to."

During 2017, a total of 229 permits for Marine Aquaculture were issued in South Africa to Right holders, agencies, importers, exporters, FPEs and transportation companies (Table 8). The total permits issued for imports exceeded the number of permits issued for exports, this is a clear reflection of increased fish demand and value added traders in the country due to increased fish processing, packaging, re- selling to local markets and re-exporting products to other African countries through South Africa. There were 28 permits issued to "Possess and sell Undersized Cultured Abalone obtained from Right holder" depicting a remarkable decrease from the 52 permits issues in 2016, was however the local demand for abalone sale in the domestic markets, especially in the hospitality and retailing industry, remained steady.

Table 8: Types of permits issued in 2017.

Permit type	Number issued
General Imports	52
Ornamental Imports	11
Exports	53
Transport	11
Engage in Marine Aquaculture Activities	34
Possess Broodstock and Operate a Hatchery	9
Possess and sell Undersized Cultured Abalone obtained from Right holder	
(Exemption permits)	28
Permit to possess and sell undersized kob obtained from a Right Holder	0
(Exemption permits)	
Right to Engage in Abalone Ranching and Stock Enhancement Pilot Project:	4
Seeding	
Engage in Ranching Activities of Marine Species: Harvesting	2
Collect Broodstock for Marine Aquaculture purposes	0
Operate a Fish Processing Establishment (Exemption permits)	16
Scientific Investigations and Practical Experiments	4
Permit for the Purposes of Diving and possession of prohibited gear within the	
listed areas in terms of Regulation 3(3) of Government Gazette no. 30716 of 1 February 2008 (Regulations for the protection of wild abalone)	5
Total Issued	229

3.6. Marine aquaculture site surveillance during 2017.

The D: SAM conducts site surveillance on an annual basis to various marine aquaculture farms when necessary. This has played a vital role since 2008 in updating information on growth in the sector and ensuring compliance with the Department's marine aquaculture permitting frameworks and regulations promulgated under the Marine Living Resources Act, 1998 (Act No. 18 of 1998). The purpose of the site visits are to ensure compliance with food safety requirements (e.g. annual EU food safety inspections), permit conditions, and to obtain information on any changes in shareholding, marketing, culture techniques and expansion activities in the marine aquaculture sector. This has been essential in ensuring that non - compliant operations are communicated through proper channels such that the Chief Directorate: Monitoring, Control and Surveillance (MCS) performs its role responsibly in protecting the wellbeing of the industry. This has also ensured open channels of communication between the Department and the marine aquaculture industry in the development of permit conditions for the sector. In 2017, the Department conducted ten (10) site surveillance of which nine (9) were marine aquaculture operations and one (1) was a marine aquaculture Fish Processing Establishment (FPE). The operations and the FPE visited are outlined below:

- 4 mussel (Mytilus galloprovincialis) grow out operations in Saldanha Bay, Western Cape
- 3 oyster (Crassostrea gigas) grow out operations in Saldanha Bay, Western Cape
- 1 oyster (Crassostrea gigas) nursery operation in Saldanha Bay, Western Cape
- 1 finfish sea cage pilot operation for coho salmon (Onchorhynchus kisutch) and rainbow trout (Onchorhynchus mykiss) in Saldanha Bay, Western Cape
- 1 mussel (Mytilus galloprovincialis) marine aquaculture FPE in Veldrift, Western Cape

04

STATUS OF THE FRESHWATER AQUACULTURE IN 2017

4.1. Freshwater aquaculture farms in 2017

Freshwater aquaculture is advantaged in that it can take place in all nine (9) provinces. During 2017, a total of 172 freshwater farms were recorded, representing three (3) farms less than that recorded in 2016. Gauteng province had the highest number of farms operating in 2017 with a total of thirty six (36), followed by Western Cape Province with thirty (30), Mpumalanga (28), Limpopo (24), Kwa-Zulu Natal (19), North West (17), Eastern Cape (8), Free State (8) and Northern Cape (2) as shown in Table 9.

Table 9: Total number of freshwater aquaculture farms operating in South Africa by sub-sector and province in 2017.

Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Tilapia	3	0	24	5	18	12	1	16	2	81
Trout	0	0	1	5	0	12	0	0	24	42
Catfish	2	4	1	0	4	1	0	3	0	15
Marron Crayfish	1	0	0	0	0	0	0	0	0	1
Carp	0	0	1	0	1	0	1	0	1	4
Koi carp	0	2	5	2	0	1	0	0	1	11
Orna-mental	2	2	4	5	1	2	0	0	2	18
Total	8	8	36	17	24	28	2	19	30	172

**The above data does not include information on crocodile farms.

4.2. Freshwater aquaculture species farmed in 2017

The 2017 freshwater aquaculture sub-sectors include trout (Onchorynchus mykiss and Salmo trutta), tilapia (Oreochromis mossambicus, Oreochromis niloticus and Tilapia rendalli), catfish (Clarias gariepinus), carp (Cyprinus carpio and Ctenopharygodon idella), marron crayfish (Cherax tenuimanus), and a number of ornamental species (e.g. Koi-carp). A total of seven (7) species were farmed at a commercial scale (Table 10).

Table 10: Freshwater aquaculture species cultured in South Africa in 2017 and their operational scale.

Common Name	Scientific Name	Operational Scale
Rainbow trout	Oncorhynchus mykiss	Commercial scale
Brown trout	Salmo trutta	Commercial scale
Mozambique tilapia	Oreochromis mossambicus	Small scale
Nile Tilapia	Oreochromis niloticus	Commercial scale
African Sharptooth catfish	Clarias gariepinus	Small scale
Common carp	Cyprinus carpio	Small scale
Koi carp	Cyprinus carpio	Small scale
Marron (Freshwater crayfish)	Cherax tenuimanus	Small scale

4.3. Freshwater aquaculture production

4.3.1 Freshwater aquaculture production in 2017

In 2017, South Africa's total freshwater aquaculture production was 1680.70 tons. The trout sub-sector was the highest contributor with 1249.80 tons, followed by tilapia with 402.30 tons, Ornamentals with 9.00 tons, Koi Carp 7.00 and Carp 5.30. Marron crayfish and African catfish had the lowest production of 4.00 tons and 3.30 tons respectively (Table 11).

Table 11: Production (tons) per species per province.

Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Tilapia	21.5	0	89.8	6.5	146.5	43	3	87	5	402.3
Trout	0	0	21	378.7	0	138	0	0	712.1	1249.8
Catfish	3.3	0	0	0	0	0	0	0	0	3.3
Marron crayfish	4	0	0	0	0	0	0	0	0	4
Carp	0	0	1.6	0	2.5	0	0.6	0	0.6	5.3
Koi-carp	0	0.8	3.7	1.4	0	0.6	0	0	0.5	7
Ornamental	1.7	1.2	0	3.1	0.8	1.3	0	0	0.9	9
Total	30.5	2	116.1	389.7	149.8	182.9	3.6	87	719.1	1680.7

The total freshwater aquaculture production decreased by 186.41 tons from 1867.11 tons recorded in 2016, representing a decrease of 9.98%. The total freshwater aquaculture contribution to the overall aquaculture production is 30.07 % of 5588.46 tons.

The trout subsector contributed 74.39% to the total freshwater aquaculture production (Figure 10). It recorded a decrease of 253.2 tons (16.85%) from 2016 (Figure 11). The tilapia subsector contributed a percentage of 23.94% and recorded an increase of 61.49 tons (18.04%) (Figure 10 and Figure 11). The other subsectors (ornamentals, koi-carp, carp, marron crayfish and catfish) respectively contributed 0.54%, 0.42%, 0.32%, 0.24% and 0.2% to the total freshwater aquaculture production (Figure 10). These four latter subsectors recorded same production volumes as the ones recorded in 2016.

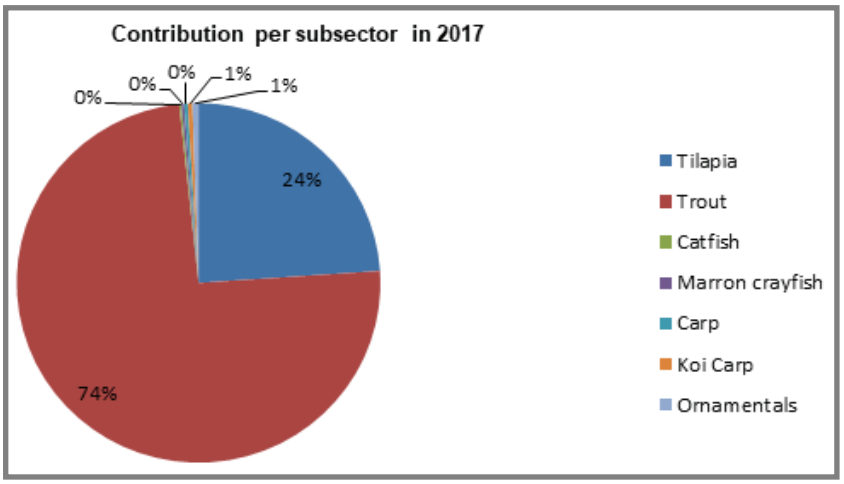


Figure 10: The contribution of each freshwater aquaculture sub-sector to the total production in 2017

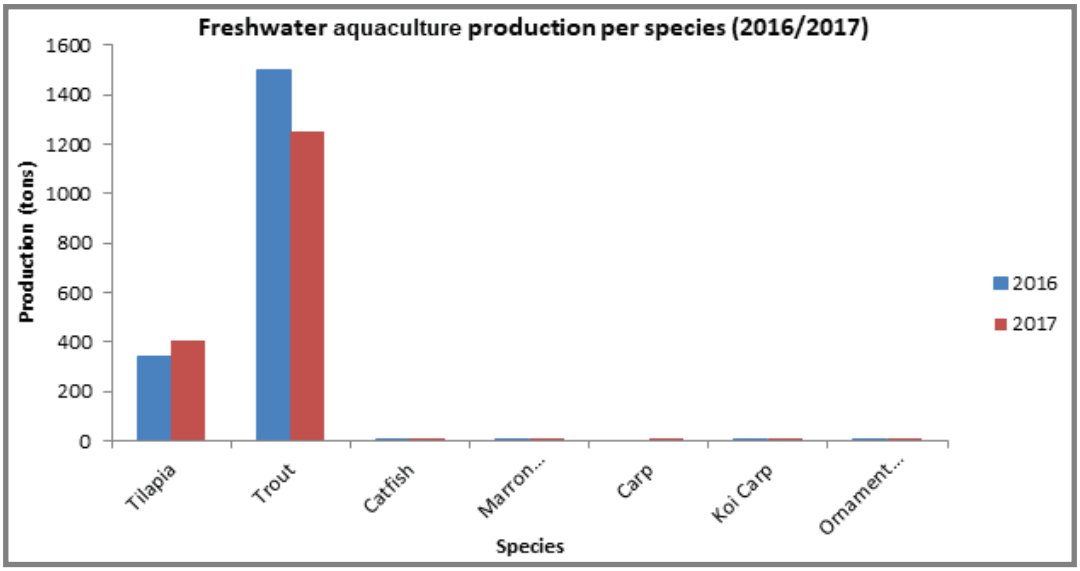


Figure 11: Production of freshwater aquaculture species for 2016 and 2017

4.3.2 Freshwater aquaculture production from 2008-2017

South Africa's freshwater aquaculture industry has shown a rapid growth since the year 2008. From 2008 to 2017, total production recorded is 15486.81 tons. The industry's production have increased by 557.3 tons since 2008, demonstrating a 49.61% increase (Figure 12 below). Over the ten (10) year period, the lowest production volume recorded was in 20181123.4 tons while the highest production volume was recorded in 2016 at 1867.11 tons (Table 12).

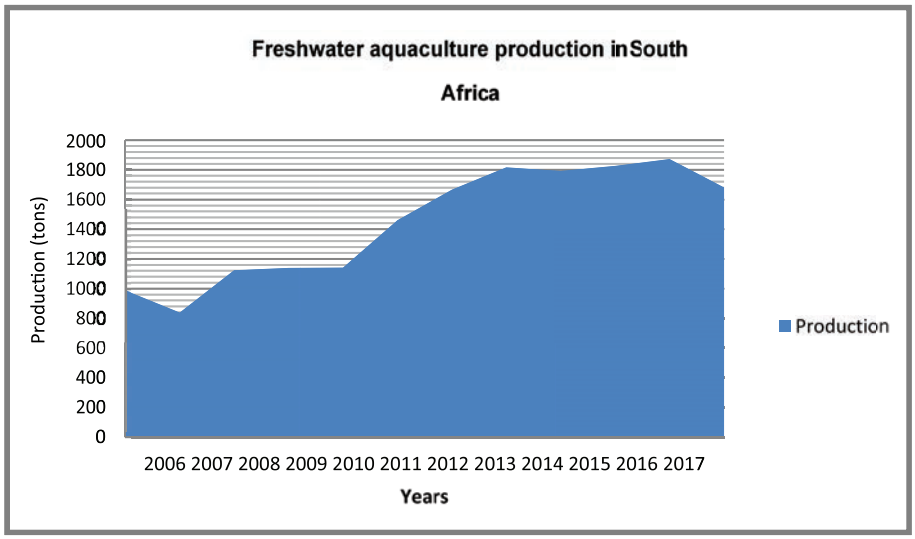


Figure 12: South Africa's freshwater aquaculture production from 2008-2017.

Table 12: Freshwater aquaculture production from 2008-2017 per sub-sector

Subsector	Year and production(tons)										Total production (tons)
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008 - 2017
Tilapia	0	10	10	100	234.17	289.71	289.71	325.29	340.81	402.30	2001.99
Trout	943	948.62	950	1199	1428	1497.3	1497.3	1497	1503	1249.8	12713.02
Catfish	180	180	180	160	0	0	0	0	3.3	3.3	706.60
Marron crayfish	0.4	0.4	0.8	0.8	3.5	5	5	4	4	4	27.9
Carp	0	0	0	0	0	0	0	0	0	5.3	5.3
Koi Carp	0	0	0	0	0	0	0	0	7	7	14
Ornamentals	0	0	0	0	0	0	0	0	9	9	18
Totals	1123.4	1139.02	1140.8	1459.8	1665.67	1792.01	1792.01	1826.29	1867.11	1680.70	15486.81

4.4 Analysis of freshwater aquaculture sub-sector

4.4.1 Trout sub-sector

Onchorynchus mykiss and Salmo trutta are the two (2) trout species currently cultured in South Africa. The trout sub-sector has contributed 74% of South Africa‘s total freshwater production in 2017, recording a total production of 1249.8 tons (table 12 and figure 13). There was a decrease of 253.2 tons, representing 16.85 % of the Trout sub-sector.
The trout farms are currently located in the Western Cape, Mpumalanga, Eastern Cape and Kwa-Zulu Natal provinces. The technology used to cultivate these species includes raceway, pond, cage culture and recirculating systems.

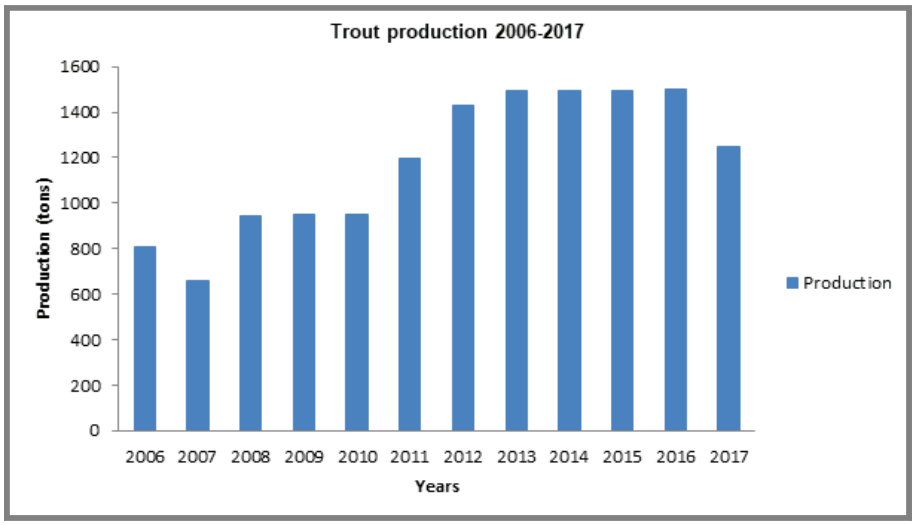


Figure 13: Trout production in South Africa from 2006-2017.

4.4.2 Tilapia sub-sector

The tilapia sub-sector in South Africa is based on the culture of the two (2) species, namely, the Mozambique tilapia (Oreochromis mossambicus) and the Nile tilapia (Oreochromis niloticus). This sub-sector contributed 23.94% to South Africa’s freshwater production, recording 402.3 tons (Table 12). There was a 61.49 tons (18.04%) increase in production from 2016 to 2017 (Figure 14). Most tilapia farmers are small scale farmers and they employ recirculation and pond culture systems and are located in all the provinces except in the Free State Province.

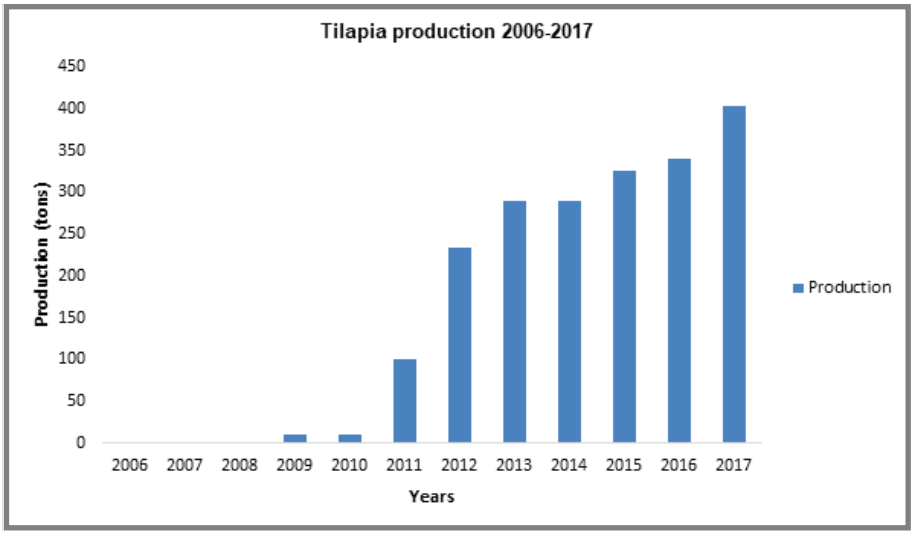


Figure 14: Tilapia production in South Africa from 2006-2017

4.4.3 Catfish sub-sector

The catfish sub-sector in South Africa is based on the indigenous species, the African sharptooth catfish (Clarias gariepinus). The catfish industry maintained a record of 3.3 tons production volume in 2017 as was recorded in 2016 (Figure 15). The sub-sector therefore contributed only about 0.20% to the total freshwater production. Most of the farmers concentrated on producing fingerlings for the export market rather than growing the fish to market size. The only one farm producing catfish to market size is in the Eastern Cape Province.

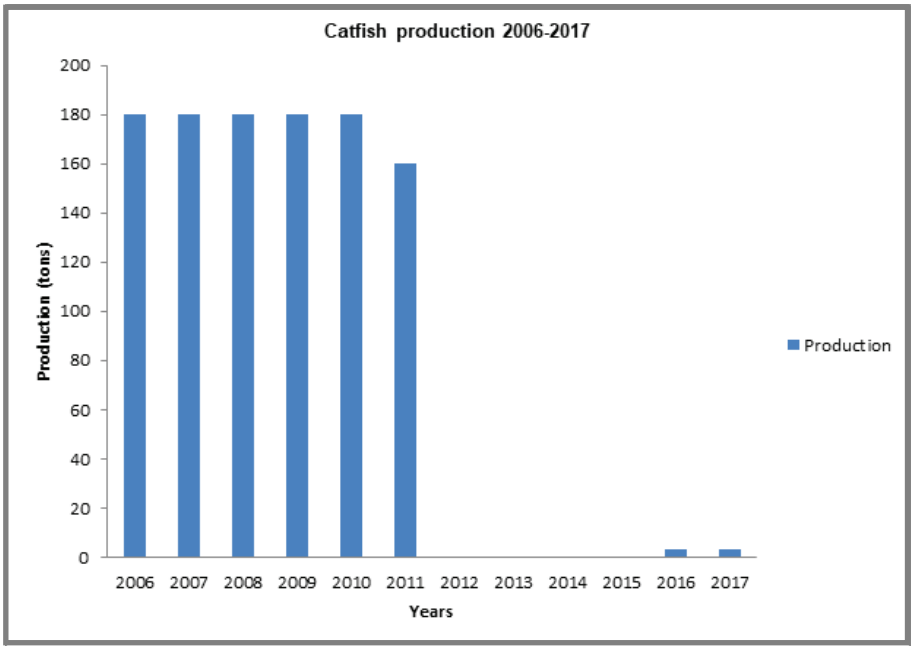


Figure 15: Catfish production in South Africa from 2006-2017

4.4.4 Marron crayfish sub-sector

Marron crayfish (Cherax tenuimanus) is exotic to South Africa with a single farmer culturing the species. The farm continued to produce a total of 4.00 tons in 2017 as was in 2016 (Figure 16). Marron crayfish produced in 2017 contributed 0.24% to the total freshwater aquaculture sector. The current marron crayfish farm is located in the Eastern Cape where it is cultured in tanks during the juvenile phase, before being moved to semi-intensive pond culture for grow-out.

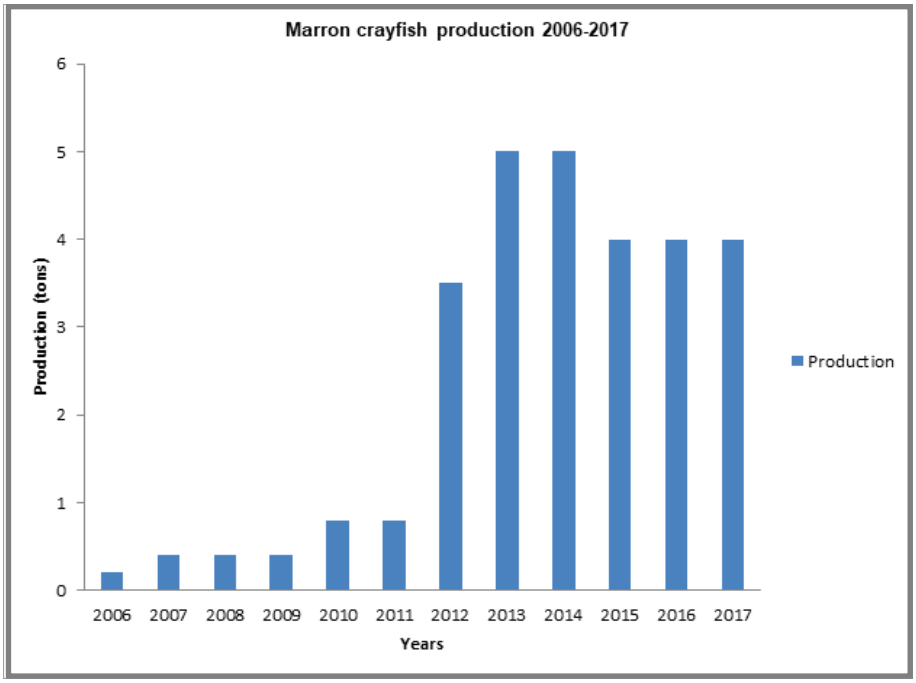


Figure 16: Marron crayfish production in South Africa from 2006-2017

4.4.5 Ornamental sub-sector

The Ornamental sub-sector has contributed 0.54% to South Africa's total freshwater production in 2017, recording the same production of 9 tons as was recorded in 2016 (Table 12, Figure 17). The Ornamental farms are currently located in the Western Cape, Mpumalanga, Eastern Cape, Free-State, Limpopo and Kwa-Zulu Natal provinces.

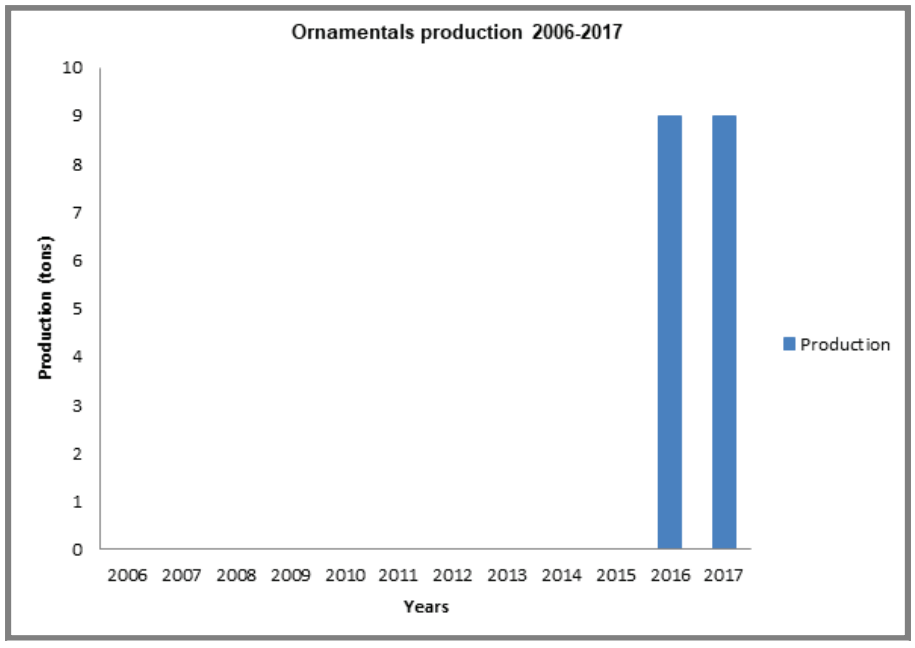


Figure 17: Ornamentals production in South Africa from 2006-2017

4.4.6 Koi Carp sub-sector

The Koi Carp sub-sector has contributed 0.42% to South Africa's total freshwater production in 2017, with a total production of 7 tons as was recorded in 2016 (Table 12 and figure 18). The Koi Carp farms are currently located in the Western Cape, Mpumalanga, Eastern Cape, Free-State, Gauteng and Kwa-Zulu Natal provinces.

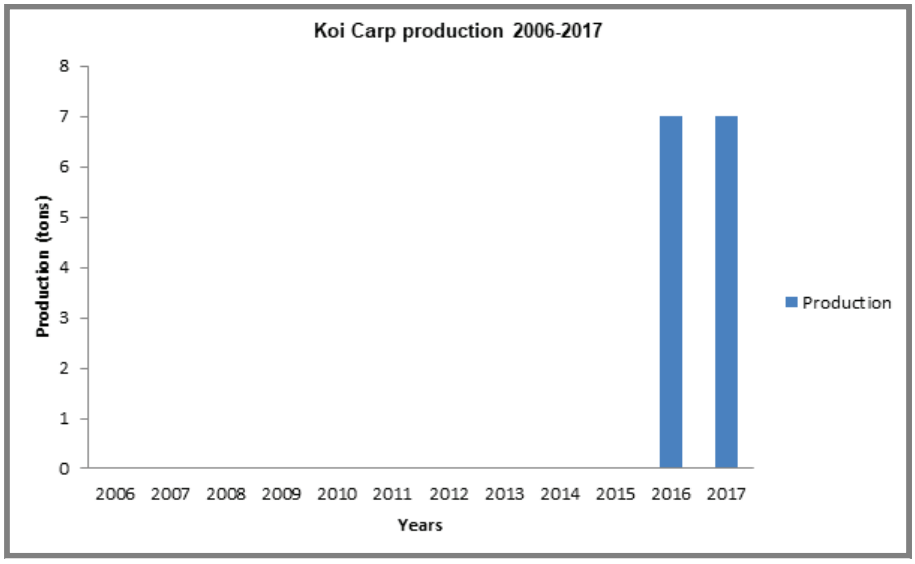


Figure 18: Koi Carp production in South Africa from 2006-2017

4.4.7 Carp sub-sector

The Carp sub-sector has contributed 0.32% to South Africa's total freshwater production in 2017, recording a total production of 5.3 tons (Table 12 and Figure 19). The carp farms are currently located in the Western Cape, Gauteng, Limpopo and Northern Cape provinces.

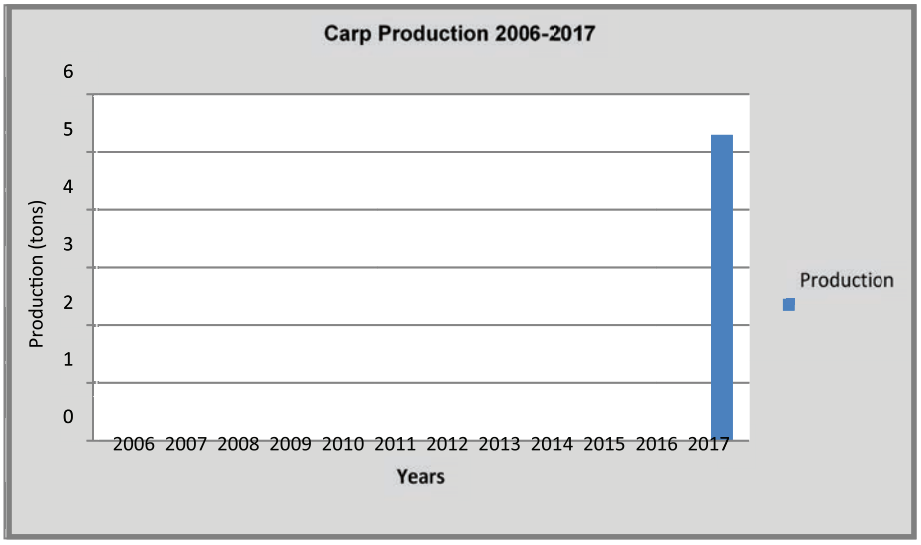


Figure 19: Carp production in South Africa in 2017

4.5 Freshwater aquaculture authorisations in 2017

There are no national authorizations for the freshwater aquaculture sector. This is due to lack of overarching legislative tool by the lead government department, i.e. DEFF. The DEFF is addressing this challenge through development of an Aquaculture Development Bill.

4.6 Freshwater site surveillance in 2017

No site surveillances were undertaken for freshwater aquaculture in 2017. The DEFF is limited by the non-existent legislative tools. Some farms were visited as part of the Aquaculture Development and Enhancement Programme (ADEP) and are accounted for in the ADEP section of this report.

05

PROVINCIAL ANALYSIS OF SOUTH AFRICA'S AQUACULTURE SECTOR IN 2017

5.1. Eastern Cape

The Eastern Cape is one of the four coastal provinces able to undertake both marine and freshwater aquaculture activities. The province has the advantage of several ports for transportation.

Number of farms and species farmed: : In 2017, the Eastern Cape Province recorded a total of fourteen (14) farms: six (6) marine farms and eight (8) freshwater farms. These comprised of two (2) abalone, two (2) finfish, two (2) oyster, three (3) tilapia, two (2) catfish, two (2) ornamentals and one (1) marron crayfish farm. The numbers of farms recorded in 2017 decreased by four (4) farms compared to 2016.

Production: The total production for the Eastern Cape was 410.2 tons from both freshwater and marine sub-sectors, contributing about 7.34% to the total aquaculture production (Figure 20). The total aquaculture production in the Eastern Cape has decreased by 208.4 tons (33.69%) from 618.6 tons in 2016. Marine aquaculture in the province produced 379.7 tons, accounting for 9.72% of the national marine production and 6.79% of the national production. Freshwater aquaculture produced 30.5 tons in the Eastern Cape, accounting for 1.8% of the total freshwater aquaculture production and 0.5% of the national production.

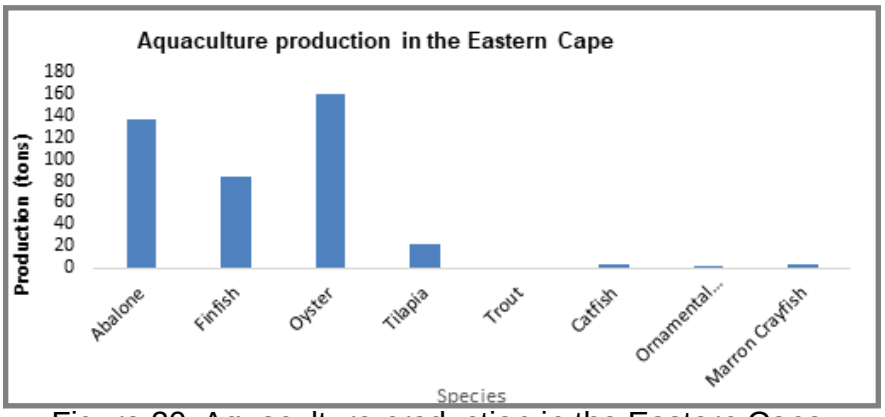


Figure 20: Aquaculture production in the Eastern Cape.

5.2. Free State

Free State province has a facility for training and capacity building, technology demonstration and aquaculture research that is located in Xhariep district.

Farms and species farmed: In 2017, the Free State province continued to record a total of eight (8) freshwater farms, as in 2016, with no newly established or closed farms. The farms comprised of four (4) catfish farms, two (2) Koi carp farms and two (2) ornamental farms.

Production: The Free State province continued to record a total production of 2 tons on 2017 as was recorded in 2016. The production volume was recorded only from the freshwater sub-sector. The province's production contributed 0.12% to the national freshwater aquaculture production and 0.04% to the national aquaculture production (Figure 21).

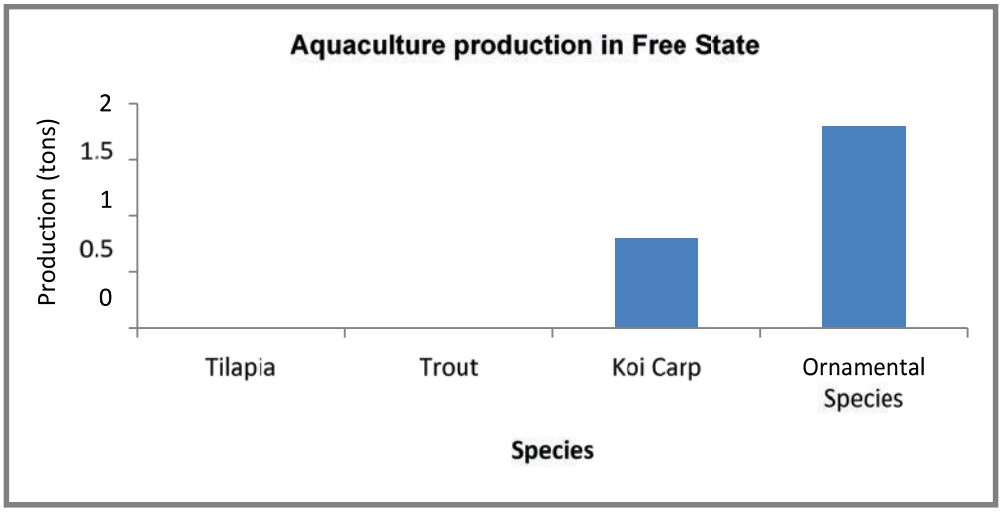


Figure 21: Aquaculture production in Free State

5.3. Gauteng

Gauteng province has the potential to play a key role as an import and export hub for South Africa's aquaculture industry due to availability of relevant logistical resources and its proximity and accessibility to all provinces.

Number of farms and species farmed: In 2017, the Gauteng province recorded a total of thirty six (36) freshwater farms representing an addition of four (4) newly established farms compared to the thirty two (32) farms recorded in 2016. There were twenty four (24) tilapia, one (1) trout, one (1) catfish, five (5) Koi carp, one (1) carp and four (4) ornamental fish farms.

Production: The total production for Gauteng was 116.1 tons from only freshwater sub-sector, contributing 6.91% of the national freshwater aquaculture production and 2.08% to the national aquaculture production (Figure 22). The total aquaculture production in the Gauteng in 2017 increased by 51.1 tons (78.62%) from the 65 tons produced in 2016.

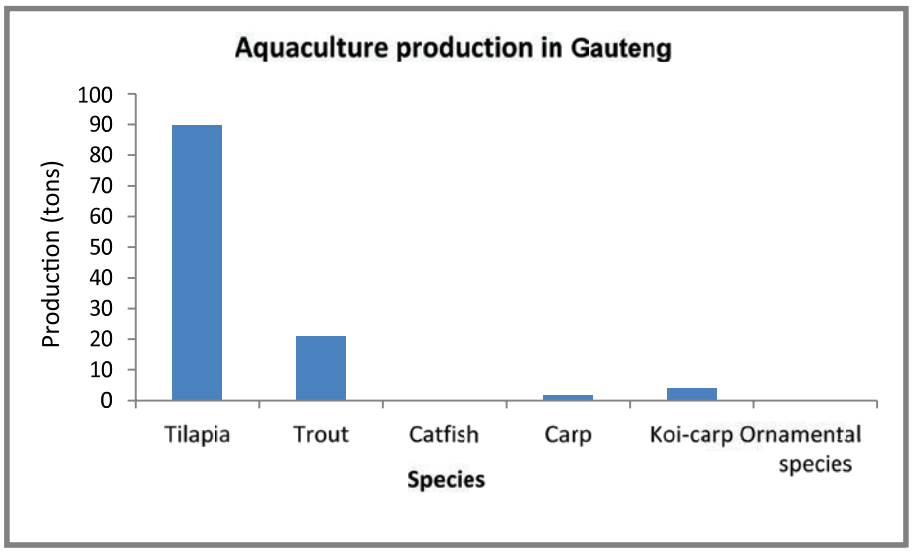


Figure 22: Aquaculture production in Gauteng.

5.4. Kwa-Zulu Natal

Kwa-Zulu Natal is also one of the four coastal provinces able to undertake both marine and freshwater aquaculture activities. In addition, its warm temperatures can reduce farming costs.

Number of farms and species farmed: In 2017, the Kwa-Zulu Natal province recorded a total of nineteen (19) farms comprising two (2) marine farms and seventeen (17) freshwater farms. The province did not realize establishment of new farms or closure of any existing farms in both freshwater and marine sub-sectors. The existing farms comprised of two (2) marine finfish, five (5) trout, five (5) tilapia, two (2) Koi carp and five (5) ornamental farms as was the case in the previous year of 2016.

Production: The total production for Kwa-Zulu Natal was 421.81 tons from both freshwater and marine sub-sectors, contributing 7.55% to the overall aquaculture production (Figure 23). The total aquaculture production in Kwa-Zulu Natal increased in 2017 by 30.01 tons (7.66%) from 391.8 tons recorded in 2016. The marine aquaculture production in the province recorded a production of 32.01 tons, accounting 0.82% of the national marine production and for 0.57% of the national aquaculture production. Freshwater aquaculture in the province continued to record a production of 389.7 tons, as was recorded in 2016, accounting 23.19% of the national freshwater production and 6.97% of the national aquaculture production.

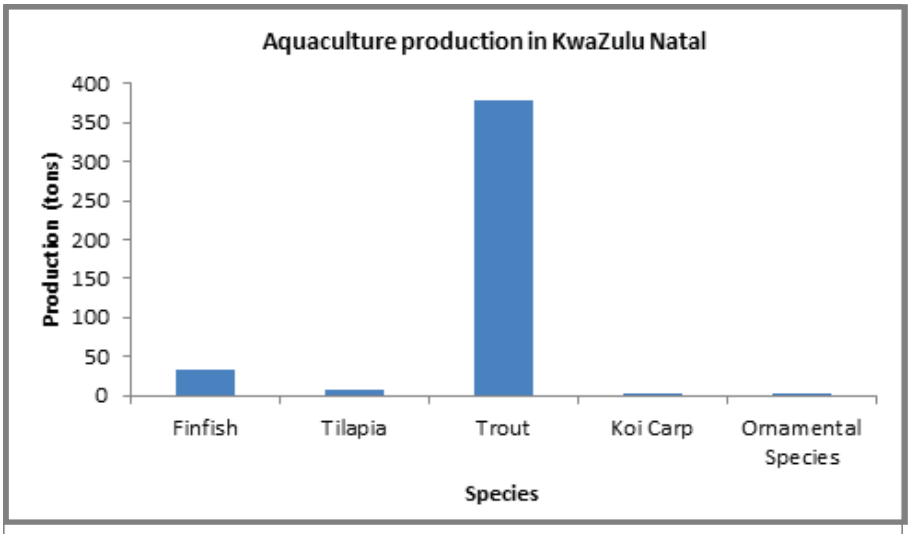


Figure 23: Aquaculture production in Kwa-Zulu Natal.

5.5. Limpopo

Limpopo province is supported by the Turfloop state-owned hatchery and research and development activities undertaken by the University of Limpopo.

Number of farms and species farmed: In 2017, Limpopo province recorded a total of twenty four (24) freshwater farms representing an increase of two (2) farms compared to the twenty two (22) farms recorded in 2016. The farms comprised eighteen (18) tilapia, three (4) catfish, one (1) carp and one (1) ornamental fish farm.

Production: Limpopo province continued to produce 149.8 tons in 2017, as was recorded in 2016 from its only freshwater sub-sector, contributing about 8.91% to freshwater aquaculture production and 2.68% to the national aquaculture production (Figure 24).

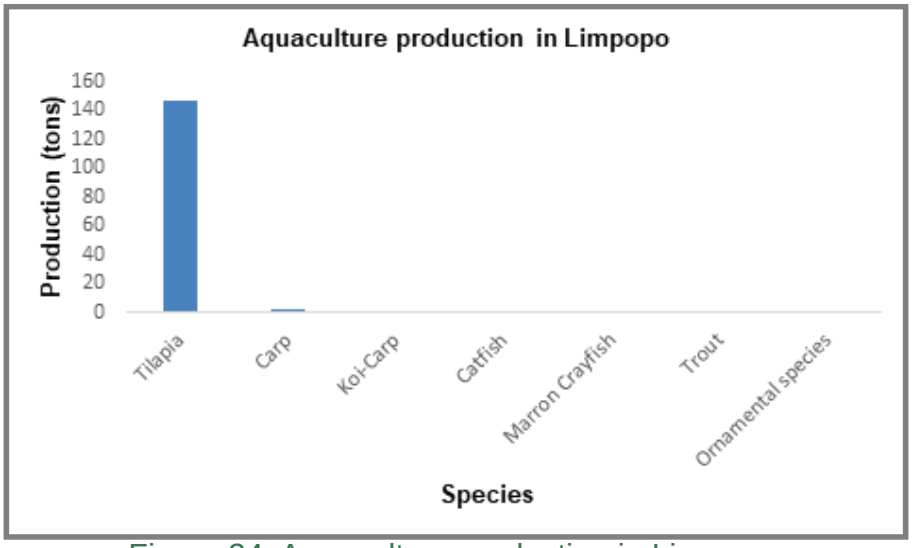


Figure 24: Aquaculture production in Limpopo.

5.6. Mpumalanga

Freshwater aquaculture has the potential of thriving in Mpumalanga province due to the ideal environment conditions. It is yet to be determined what are the factors hampering the sector growth in terms of production.

Number of farms and species farmed: In 2017, Mpumalanga province recorded a total of twenty eight (28) freshwater farms representing an increase of two (2) farms compared to the twenty six (26) farms recorded in 2016. The farms comprised twelve (12) tilapia, twelve (12) trout, one (1) catfish, two (2) ornamentals and one (1) koi - carp farm.

Production: The total production for Mpumalanga, from the freshwater sub-sector only, was 182.9 tons contributing 3.27% to the national aquaculture production (Figure 25). Aquaculture production in the province increased by 20.21 tons (12.42%) from the 162.69 tons produced in 2016. This provincial production accounted for 10.88% of the national freshwater aquaculture production.

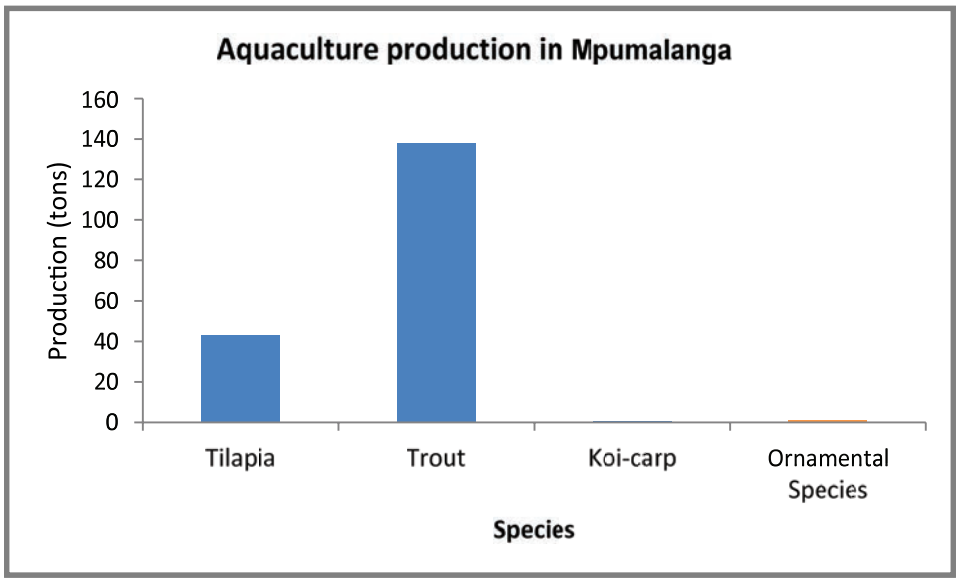


Figure 25: Aquaculture production in Mpumalanga.

5.7. Northern Cape

As in other coastal provinces, the Northern Cape is able to support both marine and freshwater aquaculture. In 2017, the province engaged in both marine and freshwater aquaculture.

Number of farms and species farmed: In 2017, the Northern Cape province recorded a total of eight (8) farms comprising of six (6) marine and two (2) freshwater farms. There was an increase of two (2) marine farms when compared to the four (4) farms recorded in 2016. There were no new freshwater farms established. The farms comprised of five (5), abalone, one (1) oyster, one (1) tilapia and one (1) carp farm.

Production: The total production for the Northern Cape in 2017 was 53.61 tons from both marine and freshwater sub-sectors, contributing 0.96% to the national aquaculture production (Figure 26) and representing an increase of 48.18 tons from the 5.43 tons produced in 2016. Marine aquaculture produced 50.01 tons, accounting for 1.28% of the national marine aquaculture production and 0.89% of the national aquaculture production. Freshwater aquaculture continued to record 3.6 tons in the Northern Cape, accounting for 0.21% of the national freshwater production and 0.06% of the national aquaculture production.

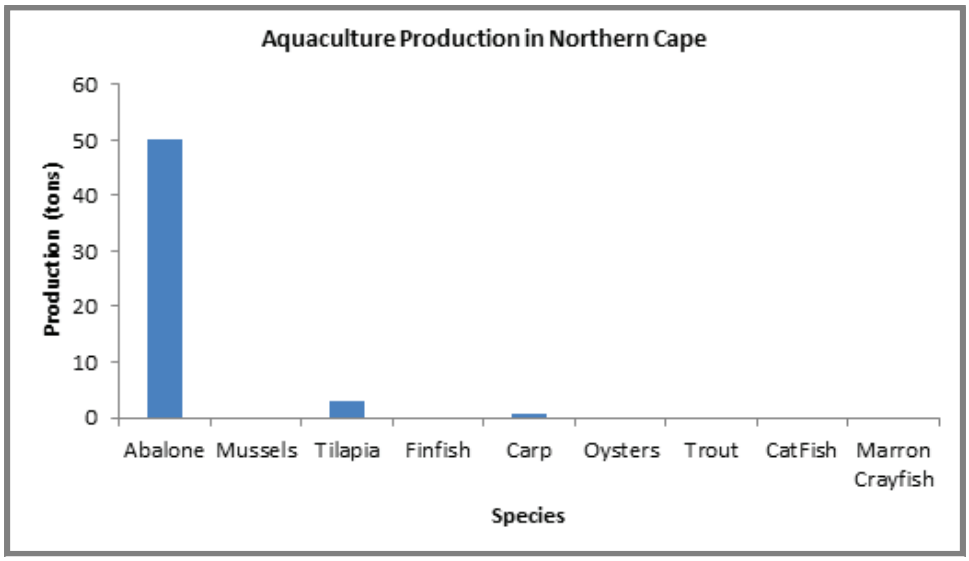


Figure 26: Aquaculture production in Northern Cape.

5.8. North West

North West province has proven to be at a disadvantage when looking at access to markets, but has a strong advantage in terms of access to suitable water bodies. Due to its location within the country, North West can only successfully engage in freshwater aquaculture and not in marine aquaculture.

Number of farms and species farmed: In 2017, North West province recorded a total of nineteen (19) freshwater farms representing an increase of one (1) farms from the eighteen (18) farms recorded in 2016. The farms comprised of sixteen (16) tilapia and three (3) catfish farms.

Production: The total production for North West recorded from the freshwater aquaculture was 87 tons, contributing 5.18% of total freshwater production and 1.56% to the national aquaculture production (Figure 27). Aquaculture production in the North West increased by 11.2 tons (14.78%) in 2017 from the 75.8 tons produced in 2016.

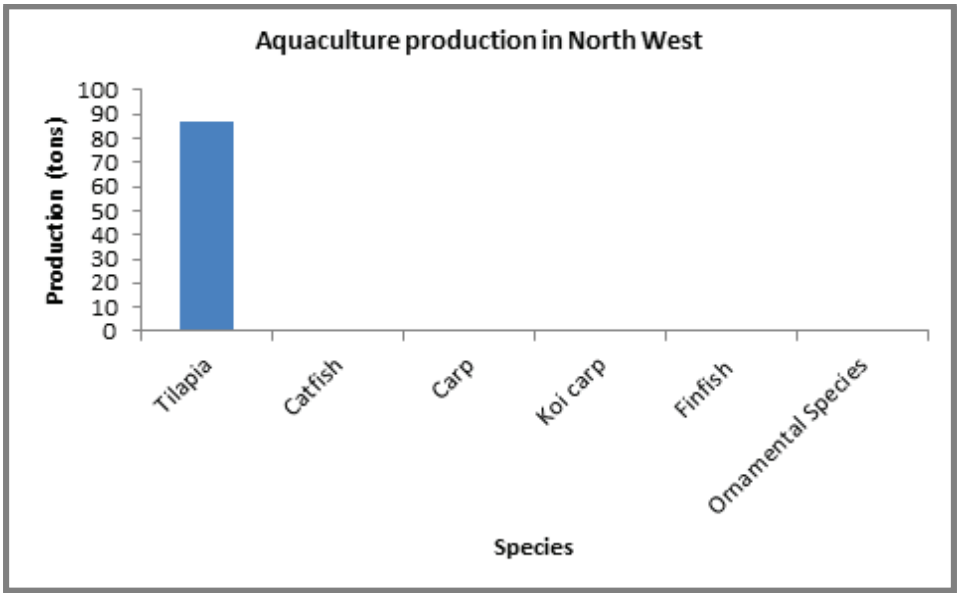


Figure 27: Aquaculture production in North West.

5.9. Western Cape

The Western Cape is also a coastal province able to support both marine and freshwater aquaculture activities. This province remains the backbone of the aquaculture sector in South Africa.

Number of farms and species farmed: In 2017, the Western Cape province recorded a total of fifty four (54) farms comprising of twenty four (24) marine farms and thirty (30) freshwater farms. There was a decrease of eleven (11) farms compared to the sixty five (65) farms recorded in 2016. The farms comprised eleven (11) abalone, one (1) finfish, nine (9) mussel, three (3) oyster, two (2) tilapia, twenty four (24) trout, one (1) carp, one (1) koi-carp and two (2) ornamental fish farms.

Production: The total production for the Western Cape was 4165.14 tons (freshwater and marine), contributing 74.53% to national aquaculture production (Figure 28). Aquaculture production in the Western Cape decreased by 576.26 tons (12.15%) from the 4741.4 tons produced in 2016. Marine aquaculture produced 3446.04 tons, accounting for 88.18% of the national marine aquaculture production and 61.66% of the national aquaculture production. Freshwater aquaculture produced 719.1 tons in the Western Cape, accounting for 42.79% of the national freshwater aquaculture production and 12.87% of the national aquaculture production.

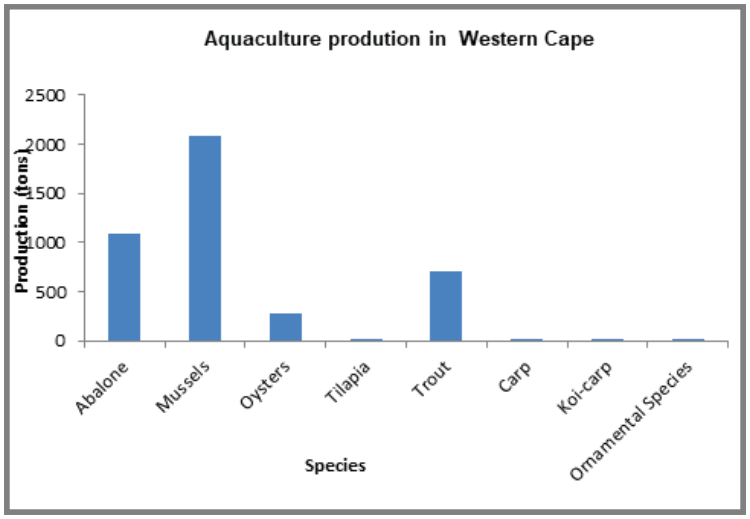


Figure 28: Aquaculture production in Western Cape.

06

AQUACULTURE FOOD SAFETY

6.1. Fish farms status

Throughout the South African coastline, there were 39 shellfish and finfish farms monitored by the Food Safety Office (FSO) through the South African Molluscan Shellfish and Finfish Monitoring and Control Programme (SAMSFM&CP) during 2017. These farms include 16 abalone farms, 7 mussel farms, 12 oyster farms, 5 finfish farms and 1 Rock Lobster Farm (Figure 29). With regards to shellfish farms, there were 4 abalone farms located to the west of Cape Point and 16 farms to the east of Cape Point and one Lobster farm to the east of Cape Point. The mussel farms were all located to the west of Cape Point in Saldanha Bay. There were 10 oyster farms to the west of Cape Point in Saldanha Bay and only 2 oyster farms on the east of Cape Point. The 5 Finfish farms were monitored according to the groups. All the abalone farms and the lobster farm that were monitored are land based. The animals are grown in tanks and the water is pumped into the tanks through free flow and/or recirculation systems. The oyster and mussel farms were sea-based. The oyster and mussels are grown in and on cages and ropes respectively suspended from floating rafts or buoys. The finfish farming was conducted in sea cages, pond systems and land base fish tank systems.

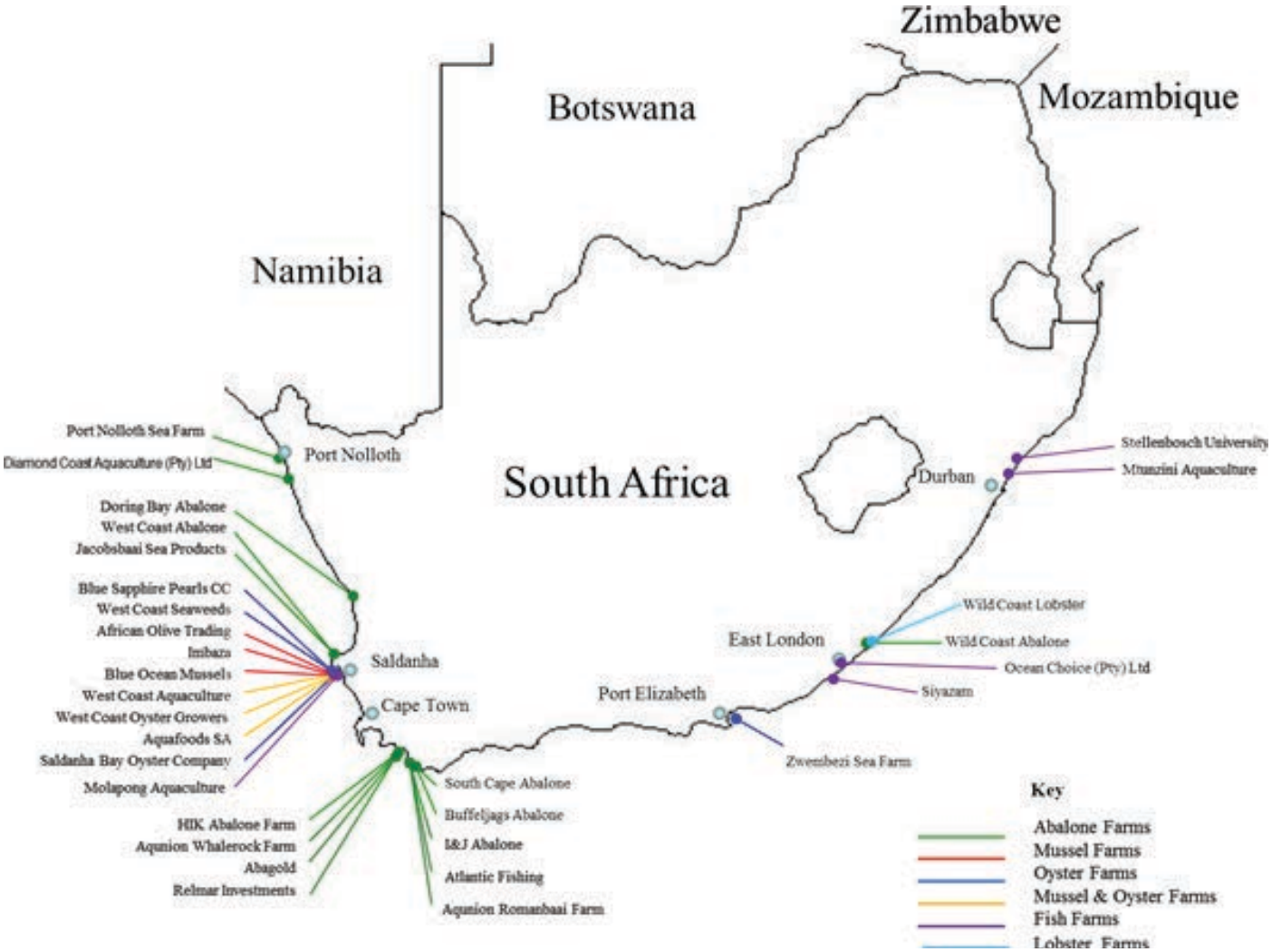


Figure 29: Distribution of fish farms along the South African coast

6.2. Monitoring of hazardous substances

The farms which are at most risk of pollution are those situated near the industrialized or urban areas. Most of the farms in South Africa however are situated in areas that are relatively free of pollution. Generally the farms to the west of Cape Point, particularly, shellfish farms are more at risk of biotoxin contamination than the farms to the east of Cape Point.

The fish farms were monitored for human health hazards such as heavy metals, pesticides, polychlorinated biphenyls (PCBs), dioxins, dyes, veterinary drug residues and radionuclides during the production phase. In addition shellfish farms were furthermore monitored for biotoxins and microbiological contamination. Should the regulatory limit for any of the hazardous substances in the fish be exceeded, the farms were temporarily closed for harvesting until the contaminant reaches

acceptable limits. The methods used are stipulated in the food safety programmes and are SANAS accredited or the labs are working towards accreditation.

When any of the hazardous substances or microbiological organism concentrations exceeds the regulatory limit, The criterion for reopening a farm depends on the contaminant that is present on that particular farm. As an example, when a farm is temporarily closed due to biotoxins, the biotoxin concentration in three consecutive samples is required to be below the regulatory limit. The samples should be taken over a period not exceeding two weeks and samples may not be taken on the same day. When the farm is closed due to other contaminants, the farm is reopened when the contaminant is below the regulatory limit.

The laboratories inform the FSO in the form of a red alert. The red alert requires that the lab phone the staff at the FSO responsible for farm closures and send an email to the official indicating the test result. The FSO then warns the farm not to harvest until the test result has been confirmed. If the result is confirmed to exceed the regulatory limit the farm is temporarily closed and the relevant stakeholders are informed accordingly.

A farm is also temporarily closed if fish are not tested in accordance with the food safety programmes. The farm is reopened only when the concentration of the hazardous substance is below the regulatory limit (Table 13). The criterion for reopening a farm depends on the contaminant that is present on that particular farm. As an example, when a farm is temporarily closed due to biotoxins, the biotoxin concentration in three consecutive samples is required to be below the regulatory limit. The samples should be taken over a period not exceeding two weeks and samples may not be taken on the same day. When the farm is closed due to other.

contaminants, the farm is reopened when the contaminant is below the regulatory limit.

Table 13: Regulatory limit for human health hazards monitored and test laboratories

Hazardous Substances	Regulatory Limit	Laboratory
Biotoxins		
PSP toxins	< 0.8 mg PSP/kg edible flesh	Aspirata
Okadaic acid group toxins: OA, DTX 1, DTX 2 & DTX 3 and	≤ 0.16 mg okadaic acid equivalents / kg edible flesh (Commission Regulation (EC) No 853/2004). (EU-RL* LC-MS/MS method)	Aspirata
Pectenotoxins group toxins: PTX 1 & PTX 2	(Commission Regulation (EC) No 15/2011)	
Yessotoxins group toxins: YTX, 45 OH YTX, homo YTX, and 45 OH homo YTX	≤ 8 mg yessotoxin equivalents / kg edible flesh (Codex). (^Liquid Chromatography Mass	Aspirata
	Spectrometry (EU-RL LC-MS/MS method) (Commission Regulation (EC) No 15/2011)	

Azaspiracids group toxins: AZA1, AZA2 and AZA3.	≤ 0.16 mg azaspiracid equivalents / kg edible flesh (Commission Regulation (EC) No 853/2004). (^Liquid Chromatography Mass	Aspirata
	Spectrometry (EU-RL LC-MS/MS method) (Commission Regulation (EC) No 15/2011)	
ASP	ASP < 20 mg DA/kg edible flesh	Aspirata
Microbiological Organisms		
E. coli	<230/100g edible flesh	Mérieux
Salmonella	absent	SABS/ Mérieux
Vibrio spp	absent	SABS/ Mérieux
Prohibited drugs and Other Hazardous substances		
Heavy Metals	Lead: < 1.5 mg/kg edible flesh Mercury: < 0.5 mg/kg edible flesh	Aspirata/ Mérieux
	Cadmium: < 3.0 mg/kg edible flesh	
Pesticides	< 0.01 mg/kg	Mérieux
Non-dioxin-like -PCB	< 75 µg/kg	Mérieux
Dioxin-like PCB & Dioxin	< 6.5 µg/kg	Mérieux
Dioxins	< 3.5 µg/kg	Mérieux
Hazardous Substances	Regulatory Limit	Laboratory
PAH 4	< 35 µg/kg	Mérieux
Radionuclides	< 600 Bq/kg	NECSA/ Mérieux
Stilbenes & Hormones	Not detected	Mérieux
Sulphonamides	Not detected	Mérieux
Benzimidazoles (Anthelmintics)	Not detected	Mérieux
Chloramphenicol	Not detected	Mérieux
Florfenicol & Thiamphenicol	Not detected	Mérieux
ß-Lactams	Not detected	Mérieux
Malachite Green & Crystal Violet	Not detected	Mérieux
Nitrofuran metabolites	Not detected	Mérieux
Quinolones	Not detected	Mérieux
Aflatoxins	Not detected	Mérieux
Nitroimidazoles	Not detected	Mérieux
Tetracyclines	Not detected	Mérieux
Avermectins, including ivermectin	Not detected	Mérieux

6.2.1. Microbiological Monitoring

The E. coli was tested on weekly basis in mussels and oysters and Salmonella and Vibrio was tested for monthly. These microbiological organisms were tested by the South African Bureau of Standards (SABS), situated in Rosebank, Cape Town and Mérieux NutriSciences laboratories situated in Claremont, Cape Town. Mérieux NutriSciences is the South African National Accreditation System (SANAS) accredited for Salmonella, Vibrio and E. coli and SABS is SANAS accredited for Salmonella and Vibrio.

E. coli is used as an indicator species for the potential presence of sewerage borne diseases, as well as for the classification of production areas. The abalone farms were all classified as “Approved Class A” based on the data received. The mussel and oyster farms were classified as “Conditionally Approved Class A”. Other microbiological species tested for included Salmonella and Vibrio.

During 2017 the shellfish farms received 5 closure notices from the FSO informing them that the microbiological concentration in the shellfish had exceeded the regulatory level (Figure 30). The farms were prohibited from marketing live products; however, they were permitted to market processed products. Each time the closure notices were sent, the farms were temporarily closed for an average period of 3 days (Figure 31). There was one closure notice that was sent to a farm contaminated with Salmonella.

The abalone production facilities continued to be classified as Approved and exempted from testing the production area monthly for microbial contamination viz.

E. coli. They were required to monitor for microbial contamination during official surveillance of end-of-line product. In 2017 there were no end-of-line products that were non-compliant and therefore there were no farm closures due to presence of microbiological contamination.

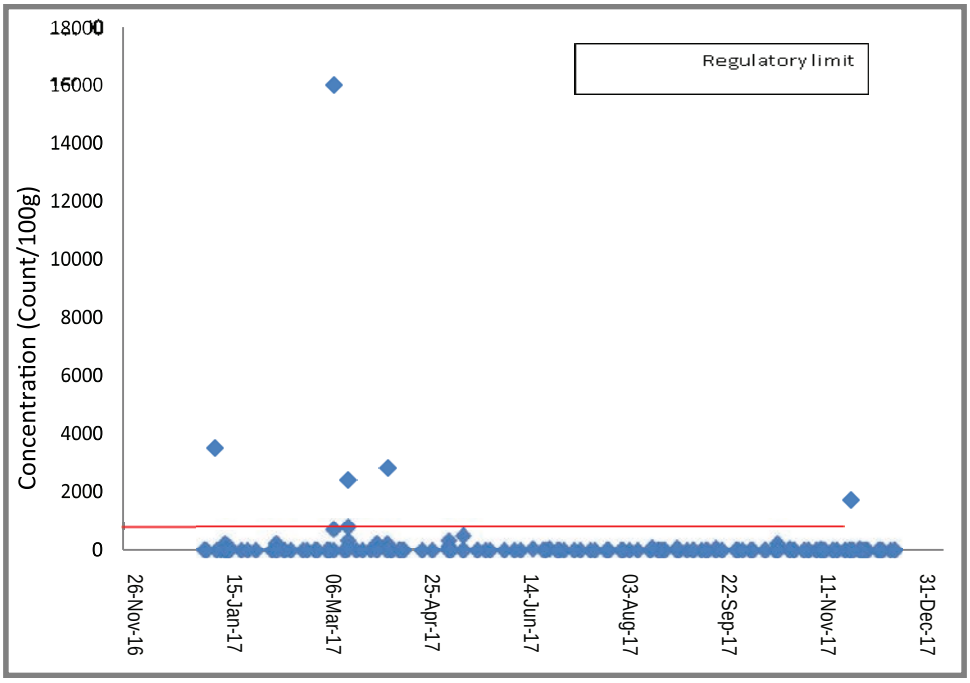


Figure 30: E. coli results for molluscan shellfish farms in 2017

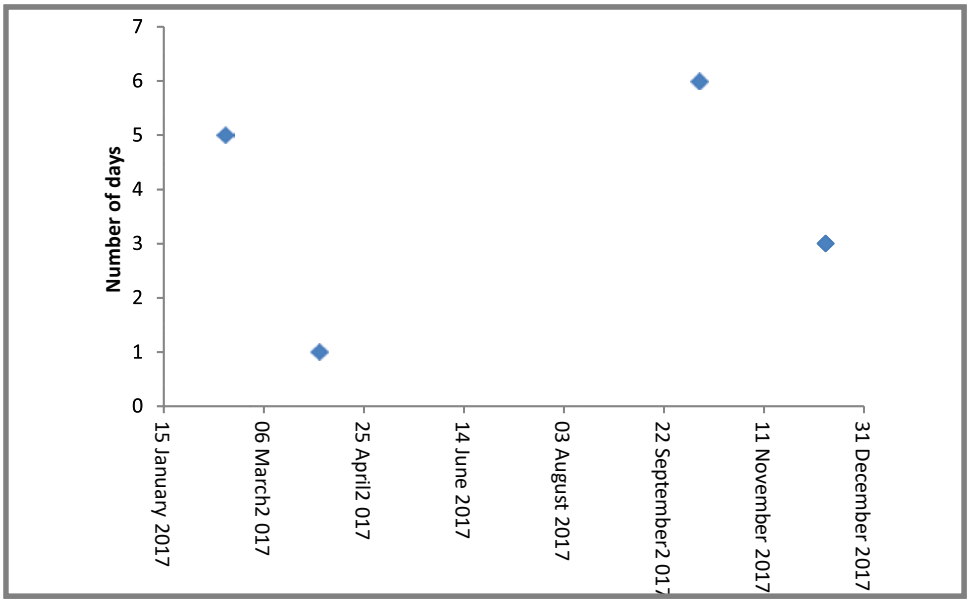


Figure 31: Number of days farms were closed due to microbiological contamination in 2017

6.2.2. Wet Storage Facilities

Wet storage refers to the temporary re-immersion of live shellfish in near shore waters or onshore tanks prior to placing on the market. The primary reasons for wet storage are holding shellfish harvested for a period of time to allow the shellfish to purge and to be more accessible for marketing.

During the year, the wet storage facility is monitored weekly for E. coli and monthly for Vibrio cholera, Vibrio parahaemolyticus and Salmonella and classified accordingly. The majority of incidences of microbiological contamination were generally below the regulatory limit throughout the year 2017. However we had two incidences where the contamination exceeded the regulatory limit.

6.2.3. Biotoxin Monitoring

The routine monitoring frequency of farms and the location of sampling were based on the potential risk of contamination. There tends to be substantially more upwelling systems to the west of Cape Point resulting in higher incidences and concentrations of Harmful Algal Blooms (HABs) and concomitant biotoxin accumulation in the shellfish.

The biotoxins were tested for at the food and beverage section of the Council for Scientific and Industrial Research (CSIR) in Rosebank, Cape Town. Later in the year, the food and beverage section was procured by Aspirata. The laboratory is operating in Rosebank, Cape Town as Aspirata Food and Beverages. The biotoxins monitored (Table 14) included Paralytic Shellfish Poisoning (PSP) toxins, Diarrhetic Shellfish Poisoning (DSP) toxins and Amnesic Shellfish Poisoning (ASP) toxins. PSP, DSP and ASP toxins were tested using the Liquid Chromatography– Fluorescence Detector (LC-FLD), Liquid Chromatography–Mass Spectrometry (LC- MS/MS) and the High-performance liquid chromatography (HPLC) instruments respectively.

During 2017 a total 25 DSP closure notices were sent to shellfish farms informing them that the biotoxin concentration in the shellfish had exceeded the regulatory limit. ASP toxins were not detected on any of the shellfish farms. PSP toxins were only found in shellfish farms in low concentrations. Many of the abalone farms, however, canned their products thus further reducing the PSP toxin levels as the abalone were eviscerated and scrubbed to remove the PSP toxins (Figure 32 and Figure 33). The farms that were affected by the presence of biotoxins were farms situated to the west of Cape Point (Table 15).

Table 14: Count of toxins tested above regulatory limit in abalone

Year	PSP	OA	AZA	YTX	DSP	ASP
2010	51 (228)	-	-	-	5 (133)	0 (122)
2011	16 (170)	0 (1)	0 (1)	0 (1)	2 (99)	0 (129)
2012	21 (228)	0 (1)	-	-	0 (1)	0 (52)
2013	16 (273)	0 (43)	0 (34)	0 (38)	4 (112)	0 (17)
2014	9 (286)	0 (135)	0 (70)	0 (131)	0 (7)	0 (49)
2015	6 (269)	0 (148)	0 (145)	0 (145)	0 (0)	0 (35)
2016	3 (385)	141 (437)	0 (439)	0 (432)	0 (0)	0 (30)
2017	32 (491)	10 (380)	0 (381)	-367	-	-

() = Number of samples tested

PSP – Paralytic Shellfish Poisoning, OA – Okadaic Acid, AZA – Azaspiracid, YTX – Yessotoxin, DSP – Diarrhetic Shellfish Poisoning, ASP – Amnesic Shellfish Poisoning.

The mussel and oyster farms in Saldanha Bay were not allowed to market any product when the biotoxins exceeded the regulatory limit. Each time the closure notices were sent, the Saldanha Bay farms were temporarily closed for an average period of 22 days in 2017. Mussels and oysters were sampled from the sentinel sampling station at the mouth of the bay to indicate the presence of toxins in the bay. Therefore all the farms in the bay were closed simultaneously each time the toxin concentration in these samples exceeded the regulatory limit.

Table 15: Schedule for testing of hazardous substances

	West of Cape Point		East of Cape Point	
Hazardous Substances	Filter Feeder	Non – Filter feeder	Filter Feeder	Non – Filter Feeder
		Biotoxins		
PSP coursing toxins	48h or twice a week for multiple harvesting	2 weekly	Monthly	Monthly
DSP Coursing toxins	Weekly	Monthly	2 weekly	Monthly
ASP	Monthly	Monthly	Monthly	Monthly

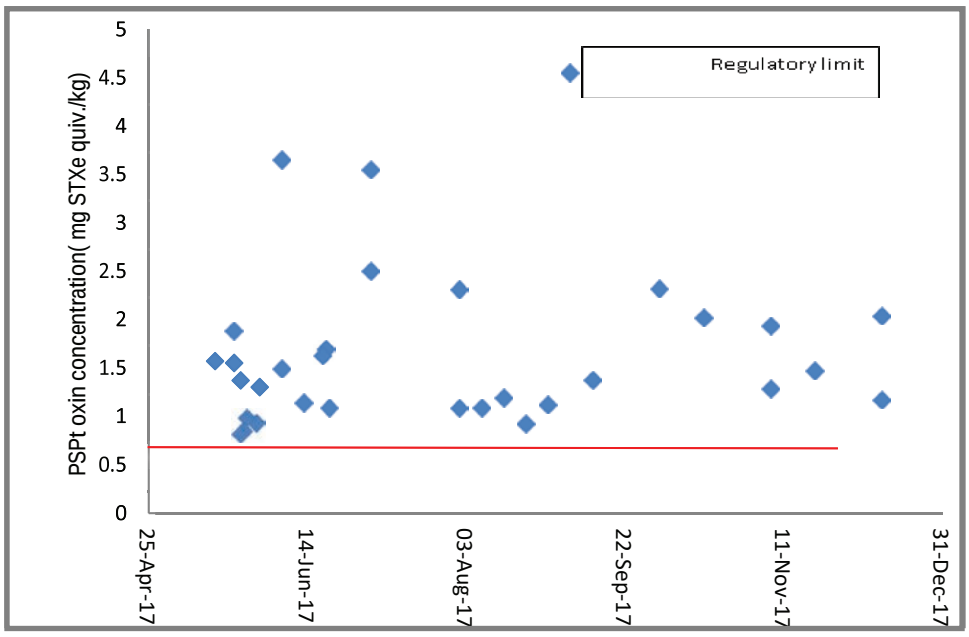


Figure 32: PSP toxin concentrations in shellfish cultured to the west of Cape Point in 2017

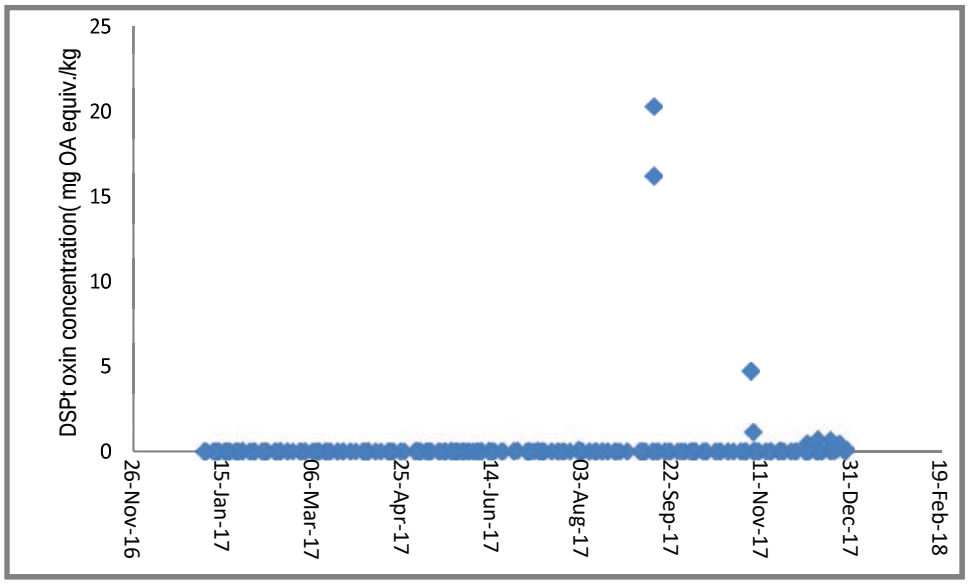


Figure 33: DSP toxin concentrations in shellfish cultured to the west of Cape Point in 2017

6.2.4. Drug and residue monitoring

Mérieux NutriSciences analysed all other hazardous substances in 2017 which included heavy metals (lead, mercury, inorganic arsenic and cadmium), pesticides, drug residues, dioxins, PAH, dyes and PCBs.

There were no farm closures due to heavy metal concentrations exceeding the regulatory limits (Table 13). The heavy metals were, however, present in the cultured shellfish in low concentrations (Figure 34, Figure 35 & Figure 36). Only those farms which had fish that contained heavy metals were recorded in the graphs below. Lead and cadmium was not detected in the majority of the abalone farms. For those farms that had concentration of heavy metals closer to regulatory limit such as the oyster and mussel farms in Saldanha Bay, contingency measures were applied namely increasing the monitoring frequency to test for heavy metals bi-annually.

The hazardous substances (Table 13) were tested randomly in the fish in accordance with the National Residue Programme. A minimum of one sample was collected from each of the fish farms. The compounds sought for analysis were selected according to their likely use and/or historical presence in the production system. The concentrations of the residues in the fish were below the regulatory limit for all the substances and not detected for the majority of the substances.

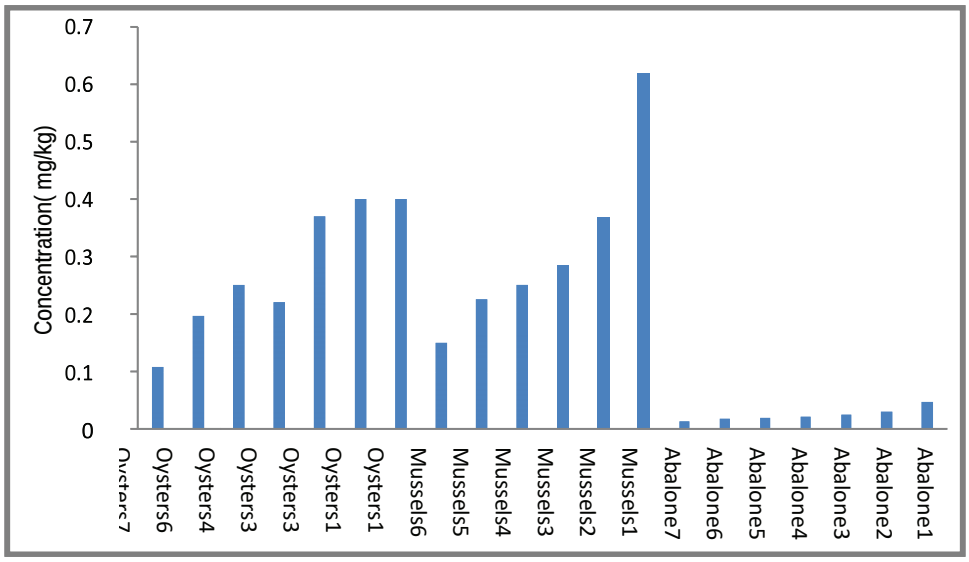


Figure 34: Lead concentrations in cultured molluscan shellfish in 2017

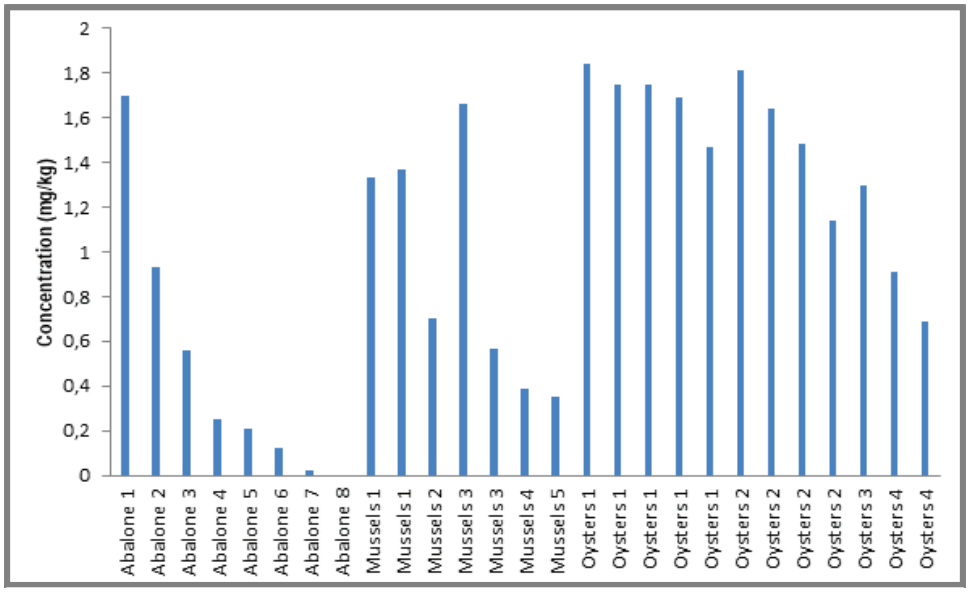


Figure 35: Cadmium concentrations in cultured molluscan shellfish in 2017

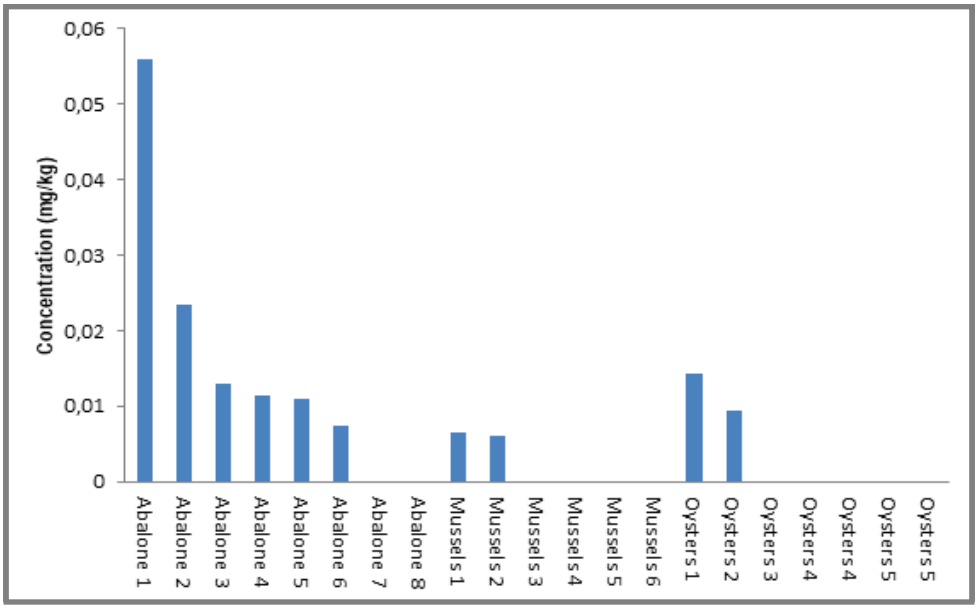


Figure 36: Mercury concentrations in cultured molluscan shellfish in 2017

6.2.5. Phytoplankton Monitoring

The FSO conducted the Official and on-farm Phytoplankton monitoring for all shellfish farms along the South African coastline. There are two official phytoplankton satellite monitoring stations that have been established by the FSO, namely: the Saldana Bay and Hermanus phytoplankton monitoring station. Both of these stations have been effectively established, the station worked and continues to do so with the FSO in implementing the phytoplankton monitoring for shellfish farms.

Harmful Algal Blooms (HABs) on the West Coast are usually associated with upwelling systems which are driven by persistent offshore south-easterly winds, typically in the region of 3 to 10 day events (Hill et al. 1998), resulting in upwelling of nutrient rich water into the euphotic zone (Pitcher et al. 2010). The timing of HABs are associated with seasonal wind patterns, particularly during late summer and early autumn (Pitcher et al. 2010). During this period the surface currents tend to be offshore and equator-ward (Pitcher et al. 2010). The HABs develop once there is relaxation of the offshore wind and increased solar irradiance, which leads to stratification (Pitcher et al. 2010). The relaxation of the south-easterly wind also results in the pole-ward movement of the longshore current and an on-shore wind drives the bloom towards the shore (Pitcher et al. 2010) and together with the longshore current into close proximity of the aquaculture farms. Consequently the highest incidence of HABs south of Cape Columbine is during April and May (Pitcher & Calder 2000).

The official phytoplankton monitoring for 2017 shows that Pseudo-nitzschia dominated at all the phytoplankton monitoring station throughout the year; other toxic phytoplankton species had a very low count, Figure 37.

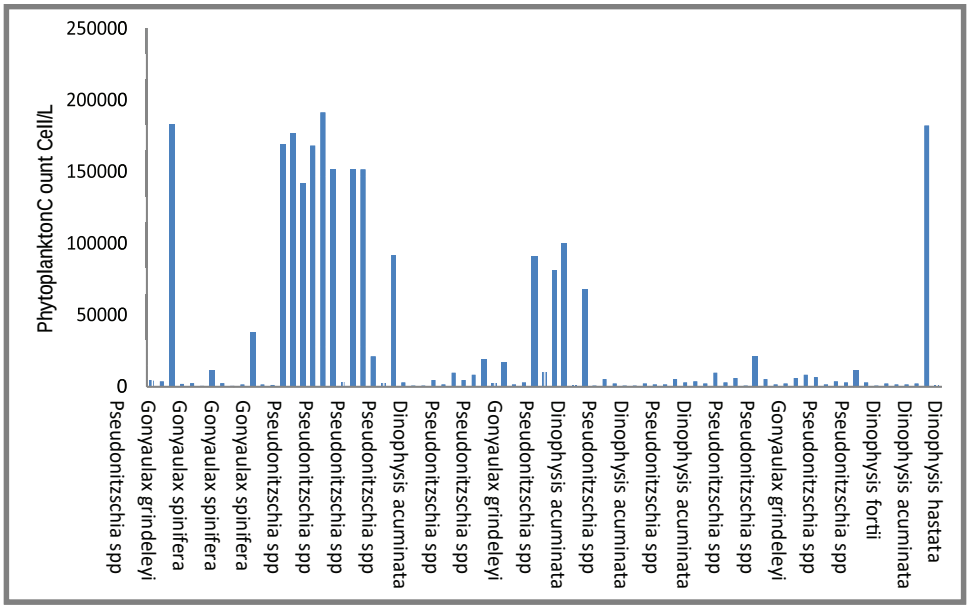


Figure 37: Official phytoplankton counts for 2017

6.3. Compliance history of farms

In 2017 all monitored farms continued to comply with the food safety requirements as prescribed in the food safety programmes.

6.4. Food safety monitoring programme status

The SAMSM&CP and SAAMFM&CP have been reviewed and updated to ensure harmonisation with Codex Alimentarius standards as South Africa is a signatory to Codex Alimentarius and the relevant South African legislation. The South African fish farmers have accepted the revised programmes and with the assistance of the FSO are prepared to comply with its requirements.

The phytoplankton satellite monitoring stations have been effectively established, in 2017, the station worked very well with the FSO in implementing the phytoplankton monitoring for shellfish farms. The FSO has also conducted phytoplankton audits that ensured effective implementation of the programmes.

The Joint Biotoxin Monitoring Programme for the Saldanha Bay mussel and oyster farms had been updated. The biotoxin test results of the samples taken from the sentinel sites were shared by the programme members who jointly contributed to a joint fund managed by the farmers themselves. The FSO furthermore updated and continued to implement the Joint Microbiological Action Plan for Saldanha Bay and the Traceability Protocol for aquacultured products in order to bring the farms in line with Codex Alimentarius and national requirements.

The FSO staff continued to improve communications with relevant stakeholder involved in the programme. Various meetings were held to exchange ideas to assist with the improvement of service delivery e.g. improvement of turn-around times for the availability of results to the FSO and farmers.

07

ECONOMIC OVERVIEW OF SOUTH AFRICA'S AQUACULTURE SECTOR IN 2017

7.1 Introduction to Aquaculture Economics

In order for aquaculture to contribute significantly to food security and poverty alleviation, there is a need to pursue aquaculture as a business entity. It is essential to understand the commercial and marketing concepts. An understanding of how effective and efficient production and marketing systems are run will help the stakeholders establish economic problems in aquaculture for comprehensive decision making.

This section is aimed at providing overall annual economic performance of the aquaculture sector for the year 2017. This section analyses economic data and statistical trends of the sector in terms of capital investments, employment opportunities created, exports and imports.

7.2 Value of the Aquaculture Industry

The total value of the aquaculture sector in 2017, was estimated at R 1 010 592 680 showing a decrease of 3% from R 1 042 072 340.31 recorded in 2016. A decrease in the value of aquaculture can be attributed to a significant 13% decrease in production in 2017 from 5418 tons produced in 2016. Figure 38 below illustrates the percentages contributed by each subsector during the year 2017.

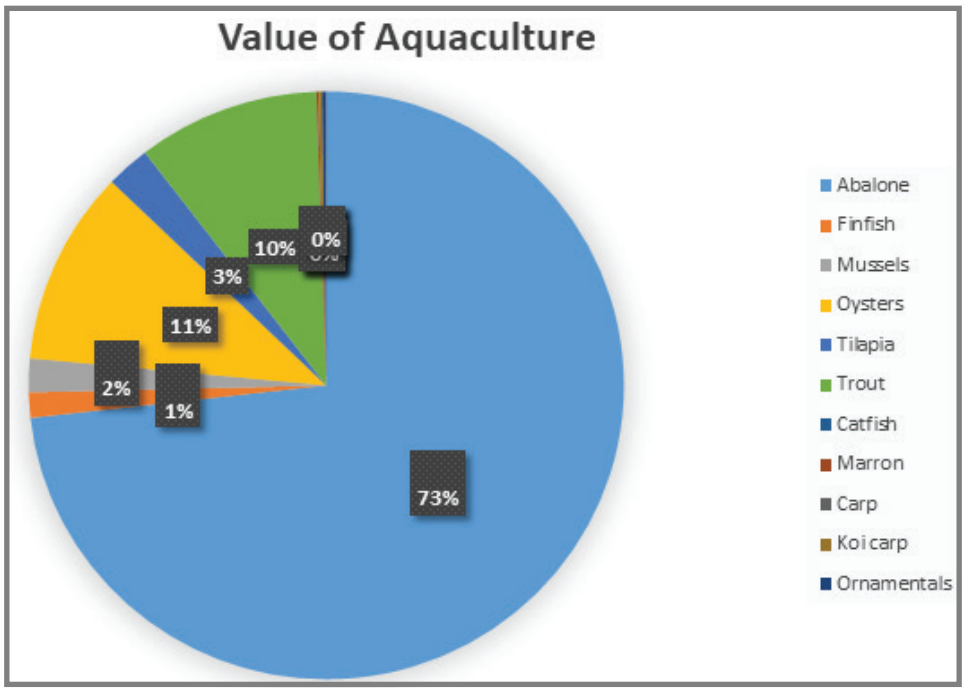


Figure 38: Contribution of each sub-sector to the total value of aquaculture in 2017

The marine sector contributed R881 042 000 representing 87% to the overall aquaculture value. Locally, aquaculture continues to be dominated by the abalone sub-sector which was estimated to be valued at R 740 114 800. The value for abalone subsector showed a decrease of 5, 06% from R 779 560 217.73 value recorded in 2016. The decrease in value may be due to a decrease in production experienced by the sub-sector in 2017. However, the abalone sub-sector contributed the highest with 84% to the marine value and 73, 2% to the overall aquaculture value. The oyster sub-sector was the second largest contributor with 12% of the marine value and 11% to the total aquaculture value. Mussels and Finfish subsector contributed 2% respectively to the marine sector value.

The freshwater sector contribution to the aquaculture value decreased by 6, 9% from R 138 543 500 in 2016 to R129 550 000 in 2017. The freshwater contributed 12.8% to the overall aquaculture value in 2017. The largest contributor was the trout sub-sector with an estimated R 100 000 000, representing 77% to the freshwater sector and 10% to the overall aquaculture value. The second largest contributor was tilapia with R 24 120 000 representing 19% to the freshwater sector and 3% to the overall aquaculture value. Tilapia sub-sector increased its contribution to the freshwater subsector by 29%. This can be attributed to 15% increase in production volumes from 340, 81 tons produced in 2016 to 402 tons produced in 2017. Ornamentals, Marron crayfish and the Koi contributed 2%, 1% and 1% respectively to the freshwater sector value. The smallest contributor were Catfish and Carp contributing less than 1% to both freshwater sector value and the overall aquaculture value. Figure 38 above illustrate the value of aquaculture contributed per sub-sector. Figure 39 A and B shows the contribution by each subsector towards the marine and freshwater aquaculture value.

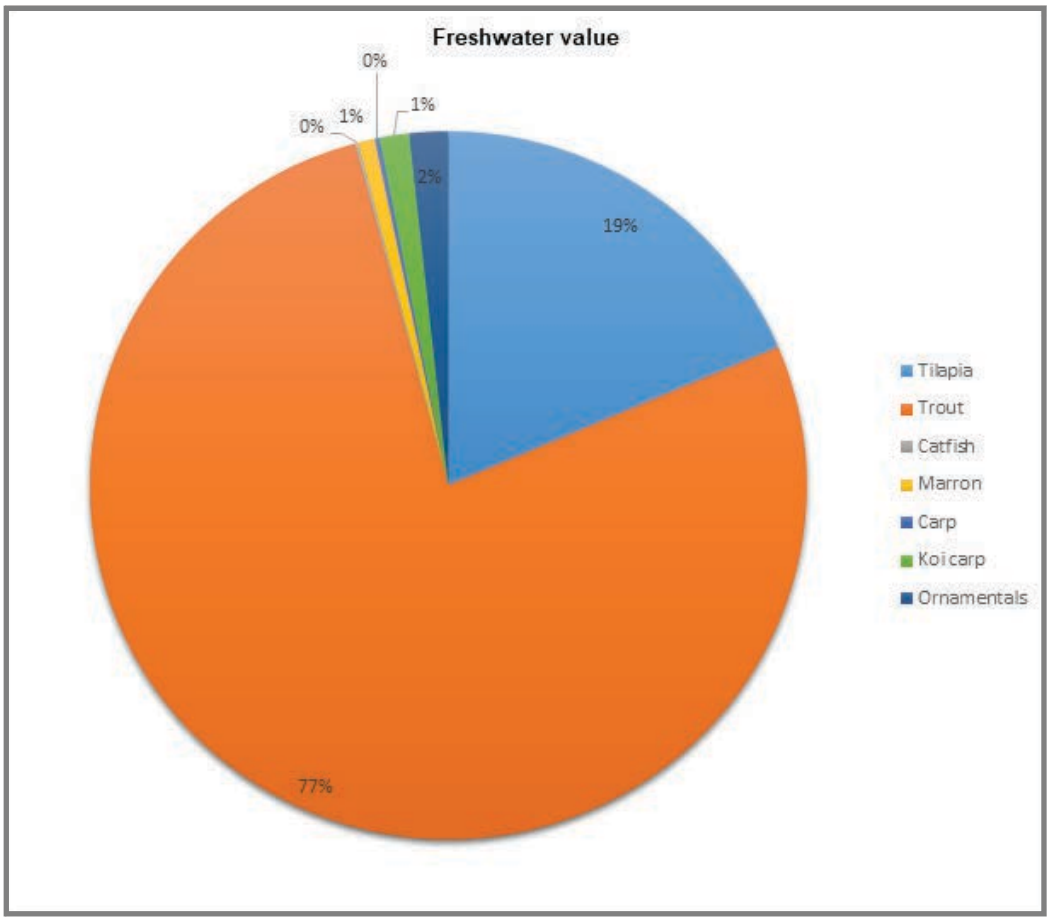


Figure 39 (A): The estimated percentage contribution of the total value of South Africa's aquaculture sector in 2017.

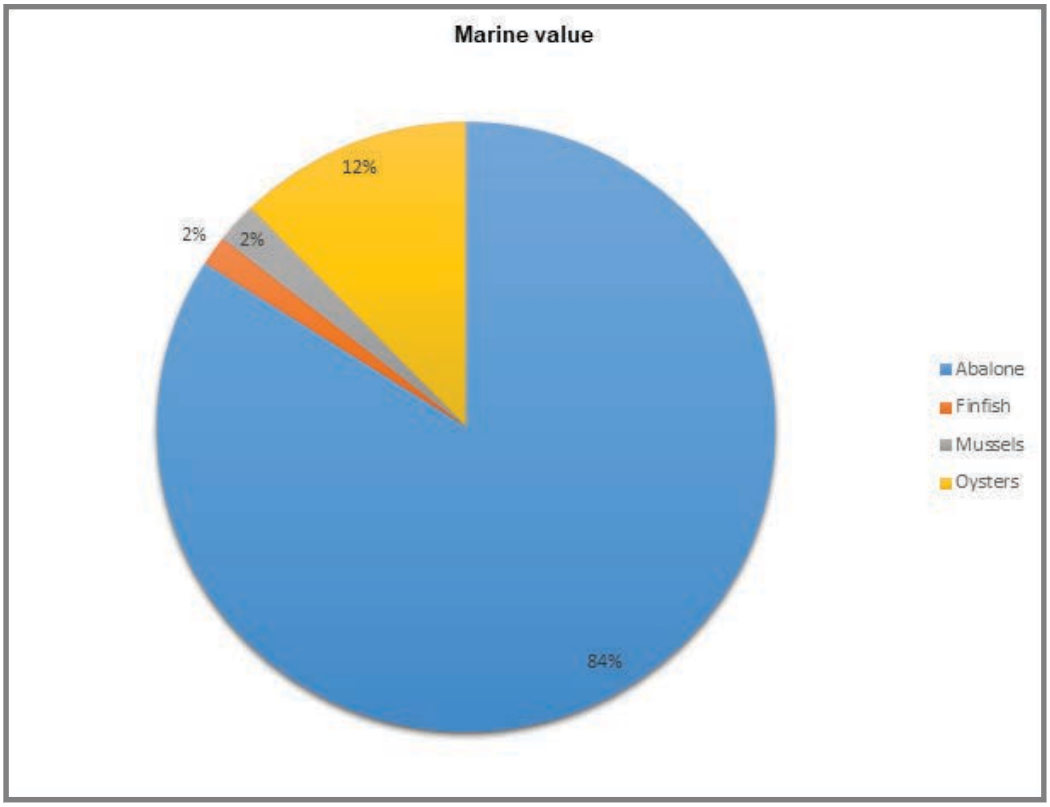


Figure 39 (B): The estimated percentage contribution of the total value of South Africa's aquaculture sector in 2017.

7.3 Aquaculture Investment

Access to funding is one of the major challenges identified to hinder growth of the aquaculture sector. To address this challenge and to ensure that aquaculture in South Africa continues to grow substantially, the DAFF in partnership with several departments and developed strategies and programmes that will ensure support for the sector. Among other key programmes, Aquaculture Development and Enhancement Programme (ADEP), was established by the DAFF in collaboration with the Trade and Industry (the dti) as an incentive scheme devoted to the aquaculture sector. ADEP has contributed significantly to the growth and development of the aquaculture sector. It has proven to be an important tool to positively contribute to increased aquaculture production, investments in the sector and job creation.

Furthermore, there are various public-sector funding mechanisms that currently exist that can potentially provide financial support to aquaculture operations. These are provided at national level by government departments such as DAFF, the Department of National Treasury, the dti and etc. At provincial level, institutions such as the Eastern Cape Development Corporation (ECDC), Gauteng Entrepreneur Propeller (GEP) and Mpumalanga Economic Growth Agency (MEGA) also provide funding. The aquaculture industry is also funded by private and Development Finance Institutions (DFIs) such as the Industrial Cooperation Development (IDC), Land Bank, the National Empowerment Fund (NEF) as well as commercial banks such as Amalgamated Banks of South Africa (ABSA), First National Bank (FNB) and Nedbank.

The government is committed to grow the sector and stimulate the investments. The aquaculture sector remains an insignificant contributor to the national fish supply and the country's Gross Domestic Product (GDP).

In 2017, the total additional investment of approximately R677, 517,777.91 million was attained from both the freshwater and the marine aquaculture sectors; representing an increase of R203, 517, 777 with a percentage of 30% from R474 million that was recorded in 2016 (Table 17).

Figure 40 and 41 below illustrate the investments per sub-sector. The abalone sub- sector contributed the highest investments in the sector with 70% followed by the mussels and tilapia sub sectors with 19% and 5% respectively. The high investments in the abalone sub sector can be attributed to expansion of farms and competitive improvements undertaken by most farms in the sub sector. While the high investments in the mussels and tilapia sub sectors can be associated to an increase in number of farms and expansions. The catfish and kob sub sectors contributed lower investments with 1% for each showing slow growth or developments in the subsectors. There were no investments recorded for the marron sub sector.

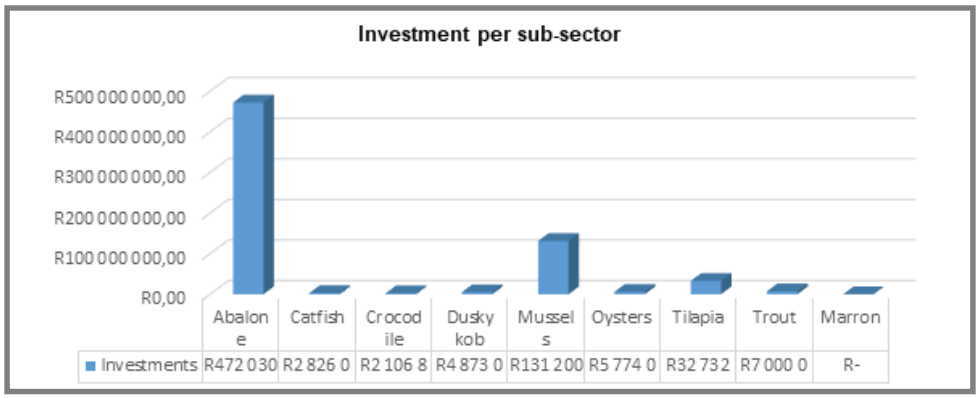


Figure 40: Investments per sub-sector in 2017

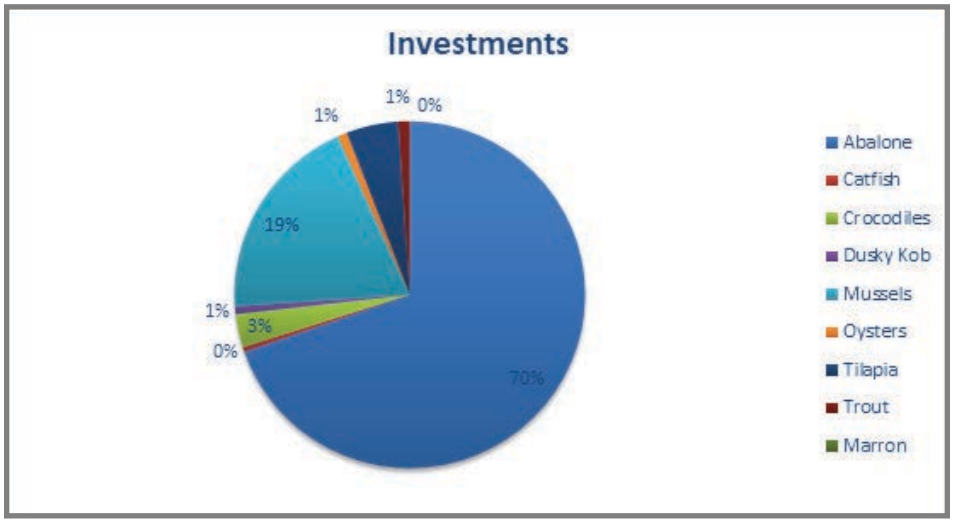


Figure 41: Percentage contributed by each subsector in 2017

7.4 Employment Status

The aquaculture represents a sector with potential to make a significant contribution towards the South Africa economy growth and the development through the creation of skills based employment, being a food supplier and income generator.

The sector employed an estimated 4 448 people (including the crocodile sub sector and value chain jobs i.e. processing) during 2016. In 2017, the sector recorded a total of 67 job losses which can be attributed to factors such as diseases, farm closures and etc. However, a total of 481 additional jobs were created in 2017 due to continuous increase in number of farm expansions, and the number of farms, investments and increased support from the government, the number of jobs increased. This resulted in the employment figure increasing from 4 448 in 2016 to 4 862 in 2017 representing an increase of 8, 5%% from 2016 estimated employment figure.

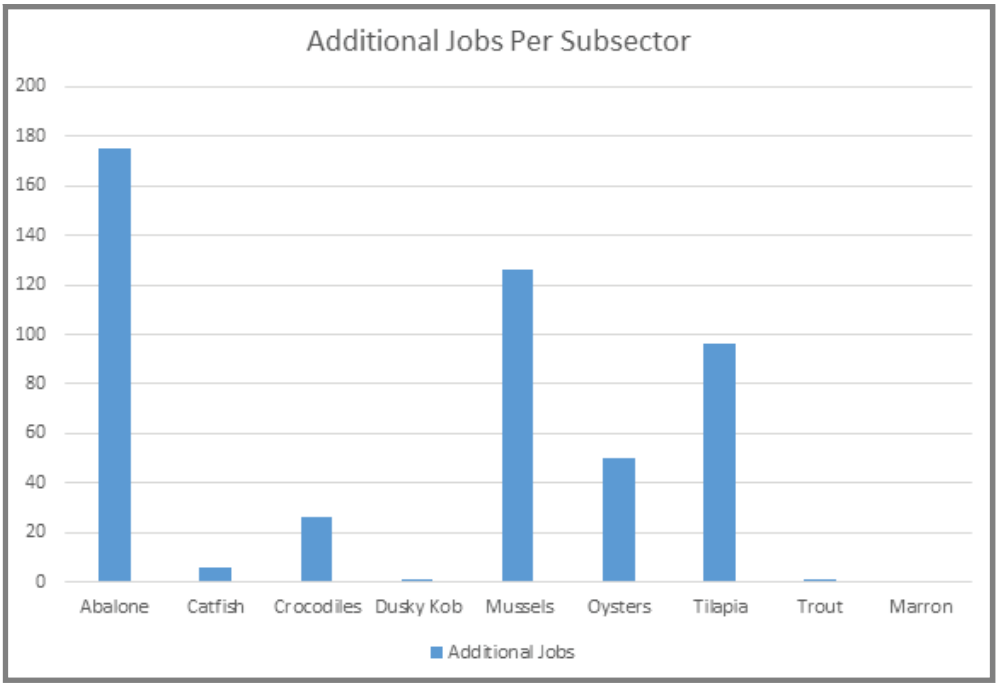


Figure 42: Total aquaculture employment created during 2017

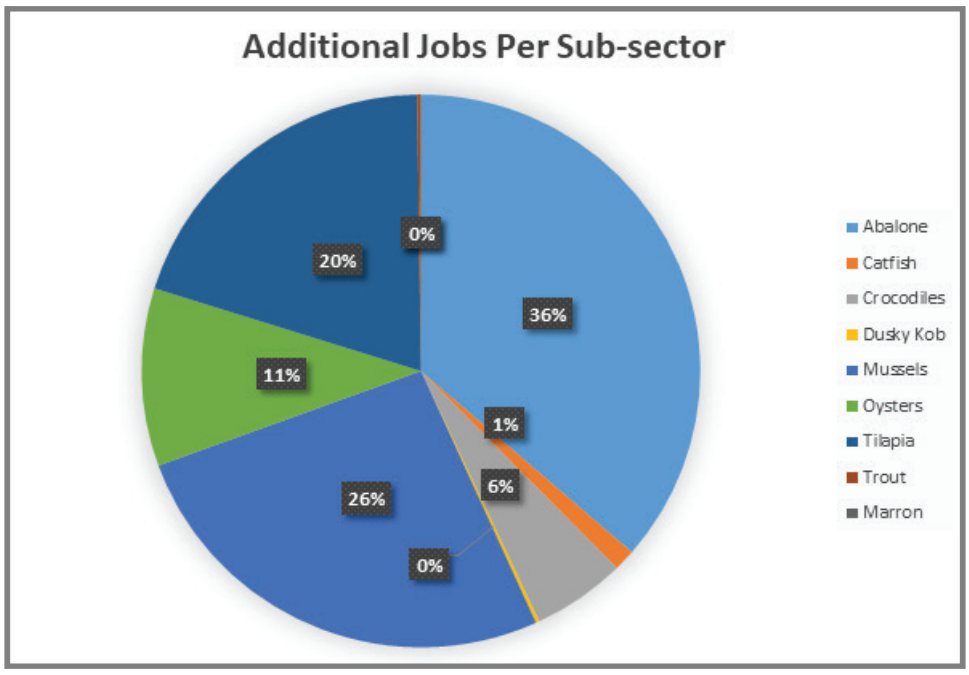


Figure 43: Total jobs per sub-sector during 2017

Figure 42 and 43 shows number of additional jobs created in 2017 by each aquaculture sub sector. As the biggest employer, the abalone sub sector created the highest employment with 36% followed by mussels and tilapia sub sectors with 26% and 20% respectively.

Figure 44 below illustrate jobs per province. The Western Cape was the highest employer with 66%. Due to increasing number of farms in other provinces, the Western Cape contribution towards the total aquaculture employment figure decreased by 2%. But due to a highest number of abalone, mussels and trout farms based in the province Western Cape.

continue to maintain its first position. Eastern Cape was the second largest contributor with 12% increasing from 11% contributed in 2016 and Limpopo came third with 6% increasing from 5% contributed in 2016.

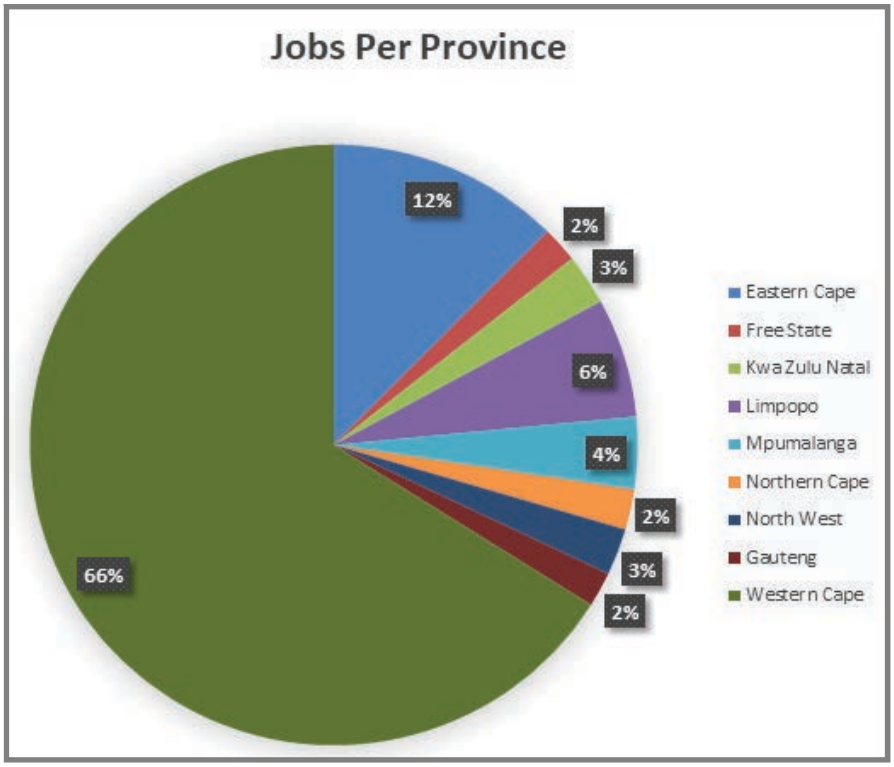


Figure 44: Jobs per province during 2017

7.5 Overview of aquaculture market

Aquaculture is the fastest growing food production sector in the world. The contribution of aquaculture to the world fisheries production has been growing steadily over the last decade and accounts for almost half of total fish supplies for human consumption. With global demand increasing and natural stocks already largely at or exceeding their maximum capture potential, it is clear that aquaculture will play an important role in satisfying future global demand and in contributing to the security of the global food production system (FAO, The state of world's fisheries and aquaculture, 2010). Globally, marine aquaculture is fast becoming recognized as a priority sector. Considering the major contribution of this sector to the economy of other countries, South Africa needs to ensure that this sector grows to its significant potential. Currently, marine aquaculture contributes 0.029 percent to the South African GDP (freshwater aquaculture contribution not confirmed at present).

South Africa's aquaculture industry, though still in its infancy, has been identified by government as a key priority sector because of its potential to supplement dwindling wild- caught fish stocks with cultured fish products. The marine and freshwater aquaculture presents a good opportunity to diversify fish production to satisfy local demand; contribute to food security, job creation, economic and rural development, and improve export opportunities. Aquaculture operations can be found across South Africa in every province, producing a few important species under a variety of culture methods.

South Africa has suitable environmental conditions for aquaculture development and opportunities for commercial production of various cultured species. The local aquaculture sector has performed below its potential and remains a minor contributor to national fishery products and the country's GDP. However, more focus is being placed on the major constraints that have been limited to aquaculture growth. Constraints such as access to water and land, access to technology, high transaction costs, lack of supporting policies and legislation and barriers to marketing which are currently being addressed by DAFF.

7.6 Supply Structure

South African aquaculture products are marketed both locally and internationally, depending on the specific species. The abalone industry markets the bulk of their stock in Asia. The trout industry markets the bulk of their products locally. Products such as crocodile skins are exported, while many of the other experimental species such as dusky kob are marketed mainly on the local market (Aquaculture Market Value Chains: DAFF, 2015).

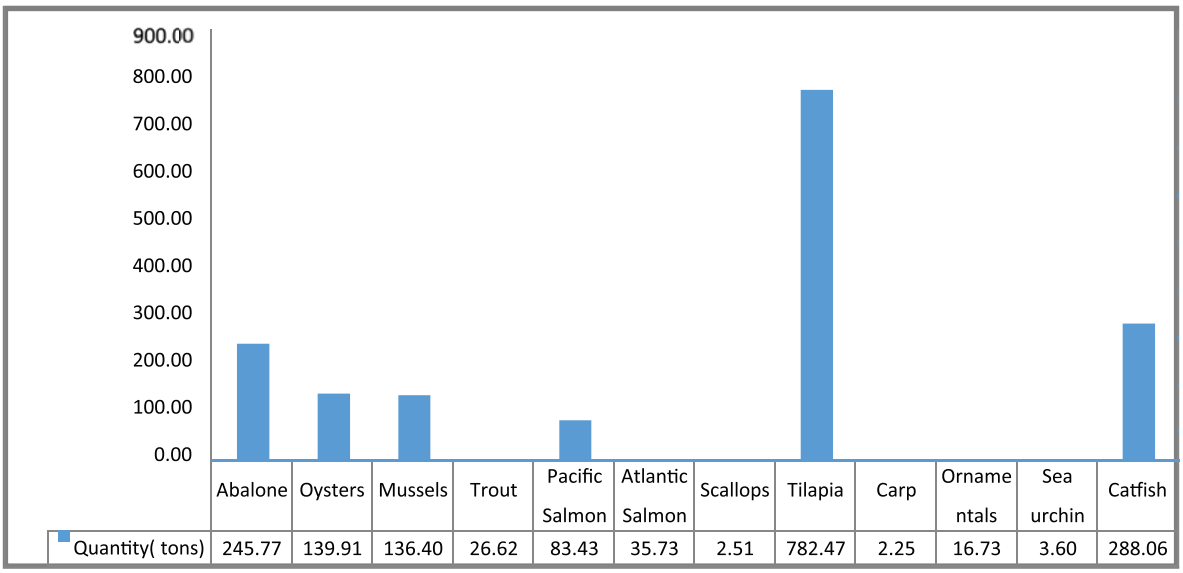
According to FAO, the growth of aquaculture has led to significant changes in how its products are perceived and marketed. In becoming an important contributor to the markets for seafood, aquaculture is increasingly subject to safety mechanisms and controls. The long-term viability of aquaculture development will be market driven, accounting for consumer demand and the capacity to adapt to the structure and legislative demands of the target markets.

Fish can be supplied to the market live or processed. Processing assures best possible market quality, provides a proper form of the semi-processed final product, assures health safety of products when produced in a HACCAP accredited environment, applies the most rational raw processing method and reduces waste to the extent possible.

7.7 Status of local aquaculture market

South Africa's coast has some production potential. In terms of freshwater aquaculture, however, South Africa's environment provides limited potential. The weather is too temperate to farm large amounts of warm-water fish like tilapia and catfish, which require tropical weather all year round. The rising electricity costs are a general concern for aquaculture stakeholders, including abalone farmers, who use a significant amount of power to pump water onshore and into tanks. Farmed products, therefore, tend to be quite expensive. South Africa continues to import low value species at cheaper tariffs to satisfy the local market. High value species which include abalone are exported due to higher returns from the international market. The challenge is to reduce production costs and align them with competing imports (SA moving to secure its share of world aquaculture growth, 2013).

7.8 Aquaculture export market



	Abalone	Oysters	Mussels	Trout	Pacific Salmon	Atlantic Salmon	Scallops	Tilapia	Carp	Ornamentals	Sea urchin	Catfish
Quantity(tons)	245.77	139.91	136.40	26.62	83.43	35.73	2.51	782.47	2.25	16.73	3.60	288.06

Figure 45: Total aquaculture exports

The total marine and freshwater aquaculture exports in 2017 was 1763 tons with a value of R154 128 452. Tilapia subsector was the leading exporter with 782.47 tons followed by the catfish subsector with 288.06 tons then abalone, oysters, mussels, Pacific Salmon, Atlantic Salmon and trout with 245.77,139.91, 136.40, 83.43, 35.73 and 26.62 respectively (Figure 45). Carp, scallops and sea urchin were the smallest subsectors that contributed to the total exports with 2.25 tons for carp, 2. 51 for scallops and 3.60 tons for the sea urchin exported (Figure 45). The percentage decrease in the total quantity exported for the industry was 22% in comparison with 2016 whilst the total aquaculture exports by value increased by 305%.

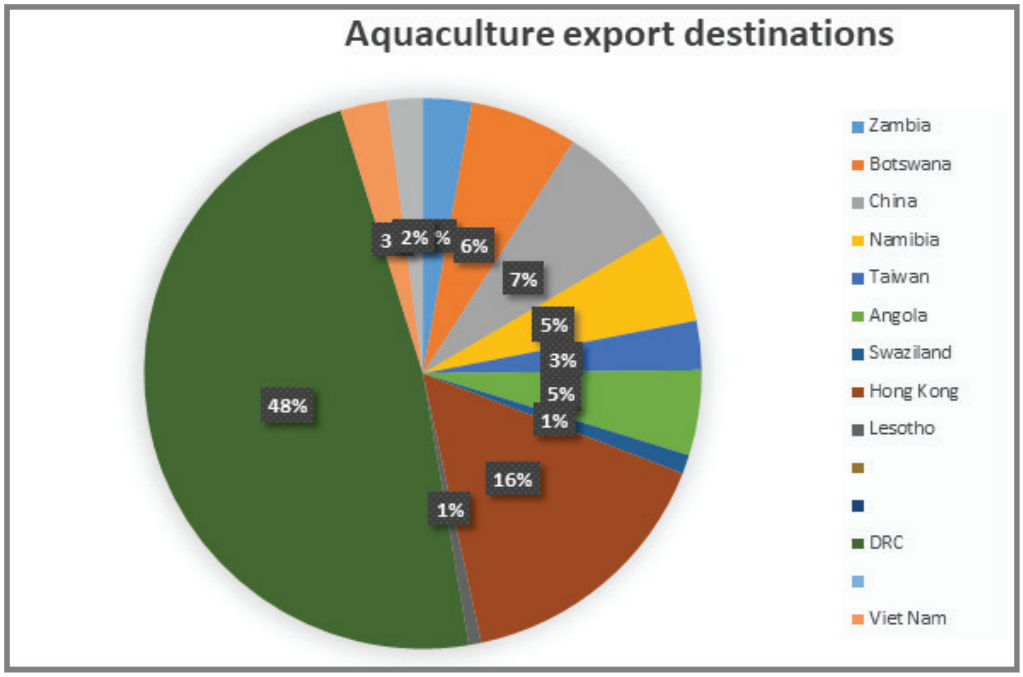


Figure 46: Total Aquaculture export destinations in 2017

Table 16: Total aquaculture exports destinations in 2017

Country	Total quantity (tons)
Zambia	50.14585
Botswana	110.38485
China	130.77078
Namibia	96.29732
Taiwan	51.09495
Angola	88.29598
Swaziland	19.69553
Hong Kong	278.01487
Lesotho	12.83698
DRC	846.46
Viet Nam	47.98
Australia	0.838
Malaysia	1.4091
Canada	0.011
Seychelles	0.27
Malawi	1.62941
Tanzania	0.102
Ethiopia	0.198
Georgia	0.128
Nigeria	1.30322
Malawi	1.62941

Iran	0.82
Lebanon	0.288
Mauritius	1.50697
Uganda	2.37296
Congo	0.484
United Kingdom	0.128
United States of America	0.685
Singapore	0.009
Unclassified	2.20145
Kenya	0.114
Israel	0.016
Romania	0.052
Norway	0.05699
Rwanda	0.041
Sri Lanka	0.016
Maldives	0.013
Saint Helena, Ascension an Tristan da Cunha	1.35392
Sao Tome And Principe	0.05
United Emirates	0.048
Zimbabwe	7.79654
Ghana	3.29841
Mozambique	7.49858

Figure 46 shows the main destination of South African total aquaculture exports in 2017.The above figure 46 shows that the main destination of aquaculture total exports in 2017 was the DRC commanding 48% followed by Hong Kong with 16% then China with 7%. Botswana was the fourth highest importer with 6% followed by Namibia and Angola with 5%, then Vietnam, Taiwan and Zambia with 3%, followed by Lesotho, Swaziland with 1%. All other countries combined imported 2% of aquaculture species (Table 16).

Most of the aquaculture species such as abalone are traded internationally. Therefore, the demand and supply conditions in the domestic and international market influence domestic prices directly. International prices of fish were relatively high in 2017(Figure 47). The average index value over the third quarter of 2017 was 157 compared with 147 in the third quarter of 2016 and 138 in 2015 (FAO, 2018).

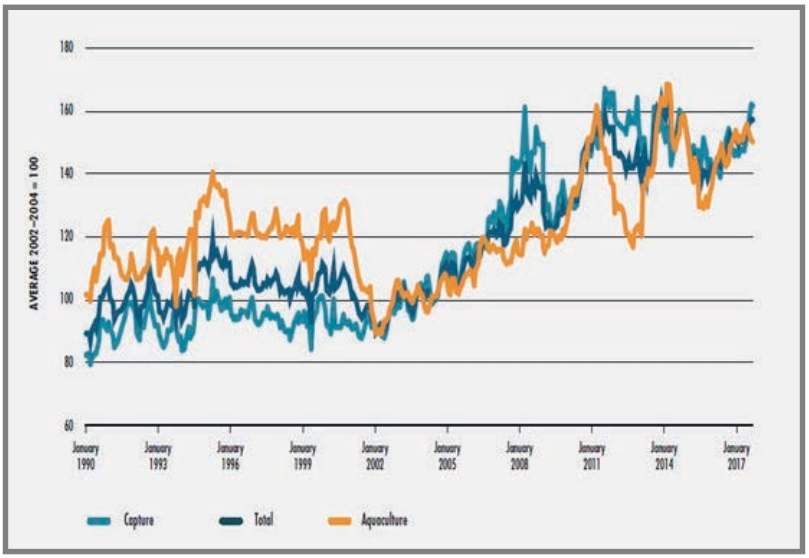


Figure 47: Fish price Index

Source: FAO

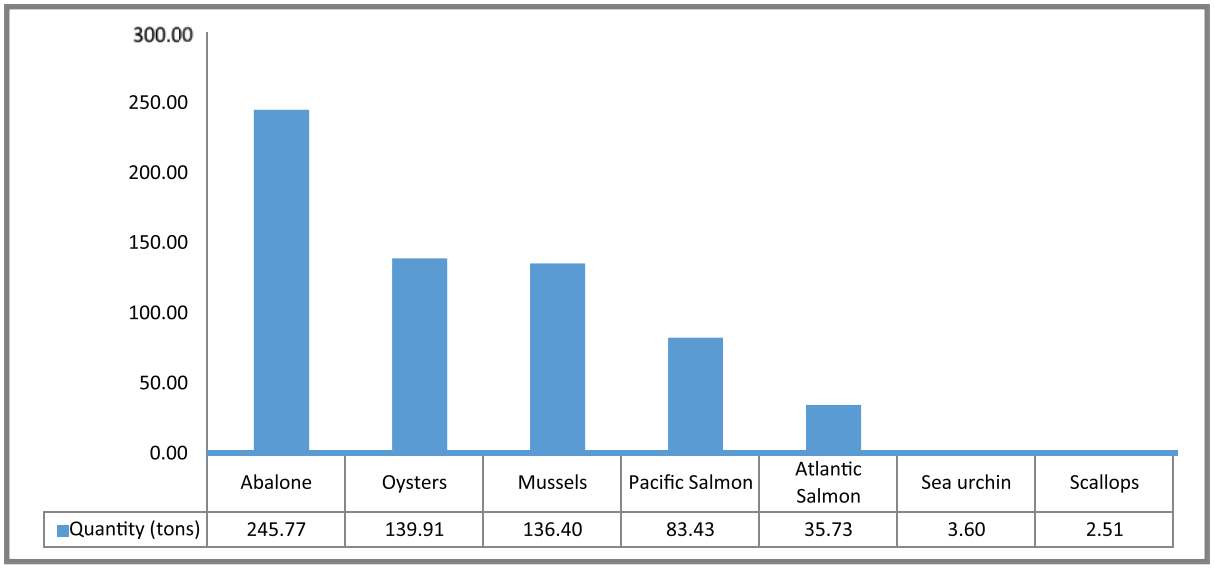


Figure 48: Total Marine exports

The total value of the marine aquaculture industry in 2017 was estimated to be R 131 397 252 with 647.36 tons exported. The industry is growing rapidly in terms of exports and this can be seen by the increase in the exports of all of the marine sub-sectors (oysters, mussels, Pacific Salmon, mussel and oysters) when compared to the previous year 2016. Furthermore, there were additional exports of Atlantic salmon, sea urchin and scallops that were not recorded for 2016 (Figure 48).

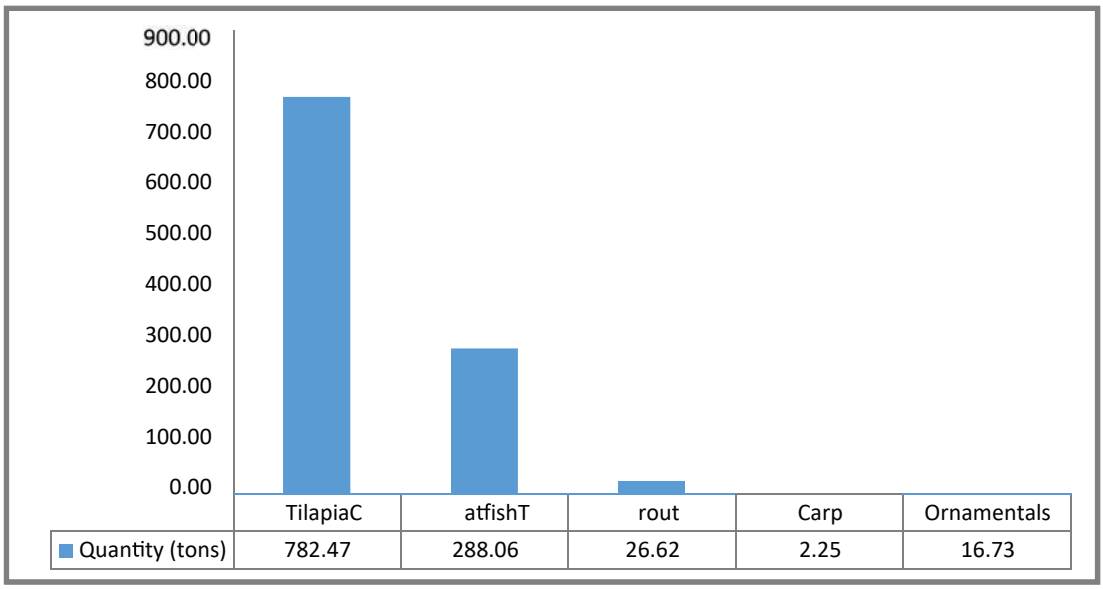


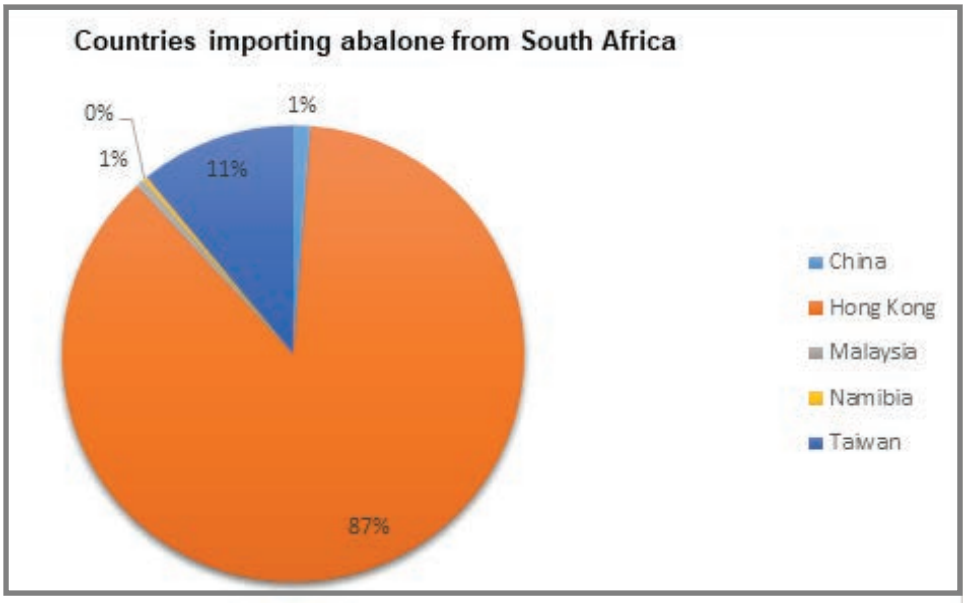
Figure 49: Total Freshwater exports

The total value of the freshwater aquaculture industry in 2017 was estimated to be R 22 731 200 with 1116.13 tons exported. The fresh water industry exports for 2017 decreased by 26%. Tilapia was the most exported with 782 tons followed by catfish, trout, ornamentals and carp with 288, 26, 16 and 2 tons respectively (Figure 49) and their exports were analysed as follows:

7.8.1. Abalone

Table 17: List of importing markets for abalone exported by South Africa in 2017

Country	Total quantity (tons)	Value (R)
China	2.98368	R 1 704 565.00
Hong Kong	213.71	R 87 334 996.00
Malaysia	1.4091	R 607 298.00
Namibia	0.84029	R 151 252.00
Taiwan	26.82915	R 12 238 501.00
Total	245.7723	R 102 036 612.00



Source: SARS (2018)

South Africa exported 245.77 tons of abalone to a value of R 102 036 612 (Figure 50). The major importing countries were Hong Kong with 87%, followed by Taiwan with 11%, China, and Malaysia with 1% (Figure 50). However, the abalone subsectors exports for 2017 decreased tremendously by 67%. Production of the abalone subsector decreased by 582 tons in 2017, this decrease may be due to harmful algal bloom that affected the abalone sub sector.

7.8.2. Atlantic salmon

South Africa exported 35.73 tons of Atlantic salmon at a value of R5 0122 66 (shown in table 18 below). The top five countries that imported Atlantic salmon from South Africa were Namibia, followed by Zambia, Zimbabwe, Botswana and the countries that were unclassified with 55%, 1%, 9%, 7% and 6% respectively while all other countries combined imported 10% (Figure 51).

Table 18: List of importing markets for Atlantic salmon exported by South Africa in 2017

Country	Quantity (tons)	Value
Botswana	2.44	R 269 066.00
Canada	0.01	R 66.00
DRC	0.33	R 36 143.00
Hong Kong	0.01	R 570.00
Israel	0.02	R 62.00
Lesotho	0.01	R 6 687.00
Malawi	0.50	R 37 308.00
Mozambique	0.43	R 57 335.00
Swaziland	1.01	R 64 618.00
Namibia	19.89	R 2 303 556.00
Nigeria	0.50	R 167 515.00
Unclassified	2.04	R 255 208.00
United Arab Emirates	0.05	R 330.00
United Kingdom	0.02	R 61.00
United States	0.69	R 716 909.00
Zambia	5.02	R 716 909.00
Zimbabwe	2.79	R 379 923.00
Total	35.73	R 5 012 266.00

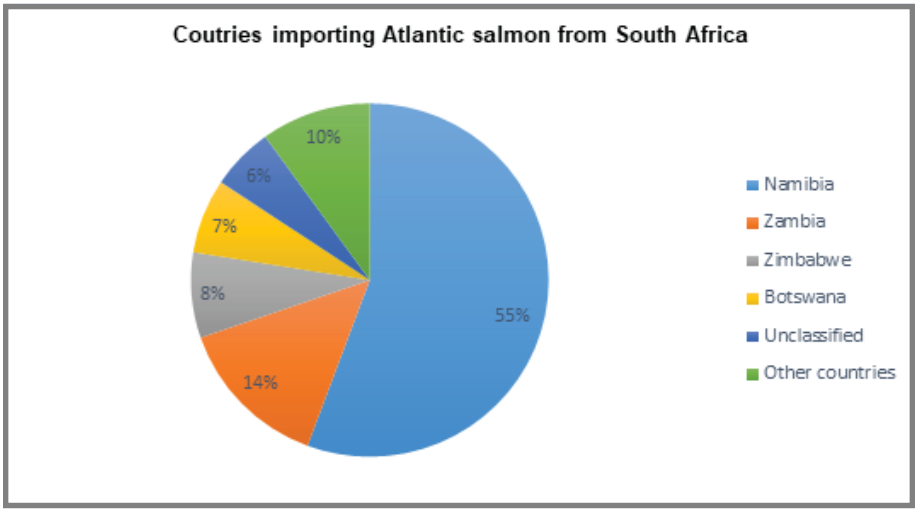


Figure 51: Importing markets for Atlantic salmon in South Africa

Source: SARS (2018)

7.8.3. Carp

Table 19 shows that South Africa exported 2.25 tons of carp to Botswana valued at R2 530 in 2017. Botswana is the only country that has been importing South African produced carp. The carp exports increased by 2.05 tons when compared to 0.2 exported in 2016.

Table 19: List of importing markets for carp exported by South Africa in 2017

Country	Quantity (tons)	Value
Botswana	2.25	R 2 530.00
Total	2.25	R 2 530.00

7.8.4. Catfish

South Africa exported 288.06 tons of catfish valued at R5 442 201 in 2017 (shown in Table 20). The leading importing countries were Democratic Republic of Congo and Vietnam with 80% and 17 % respectively while all other importing countries shared 3% of the exported catfish (shown in Figure 52). South Africa's catfish exports increased by 88% when compared with 2016 exports.

Table 20: List of importing markets for catfish exported by South Africa in 2017

Country	Quantity	Value
Angola	1.45	R 93 578.00
Botswana	1.45	R 59 996.00
DRC	230.01	R 2 955 238.00
Ghana	2.50	R 117 012.00
Lesotho	2.33	R 482 853.00
Swaziland	0.70	R 32 279.00
Viet Nam	47.98	R 1 643 556.00
Zambia	1.66	R 57 689.00
Total	288.06	R 5 442 201.00

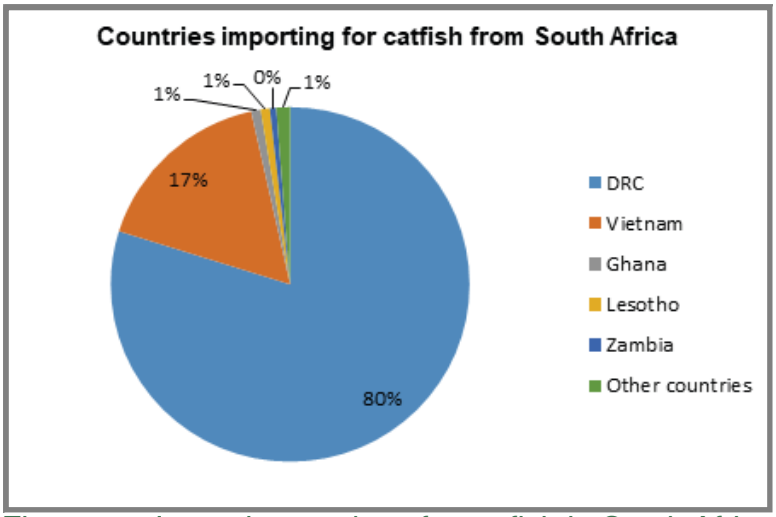


Figure 52: Importing markets for catfish in South Africa

Source: SARS (2018)

7.8.5. Mussels

South Africa exported 136.4 tons of mussels in 2017 at a value of R166 265 (Table 21). South Africa exported its mussels to Angola, Australia and Botswana. These countries imported 60%, 39% and 1% respectively (Figure 53). The South African mussel exports decreased by 48% compared to 2016.

Table 21: List of importing markets for mussels exported by South Africa in 2017

Country	Quantity (tons)	Value (R)
Angola	82.11	R 119 814.00
Australia	0.79	R 4 988.00
Botswana	53.504	R 41 463.00
Total	136.404	R 166 265.00

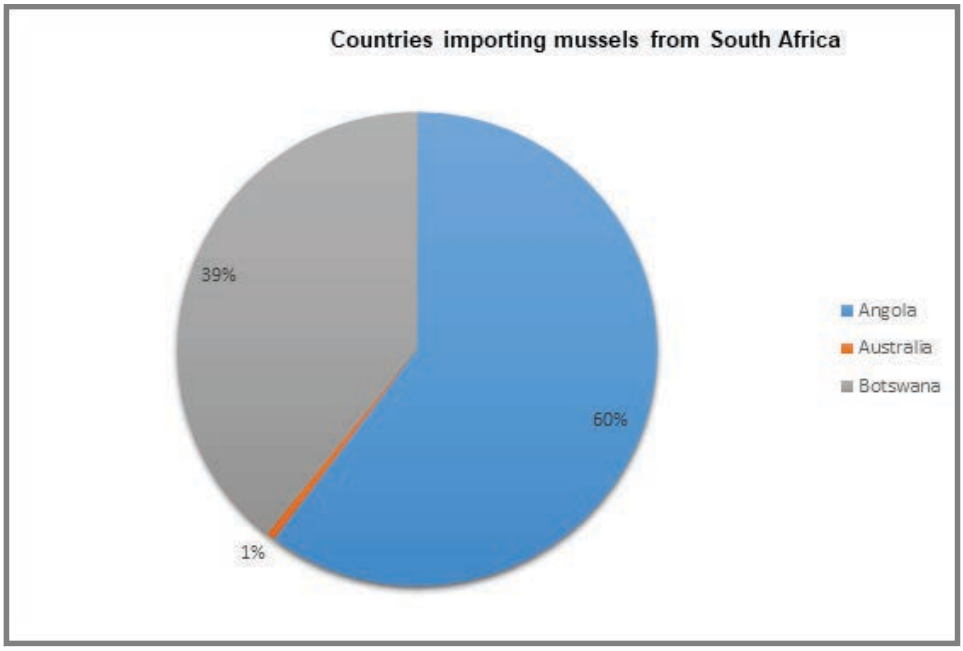


Figure 53: Importing markets for mussels in South Africa, 2017

Source: SARS (2018)

7.8.6. Ornamentals

South Africa exported 16.73 tons of ornamentals at a value of R1 095 504 (Table 22). Botswana imported 55% of the South African produced ornamentals followed by Namibia with 23%, Lesotho with 11%, Mozambique 5%, Zimbabwe 3% and all other countries imported 3% (Figure 54). When comparing these exports with 2016 exports, the quantity of ornamentals exported decreased by 37% (Figure 8).

Table 22: List of importing markets for ornamentals exported by South Africa in 2017

Country	Quantity (tons)	Value (R)
Botswana	9.23	R 409 593.00
Hong Kong	0.02	R 82 330.00
Lesotho	1.74	R 77 689.00
Malawi	0.01	R 2 494.00
Mauritius	0.19	R 35 961.00
Mozambique	0.85	R 720.00
Namibia	3.89	R 400 155.00
Swaziland	0.05	R 242.00
Taiwan	0.08	R 62 605.00
Unclassified	0.11	R 15 330.00
Zambia	0.08	R 2 000.00
Zimbabwe	0.48	R 6 385.00
Total	16.732	R 1 095 504.00

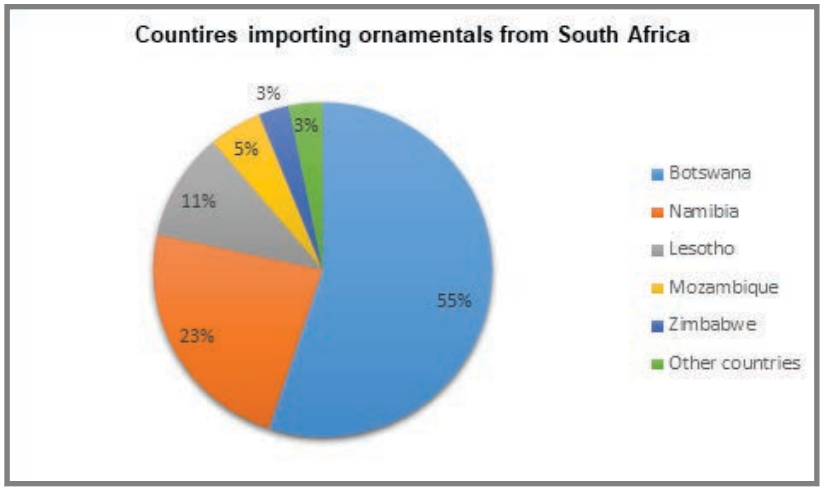


Figure 54: Importing markets for ornamentals in South Africa

Source: SARS (2018)

7.8.7. Oysters

South Africa exported 139.91 tons of oysters in 2017 at a value of R15 640 106 (Table 23) Hong Kong imported 46% followed by China 20%, Taiwan with 18%, Namibia 14%, and Zambia and the rest of other countries exported 1% of the South African produced oysters (Figure 55). When comparing these exports with 2016 exports of 12 tons, the quantity of exported oysters has significantly increased with 1065%, which shows that South Africa's oyster production capacity has increased.

Table 23: List of importing markets for oysters exported by South Africa in 2017

Country	Quantity (tons)	Value (R)
Australia	0.05	R 2 918.00
Botswana	0.48	R 89 836.00
China	27.81	R 3 715 327.00
Hong Kong	64.28	R 8 435 960.00
Lesotho	0.25	R 60.00
Malawi	0.02	R 2 242.00
Maldives	0.01	R 4 615.00
Mauritius	0.72	R 57 600.00
Mozambique	0.69	R 40 801.00
Namibia	19.40	R 321 273.00
Sao Tome And Principe	0.05	R 3 928.00
Singapore	0.01	R 3 928.00
Swaziland	0.41	R 18 009.00
Taiwan	24.19	R 2 870 898.00
Tanzania	0.00	R 470.00
Zambia	1.55	R 45 431.00
Zimbabwe	0.21	R 26 810.00
Total	139.91	R 15 640 106.00

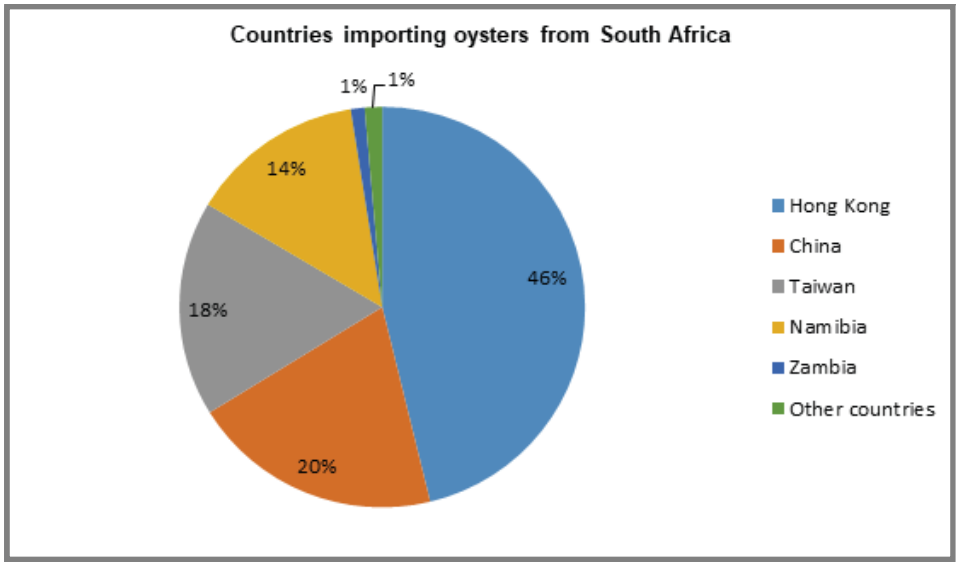


Figure 55: Importing markets for oysters in South Africa

Source: SARS (2018)

7.8.8. Pacific Salmon

South Africa exported 83.43 tons of Pacific salmon at a value of R8 334 499 (Table 24). The top five leading importers were Namibia, Botswana and Zambia with 58%, 17%, 13%, Zimbabwe 4% and Uganda with 3% respectively while all other countries shared 5% of the exported quantity (Figure 56). South Africa's Pacific salmon exports have increased by 32% when compared with 2016 exports.

Table 24: List of importing markets for Pacific salmon by South Africa in 2017

Country	Quantity (tons)	Value (R)
Angola	1.25	R 227 695.00
Botswana	14.49	R 840 295.00
Congo	0.24	R 49 141.00
DRC	1.39	R 217 042.00
Ghana	0.56	R 98 115.00
Lesotho	0.11	R 227 695.00
Malawi	0.64	R 110 966.00
Maldives	0.01	R 16.00
Mauritius	0.09	R 7 849.00
Mozambique	1.04	R 178 515.00
Namibia	48.71	R 2 594 044.00
Nigeria	0.50	R 16 100.00
Rwanda	0.04	R 12 474.00
Saint Helena, Ascension and Tristan da Cunha	0.68	R 38 915.00
Seychelles	0.27	R 65 827.00
Tanzania	0.10	R 38 468.00
Uganda	2.34	R 147 538.00
Zambia	10.96	R 2 594 044.00
Zimbabwe	3.04	R 869 760.00
Total	83.43	R 8 334 499.00

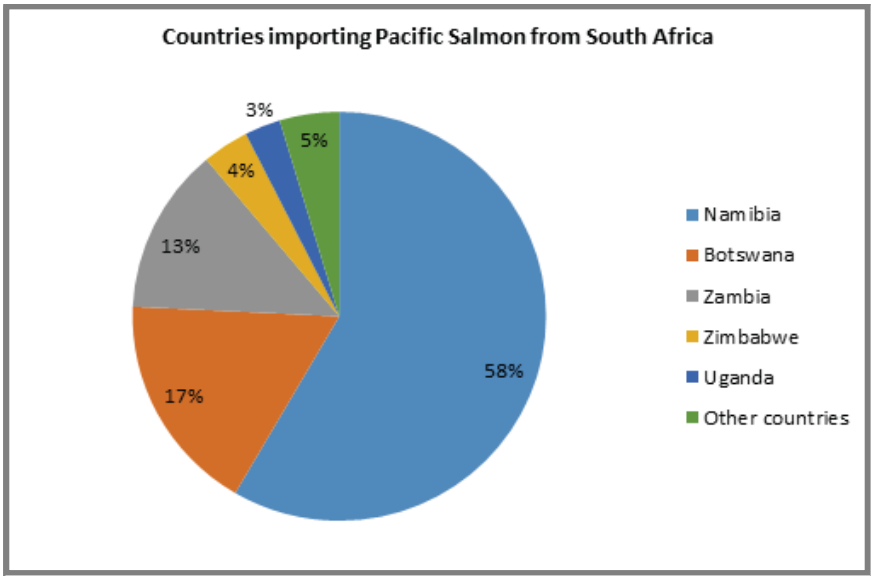


Figure 56: Importing markets for Pacific salmon

Source: SARS (2018)

7.8.9. Scallops

South Africa exported 2.51 tons of scallops in 2017 at a value of R174 701 (Table 25). The leading importers were Namibia, DRC, Botswana, Ghana and Mauritius. Namibia imported 31% of scallops while DRC imported 22% followed by Botswana at 21%, followed by Ghana at 9% and Mauritius at 5%. All other countries combined imported 12%.

Table 25: List of importing markets for scallops exported by South Africa in 2017

Country	Quantity	Value
Botswana	0.52	R 42 367.00
DRC	0.55	R 51 000.00
Ghana	0.24	R 28 158.00
Malawi	0.05	R 6 834.00
Mauritius	0.13	R 11 632.00
Mozambique	0.11	R 7 847.00
Namibia	0.77	R 19 999.00
Norway	0.06	R 1 264.00
Zimbabwe	0.08	R 5 600.00
Total	2.51	R 174 701.00

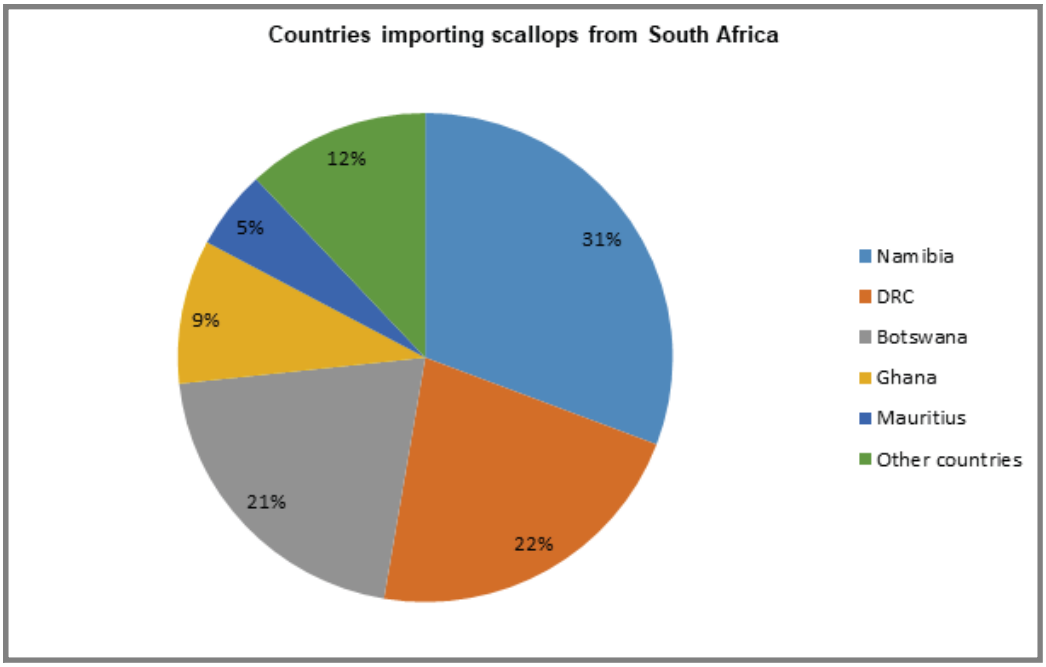


Figure 57: Importing markets for scallops in South Africa

Source: SARS (2018)

7.8.10. Sea urchins

South Africa exported 3.6 tons of sea urchins valued at R32 803 (Table 26). The importing countries were Lesotho and Mozambique with 82% and 18% respectively (Figure 58).

Table 26: List of importing markets for sea urchins exported by South Africa in 2017

Country	Quantity (tons)	Value (R)
Lesotho	0.65	R 23 003.00
Mozambique	2.95	R 9 800.00
Total	3.6	R 32 803.00

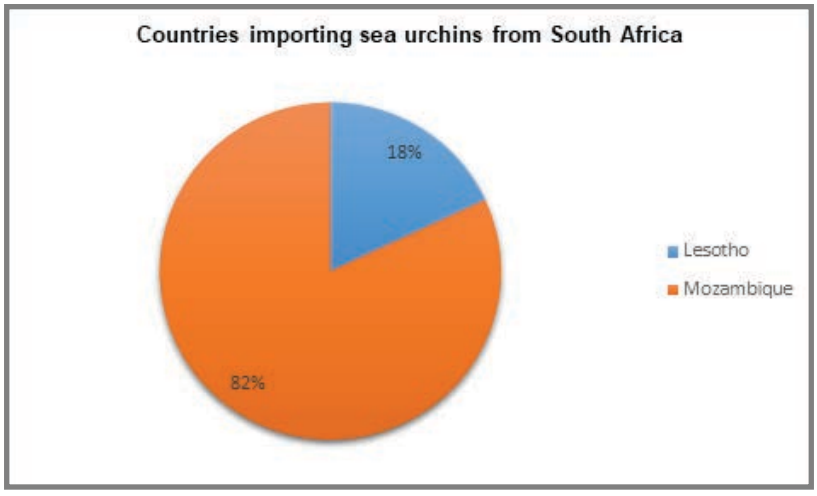


Figure 58: Importing markets for sea urchins in South Africa

Source: SARS (2018)

7.8.11. Tilapia

South Africa exported 782.47 tons of tilapia at a value of R9 742 081 during 2017 (Table 27). The top leading importers were DRC and China with 78% and 13% respectively while other countries such as Zambia, Botswana and Swaziland imported less than 5%. All other countries combined imported 1% of the total quantity exported (Figure 59).

Table 27: List of importing markets for tilapia exported by South Africa in 2017

Country	Quantity (tons)	Value
Angola	2.2	R 343 022.00
Botswana	18.1	R 765 213.00
China	100.0	R 1 061 428.00
DRC	612.9	R 6 918 123.00
Lesotho	0.5	R 18 127.00
Malawi	0.2	R 10 720.00
Mauritius	0.4	R 6 786.00
Mozambique	1.2	R 24 455.00
Namibia	0.5	R 18 026.00
Swaziland	16.9	R 254 745.00
Uganda	0.0	R 579.00
Zambia	29.5	R 320 857.00
Total	782.47	R 9 742 081.00

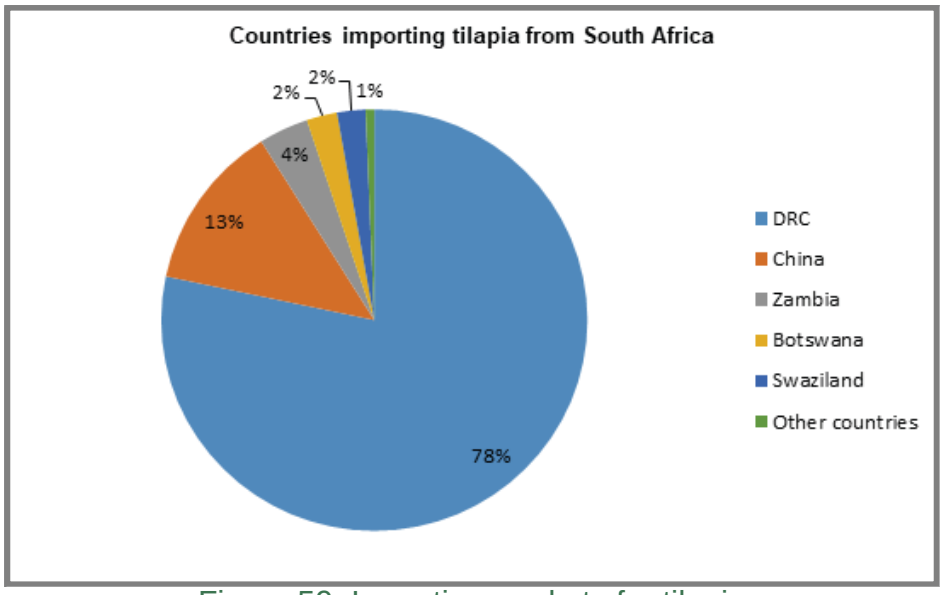


Figure 59: Importing markets for tilapia

Source: SARS (2018)

7.8.12. Trout

South Africa exported 26.62 tons of trout at a value of R6 448 884 (Table 28). The leading importing countries were Botswana with 30%, Lesotho with 27%, Namibia 9%, Zambia 5%, Zimbabwe 4% and all countries combined with 25% (Figure 60).South Africa's trout exports decreased by 29% when compared to 2016.

Table 28: List of importing markets for trout exported by South Africa in 2017

Country	Quantity	Value
Angola	1.25	R 227 695.00
Botswana	7.95	R 272 430.00
Congo	0.24	R 49 141.00
DRC	1.29	R 204 542.00
Ethiopia	0.20	R 43 248.00
Georgia	0.13	R 49 736.00
Iran	0.82	R 877 923.00
Kenya	0.11	R 149 036.00
Lebanon	0.29	R 367 916.00
Lesotho	7.25	R 3 077 544.00
Mauritius	0.02	R 1 440.00
Mozambique	0.20	R 4 450.00
Namibia	2.32	R 240 568.00
Nigeria	0.30	R 110 843.00
Romania	0.05	R 66 108.00
Saint Helena, Ascension an Tristan da Cunha	0.67	R 36 453.00
Sri Lanka	0.02	R 2 438.00
Swaziland	0.59	R 57 655.00
Unclassified	0.05	R 5 391.00
UK	0.13	R 206 196.00
Zambia	1.36	R 12 354.00
Zimbabwe	1.20	R 342 692.00
Malawi	0.17	R 43 085.00
Total	26.62	R 6 448 884.00

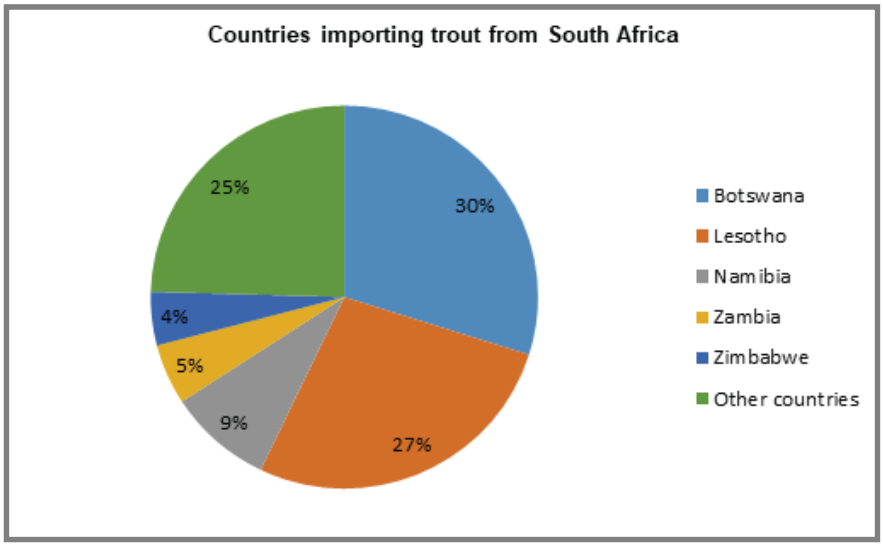


Figure 60: Importing markets for trout in South Africa

Source: SARS (2018)

7.9. South African import status

7.9.1. Catfish

In 2017, South Africa imported 776. 49 tons of Catfish valued at R21, 735,172 (shown in table 29). The quantity of catfish imported increased by 605.5 tons in 2017 when compared to 2016. The top three exporting countries were Vietnam, China and Singapore with 71%, 22% and 6% respectively (shown in figure 61).

Table 29: Imported catfish in South Africa

Country	Quantity (tons)	Value (R)
Vietnam	550.00	18,566,008.00
China	173.88	1,517,967.00
Singapore	47.22	1,523,585.00
Namibia	5.39	127,612.00.00
Total	776.49	21,735,172.00

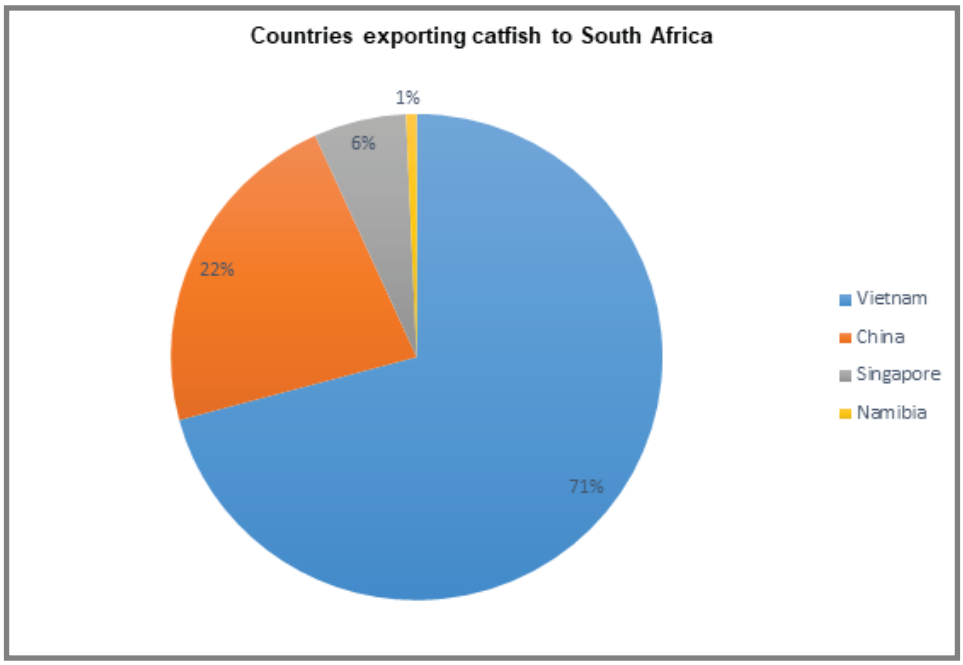


Figure 61: Imported catfish in South Africa

Source: SARS (2017)

7.9.2. Mussels

The total quantity of mussels imported in 2017 was 94.5 tons valued at R2, 096,285 (shown in table 30). China was the leading exporting country contributing 99% of the mussel imports followed by Portugal with 1% contribution, the other 2 countries (New Zealand and Namibia) contributed less than 1% each (shown in figure 62). When compared with 2016, mussels imported in South Africa have significantly decreased with 629.79 tons.

The growth in production for the industry could have led to the decrease in the quantity of mussels imported in South Africa since the capacity for producing mussels in the country has been growing over the years. The South African mussel sub sector has been recorded as the highest in terms of production showing a significant increase as a result, in 2017; the sector contributed 53% to the total marine aquaculture in South Africa. This was marked as the highest contribution in the country's marine aquaculture, giving South Africa an opportunity to export more than they can import.

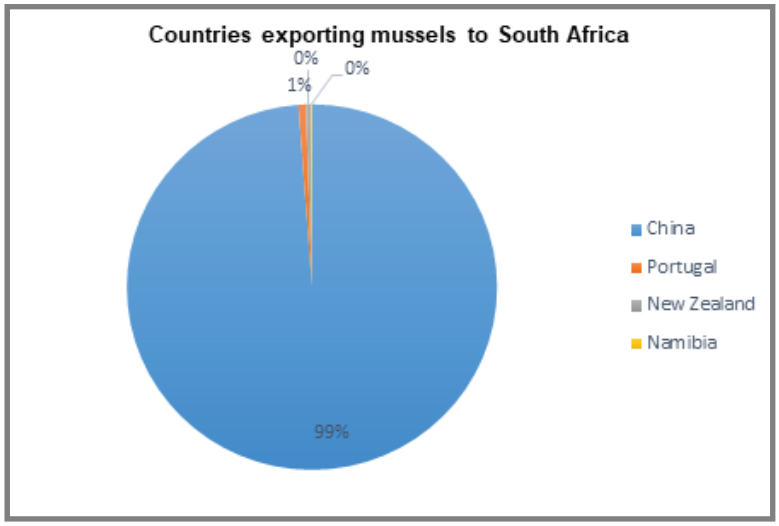


Figure 62: Quantity of mussels imported in South Africa

Table 30: Imported mussels in South Africa

Country	Quantity (tons)	Value (R)
China	93.4	923,002
Portugal	0.6	375,734.
New Zealand	0.4	779,427
Namibia	0.1	18,122
Total	94.5	2,096,285

7.9.3. Ornamentals

South Africa imported 226.50 tons of ornamentals valued at R870, 176 (shown in table 31). From the 27 countries that exported their ornamental fish to South Africa, Indonesia was the leading exporter contributing 23% followed by Sri Lanka, Israel and Singapore with 12%, 11% and 10% respectively and all other countries had 43% share to the imported total ornamental imports.(shown in figure 63). When comparing with 2016 imports, the quantity of imported ornamental fish has slightly increased with 8.53 tons.

Table 31: South Africa's ornamental imports

Country	Quantity (tons)	Value (R)
Australia	0.87	282,272
China	4.30	635,925.
Colombia	1.83	213,752
Germany	0.40	29,846
Hong Kong	1.81	123,479
India	0.55	53,512
Indonesia	51.46	3,356,086
Israel	23.87	249,2748
Japan	8.13	610,113
Kenya	11.87	434,184
Madagascar	0.09	29,991
Malawi	0.15	37,252
Malaysia	11.85	1,071,323
Mauritius	0.89	52,253
Netherlands	0.04	75,335
Nigeria	1.68	259,922
Philippines	5.88	33,0821
Puerto Rico	0,28	26,52
Singapore	21.86	5,701,046
Sri Lanka	28.22	2,021,692
Taiwan	7.74	1,047,568
Tanzania	0.10	4,224
Thailand	24.98	2,461,959
United Kingdom	2.51	84,994
United States	3.84	659,643
Vietnam	11.20	870,176
Zambia	0.12	6,988
Total	226.50	25,431,359

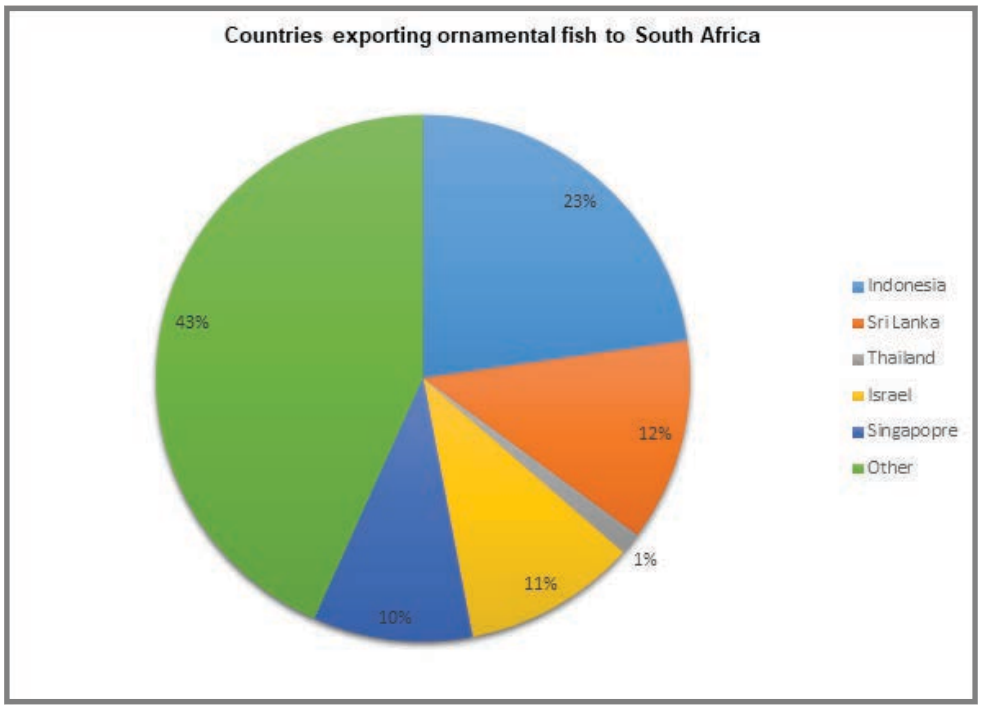


Figure 63: Ornamental fish imports Source: SARS (2017)

7.9.4. Oysters

During 2017, South Africa imported 144. 07 tons of oysters valued at R7, 048, 541 (shown in table 32). The leading exporting country was Namibia with 99% followed by Chile with 1% and all other countries contributed less than 1 %(shown in figure 64). When comparing the quantity imported in 2017 with that of 2016, the quantity has increased with 63.24 tons.

This increase in the quantity imported coincides with the increase in the total production of oysters in South Africa. In 2017, the oyster sub-sector recorded a production of 432.66 tons and contributed 11.07% towards the overall marine aquaculture production, which has demonstrated an increase of 75.39 tons (21.10%) with effect from 2016.

Table 32: South Africa's oyster imports during 2017

country	Total quantity	Value (R)
Namibia	142,96	6,481,897
Chile	1,02	499,190,
Venezuela	0,08	64,915
France	0,02	2,539
Total	144,07	7,046002,

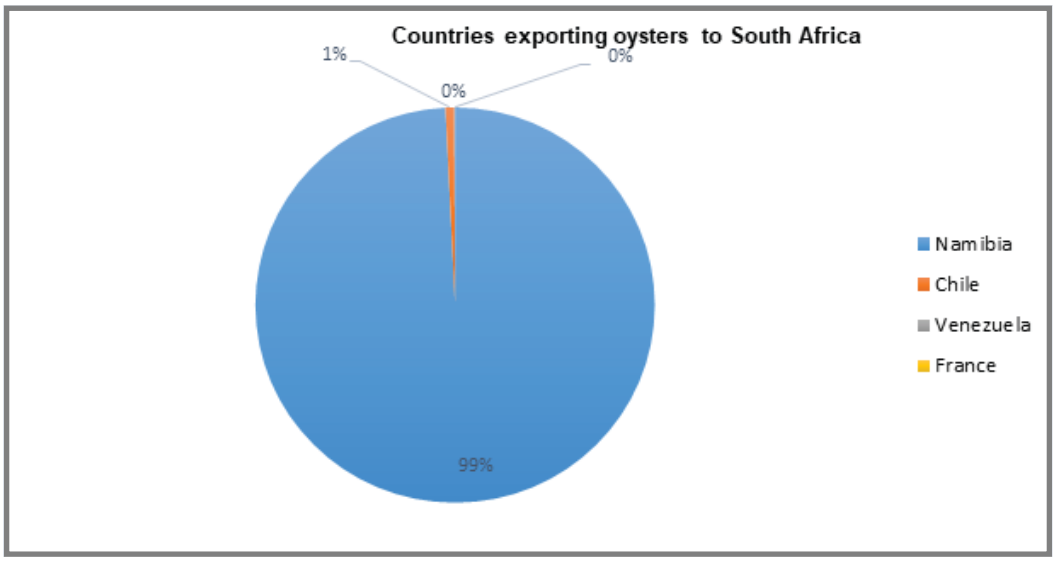


Figure 64: South Africa's oyster imports Source: SARS (2017)

7.9.5. Atlantic salmon

South Africa imported 2223.71 tons of Atlantic salmon in 2017 valued at R229, 760,910 (shown in Table 33). Norway and Germany were the leading exporters with 96% and 4% respectively; all other countries contributed less than 1% (shown in figure 65).The quantity of Atlantic salmon imported has decreased by 90% with effect from 2016.

The oyster subsector has contributed 11, 07% to the South Africa's total marine aquaculture production showing an increase of 21% with effect from 2016.This increase in the production of oysters coincides with the 90% decrease in the imported quantity. This might lead to a conclusion that, the species might have slightly or contributed in the decrease of the oyster imports in South Africa.

Table 33: Imported Atlantic salmon

COUNTRY	TOTAL QUANTITY (TONS)	Value (R)
Norway	2122.54	218,544,201
Germany	83.67	935,1887
United Kingdom	9.95	1,263,278
Netherlands	6.72	55,6891
Namibia	0.6	25,408
France	0.23	19,245
Total	2223.71	229,760,910

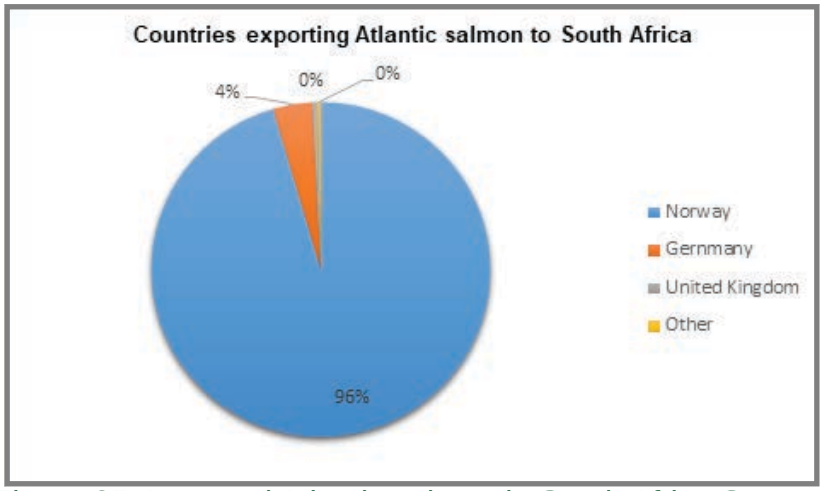


Figure 65: Imported Atlantic salmon in South Africa Source: SARS (2017)

7.9.6. Scallops

In South Africa, scallops (Pecten Sulcicostatus) have been found to have high economic value and have the potential to be cultivated on a commercial scale. Out of all species recorded in the Southern African coastline Pecten Sulcicostatus is the only species considered suitable for aquaculture due to its large size (Aboe et al.;2014)

During 2017, South Africa imported 99.9 tons of scallops valued at R5, 949,193 (shown in table 34). China was the leading exporting country contributing 84% followed by United States, Ireland, France and Japan with United States contributing 8% and other countries with 2% each to the quantity of scallops imported. (Shown in figure 66).

Table 34: South African imported scallops

Country	Total Quantity	Value
China	83.51	R1,318,992
United States	7.65	R2,014,024
France	2.40	R1,025,186
Ireland	2.13	R662,10
Japan	2.00	R513,02
United Kingdom	1.17	R128,66
Netherlands	1.1	R287,21
Total	99.9	R5,949,193

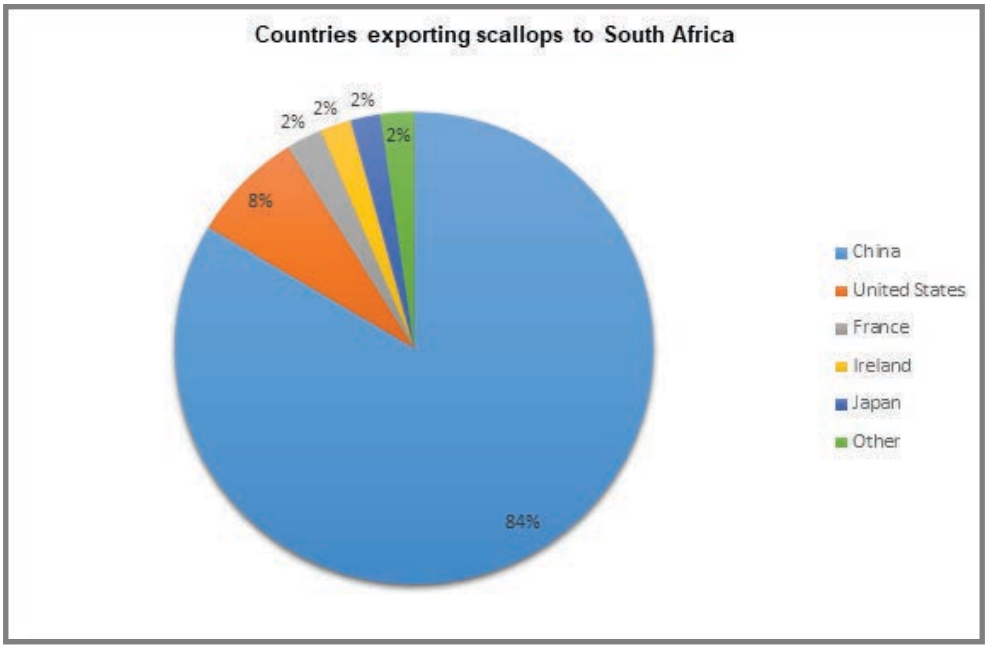


Figure 66: Quantity of scallops imported in South Africa Source: SARS (2017)

7.9.7. Trout

South Africa imported 623.93 tons of trout valued at R50, 017,806 (shown in table 35). The leading exporting country was Lesotho with 61% contribution followed by Norway with 39% (shown in figure 67) with all other countries shown in Table 8 contributing less than 1%. When compared to 2016, trout imports in South Africa have decreased with 142, 64 tons.

Table 35: Quantity of trout imported in South Africa.

COUNTRY	TOTAL	Value (R)
Lesotho	377.68	23,418,620
Norway	241.12	25,960,017
Kenya	3.73	223,477
Tanzania	0.46	10,401
Zambia	0.34	12,471
Denmark	0.18	191756
Indonesia	0.18	191,756
Nigeria	0.10	773
Malawi	0.07	8,535
Total	623.93	50,017,806

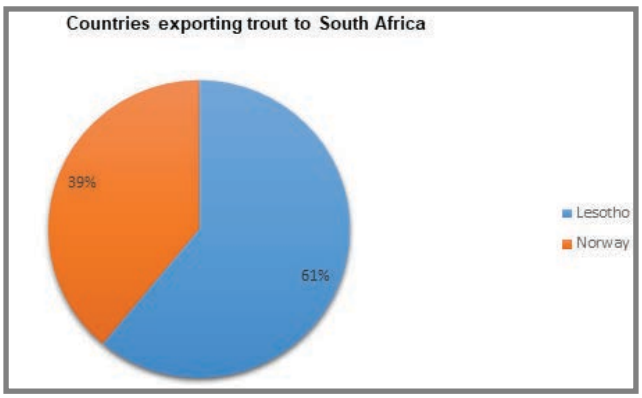


Figure 67: Imported trout in South Africa Source: SARS (2017)

7.9.8. Tilapia

South Africa imported 5649,664 tons of tilapia in 2017 valued at R57, 337,887 (shown in Table 36). The leading exporting country was China, which contributed 94% to the South African tilapia imports. China was followed by Hong Kong contributing 4% and all other countries contributing 2% (shown in figure 68).The quantity of tilapia imported has increased by 1,099 tons with effect from 2016, which highlights a 5% decrease.

The oyster subsector has contributed 11, 07% to the South Africa's total marine aquaculture production showing an increase of 21% with effect from 2016.This increase in the production of oysters coincides with the 90% decrease in the imported quantity. This might lead to a conclusion that, the increase in the production of the species in South Africa might have slightly or contributed in the decrease of the oyster imports in South Africa.

Table 36: Quantity of tilapia imported in South Africa

Country	Quantity (tons)	Value (R)
China	5301,984	51,852,561
Hong Kong	205,31	2,079,633
Indonesia	13,62	515,011
Myanmar	3	16,299
Namibia	1	48,737
United states	49,21	774,096
Uruguay	26,1	428,106
Zimbabwe	49,44	1,623,444
Total	5649,664	57,337,887

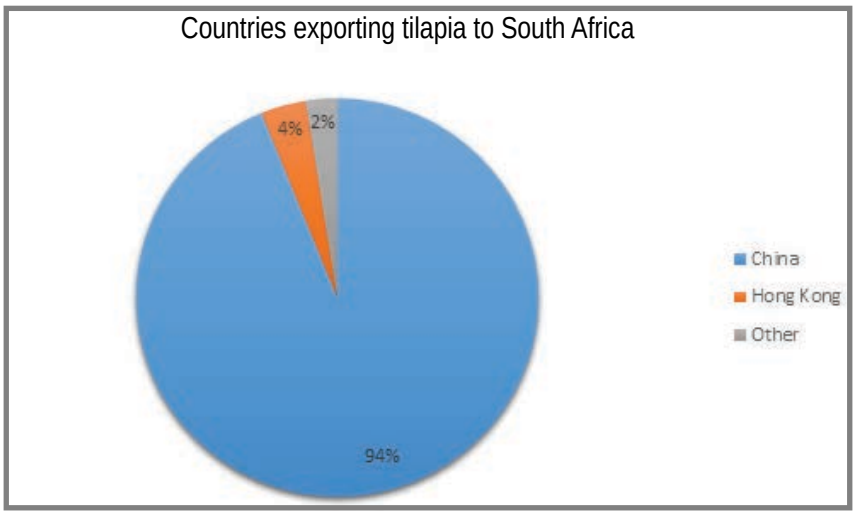


Figure 68: Imported tilapia in South Africa Source: SARS (2017)

7.9.9. Sea Urchins

South Africa imported a total quantity of 2.2 tons of sea urchins in 2017 at a value of R2, 249 (shown in table 37). The top exporting countries were Mozambique and Hong Kong with 96% and 4 % respectively (shown in figure 69).

Table 37: Quantity of sea urchins imported

Country	Quantity (tons)	Value (R)
Mozambique	2.11	24,65
Hong Kong	0.09	27,53
South Korea	0.01	R2,55
Total	2.21	54,73

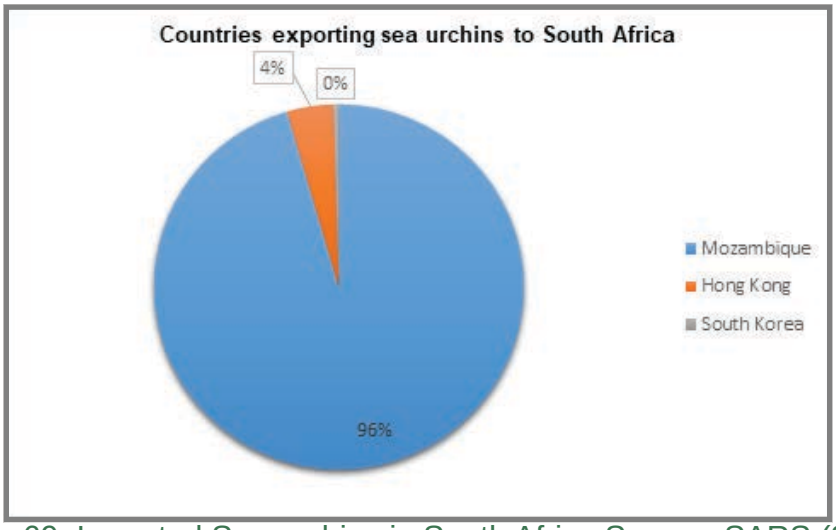


Figure 69: Imported Sea urchins in South Africa Source: SARS (2017)

7.9.10. Pacific salmon

South Africa imported 1418, 35 tons of pacific salmon in 2017 at a value of R52, 370,523 (shown in table 38). The top three exporting countries were Norway, Netherlands and Nigeria with 86%, 7% and 3% respectively (Shown in figure 70).

Table 38: Imported pacific salmon

Country	Quantity (tons)	Value (R)
Norway	1218.09	38,801,49
Netherlands	98.50	10,121,293
Nigeria	48.39	1,032,713
Namibia	25.72	970,004
Canada	23.27	1,434,147
United States	4.31	719
Germany	0.03	8,41
DRC	0.00	894
Cameroon	0.00	659
Chile	0.00	198
Total	1418.35	52,370,523

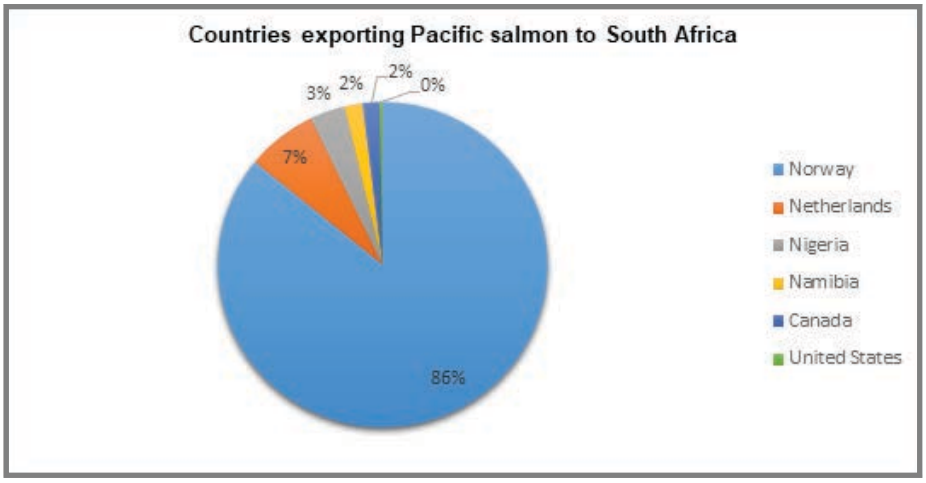
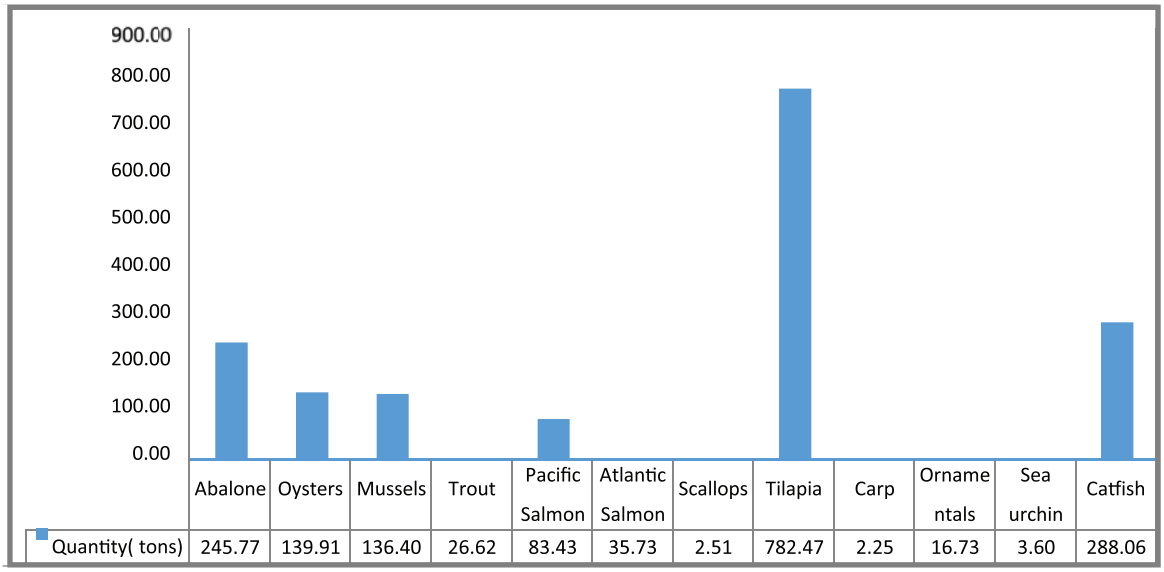


Figure 70: Imported pacific salmon

Source: SARS (2017)

7.10 Trade Balance

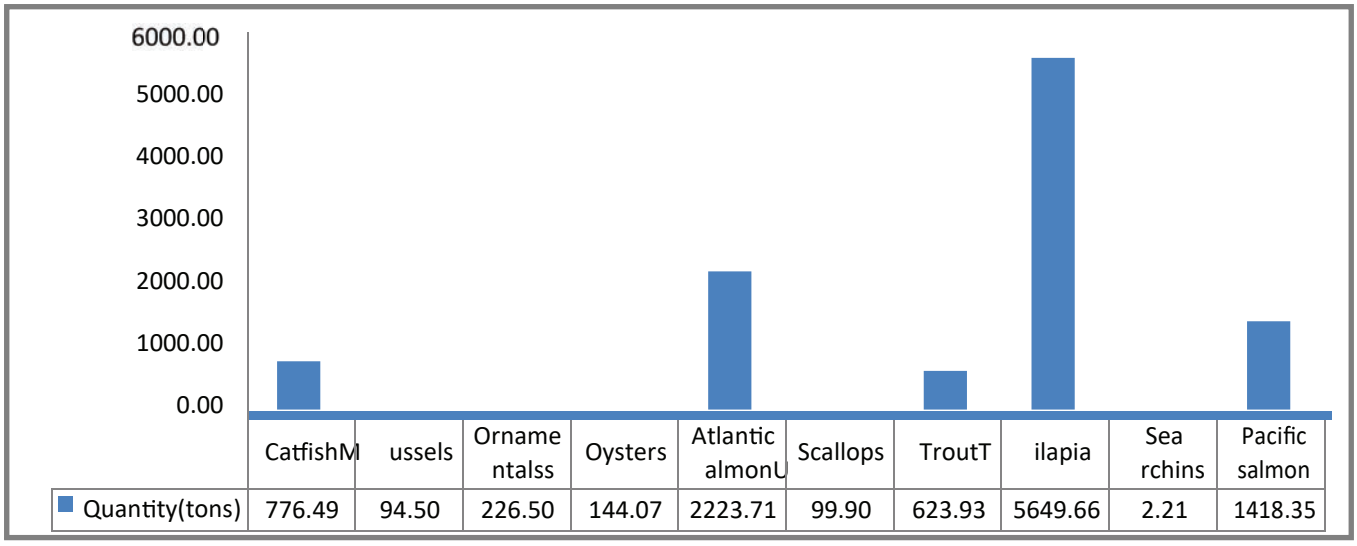
South African aquaculture recorded a trade deficit of R 2 449 404 186.00 that is attributable to R 154 128 452.00 for exports and R 2 603 532 638.00 for imports in 2017 (Figure 71 and 72). Furthermore South Africa experienced a trade deficit of 9495.84 in terms of quantity which is attributable to 11259.32 tons of imports and 1763.48675 of exports (Figure 74). When comparing with 2016 South Africa had a trade surplus in terms of value of R219.59 million.



	Abalone	Oysters	Mussels	Trout	Pacific Salmon	Atlantic Salmon	Scallops	Tilapia	Carp	Ornamentals	Sea urchin	Catfish
Quantity(tons)	245.77	139.91	136.40	26.62	83.43	35.73	2.51	782.47	2.25	16.73	3.60	288.06

Figure 71: Total aquaculture exports

The total marine and freshwater aquaculture exports in 2017 was 1763 tons with a value of R154 128 452. Tilapia subsector was the leading exporter with 782.47 tons followed by the catfish subsector with 288.06 tons then abalone, oysters, mussels, Pacific Salmon, Atlantic Salmon and trout with 245.77,139.91, 136.40, 83.43, 35.73 and 26.62 respectively (Figure 71). Carp, scallops and sea urchin were the smallest subsectors that contributed to the total exports with 2.25 tons for carp, 2. 51 for scallops and 3.60 tons for the sea urchin exported (Figure 71). The percentage decrease in the total quantity exported for the industry was 22% in comparison with 2016 whilst the total aquaculture exports by value increased by 305%.



	CatfishM	ussels	Ornamentalss	Oysters	Atlantic almonU	Scallops	TroutT	ilapia	Sea rchins	Pacific salmon
Quantity(tons)	776.49	94.50	226.50	144.07	2223.71	99.90	623.93	5649.66	2.21	1418.35

Figure 72: Total aquaculture imports

The total marine and freshwater aquaculture imports in 2017 was 11259.32 tons with a value of R 2 603 532 638.00. Tilapia subsector was the leading importer with 5649 tons followed by the Atlantic Salmon subsector with 2223.71 tons then Pacific salmon, catfish, trout, ornamentals, oysters, scallops, mussels and sea urchins with 1418.35, 776.49,623.93,226.50,144.07,99.90,94.50 and 2.21 respectively (Figure 72). Carp, scallops and sea urchin were the smallest subsectors that contributed to the total exports with 2.25 tons for carp, 2. 51 for scallops and 3.60 tons for the sea urchin exported (Figure 71).

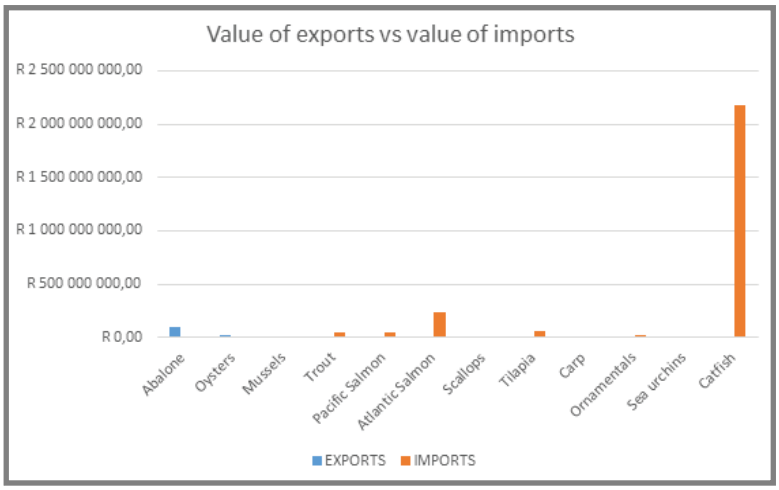


Figure 73: Value of exports vs value of imports

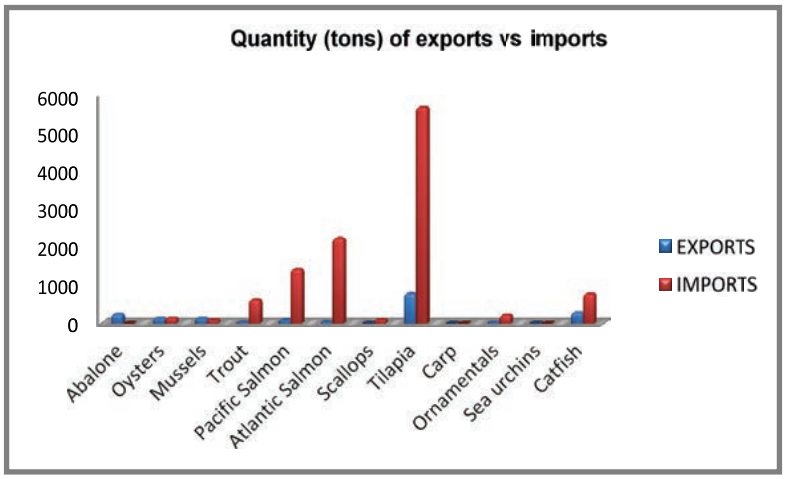


Figure 74: Quantity of exports vs imports

08 AQUACULTURE ENVIRONMENTAL INTEGRITY

8.1. Aquaculture Environmental Assessments

Aquaculture operations trigger a number of listed activities under the National Environmental Management Act, 1998 (Act No. 107 of 1998): Environmental Impact assessment (EIA) Regulations of 2014 (as amended). Depending on the listed activities triggered, this may require a Basic Assessment or a full Scoping and Environmental Impact Assessment. Other relevant legislation which should be considered by a new aquaculture venture are the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and its Alien Invasive Species regulations, National Environmental: Integrated Coastal Management Act, 2014 (Act No. 36 of 2014), National Water Act, 1998 (Act No. 36 of 1998) and Marine Living Resources Act, 1998 (Act No. 18 of 1998) to name a few.

Draft legislation, which may become applicable to the aquaculture industry in the future include the following:

- Aquaculture Bill – DAFF mandate
- Inland fisheries Policy – DAFF mandate
- Marine Spatial Planning Bill – DEA mandate
- 22 Proposed Marine Protected Areas regulations – DEA mandate
- General Discharge Authorisation – DEA mandate
    - Coastal Waters Discharge Permit – DEA mandate
    - NEMBA Amendment Bill – DEA mandate

The Directorate: Sustainable Aquaculture Management (SAM), Sub-Directorate: Aquaculture Animal Health and Environmental Interactions (AAH&EI) together with the provincial Department of Environmental Affair and Development and Planning (DEA&DP) and the national Department of Environmental Affairs (DEA) has been working alongside industry to set standards for the abalone and trout aquaculture sectors since 2011. The project is a national initiative to develop standards as a proactive environmental management tool to achieve efficiency and effectiveness in environmental impact management by reducing the time and cost of following an EIA process, whilst ensuring that the environmental management is adequately addressed.

Chapter 5 of the National Environmental Management Act, 1998 (Act No.107 of 1998) provides for the development or adoption of norms or standards for listed activities, or more specifically, that adherence to a norm or standard will negate the need to apply for an environmental authorisation (and by implication also negating the need for an EIA) as long as the proposed development falls within the scope of the standard. The draft abalone standards have undergone a number of edits and refinements to the scope and are to be incorporated into the Strategic Environmental Assessment process (for more information please read below regarding this project), however the trout standards require further refinement.

The Directorate: SAM, Sub-Directorate: AAH&EI render technical advice regarding EIA's. The Sub-Directorate reviews and comments on EIA's for aquaculture operations and any developments that may have an adverse impact on existing aquaculture farms.

8.2. DAFF initiated Aquaculture Environmental Projects Update

8.2.1. The Qolora Aquaculture Development Zone

In 2012, the Qolora land-based Aquaculture Development Zone in the Eastern Cape received a positive Environmental Authorisation from the Department of Economic Development, Environmental Affairs and Tourism which was extended to the 29th September 2020. The area for the proposed activity covers 26.4 ha with authorisation to farm a variety of marine species such as yellowtail, kob, abalone, seaweed and other marine species. A hatchery, offices and on site centralised processing facility will also be constructed. The Department has completed the management plans which had

to be completed prior to construction. The Department has applied for a Coastal Waters Discharge Permit which will be issued during the operational phase of the project; the Coastal Lease and the Water Use License have been granted. The Department of Rural Development and Land Reform have granted a long term lease between the Community Trust and the Minister of Rural Development and Land Reform. The Department is in the process of initiating the second phase which includes the securing of funds for the construction phase of basic infrastructure.

8.2.2. Algoa Sea-based Aquaculture Development Zone

The Environmental Impact Assessment process for the establishment of a Sea- based Aquaculture Development Zone in the Eastern Cape was initiated in 2011 and conducted by an independent, qualified Environmental Assessment Practitioner. Indigenous finfish species, such as yellowtail, silver and dusky kob, white stumpnose, white steenbras and yellowfin tuna are amongst other species that are proposed to be farmed in the Algoa Bay Aquaculture Development Zone.

The Environmental Authorisation was granted in 2014 however this decision was appealed. The Minister of the Department of Environmental Affairs instructed the DAFF to undertake comparative studies to further assess the Algoa 5 and Algoa 1 sites based on the appeals. An Ecological Assessment, Feasibility and Socio- Economic Assessment were conducted as part of the comparative studies in 2016. A new Basic Assessment process has been reinstated with the EIA process to be conducted in 2018.

8.2.3. Saldanha Bay Aquaculture Development Zone

In May 2016 the Department undertook the Environmental Impact Assessment (EIA) process for the Saldanha Bay Aquaculture Development Zone (ADZ) which aims to develop and facilitate aquaculture The ADZ will assist the existing farms with expansion as well as create an enabling environment for new entrants to become established in Saldahna Bay. Indigenous species such as abalone, South African scallop, white stumpnose, silver kob and yellowtail, and alien species such as pacific oyster, Mediterranean mussel, black mussel, Atlantic salmon, Coho salmon, King/Chinook salmon, rainbow trout and brown trout and the seaweed Gracilaria gracilis, are potential species to be farmed, some of which are currently being farmed in the Bay.

The final Basic Assessment was submitted to DEA on the 30th September 2018 and a response is expected from DEA in January 2018, and appeals process will follow. If the Environmental Authorisation is granted for the ADZ he Department will set up an Aquaculture Development Zone Management Committee (AMC) and Consultative Forum (CF).

8.2.4. Amatikulu Aquaculture Development Zone

The Department is currently undertaking the Environmental Impact Assessment (EIA) process for establishment of a land-based Aquaculture Development Zone (ADZ) at Amatikulu, in Kwa-Zulu Natal. The area for the proposed ADZ is 108.37 ha (pre-assessment) and is situated next to the Amatikulu estuary. The site is suitable for indigenous and temperate water marine and fresh water species. The EIA will cover the existing ornamental fish facility currently operating as well as new marine and fresh water species. The ADZ will entail the establishment of aquaculture facilities that will be used for the farming of a range of species, which could include Dusky Kob, Barramundi, Scallops, Sea Cucumbers, marine and freshwater Ornamental Fish and Ornamental Plants, Tilapia, Catfish and Nile Crocodile. An independent, qualified Environmental Practitioner was appointed in 2017 and the project is estimated to be completed by April 2019.

8.3. Strategic Environmental Assessment for Marine and Freshwater Aquaculture

One of the major challenges impacting negatively on the economic growth of the aquaculture sector is the lack of an enabling legislative environment. For this reason, the DAFF embarked on a process of undertaking Environmental Impact Assessments (EIAs) for various Aquaculture Development Zones (ADZ) around the country to create an enabling environment for new entrants. However, there are numerous challenges associated with this process which include the high cost of undertaking individual EIAs, the expiry of Environmental Authorisations (EA) after a specified period, the need to assess alternative locations within an EIA and the fact that most investors show serious interest to invest only once the EA is granted.

The DEA and the DAFF embarked on addressing the concerns of the aquaculture industry by undertaking Strategic Environmental Assessments (SEA) of the sector with the aim to streamline, fast track and reduce the number of EAs required for these projects within the areas that are identified. The Council of Scientific & Industrial Research (CSIR) was appointed in 2015 to undertake the SEA with the aim to identify Aquaculture Development Zones (ADZs) for offshore, inshore, land-based and inland water based aquaculture national, for prioritising and incentivising of aquaculture. It is intended that through a pre-assessment of the environmental sensitivities within these ADZs, certain aquaculture activities could be excluded from requiring EAs based on the implementation of aquaculture standards. In addition, within the ADZs, the management and legislative framework will also be streamlined and integrated to reduce complexity and to incentivise environmentally sustainable aquaculture. The SEA is currently being developed through an extensive consultative process which includes all relevant government departments, which form part of the Project Steering Committee, as well as external stakeholders and people with expertise in aquaculture operation, who are part of the Expert Reference Group. The SEA is being undertaken through the extensive use of spatial tools, positive and negative mapping of environmental attributes, sensitivity mapping and detailed assessment of potential impacts including cumulative impacts and risk assessments. Updating of the Biological Risk and Benefit Assessment for the seven species used for aquaculture has been included in CSIR scope of work, these species are rainbow trout, brown trout, African sharptooth catfish, Nile tilapia, Pacific oyster, Mediterranean mussel and marron. Phase I and 2 of the project have been completed and phase three: scientific assessment of the project is underway, the various specialist chapters of the project are being finalised.

AQUACULTURE ANIMAL HEALTH PROGRAMME

9.1. Aquaculture and Animal Health

Aquaculture is the world's most diverse farming system in terms of number of species, methods and the environments where the farms are located. Aquaculture has contributed significantly towards food security, sustainable livelihoods and job creation. It is currently the fastest growing food producing sector globally. However, with the fast growth of this sector there are associated challenges. Aquaculture as a global practice of farming aquatic organisms, including fish molluscs, crustaceans and amphibians, is prone to risk associated with the movement of live animals and products among traders and could result in the spread of diseases.

The department's Aquatic Animal Health programs aim to monitor disease occurrence, mitigate the economic and social effects of disease, facilitate the marketing of aquaculture and aquaculture products, and promote the welfare of farmed animals. In 2016, The Department together with the marine aquaculture industry developed the **"Health management procedures for South African bivalves (oysters and mussels) produced for export"** and **"Health management procedures for South African abalone produced for export protocols** which were approved by both the Director: Animal Health and the Deputy Director General: Fisheries Management in 2017. The Veterinary Procedural Notice (VPN) was implemented which allowed for the industry to apply for farm export registration. The applicants were audited according to the standards and requirements of the VPN.

9.2. Disease events in 2017

Infection with Halioticida noduliformans (Abalone Tubercle Mycosis – ATM) Abalone Tubercle mycosis refers to an infection with the oomycete Halioticida noduliformans. This disease was first detected and characterised in 2006 and is still considered as a production disease with the potential to pose a significant threat to the South African abalone aquaculture industry. A single case of the Abalone Tubercle Mycosis was reported to the Department in 2017 and was associated with elevated mortality in the grow-on population on the farm. Infection with Halioticida noduliformans was confirmed by PCR and the necessary disease containment steps were implemented.

Inefction with Aphanomyces invadans (Epizootic Ulcerative Syndrome – EUS) Epizootic Ulcerative Syndrome refers to an infection with the oomycete Aphanomyces invadans. Both freshwater and estuarine or brackish water fish are susceptible to this pathogen. EUS is an OIE listed disease and was first reported from South Africa in 2011. Samples were received from to cases in 2017 from Kruger National Park (Limpopo River System) and Clanwilliam Dam (Olifants River) respectively. EUS was confirmed in both these cases using PCR. Both of these cases were duly reported to the OIE.

9.3. Aquatic Animal Health workshop attended during 2017

The African Bureau for Animal Resource (AU-IBAR) in collaboration with the NEPAD planning and coordination agency (NPCA) with support from the European Union (EU) presented a continental training workshop for national aquatic animal health focal points on the diagnosis and control of aquatic animal diseases in Cairo Egypt from 26th to 31st March 2017.

The purpose of the training was to strengthen the veterinary capacity for aquatic animal disease diagnosis, control and surveillance on the continent and to also impart practical knowledge and skills to veterinarians and fisheries managers.

Prof Adel Shaheen (Prof. Emeritus, Benhar University, Faculty of veterinary Medicine, Moshtohor – Toukh, Egypt) covered the theoretical aspects of the course through a series of lectures which will form chapters of an aquatic animal health manual he is currently developing for AU-IBAR.

The training course also included a practical session which took place at World Fish Africa Aquaculture Research and Training Centre and Central Laboratory for Aquaculture Research (CLAR) located at Abassa, Arab Republic of Egypt. The practical session included modules on taking a case history, evaluating environmental or water quality parameters, autopsy methods and sample collection for parasitology and microbiological analyses. In addition to this method demonstrations were provided regarding histology, ELISA, PCR and Atomic Absorption Spectrometry.

10

AQUACULTURE RESEARCH AND DEVELOPMENT

The South African government is currently undertaking various aquaculture research projects which are intended to enhance the culture of the species and their economic viability. This species includes both freshwater and marine such as dusky kob, tilapia, spotted grunter and white stumpnose.

10.1. Development of sperm cryopreservation methods for four South African marine finfish species

Development of sperm cryopreservation methods for four South African marine finfish species (*Argyrosomus japonicus, Pomadasys commersonnii, Liza richardsonii and Lithognathus aureti*)

INTRODUCTION

Biotechnology requirements are increasing in a fast growing aquaculture sector globally. The benefits of fish semen cryopreservation include the following:

1. Provision of a continuous supply of good quality sperm for artificial insemination.
2. Protection of male stocks from being totally eliminated due to sudden diseases outbreaks, natural disasters, or accidents such as oil spills.
3. Improvement of existing hatchery operations by providing sperm on demand and simplifying the timing of induced spawning.
4. Enhancement usage of facility space by eliminating the need to maintain live males.
5. Valuable genetic lineages such as endangered species, research models or improved farmed strains can be protected by storage of frozen sperm.
6. Rapid genetic improvement. Frozen sperm can be used in breeding programs to create improved lines (hybridization included) and shape the genetic resources available for aquaculture.

The current investigation will be focused on the development of efficient cryopreservation methods for four South African marine finfish species with aquaculture potential.

Pomadasys commersonnii

Liza richardsonii

Lithognathus aureti

MATERIALS AND PROCEDURES

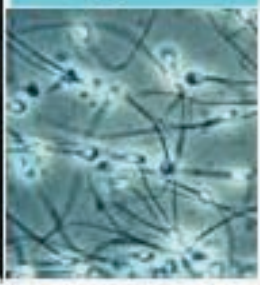
CRYO-EXTENDER : ASP-Artificial seminal plasma (dissolved in 1000ml of distilled water)

NaCL : 9.92g
KCL : 0.77g
$CaCl_2$: 0.13g
$MgCl_2$: 0.01g

CRYOPROTECTANT :
Etghylene glycol (EG)

Argyrosomus japonicus

Argyrosomus japonicus sperm (1000x magnification)



PROCEDURES :

-*Liza Richardsonni* and *Lithognatus aureti* milt collected from freshly dead males (Oranjemund) and mixed with Dimethylsulfoxide (DMSO) and methanol (see Table) and stored in transit (48-72H) at 4°C.

-*Argyrosomus japonicus* and *Pomadasys commersonni* milt were collected 32 hours post induction with LHRHa.

- All milt (80µl) were mixed with 95% ASP + 5% EG(400µl) and equilibrated at 4°C for 2 hours prior to vitrification procedures.
- Respective cryovials (2.5ml) of *L. richardsonni* and *L. aureti* milt-cryoprotectant mix were then immersed in an iso-propanol bath and placed in a -80° C freezer for 1.5H (vitrification="Mr. Frosty technique") prior to flash freezing in liquid nitrogen and cryo-storage (-150°C) for 7 months prior to sperm activity (see Table). *A.japonicus* and *P. commersonni* milt were similarly prepared but after 4°C equilbration vitrified in liquid nitrogen vapor (3.5cm above liquid surface) for 5 minutes prior to flash freezing and subsequent cryo-storage.
- Frozen milt were thawed at best result temperatures and thawing time windows (see Table).
- The milt+cryoprotectant mixtures were mixed with seawater (ambient temperature at a volume ratio of 1:5 prior to immediate subjective sperm motility assessments at 400x magnification (transmission microscope).

TABLE-Preparation summary and Results

Species	*Liza richardsonii*	*Lithognathus aureti*	*Pomadasys commersonnii*	*Argyrosomus japonicus*
Milt preparation status	Transit delay (72H)	Transit delay (48H)	Immediate use	Immediate use
4°C Milt storage additives 2.2ml^{-1} sample	0.11ml Methanol+0.22ml DMSO	0.11ml Methanol+0.22 ml DMSO	-	-
Extender + cryoprotectant (400µl vial $^{-1}$)	ASP (95%) + EG (0.5%)	ASP (95%) + EG (0.5%)	ASP (95%) + EG (0.5%)	ASP (95%) + EG (0.5%)
Sperm volume	80µl vial $^{-1}$	80µl vial $^{-1}$	80µl vial $^{-1}$	80µl vial $^{-1}$
Vitrification method	Mr. Frosty*	Mr. Frosty	LNV**	LNV
Water bath (°C)	48	46	50	49
Thawing time (s)	50	60	50	50
Sperm activity (%) after 7 months in cryoogenic freezer (-150°C)	20	25	90	70
Sperm oscillation %	50	50	20	20
Sperm translocation %	50	50	80	80

* Vial (4°C) immersed in isopropanol (4°C) prior to exposure at -80 °C (1.5H), followed by flash freezing (liquid nitrogen)
**= Vial (4°C) suspended 3.5cm above liquid nitrogen vapour for 5min prior to flash freezing in liquid nitrogen.

CONCLUSIONS

- This is the first sperm (milt) cryopreservation work on the four species investigated.

-The mixture of 95% ASP and 5% EG was the most efficient and consistent cryoprotectant in vitrifying (nitrogen vapor) and cryopreserving freshly collected milt (*A. japonicus* and *P. commersonni*) for 7 months. Post cryopreserved motile sperm activity was 56% for the former species and 72% for the latter species.

- The used cryoprotectant was apparently less efficient in cryopreserving the milt of of *L. richardsonni* and *L. aureti* though milt was not fresh (freshly dead males)and stored at 4°C for 48-72H before cryopreserved. However, this investigation proved viability of post cryopreserved sperm after 72H of extraction from freshly dead fish. The "mr. Frosty" technique yielded viable sperm (Table 1) - the nitrogen vapour vitrification method failed.

- Further investigation is required to compare the cryopreservation efficiencies of vitrifying sperm with the two methods used in the current study.

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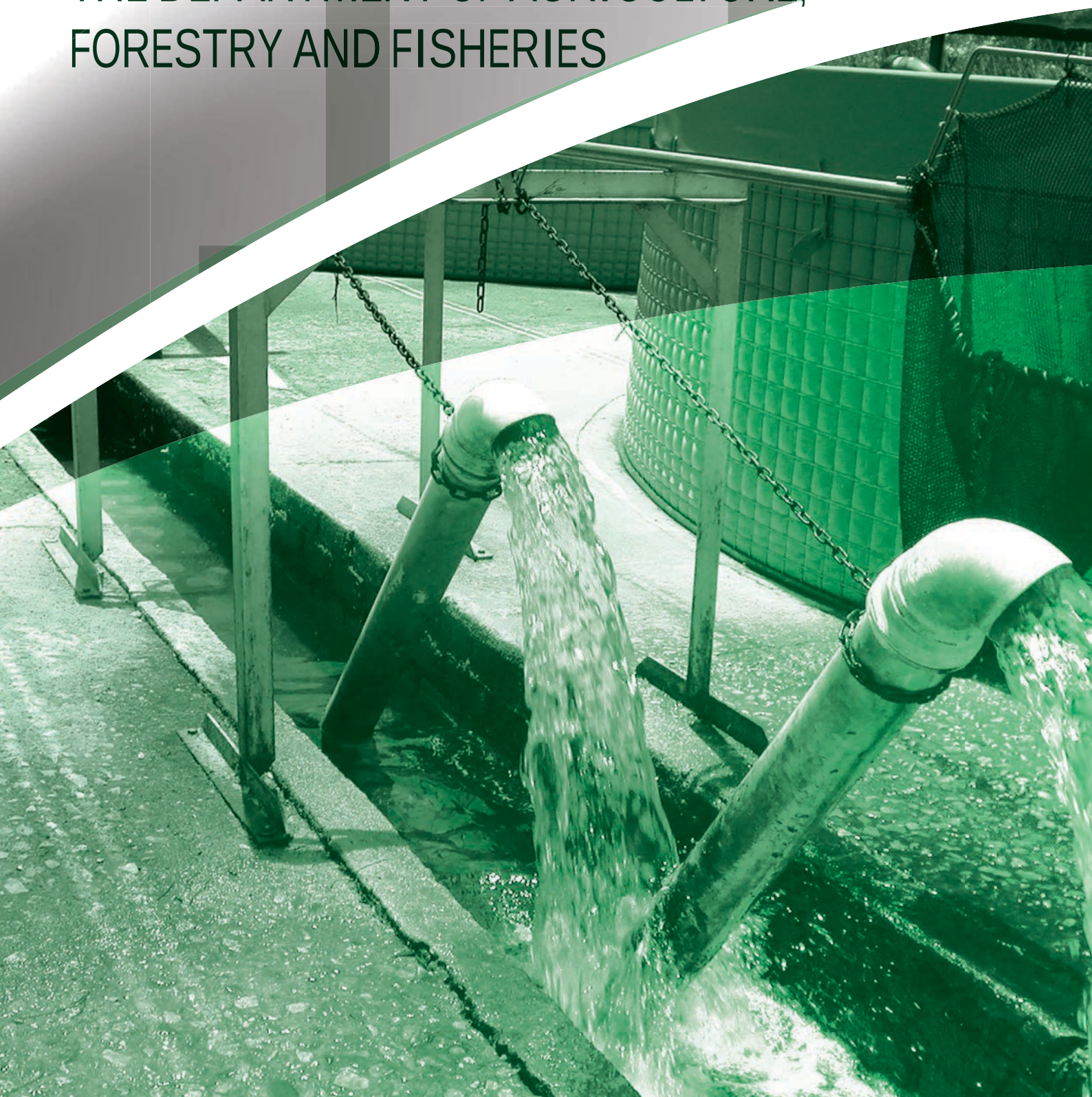
AQUACULTURE DEVELOPMENTAL PROJECTS BY THE DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES



11.1. Agricultural Technology Demonstration Centre (ATDC)

11.1.1. Project background

The Agricultural Technology Demonstration Centre (ATDC) is located in GariepDam Town in Xhariep District of the Free State Province. The Centre was initiated and funded by the Chinese Ministry of Agriculture (MoA) and Ministry of Commerce (MOFCOM) respectively. The purpose of the ATDC is to demonstrate and extent the freshwater aquaculture technology through provision of a comprehensive training and conducting research on freshwater aquaculture aspects. The centre also demonstrates breeding techniques for freshwater aquaculture species and their culture techniques. These functions of the Centre were jointly managed by the Chinese government appointed implementing agent, the China National Agricultural Development Agent (CNADC) and the Free State Department of Agriculture and Rural Development (FSDARD) and this phase, the Technical Cooperation Phase (TCP), was conducted for a period of three years since February 2014. In addition, the Centre continued to provide technical and advisory support to the six (6) aquaculture grow out projects which are funded by FSDARD for community development.

The TCP was officially ended in February 2017 and the project handover to South Africa's Department of Agriculture, Forestry and Fisheries (DAFF) was in June 2017 (Figure 75). The handover ceremony was attended by the DAFF Minister, other relevant diplomats and senior members from both MOA, DAFF and FSDARD. During the handover ceremony, the handover certificate was signed and handed over to the DAFF Minister for South Africa to accept the project.

Figure 75 (A & B): The signing of the handover certificate during the handover ceremony of ATDC.

The centre is currently under the management and operation of both DAFF and FSDARD with DAFF providing financial support towards the implementation of planned activities.

11.1.2. Project status on production related activities

(a) Breeding and Technology Demonstration

The Centre is currently conducting breeding techniques on the following species: African catfish (Clarias gariepinus), Common carp (Cyprinus carpio) and ornamental fish (Koi carp (Cyprinus carpio and Gold fish (Carassius auratus)). Breeding of some of these species is done during the summer season, January to March and October to December. However breeding can still be done during the other periods by use of a boiler to increase the water temperature.

During the winter periods, the average temperature is between 10-12ºC and can reach the minimum of -3ºC in Gariep Dam. Therefore are moved from the outside ponds into the nursery for overwintering.

The ATDC employs three (3) types of breeding methods which include: the natural breeding of Gold fish, the semi-artificial breeding of Common carp, Koi carp and African catfish, as well as artificial breeding of African catfish. During the breeding season, the demonstration of the semi-artificial breeding is facilitated by injecting both the male and female with hormones to induce the spawning

activities. The fish are then left in the tank for further natural breeding. The egg collectors are placed in tanks for the collection of fertilized eggs which will be transferred to the outside ponds.

The demonstration of the artificial breeding (Figure 76) of catfish is facilitated by injecting both the male and female with hormone to induce the spawning activities. The eggs are then stripped out from the female while the male is being sacrificed to collect the gonads. The malt from the gonads is sprayed and mixed with the eggs to induce fertilization. The fertilized eggs are kept in the tanks for hatching into fry. When the fry become fingerlings, they are transferred from the hatchery to the external ponds for further growth and improvement.

Figure 76: Demonstration of artificial breeding of African catfish at ATDC.

Table 39: Quantity of fries bred from various species during 2017.

Breeding Year	Breeding Species	Quantity of Broodstocks	Quantity of Fries
Mar-17	African Catfish	8 females, 2 males	15000
Mar-17	African Catfish	2 males, 6 females	10000
Mar-17	African Catfish	2 males, 4 females	7000
Nov-17	African Catfish	4 males, 2 females	200
Sep-17	Gold fish	Natural Breeding	1000
Dec-17	African Catfish	3 males, 5 females	5000
Dec-17	African Catfish	2 females, 3 males	5000

(b) Training and promotion

The Centre has trained about 818 candidates since the initiation of the Technical Cooperation Phase in 2014 until the end of January 2017. A total of 169 individuals have been trained during 2017 as shown on Table 40 below.

Training completed at ATDC during 2017

The Centre has trained about 818 candidates since the initiation of the Technical Cooperation Phase in 2014 until the end of January 2017. A total of 169 individuals have been trained during 2017 as shown on Table 40 below.

The content of the course offered include the following:

- Fish Biology and Introduction of Fish Species
- Water Quality Requirements and Management
- Aquaculture Equipment
- Fish breeding and fry rearing
- Fish nutrition
- Fish transporting
- Environmental Legal Requirements of Freshwater Aquaculture
- Aquaculture Data collection
- Fish disease and Health Management
- Freshwater Aquaculture Stock Management
- Aquaculture Economics
- Fish processing
- Aquaculture farming systems

Figure 77: The University of Free State students' and the ATDC officials.

Table 40: Training status for trainees that were trained during 2017

Training dates	Training Category	Town/ Province/ Country	Number of trainees
01-Feb-17 – 31 January 2018	Interns	Limpopo (DAFF)	1
27 February 2017 – 3 March 2017	Farmers	Free State	45
6 March 2017 – 10 March 2017.	Potential farmers	Kwa-Zulu-Natal	13
27 March 2017 – 31-Mar-2017	Interns	Eastern Cape, Gauteng, Western Cape	16
9 April 2017 – 15-Apr-17	Higher Education Students	Free State	20
1 July 2017 – 31 Oct-17	In-service training	Free State	2
17 July 2017 – 21-Jul-17	Potential farmers and In-service training	Gauteng, Free State, North West, Kwa-Zulu Natal and Western Cape	9
4 September 2017 – 8 Sep-17	Potential Farmers	Free State, Mpumalanga, Gauteng, and Eastern Cape,	29
23 October 2017- 27 Oct-17	Potential farmers	Eastern Cape, Western Cape and Free State	10

06-Nov 2017 – 10 Nov-17	Farmers/ government officials/ Potential farmers	North West, Eastern Cape, Gauteng and Western Cape	17
4 December 2017 – 8 Dec-17	Potential famers/ Interns	Kwa-Zulu Natal, Free State Western Cape, and Gauteng	7
Total trained			169

Education and Awareness

The ATDC officials attended several exhibitions and events in order to promote the activities of the center. Bloem show is one of the annual events where organizations showcase their products. The ATDC also conducted the exhibitions during this show where different posters and banners were displayed. Other exhibitions attended included the “Re kgaba ka diratswana’ which is also an annual event.

11.2. The Hamburg Aquaculture Project

11.2.1. Project background

The Hamburg Aquaculture Project is a mariculture farm situated in a small rural settlement called Hamburg, within Ngqushwa Local Municipality, Eastern Cape Province, The farm is situated along the banks of the Keiskamma estuary, about 500 metres from the estuary mouth. The project has a dusky kob (Argyrosomonus japonicas) farm operating at a pilot scale, Figure 78 and an oyster (Crassostrea gigas) farm which is under refurbishment (Figure 79).

The Hamburg Aquaculture Project aims to commercialize the dusky kob at a later stage to produce 1000 tons of fish. The project has forty eight (48) members, only twenty (20) Siyazama Primary Aquaculture Co-operative members are currently benefiting from it.

Figure 78: The dusky kob farm at the Hamburg Aquaculture Project.

Figure 79: The oyster farm situated in the Keiskamma estuary.

11.2.2. Project status on production related activities

During 2017, tasks pertaining to the revamping of the oyster farm and maintenance of the dusky kob farm which included minor adjustments to the culture system were conducted. In terms of capacity building, project beneficiaries were trained on Occupational Health and Safety, First Aid and Fire Management.

The farm sold 511,1 kg fish at R40/kg to an East London retailer. A total of 21 000 dusky kob juveniles, with an average weight ranging from 46 to 180 g were purchased from Ocean Choice (Pty) Ltd. The total weight of fish was 1637.58 kg which equates to about 1.5 tons. Towards the end of the year, it was proposed that the farm should explore opportunities of farming a third species on site, such as Sea urchin (Tripneustes gratilla) species. The proposed trial has the potential to boost the farm's income and job creation.

11.3. Karoo Catch (Pty) Ltd

11.3.1. Project background

Karoo Catch (Pty) Ltd is located in the Camdeboo Local Municipality, in the Eastern Cape Province. Camdeboo is a remote rural area which falls under the Cacadu District Municipality. Karoo Catch (Pty) Ltd is cultivating the African Sharptooth Catfish (Clarias gariepinus) in a Recirculating Aquaculture System (RAS) and is also breeding on site (Figure 80). The project aims to grow fish until a market size, thereafter, process, package and dispatch it to the market. The targeted monthly production of the farm is 20 tons.

Figure 80: Tunnels at Karoo Catch with a Recirculating Aquaculture System.

11.3.2 Project status on production related activities

Karoo Catch (Pty) Ltd is at a commercial phase. The project has six (tunnels) on site. These tunnels include two (2) hatcheries, one (1) for experimental purposes and the other hatchery for actual spawning purposes. There are also three (3) grow-out tunnels and a feed storage tunnel. During 2017, solar panels were installed on site. In addition to the onsite infrastructure, the project rented a fish processing factory while planning to construct its own processing plant.

In 2017, the construction of additional of three (3) grow-out tunnels commenced, with the construction process anticipated to end in 2018. Furthermore, the construction of a wastewater treatment system commenced, which is expected to be completed in 2018. The wastewater treatment system adopted was high rate algal ponds for the treatment of aquaculture effluent.

The facility was also processing fish to value added products, such as fish wors and fish burgers. These products were sold local retailers. Processes pertaining to the synthesis of pet food from fish viscera and other unwanted fish flesh were initiated in 2017 and will be finalized in 2018. Karoo Cath (Pty) Ltd attended an Operation Phakisa: Ocean’s Economy Presidential event in Durban to exhibit their products.

12

NATIONAL AQUACULTURE STAKEHOLDER ENGAGEMENTS

12.1. Aquaculture Intergovernmental Forum (AIF)

The main objective of the committee is to provide better management through joint planning, facilitation, coordination, resources mobilization and evaluation and oversight for the aligned implementation and reporting of all key programmes government to achieve sustainable aquaculture development in the country.

DAFF chairs the committee, and as an industry development and trade partner, the DTI deputizes. The committee consist of the DST as a technology partner; the DoH as the food safety partner; DEA, DWS and DRDLR as the custodians of the environment and natural resources and sustainability partners. Representatives of the key State-Owned Entities (SOEs) and Provincial Departments of Agriculture and Environmental Affairs are also invited.

12.2. Marine Aquaculture Working Group (MAWG)

This forum has an advisory role to the Chief Director: Aquaculture and Economic Development and is convened and chaired by the Director: Sustainable Aquaculture Management. It advises the CD: AED on any matter referred to it by the Chief Directorate or relevant matters within the industry, such as:

- The assessment of Marine Aquaculture Scientific investigations and practical investigations permit applications;
- The assessment of Marine Aquaculture Right applications;
- The management and development of Aquaculture, including issues relating to environmental protection ; guidance on the Aquaculture policy and legislation;
- And establishment and amendment of operational management procedures and sector development plans; and recommendation directives on areas of research.

The lead directorate is the Directorate: SAM. The MAWG consists of representatives of the Branch: Fisheries from the Chief Directorates: Aquaculture and Economic Development, Fisheries and Development and Monitoring, Control and Surveillance (MCS).The representative are nominated by the relevant Chief Director: The MAWG will sit every month ,however the Director: SAM may call an emergency MAWG meeting whenever appropriate .The Directorate: SAM provide MAWG secretariat.

12.3. Aquaculture Industry Liaison (AIL)

This Forum provides a platform for industry to engage and communicate with government on issues that affect the marine aquaculture industry. Convened and chaired by Chief Directorate Aquaculture and Economic Development. Its members as DAFF officials from relevant Chief Directorates such as Fisheries Research, Aquaculture and Economic Development, Monitoring Control and Surveillance, Marine Aquaculture Right and Permit Holders.

12.4. Provincial Aquaculture Intergovernmental Forum (PAIF)

The main purpose of the PAIF is to ensure cooperation and coordination between national departments and provincial departments/ agencies that have a mandate in aquaculture development. Convened and chaired by Chief Directorate Aquaculture and Economic Development. Its members as DAFF officials from relevant Chief Directorates such as Fisheries Research, Aquaculture and Economic Development, Monitoring Control and Surveillance, Marine Aquaculture Right and Permit Holders.

12.5. Aquaculture Value Chain Round Table (AVCRT)

The purpose of this forum is to foster collaborative industry-government action that helps to secure an enduring global advantage without limiting the round table to issue and developments that are external to South Africa. The round table considers domestic sectoral development activities as they directly impact on South Africa's global competitiveness and its reputation as food suppliers.

The objectives of the AVCRT are as follows:

- Create a formal platform to address key industry challenges and constraints and utilize opportunities for the benefit of the sector or subsector;
- Set goals and targets which, if achieved, will strengthen the sector's competitive position and enhance South Africa's overall capacity to meet the challenging demands of both domestic and international market;
- Building the maximum degree of agreement possible on the development and implementation of coordinated action plans to achieve set goals and targets;
- Track progress on implementation of agreed actions and thereby ensure results;
- Develop and implement strategies and initiatives aimed at securing and utilizing the country's competitive advantage.

12

AQUACULTURE & OPERATION PHAKISA - OCEAN'S ECONOMY PROGRESS

13.1. Aquaculture Year Three Review

Operation Phakisa is a results-driven approach to development, involving various sectors such as business, labour, academia, civil society and government. These stakeholders worked together to develop delivery action plans with set targets which require ongoing monitoring of progress and making these results public, in order to address the triple challenges of poverty, unemployment and inequality.

The Operation Phakisa: Ocean Economy focuses on:

- Marine Transport and Manufacturing, led by the Department of Transport;
- Offshore Oil and Gas, led by the Department of Mineral Resources;
- Aquaculture, led by the Department of Agriculture, Forestry and Fisheries;
- Marine Protection Services and Ocean Governance, led by the Department of Environmental Affairs;
- Small Harbours Development, led by Department of Public Works; and
- Coastal and Marine Tourism, led by the Department of Tourism.

All initiatives are enabled by skills development and capacity building, led by the Department of Higher Education and Training, and research technology and innovation initiatives, led by the Department of Science and Technology.

The Department of Agriculture, Forestry and Fisheries (DAFF) is the lead department for the Oceans Economy Aquaculture focus area and its deliverables. The lab concluded that South Africa's aquaculture sector has a high growth potential due to an increasing demand of fish products due to the increasing global population; increasing income by the middle class in developing countries and more awareness on the dietary benefits offered by fish products. Moreover the capture fisheries yield has been plateauing over the past decade while aquaculture continues to grow over 7% per annum. This growth is expected to continue at a higher rate in the future.

The goal is to grow the aquaculture sector in South Africa to play a major role in supplying fish products; an enhanced role in job creation, increased contribution to national income and rural livelihoods. The targets over five years (2014-2019), seeks to grow sector revenue from R0, 67 billion to R3 billion; production by 20 000 tons; jobs from 2 227 to 15 000 and to ensure increased participation to support transformation in the sector.

The Aquaculture lab comprised of stakeholders from industry, government and academia who identified eight (8) key initiatives, which are expected to spur the growth of the sector. One initiative will address the selection and implementation of 24 catalyst projects, improving both the number and productivity of the new farms. Three initiatives relate to the creation of an enabling regulatory environment and others focus on funding support, increasing skills pool and awareness and improving access to markets.

To deliver these initiatives, the Aquaculture lab created detailed implementation plans and accompanying budgets, a proposed governance system to take responsibility for initiatives and key performance indicators to help monitor delivery. The highlights outlined are consequences of the good progress achieved on the 3 feet plans across the three horizons defined by the lab participants in 2014.

Table 41: Aquaculture investments, production jobs, transformation and GDP driven by operation Phakisa in 2017

YEAR	2016/2017	2016 PROJECTED
INVESTMENT	By end of 2016, total actual investment committed to Operation Phakisa Aquaculture Projects was over R690 million, of which over R227 million was from government. The additional investment in 2016 was R246 million. This is 32.8% of the projected R750 million projected target.	During phase two of Operation Phakisa (2016) an additional investment of R750 million (government and private) was projected.
PRODUCTION	Phakisa projects contributed a total of 3429.5 tons production in 2016, of which 424.3 tons were additional. additional (this equates to 21% of the production projected in 2016). The total production for the sector is 6012.54 tons. The production target set in the Phakisa Lab report for 2016/2017 was 7400, therefore in terms of the sector as a whole the production is 81% on target.	2000 additional tons production
JOBS	The total number of jobs contributed by Operation Phakisa projects was 1806, these included: • 1550, previous total jobs on 23 farms in 2015 • 171, new direct jobs created In 2016 (this equates to 38% of the 450 jobs projected in 2016). • 85, existing jobs from 3 new projects in 2017, from (Karoo Catch, Salmar Trading, Aquafoods). Disaggregated jobs (of total jobs on farm): • Gender: Females (502) • Ages: Youth (830) 46% • Race: African black (1093) 61%; Coloured (558) 31%; White (154) 8.6%; Indian (1) 0.06% • Disabilities (15) 1% • Veterans (1) 0.05% The total jobs for the sector was 4448 (622 additional new jobs in 2016)	An additional 450 direct jobs
TRANSFORMATION	Operation Phakisa project transformation statistics in 2016: SMMEs = 15 Cooperatives = 1 Average BBBE Level = < Level 4	
GDP	Total estimated turnover (based on tonnage) across 36 projects amounted to over R 608 million per annum in 2016. (There was a R108 million increase in GDP contribution in 2016. In 2015 the turnover amounted to R500 million) The total value of the aquaculture sector in 2016, was estimated at R1 042 072 340.31.	The projected increased turnover is R500 million per annum across the 35 projects

13.2. Initiative 1: Selection and Implementation of Catalyst Projects

Since the Lab in 2014, seventeen (17) new projects have been assessed and incorporated as part of Operation Phakisa Oceans Economy. In total there are thirty- six (36) projects. Fifteen (15) of twenty six (26) of those projects are producing farmed aquaculture animals. Five (5) of the original twenty-four (24) projects have been put onto business opportunities due to various reasons from unsuitable water quality (low oxygen) to land claims.

13.3. Initiative 2: Legislative reform to promote aquaculture development

The Aquaculture Development Bill was signed off by the National Economic Development and Labour Council (NEDLAC). The Bill is due to be presented at Cabinet in early 2018. Aquaculture Strategic Environmental Assessment: suitable areas have been screened and reviewed by key stakeholders through consultative workshops.

13.4. Initiative 3: Establishment of Interdepartmental authorisations committee

The numerous authorisations required for aquaculture have been mapped in detail and recommendations have been made in terms of streamlining and further improving efficiency. Achievements since October 2014:

- Four (4) Environmental Impact Assessments (EIA) approved, two (2) appeals were completed.
- Four (4) coastal discharge permits were issued.
- Three (3) biodiversity risk assessments completed (Barramundi, Coho and King Salmon).
- Six (6) marine aquaculture permits/rights issued or amended.
- All relevant permits to undertake the pilot trout project in Van der Kloof Dam in the Northern Cape were issued.
- All relevant approvals/plans have been completed for the Qolora Aquaculture Development Zone (ADZ):
    * Water usage license has been approved for Qolora ADZ
    * The power of attorney for the land has been received by the Department of Rural Development and Land Reform
    * The coastal lease for Qolora ADZ has been issued by the Eastern Cape Department for Economic Development, Environmental Affairs and Tourism
- DAFF is currently undertaking Environmental Impact Assessments to create an enabling environment and facilitate investment for:
    * Saldanha Bay ADZ
    * Algoa Bay ADZ
    * Amatikulu ADZ

13.5. Initiative 4: Establishment of globally recognised monitoring and certification system

The European Union (EU) Residues and Public Health Audit Welcoming Meeting came to South Africa to audit the agriculture and aquaculture sector. Compulsory specification for live and chilled raw bivalve molluscs was gazetted in October 2017. This follows the development of the standard and will allow for certification and further export of the product.

13.6. Initiative 5: Establishment of an Aquaculture development fund

The working group is considering funding applications and a memorandum of co- operation between funding departments and institutions is to be finalised. The Aquaculture Development Fund model and mechanism were completed in March 2017.

13.7. Initiative 6: Capacity building and skills development for support services

The department has sent five provincial vets to the University of Stirling for a one year Masters in Aquatic Medicine. A skills and needs analysis assessment of the sector is currently underway to inform further interventions and skills requirements.

13.8. Initiative 7: Coordinated industry-wide marketing efforts

The first international conference and exposition of the World Aquaculture Society (WAS) was held on the African continent at the Cape Town International Convention Centre 26 – 30 June 2017. New markets have been explored and interest was received from Iran for tilapia; China (Taiwan) for farmed oysters and Europe for finfish and abalone.

13.9. Initiative 8: Preferential Procurement

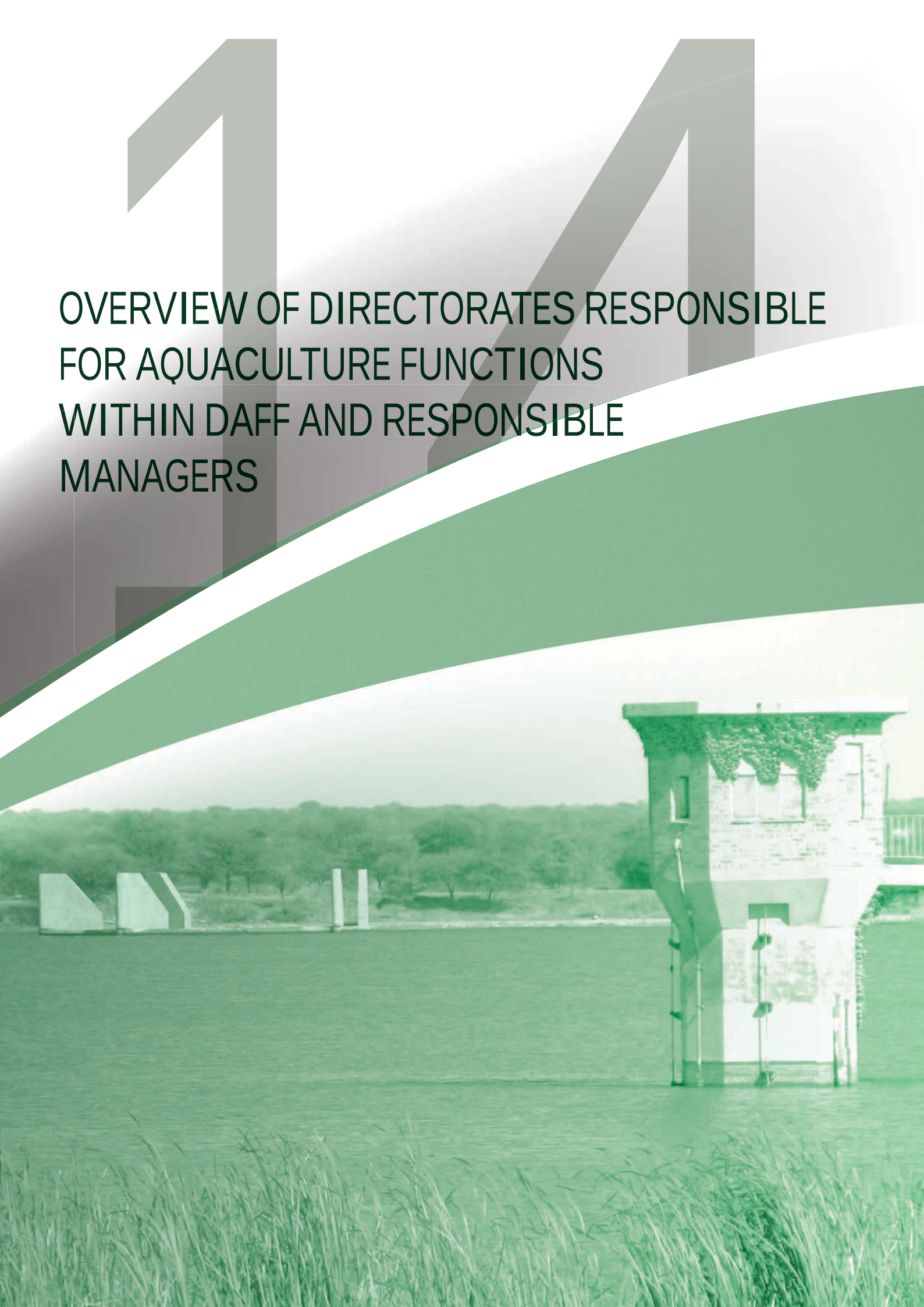
Preferential procurement can create local markets while contributing towards transformation and food security in South Africa. Initiative 8 is 'Preferential Procurement' which seeks to partner with government institutions to procure aquaculture products, thereby increasing local consumption and improving nutritional levels in South Africa. The importance of investigating preferential procurement further was again highlighted in the financial feasibility studies conducted for dusky kob and other species. Research on the current fish consumption of state owned entities and departments are currently underway.

For detailed information about progress and developments, please refer to the Operation Phakisa Aquaculture Year Three Review link below:

[http://www.daff.gov.za/daffweb3/Branches/Fisheries-Management/Aquaculture-and-Economic-Development/Operation-Phakisa]

1

OVERVIEW OF DIRECTORATES RESPONSIBLE FOR AQUACULTURE FUNCTIONS WITHIN DAFF AND RESPONSIBLE MANAGERS



14.1 Aquaculture Technical Services

The Directorate: Aquaculture Technical Services is responsible for the following functions:

a. Aquaculture Farmer Support

The Directorate ensures that farmers are obtaining the necessary support. It is again responsible for developing and implementing farm support programs; provide technical advisory services; and facilitate training and capacity building within the aquaculture sector.

b. Aquaculture Development

The Directorate ensures that enabling environment is being created for the aquaculture sector. It has been tasked with addressing zonation and facilitation of seed supply.

c. Economic and Information Management

The Directorate deals with economic assessment of fish farms in the country. Amongst other functions, this Directorate is also responsible for market issues; facilitating access to finance; and economic monitoring of the sector. It is important to ensure that the sector information is also available to assist in decision making. The Directorate is also established for driving information collection and dissemination; sector promotion through awareness programs; development and dissemination of sector promotion material; and most importantly development and publication of the South Africa's Aquaculture Yearbook. Furthermore, this Directorate deals with investment facilitation into the country.

14.2 Directorate Aquaculture Research and Development

The Directorate: Aquaculture Research and Development is responsible for the following functions:

a. Aquaculture Reproduction, Nutrition and Genetics

This Directorate deals with the research and development of culture technology for aquaculture species and their functions includes the development of programmable brood stock conditioning and hatchery methods for selected and prospective commercially viable aquaculture finfish and shellfish species. In terms of nutrition, functions includes optimising growth rates, production densities and FCR of selected commercially viable fish species, formulating and testing diets that will improve growth rates or FCR of commercially viable species.

The Directorate is also responsible for the developing techniques to optimize mass culture of phytoplankton and zooplankton required for commercial hatcheries, testing of integrated multitrophic aquaculture systems (IMTA) with respect to mechanized primary hatchery operations that will predictably produce fish juveniles with consistency, development of techniques for cryogenic stem cell preservation (genetic studies and aquaculture brood stock improvement application). They also contributing to the technology improvement of research based RAS for commercial application, functioning as a "Centre of Excellence" by providing advice and IP to ensure sustainable aquaculture industry development with minimal impact to the environment.

b. Environmental Interactions

The objective of the Environmental component of the Directorate: Aquaculture Research and Development is to promote an understanding of the interactions between the environment and aquaculture in support of a competitive and sustainable aquaculture industry in South Africa.

c. Aquatic Animal Health and Diseases

The Directorate focuses on research based on three main areas which includes:

- The development of novel methods for the diagnosis of new and emerging pathogens to provide accurate and reliable diseases diagnosis for aquatic animals.
- Collection of epidemiological data for significant aquatic animal health diseases in Southern Africa to inform management and contingency interventions.
- The development of effective preventive and treatment strategies for existing and emerging marine aquaculture diseases.

14.3 Directorate Sustainable Aquaculture Management

The Directorate: Sustainable Aquaculture Management is responsible for the following functions:

a. Aquaculture Authorisations

The Directorate is responsible for receiving, processing and granting of aquaculture rights, ranching rights and exemptions, issuing of permits and licenses; development and review of permit conditions, coordination of aquaculture stakeholder working groups (e.g. MAWG and AIL); farm visits for data collection and monitoring; and handling of appeals.

b. Aquatic Animal Health and Environmental Integrity

The AAHEI sub-unit is further divided into smaller units that include:

- **Aquatic Animal Health**

Aquatic animal health is a very important aspect in aquaculture development. To address this aspect, a sub-unit has been established which is responsible for the development, implementation and review of the Aquatic Animal Health Strategic Framework; the undertaking of farmed aquatic animal stock inspections; rendering advice to farmers of aquatic animals in terms of health and welfare issues; development of the biosecurity and better management guidelines; reporting of aquatic animal diseases in consultation with the D:ARD; and conducting of training, education and awareness programs on aquatic animal health.

- **Environmental Integrity**

This unit is responsible for aquaculture environmental interactions, this entails the assessment of the impact to the environment associated with aquaculture and related activities.

- **Food Safety**

This unit is responsible for the development and management of food safety programmes. Currently, the sub-unit is managing the South African Mollusca Shellfish Monitoring & Control Programme (SAMSM&CP). The objectives of the SAMSM&CP are, amongst other things, to ensure guarantees to domestic and international markets and consumers that South African farmed shellfish products are safe for human consumption. In order to ensure functional food safety programme, the sub-unit collaborates with other agencies such as the National Regulator for Compulsory Specifications (NRCS) and Council for Scientific and Industrial Research (CSIR).

NOTES: