

AQUACULTURE YEARBOOK **2015** SOUTH AFRICA



agriculture,
forestry & fisheries

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FOREWORD

Aquaculture has become an important growth sector and a priority for the Department of Agriculture, Forestry and Fisheries (DAFF). The aquaculture sector in South Africa is at its infancy stage and has demonstrated potential for growth over the past 10 years. Aquaculture offers a significant opportunity to contribute to food security and nutrition, rural development, job creation and the Gross Domestic Product (GDP) of the country.

In order to realise the potential identified, the aquaculture sector has been prioritised by the South African government through several policies and programmes. The DAFF, recognised aquaculture as a contributor to food security in its Agriculture Policy Action Plan (APAP), whereas, the Department of Trade and Industry (the dti) identified aquaculture as a potential investment sector and included it in the Industrial Policy Action Plan (IPAP). In addition, the Department of Environmental Affairs prioritised aquaculture through the Operation Phakisa, which is an Oceans Economy programme intended to grow the aquaculture sector. To support the sector, the DAFF further developed a National Aquaculture Policy Action Plan (NAPAP) which clearly complemented the Operation Phakisa-Oceans Economy three feet (3ft) plans under the aquaculture delivery laboratory (Lab). All government interventions towards the sector were noticed due to the information that was made available to government by different stakeholders. The DAFF therefore wishes to acknowledge the continuous support provided by the aquaculture industry, aquaculture associations, farmers, importers and exporters in providing information when requested.

The efforts made by officials in compiling the "South Africa's Aquaculture Yearbook 2015" are highly appreciated. The Directorate: Aquaculture Technical Services under the leadership of Ms. Khumo Morake is acknowledged for compiling the "South Africa's Aquaculture Yearbook 2015" through the collection and analysis of socio-economic and production data. Information pertaining to research activities was provided by the Directorate: Aquaculture Research under the leadership of Mr. Belemane Semoli. The Directorate: Sustainable Aquaculture Management, under the leadership of Mr. Asanda Njobeni provided information on aquaculture authorisation and environmental interaction.

The following officials are individually acknowledged for their contribution towards the compilation of the "South Africa's Aquaculture Yearbook 2015". Ms. Lucia Mzimba who was with the Directorate: Aquaculture Technical Services during the compilation of this document, and at publication was with the Free State Department of Agriculture and Rural Development; Mr. Keagan Halley, Ms. Pontsho Sibanda, Ms. Belinda Nako, Ms. Zimasa Jika-Kamau, Mr. Vuyani Krala, Mr. Imtiyaz Ismail, Dr. Sasha Saugh, Ms. Primrose Lehubye, Ms. Fatima Daya, Ms. Michelle Pretorius, Dr. Brett Macey, Dr. Chris Fouche, Mr. Molatelo Madibana, Dr. Grant Pitcher, Dr. Trevor Probyn, Mr. Mark Goodman, Mr. Brett Lewis, Ms. Mapula Makwela, Ms. Maite Mamabolo, Mr. John Ford and Ms. Lisa Geswindt.

The three Directorates and its officials supported by the Operation Phakisa unit with DAFF are the coal-face of aquaculture development in the country and the department would like to thank everyone for their contribution.



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EXECUTIVE SUMMARY

The Aquaculture Yearbook is an annual publication providing the status of the aquaculture sector in South Africa. The Aquaculture yearbook 2015 is based on data collected from the aquaculture sector in 2014. This publication covers species that were cultured in South Africa during 2014 which include: Abalone (*Haliotis midae*), Pacific Oyster (*Crassostrea gigas*), Mussels (*Mytilus galloprovincialis* and *Chromomytilus meridionalis*), Dusky Kob (*Argyrosomus japonicus*), seaweed (*Ulva* spp. and *Gracilaria* spp.), Trout (*Onchorynchus mykiss* and *Salmo trutta*), Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Oreochromis rendalli*), Catfish (*Clarias gariepinus*), Carp (*Cyprinus Carpio*), Marron Crayfish (*Cherax tenuimanus*), Whiteleg Shrimp (*Litopenaeus vannamei*), Yellowtail (*Seriola lalandi*), Mangrove Snapper (*Lutjanus argentimaculatus*), spotted grunter (*Pomadasys commersonnii*), yellow belly rockcod (*Epinephelus marginatus*) and bloodworm (*Arenicola loveni*), white stumpnose (*Rhabdosargus globiceps*), south coast sea urchin (*Tripneustes gratilla*), Octopus (*Octopus vulgaris*) and the South African scallop (*Pecten sulcicostatus*) and a number of ornamental species.

A total of 233 farms were established in 2014, with 39 being marine aquaculture farms and 194 were freshwater aquaculture farms. The total production of South Africa's aquaculture industry (excluding seaweed, Carp, ornamentals and Koi Carp) in 2014 was 5209.60 tons with marine aquaculture industry accounting 3417.59 tons and the freshwater aquaculture industry accounting 1792.01 tons. Between 2013 and 2014 South Africa's aquaculture sector experienced an increase in total in the production by approximately 407.49 tons, which is an increase of 8.5%. The sector has demonstrated a growth rate of 8.7% from 2005 to 2014.

At the end of 2014, there were two additional farms in marine aquaculture and also in the freshwater aquaculture. The Mpumalanga Province has been the leading province with 42 freshwater aquaculture farms, whilst, the Western Cape Province leads marine aquaculture with 27 farms.

Total freshwater aquaculture production has shown a decrease of 24.40 tons (1.34%) from 2013-2014 for the four sub-sectors (Trout, Tilapia, Catfish and Marron Crayfish) with a production of 1792.01 tons in 2014. Trout sub-sector experienced a decline in the total production by nearly 24.40 tons (1.60%) in 2014, however Trout sub-sector remained as the most contributing sector in the freshwater aquaculture industry, followed by Tilapia with 289.71 tons, Marron Crayfish with five tons, whereas, the Catfish sub-sector produced zero tons in 2014.





The department conducted site surveillance of 10 marine aquaculture right holders and one experimental hatchery, including two Abalone farms, three Oyster farms, five finfish (i.e. Dusky Kob and one experimental finfish hatchery, i.e. white stumpnose (*Rhabdosargus globiceps*), between Paternoster in the Western Cape and Mtunzini in KwaZulu Natal.

During the year 2014, a number of aquaculture research projects were undertaken by DAFF researchers in collaboration with universities. These projects included finfish reproduction conducted at the Marine Research Aquarium; a comparative growth performance test (three months) for the combined effect of formulated Trout food, fishmeal and inactivated yeast, compared to selectively added probiotics or herbal stimulants on the growth performance of South African juvenile Dusky Kob.

A number of legislative statutes which relate to aquaculture were amended during 2014; amongst these is the National Environmental Management Act (NEMA) (Act 107 of 1998), the Environmental Impact Assessment (EIA) regulations and the associated listing notices (GN R 983, R 984 and R 985) which came into effect on the 8th December 2014.

Among other collaborative initiatives with universities, the DAFF and the University of Limpopo collaboration have successfully bred Catfish in February 2014. This programme has supplied about 16 000 Catfish fingerlings to the Gariep Agricultural Technology Demonstration Centre (ATDC), located in the Free State Province for demonstration purposes. The programme also sold about 7 000 fingerlings to a non-governmental organisation based in Free State in the same year.

Other initiatives that DAFF has initiated include aquaculture Operation Phakisa. Operation Phakisa, the Big Fast Results methodology was adopted from the Malaysian Government and was launched in South Africa, by the president, in July 2014. Operation Phakisa was implemented with the aspirations of unlocking the oceans economy in the country, thus increasing the GDP to 129-177 billion and 0.8 -1 million job creations by 2033. In order to implement the Operation Phakisa initiative, different sectors were identified and selected to develop individual implementation plans to unlock their potential value in Delivery Laboratories (Labs) which were formed after the launch. Aquaculture was one of the selected sectors for implementing the Operation Phakisa initiative among others (Marine Protection Services and Governance; Marine Transport and Manufacturing; and Offshore Oil and Gas Exploration). These Labs were involved in an intensive performance process between the private sector, public sector, academia and civil society.



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ABBREVIATIONS



AASA	Aquaculture Association of Southern Africa
ADZ's	Aquaculture Development Zones
AOAC	Association of Analytical Communities
CD: AED	Chief Directorate: Aquaculture and Economic Development
ADEP	Aquaculture Developmental and Enhancement Programme
AIF	Aquaculture Intergovernmental Forum
D: ARD	Directorate: Aquaculture Research and Development
ARC	Agriculture Research Council
ARTDP	Aquaculture Research and Technology Development Programme
ASP	Amnesic Shellfish Poisoning
ATDC	Agricultural Technology Demonstration Centre
D: ATS	Directorate: Aquaculture Technical Services
BEE	Black Economic Empowerment
BMP's	Better Management Practices





CGA	Catfish Growers Association
CITES	Convention on International Trade in Endangered Species
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DBSA	Development Bank of Southern Africa
DDG	Deputy Director-General
DEA	Department of Environmental Affairs
DFI	Development Funding Institutions
DSP	Diarrheic Shellfish Poisoning
DST	Department of Science and Technology
The dti	Department of Trade and Industry
DWS	Department of Water and Sanitation
ECDC	Eastern Cape Development Cooperation
EIA	Environmental Impact Assessment
EIF	Environmental Integrity Framework
ELIDZ	East London Industrial Development Zone
EOP	Environmental Officer Production
EUS	Epizootic Ulcerative Syndrome
FAIL	Freshwater Aquaculture Industry Liaison
FAO	Food and Agriculture Organisation of the United Nations
CD: FR&D	Chief Directorate: Fisheries Research and Development
FPE	Fish Processing Establishment
GAP	Good Aquaculture Practice
GDP	Gross Domestic Product
HDI	Historical Disadvantaged Individuals
HDPE	High Density Polyethylene





IDC	Industrial Development Cooperation
IPAP	Industrial Policy Action Plan
MAIL	Marine Aquaculture Industry Liaison
MAWG	Marine Aquaculture Working Group
MLRA	Marine Living Resources Act (Act No. 18 of 1998)
MOFCOM	People's Republic of China Ministry of Commerce
MTPA	Mpumalanga Tourism and Parks Agency
CD: MRM	Chief Directorate: Marine Resources Management
CD: MSC	Chief Directorate: Monitoring, Control and Surveillance
NAPF	The National Aquaculture Policy Framework
NASF	National Aquaculture Strategy Framework
NEF	National Empowerment Fund
NEMA	National Environmental Management Act (Act 107 of 1998)
NEM: BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NGP	New Growth Path
Non-HDI	Non-Historically Disadvantaged Individual
NRCS	National Regulator for Compulsory Specifications
OIE	World organisation for animal health
OPDU	Operation Phakisa Delivery Unit
PCB	Polychlorinated Biphenyls
PAIF	Provincial Aquaculture Intergovernmental Forum
PSP	Paralytic Shellfish Poisoning
RoI	Return on Investment
D: SAM	Directorate: Sustainable Aquaculture Management
SAMSM&CP	South African Molluscan Shellfish Monitoring and Control Programme



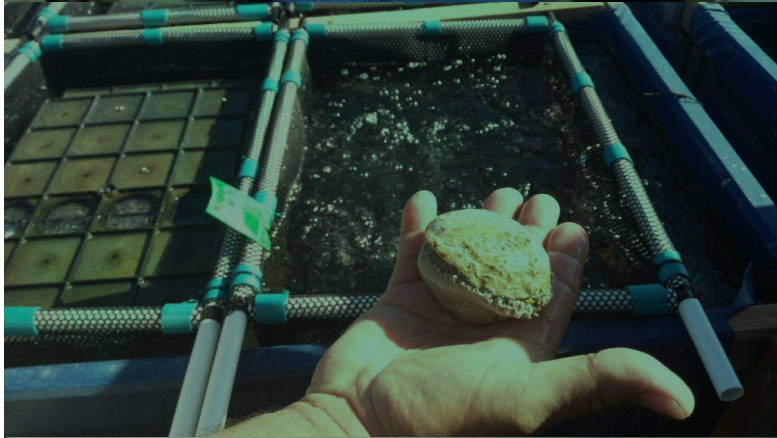
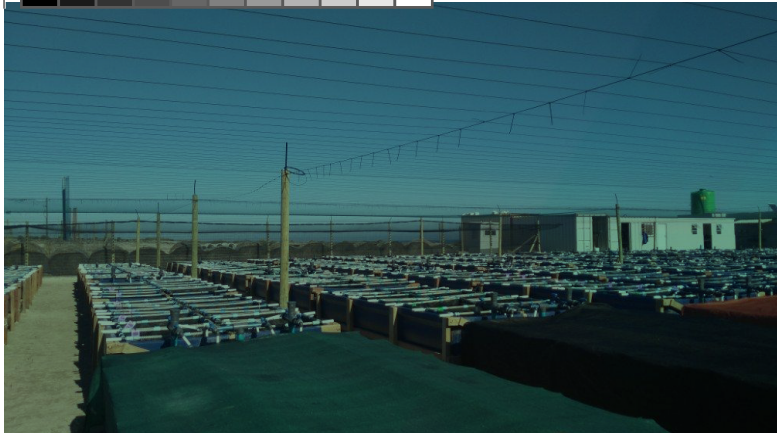
SETA	Sector of Education and Training Authority
SEZ	Special Economic Zone
SOE	State-Owned Entities
TCP	Technical Cooperation Program
TCPF	Technical Cooperation Programme Facility
MDARLA	Mpumalanga Department of Agriculture, Rural Development and Land Administration

DEFINITIONS 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.
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 closures	A period where Shellfish farms are temporally not allowed to market and or sell products due to microbiological contamination, detection of biotoxins and as well as other hazardous substances such as heavy metals, pesticides, polychlorinated biphenyls (PCBs) or radionuclides.
Pilot Scale	Status at which a project is testing or conducting trials in order to demonstrate the effectiveness of a full program.
Production	Amount of organisms produced from a farm.







OVERVIEW OF AQUACULTURE YEAR BOOK 2015





1.1 South Africa's Aquaculture yearbook 2015

The Department of Agriculture, Forestry and Fisheries (DAFF) is the leading department for aquaculture management and development in the Republic of South Africa. On annual basis, the DAFF publishes the status of the sector in a form of "Aquaculture Yearbook".

This is the sixth edition of the Aquaculture Yearbook and its name has been maintained as such since 2012 to date. Prior to 2012, the naming of the publication changed three times. In 2009, it was published under the former Departments of Environmental Affairs and Tourism as "South Africa's Marine Aquaculture Industry Annual Report 2009", focussing on marine aquaculture production only. Post government restructuring process and the establishment of the DAFF, the publication was revised and renamed "Marine Aquaculture Annual Report 2010" to accommodate the developmental mandate of the DAFF. In 2011, marine aquaculture and freshwater aquaculture sectors from the former Department of Environmental Affairs and Tourism and the Department of Agriculture respectively were fully integrated under the DAFF-Chief Directorate: Aquaculture and Economic Development. This prompted the renaming of the publication to "South Africa's Aquaculture Annual Report". The last revision of the publication name was done in 2012 when it was renamed "South Africa Aquaculture Yearbook". The change in the publication's name did drastically affect the main purpose of the publication which is to make provision for consistent information on the status of the aquaculture sector. It promotes transparency, facilitates awareness, assists in identification of deficiencies in management systems and relevant government interventions. The publication also provides easy access to information and contributes to a business case for future development of the sector.

The South Africa Aquaculture Yearbook 2015 has been compiled based on the data collected from the South Africa Aquaculture sector during 2014. Due to limitations arising from the fragmented legislative tools in management and development of the marine and freshwater aquaculture, collection of data from the two sectors was conducted differently. The marine aquaculture was collected on the basis of the provisions that exist in the Marine Living Resources Act (MLRA) (Act No.18 of 1998), through compulsory submission of data by industry and site visits conducted by the officials from the DAFF.

The collection of freshwater aquaculture data continues to be a challenge as there is no overarching legislative tool that puts an obligation to the farmers to submit data. Data was collected on voluntary basis through questionnaires to individual farmers and aquaculture associations. On this basis, it is essential to note that the freshwater aquaculture data is based on the farms affiliated to aquaculture associations and so does not include all freshwater aquaculture within South Africa. The data presented may not be a complete and accurate reflection of the freshwater aquaculture industry as some farmers may not be affiliated to these associations or are unwilling to voluntarily submit data to the DAFF.



The background image shows a coastal aquaculture facility with rows of green, dome-shaped structures (likely for oyster or mussel cultivation) in the foreground. In the background, there are buildings and a body of water under a cloudy sky. The image is overlaid with a semi-transparent green geometric pattern consisting of various triangles and polygons.

STATUS OF AQUACULTURE IN SOUTH AFRICA 2014

2.1 Overview of aquaculture in South Africa in 2014

Aquaculture continues to be the fastest growing sector with an annual growth rate of 6.6%. South Africa, however, still contributes less than 1% to the global aquaculture production. Although commercial aquaculture began in the 1980's and has been growing annually, in South Africa its total contribution to the global aquaculture industry has still remained low. Through several platforms, challenges hampering the growth of the sector were identified such as fragmented legislative tools, overregulation, poor coordination, inadequate access to funding, limited skills pools and inadequate access to marketing which continues to be the factors resulting to slow growth of the sector in South Africa. In 2014, the government embarked on a process intended to address these changes under the vehicle of Operation Phakisa-Oceans economy and a roadmap was developed with detailed solutions towards the challenges identified. Despite the challenges identified during 2014, South African aquaculture industry continued to grow and prove to have potential to increase growth.

Farms: A total of 233 farms were recorded in 2014 increasing by four from the previous year (2013) (Table 1). Marine aquaculture farms were 39, increasing by three from the previous year, whilst recorded freshwater farms where 194 were freshwater aquaculture farms with only one additional farm when compared to 2013.

Table 1: Total number of farms recorded for South Africa's aquaculture sector in 2014.

Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Abalone	1	0	0	0	0	0	4	0	13	18
Finfish	3	0	0	1	0	0	0	0	2	6
Mussels	0	0	0	0	0	0	0	0	4	4
Oysters	2	0	0	0	0	0	1	0	6	9
Ornamentals	0	0	0	0	0	0	0	0	1	1
Total Marine	6	0	0	1	0	0	5	0	26	38
Tilapia	3	1	23	5	19	20	3	21	2	97
Trout	3	0	0	5	0	19	1	0	20	48
Catfish	1	3	1	0	3	0	1	1	0	10
Marron Crayfish	1	0	0	0	0	0	0	0	0	1
Carp	0	0	2	0	0	0	0	0	1	3
Koi Carp	1	2	6	2	1	3	1	1	1	18
Ornamental species	3	1	4	4	2	0	0	0	3	17
Whiteleg Shrimp	0	0	1	0	0	0	0	0	0	1
Total Freshwater	12	7	37	16	25	42	5	23	27	194
Total Marine and Freshwater	18	7	37	17	25	42	11	23	53	233

Species farmed: In 2014, a total of 13 fish species were cultured, of which five species were marine organisms which included Abalone, finfish, Oysters, Mussels and ornamental fish. In addition to this, seven more species were attributed to freshwater aquaculture which included tilapia, trout, catfish, marron crayfish, carp, koi carp, and ornamental fish.

Production: The total production of South Africa's aquaculture industry (excluding seaweed, Carp, ornamentals and Koi Carp) in 2014 was 5209.60 tons. The sector has shown continuous growth from 2006 to date (Figure 1). It has increased the total production by 407.49 tons, which is an increase of 8.5% from 2013 to 2014. Marine aquaculture contributed 3417.59 tons towards the total production accounting 65.6% of the total production and increasing by 431.9 tons (14.5%) from 2013. The freshwater aquaculture industry contributed 1792.01 tons of the total production accounting for 34.4% of the total production and decreasing by 24.4 tons (13.4%) in 2014 (Table 2 and Figure 2). The Mussel sub-sector was leading in terms of production with a total of 1682.48 tons followed by the Trout sub-sector with production of 1497.00 tons and Abalone with production of 1306.80 tons (Figure 3).

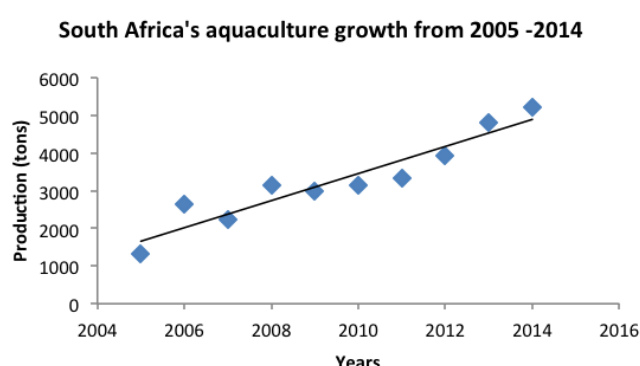


Figure 1: South Africa's aquaculture production growth from 2005 to 2014.

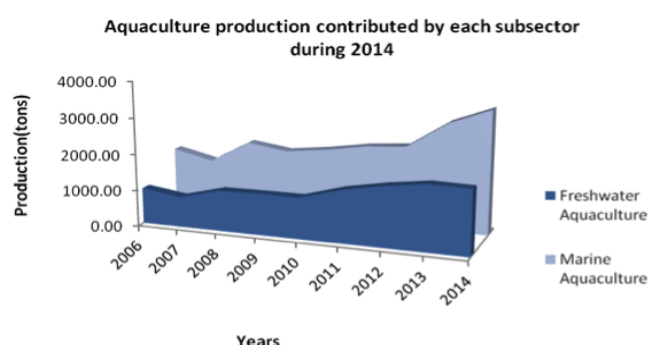


Figure 2: South Africa's marine and freshwater aquaculture production growth per sector from 2006 to 2014.

Table 2: Total production (tons) recorded for South Africa's aquaculture sector in 2014.

Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Abalone	167.97	0	0	0	0	0	7.62	0	1138.21	1306.80
Finfish	161.86	0	0	0	0	0	0	0	0	161.86
Mussels	0	0	0	0	0	0	0	0	1682.48	1682.48
Oysters	37.26	0	0	0	0	0	0	0	229.18	266.45
Total Marine	366.83	0.00	0.00	0.00	0.00	0.00	7.62	0.00	3049.87	3417.59
Tilapia	18	0.8	53.55	2.31	108	23.1	4.5	77.35	2.1	289.71
Trout	241.00	0	0	382.00	0	133.00	0	0	741.00	1497.00
Catfish	0	0	0	0	0	0	0	0	0	0.00
Marron Crayfish	5	0	0	0	0	0	0	0	0	5.00
Total Freshwater	264.00	0.80	53.55	384.31	108.00	156.01	4.50	77.35	743.35	1792.01
Total Marine and Freshwater	630.83	0.80	53.55	384.31	108.00	156.01	12.12	77.35	3793.22	5216.19



STATUS OF MARINE AQUACULTURE IN 2014

3.1 Marine aquaculture farms operating during 2014

In 2014, a total of 39 marine aquaculture farms were operational in South Africa. There was an increase of three new farms in the marine aquaculture industry, these include: one Mussel farm (which also farm Oysters), one ornamental fish farm and one finfish (Salmon) farm. The Western Cape Province had the highest number of operating marine fish farms in 2014, amounting to 27 and comprising of four sub-sectors namely Abalone, finfish, Oysters and Mussels with the Mussels sub sector being the major contributor. In the Eastern Cape Province six farms were in operation and comprised of three sub-sectors namely Abalone, finfish and Oysters. The Northern Cape had five farms and consisting of two sub-sectors namely Abalone and Oysters, whilst KwaZulu Natal had the least number of farms with only one finfish farm in operation. 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 2014.

Number of marine aquaculture farms cultivating species in each province					
Species	Western Cape	Eastern Cape	Northern Cape	KwaZulu Natal	Total
Abalone	13	1	4	0	18
Finfish	2	3	0	1	6
Mussels	5 (1)*	0	0	0	5
Oysters	6 (2)**	2	1	0	9
Ornamentals	1	0	0	0	1
Total	27	6	5	1	39

* One Oyster farm cultured Mussels as well, however the farms haven't been captured under Mussels as their primary species is Oysters

** Three Mussel farms cultured Oysters as well, however the farms haven't been captured under Oysters as their primary species is Mussels

3.2 Marine aquaculture species farmed during 2014

In 2014, different species were farmed in different scale, i.e. commercial scale and research purposes. Even though there were only four sub-sectors farming during 2014, 13 fish species were cultured. The species cultured in South Africa during 2014 and their operational scale in the sector are illustrated in table 4.

Commercial Scale: Marine aquaculture species cultured on commercial scale included Abalone (*Haliotis midae*), Pacific Oyster (*Crassostrea gigas*), Mussels (*Mytilus galloprovincialis* and *Chromomytilus meridionalis*), Dusky Kob (*Argyrosomus japonicas*), Salmon (*Salmo salar*), Whiteleg Shrimp (*Litopenaeus vannamei*) and Seaweed (*Ulva spp.* and *Gracilaria spp.*).

Research purpose: A number of aquaculture species were kept on farm premises for conditioning and research. These species included Yellowtail (*Seriola lalandi*), Mangrove Snapper (*Lutjanus argentimaculatus*), Spotted

Grunter (*Pomadasys commersonnii*), Yellowbelly rockcod (*Epinephelus marginatus*) and Bloodworm (*Arenicola loveni*). The DAFF conducted some research on potential species during 2014; these species were held at the DAFF Aquaculture Research Facility, in Sea Point, Cape Town. The species included the following, White Stumpnose (*Rhabdosargus globiceps*), South Coast Sea Urchin (*Tripneustes gratilla*), Octopus (*Octopus vulgaris*) and the South African Scallop (*Pecten sulcicostatus*).

Table 4: Marine aquaculture species and the operational scale of each species in South Africa during 2014.

Marine Aquaculture species in South Africa, 2015		
Common Name	Scientific Name	Operational Scale
Abalone	<i>Haliotis midae</i>	Commercial
Pacific Oyster	<i>Crassostrea gigas</i>	Commercial
Mediterranean Mussel	<i>Mytilus galloprovincialis</i>	Commercial
Black Mussel	<i>Choromytilus meridionalis</i>	Commercial
Seaweed	<i>Ulva spp</i>	Commercial
Seaweed	<i>Gracilaria spp</i>	Commercial
Dusky Kob	<i>Argyrosomus japonicus</i>	Commercial
Salmon	<i>Salmon sala</i>	Commercial
Yellowtail	<i>Seriola lalandi</i>	Research
White stumpnose	<i>Rhabdosargus globiceps</i>	Research
Spotted grunter	<i>Pomadasys commersonnii</i>	Research
Yellowbelly rockcod	<i>Epinephelus marginatus</i>	Research
Mangrove Snapper	<i>Lutjanus argentimaculatus</i>	Research
South Coast Sea Urchin	<i>Tripneustes gratilla</i>	Research
South African Scallop	<i>Pecten sulcicostatus</i>	Research
Bloodworm	<i>Arenicola loveni</i>	Research
Octopus	<i>Octopus vulgaris</i>	Research

3.3 Marine Aquaculture Authorization

Marine aquaculture continues to be managed under the Marine Living Resources Act (MLRA), (Act 18 of 1998). The MLRA (Act 18 of 1998) developed a regulatory framework for ecosystems conservation, the sustainable utilization of marine living resources and the orderly access to exploitation and the protection of certain marine

living resources. Even though marine aquaculture is more development focus, it formed part of the activities that are regulated in terms of the MLRA (Act 18 of 1998) due to its utilisation of the marine space and species. The marine aquaculture continues to be regulated in the form of issuing of permits and exemptions to exercise rights where necessary in terms of the MLRA (Act 18 of 1998). The DAFF embarked on a process of developing aquaculture legislation during 2014 and a concept note of the Aquaculture Bill was consulted with industry.

3.3.1 Marine Aquaculture Rights

Marine aquaculture rights are granted in terms of Section 18 (1) of the MLRA (Act 18 of 1998), which states that:

“No person shall undertake commercial fishing or subsistence fishing, engage in mariculture or operate a Fish Processing Establishments (FPEs) 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 DAFF 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.

3.3.2 Exemption

Exemptions are granted in terms of Section 81 of the MLRA (Act 18 of 1998), 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 FPEs operate under an exemption due to institutional delays in the granting of FPEs rights. Exemptions for “the possession and sale of undersized Abalone and Kob” (herein referred to as “local sales permits”) are drafted to allow for the local sales of these products by retailers and restaurants, due to the implementation of wild caught size restrictions on farmed products. The exemption process is a legislative process that is used as a mechanism to allow for the processing and local sales of undersized products. In the past year, the amount of permits approved for FPEs and local undersized sales permits has increased as compared to the previous year, 2013.

In 2014, four marine aquaculture rights were granted, including Black Mussel (*Mytilus galloprovincialis*) and Pacific Oyster (*Crassostrea gigas*), marine ornamentals and Atlantic Salmon (*Salmo salar*) and Whiteleg Shrimp (*Litopenaeus vannamei*) (Table 5). Applications for a marine aquaculture right can be submitted to the DAFF on a continuous basis. The application process is open to any individual or registered business entity that has shown interest overtaking 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 5: Rights to engage in marine aquaculture granted in terms of Marine Living Resources (MLRA) (Act No. 18 of 1998) during 2014

Company Name	Operational Area	Species	Duration of Right
Southern Atlantic Sea Farms	15 hectares of the inner bay, Port of Saldanha, Saldanha Bay, Western Cape	Atlantic Salmon (<i>Salmo salar</i>)	01/01/2014 - 31/12/2029



Company Name	Operational Area	Species	Duration of Right
Biorganics (Pty) Ltd	Windsor Road, Luipaardovlei, Mogale City. Gauteng	Whiteleg Shrimp (<i>Litopenaeus vannamei</i>)	01/01/2014 - 31/12/2029
Beast Importing CC	20 Crudop Street, Bothasig, Cape Town	Marine ornamentals	01/09/2014 - 31/08/2030
Aqua Food SA (Pty) Ltd	10 hectares of sea space in the inner bay, Port of Saldanha, Saldanha Bay, Western Cape	Mussel (<i>Mytilus galloprovincialis</i>) Pacific Oyster (<i>Crassostrea gigas</i>)	01/03/2014 - 28/02/2030

3.3.3 Permits

To activate a right or exemption, a permit is issued in accordance with section 13(1) of the MLRA (Act No. 18 of 1998) which states that:

“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 Minister 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 few socio-economic analyses have been conducted on the impact of various fishing and aquaculture activities on low-income households in South Africa as poverty is not clearly conceptualized, articulated, or measured in fisheries and aquaculture studies. However addressing fisheries issues in a developing country perspective is not the same as addressing poverty per se in fishing communities, and fisheries research would greatly benefit from drawing on the wider knowledge on the nature of poverty that is discussed in the broader development literature

Act may be refused if the conditions of a previously issued permit had not been adhered to.”

During 2014, a total of 539 permits for marine aquaculture were issued in South Africa to right holders, agencies, importers, exporters, FPEs and transportation companies (Table 6). The permits issued for imports exceeded the number of permits issued for exports, which is a clear reflection of net importation trends in South African commodities and the increased fish demand in the country. There were 23 permits issued for possession and the selling of undersized cultured Abalone in 2015, thus depicting a decrease in local demand for Abalone due to the recession experienced in 2014.

Table 6: Types of permits issued in 2014.

Permit type	Number issued
Imports	213
Exports	158
Transport	33
Engage in Marine Aquaculture Activities	42
Possess Brood stock and Operate a Hatchery	16
Possess and sell Undersized Cultured Abalone obtained from Right holder	23
Permit to possess and sell undersized Kob obtained from a Right Holder	0
Right to Engage in Abalone Ranching and Stock Enhancement Pilot Project: Seeding	4
Engage in Ranching Activities of Marine Species: Harvesting	1
Collect Brood stock for Marine Aquaculture purposes	9
Operate a Fish Processing Establishment	19
Scientific Investigations and Practical Establishments	13
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)	8
Total Issued	539

3.4 Marine aquaculture production during 2014

In the South Africa's Aquaculture Yearbook 2015, production is defined as the quantity of organisms produced from a farm mainly for human consumption and is expressed in tonnage. This definition excludes seaweed which in South Africa is used as feed for Abalone. South Africa's total marine aquaculture production in 2014 was 3417.59 tons. Amongst the four sub-sectors produced in 2014, Mussels led the production volumes with 1682.48 tons, followed by Abalone and Oyster recording production of 1306.80 tons and 229.10 tons respectively. The finfish sub-sector was the smallest contributor to total production, recording a production of 161.86 tons (Table 7).

Table 7: Total marine aquaculture production for human consumption per sub-sector and province for 2014

Production (tons) per Species and Province					
Species	Western Cape	Eastern Cape	Northern Cape	KwaZulu Natal	Total
Abalone	1138.21	167.97	7.62	0	1306.80
Finfish	0	161.86	0	0	161.86
Mussels	1682.48	0	0	0	1682.48
Oysters	229.18	37.26	0	0	266.45
Seaweed	323.60	1320.00	0	0	1643.6
Total	3049.87	366.83	7.62	0	3417.59

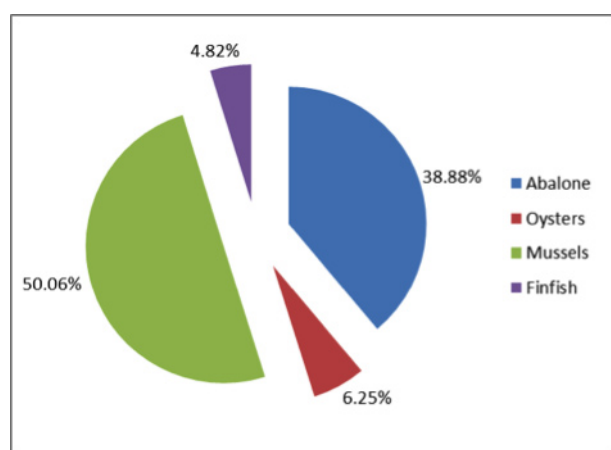


Figure 4: The percentage contribution of each marine aquaculture sub-sector to total production in 2014.

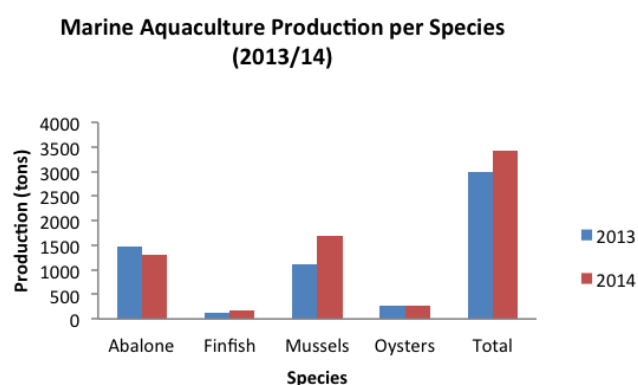


Figure 5: Demonstration of annual increase per species for marine aquaculture species between 2013 and 2014.

South Africa's total marine aquaculture production experienced an increase of 431.90 tons between 2013 and 2014, which is an increase of 14.96% and the sector contributed 65.60% to the overall aquaculture production of 5209.60 tons.

The Mussels sub-sector contributed 50.06% to the total marine aquaculture production. It recorded an increase in production by 566.34 tons (50.74%) from 2013. The Abalone sub-sector, even though it is the second in terms of production volumes, contributing 38.8% towards the overall marine aquaculture production, it has decreased by 102.98 tons (7.30%) from 2013.

The finfish sub-sector contributed 4.82% towards the total marine aquaculture production and demonstrated an increase of 39.31 tons (32%) from 2013. The Oyster sub-sector contributed 6.25% towards the overall marine aquaculture production and decreased its production by 10.78 tons (3.88%) from 2013 (Figure 4 and Figure 5).

Seaweed, which has been excluded in the total production, it recorded 1643.60 tons in 2014. Due to inconsistent recording of this sub-sector, the growth rate between 2013 and 2014 cannot be determined. The last recorded seaweed production was in 2000 tons in 2012 and it has decreased its production by 356.40 tons (17.82%).

3.5 South Africa's marine aquaculture production during 2000-2014

Since 2000, total recorded production of the marine aquaculture sector is 27 491.45 excluding seaweed. Over the 14 years, the lowest production was 1055.92 tons in 2000 and the highest was 3417.59 tons 2014 (Table 8).

Total marine aquaculture production has increased by 1929.77 tons (32.03%) between 2000 and 2014 (Figure 6 and Table 8). This growth can be attributed to continued government support, increase in demand of fish, growing awareness towards sustainable development and decreasing fish stocks.

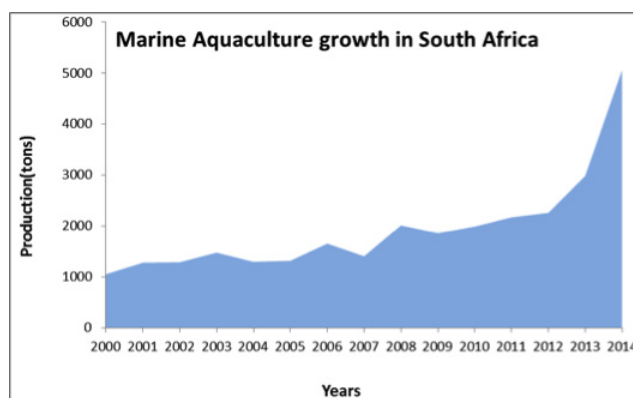


Figure 6: Growth of the Marine aquaculture sector over fourteen (14) years.

Table 8: Marine aquaculture total production in 2000 - 2014 (*Totals excludes seaweed)

Sub-sector	Year and Production (tons)															Total (2000-2014)
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Abalone	181.03	372.88	429.42	462.02	509.2	670.8	833.36	783.25	1037.11	913.58	1015.44	1036.01	1111.41	1469.78	1306.50	12 132.10
Finfish	1.04	0.30	2.38	14.0	1.81	1.68	0.00	0.00	2.71	22.75	0.00	7.99	48.46	122.55	161.86	387.52
Mussels	500	600	429.11	623.0	640.0	472.0	542.0	466.0	736.74	682.40	700.14	859.77	859.77	1116.14	1682.48	10 909.55
Oysters	247.01	187.53	272.1	255.24	147.66	174.91	279.87	157.86	226.62	223.53	276.57	269.34	241.58	277.23	266.45	3 503.50
Prawns	126.84	120.19	157.7	124.88	0.00	0.00	0.00	0.00	11.44	17.92	0.00	0.00	0.00	0.00	0.00	558.97
Seaweed	0.00	0.00	0.00	0.00	0.00	0.00	664.0	0.00	1833.49	1900.18	2015.01	2884.61	2000	0.00	1643.60	12 940.89
Total*	1055.92	1280.9	1290.71	1479.14	1298.67	1319.39	1655.23	1407.11	2014.62	1860.18	1992.15	2173.11	2261.69	2985.69	3417.59	27 491.64

3.6 Analysis of marine aquaculture industry

3.6.1 Abalone Sub-sector

The Abalone species currently being cultivated in South Africa is *Haliotis midae*. In 2014, the Abalone sub-sector contributed 38.88% to South Africa's total production recording a total of 1306.80 tons. The Abalone sub-sector experienced a decrease of 7.30% in 1469.78 tons produced in 2013 (Figure 7). The Abalone sub-sector comprised of 18 farms and there were no additional or new farms registered for operations

in 2014. Out of the 18 Abalone farms operated in 2014, 12 were land-based facilities with independent hatcheries and four operated grow-out facilities only. The other two Abalone farms included one sea cage. Among these farms, there were also two farms registered as ranching operations where the Abalone is being seeded in the natural environment. The Abalone sub-sector distribution range stretches from the Northern Cape and Western Cape to the Eastern Cape. Four farms were operating in the Northern Cape, one situated in Port Nolloth, one in Hondeklipbaai and two were operating in Kleinsee, two of them also practising Abalone ranching operation. A total of 14 Abalone farms are situated in the Western Cape of which nine are located within the Overberg region and four are located along the West Coast in Doringbaai, Jacobsbaai and St Helena Bay (two Abalone farms found in St Helena Bay). In the Eastern Cape there was only one Abalone farm in operation as well as one ranching farm. The Abalone farm is situated in Haga Haga, a few kilometres outside East London and the ranching farm is located in Cape Recife bordering Port Elizabeth. There were no Abalone farms in Kwa-Zulu Natal and the five inland provinces, i.e. Free State Province, North West Province, Mpumalanga Provinces, Gauteng Province and Limpopo Province (Table 9). The Western Cape dominated production of Abalone and contributed 88.43% to the total Abalone production in South Africa, followed by Eastern Cape with 11.57%.

Table 9: Abalone farms and production per province in South Africa during 2014.

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
No. of Farms	1	0	0	0	0	0	4	0	13	18
Production (tons)	167.97	0	0	0	0	0	7.62	0	1138.21	1306.80

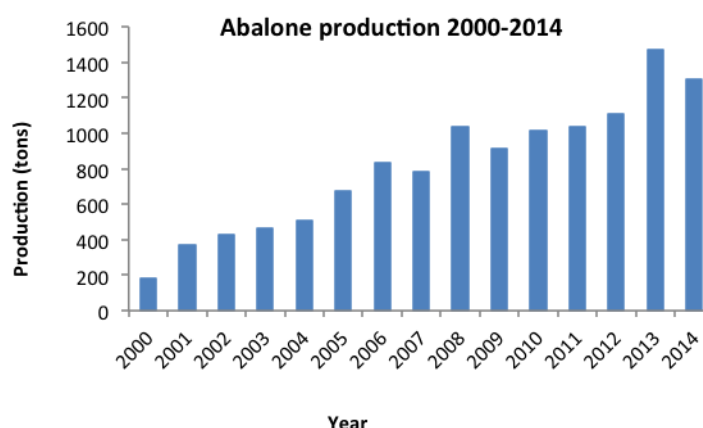


Figure 7: Farmed Abalone production in South Africa from 2000-2014.

3.6.2 Finfish Sub-sector

The finfish sub-sector in South Africa is an emerging industry. Over the years a number of species have been piloted to assess the feasibility and market access. Currently the only commercial species being cultured in the industry is the Dusky Kob (*Argyrosomus japonicus*). Other marine finfish species that were held on farm sites for research purposes were Yellowtail (*Seriola lalandi*), Mangrove Snapper (*Lutjanus argentimaculatus*), Spotted grunter (*Pomadasys commersonnii*) and Yellowbelly rockcod (*Epinephelus marginatus*). The finfish sub-sector has been growing over the last two years and in 2014 the sub-sector recorded the highest production to date, with total production of 161.86 tons (Figure 8). The finfish sub-sector experienced a dramatic increase in production of 24.28% from the 122.55 tons produced in 2013 and has contributed 4.82% to the total marine aquaculture production.

Four farms were in operation in 2014, the operations includes a one recirculation facility in the Western Cape, one pond culture facility in KwaZulu Natal and two recirculation facilities in the Eastern Cape. There we no finfish farms operating in Northern Cape and five inland provinces, i.e. Free State Province, Gauteng Province, Limpopo Province, Mpumalanga and North West (Table 10).

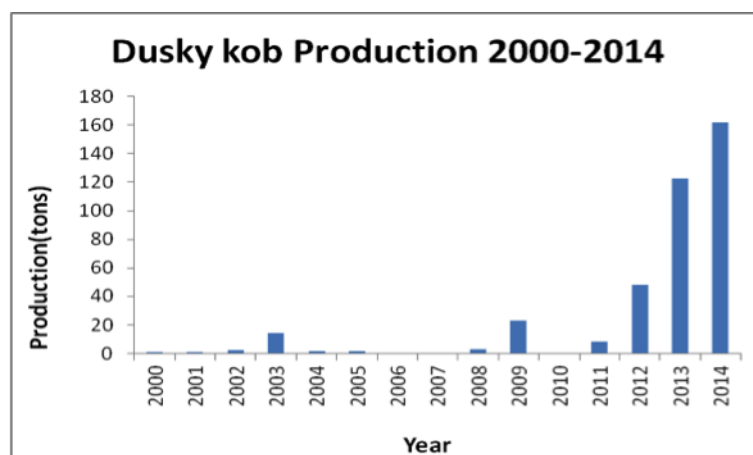


Figure 8: Farmed finfish production in South Africa from 2000 – 2014.

Table 10: Finfish farms and production per province in South Africa during 2014.

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
No. of Farms	3	0	0	1	0	0	0	0	2	6
Production (tons)	161.86	0	0	0	0	0	0	0	161.86	161.86

3.6.3 Oyster Sub-sector

The species cultivated in South Africa is the exotic Pacific Oyster (*Crassostrea gigas*). There were nine farms in operation in 2014. There are two Mussel farms which culture Oysters, however, they have not been included in the total farms of the Oyster sub-sector as they produce Oysters as a secondary crop. The production of Oysters in the sub-sector was 523.23 tons, displaying an increase of 47.01% from the 277.23 tons produced in 2013 and has contributed 6,25% to total marine aquaculture production (Figure 9). Oyster farms are currently situated in the Northern Cape, Western Cape and Eastern Cape. A total of six farms in the Western Cape were operational and includes four in Saldanha Bay, one in Knysna and one in Paternoster. The Western Cape Oyster farms contributed to the majority of production, contributing 69.70% of the total Oyster production. Oyster farming in the Eastern Cape is represented by three farms, one located in Port Elizabeth, one in Jeffery's Bay, and one in Hamburg which also farm Dusky Kob. The Northern Cape is represented by one Oyster farm located in Kleinsee. There were no Oyster farms in KwaZulu Natal and the four inland provinces i.e. North West, Limpopo, Gauteng and Mpumalanga (Table 11).

Table 11: Oyster farms and production per province in South Africa during 2014.

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
No. of Farms	2	0	0	0	0	0	1	0	6	9
Production (tons)	37.26	0	0	0	0	0	0	0	229.18	266.25

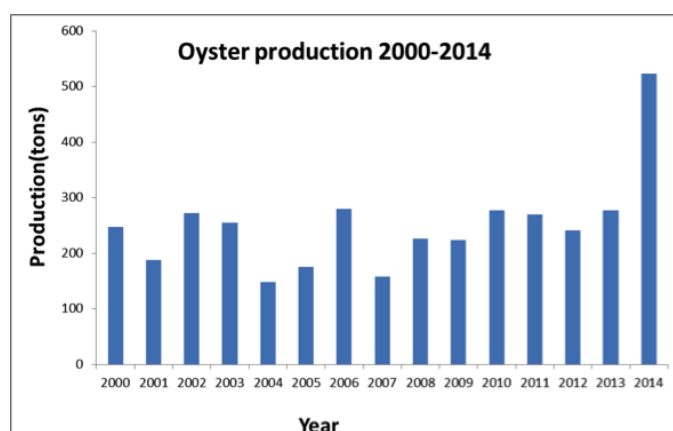


Figure 9: Farmed Oyster production in South Africa from 2000-2015.

3.6.4 Mussel Sub-sector

Mussel farming in South Africa is situated in Saldanha Bay, Western Cape, and is represented by three large scale Mussel farms in the area with one new Mussel farm established in 2014. The species cultured in South Africa are the exotic Mediterranean Mussel (*Mytilus galloprovincialis*) and the indigenous black Mussel (*Choromytilus meridionalis*). In 2014 the Mussels sub-sector recorded the highest production to date, recording a total of 1682.48 tons increasing by 566.335 tons from the 1116.14 tons of Mussels recorded in 2013 (33.6% increase) (Figure 10). This increase in production can be attributed to one Mussel farm completely stopping the production of Oyster and concentrating on increasing its production of Mussels as well as the establishment of a new Mussel farm in Saldanha Bay. The Mussel sub-sector contributed 50.06% to the total production in 2014. This sub-sector is currently the second highest contributor to the total production. The production of Mussels only occurred in Western Cape during 2014 (Table 12).

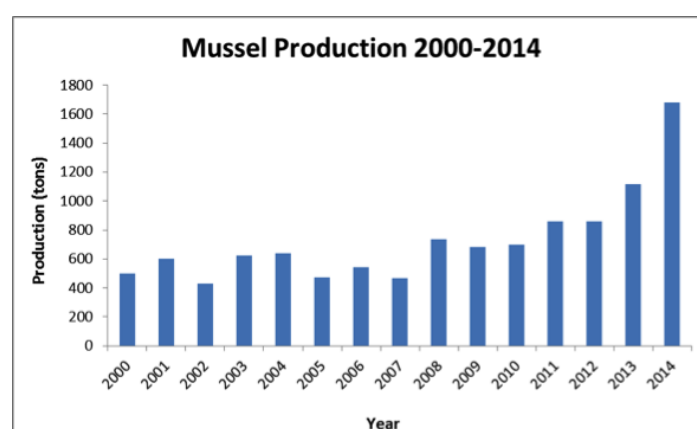


Figure 10: Farmed Mussel production in South Africa from 2000-2014.

Table 12: Mussel farms and production per Province in South Africa during 2014.

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
No. of Farms	0	0	0	0	0	0	0	0	4	4
Production (tons)	0	0	0	0	0	0	0	0	1682.48	1682.48




3.7 Marine aquaculture site surveillance during 2014

Site surveillance of the marine aquaculture sector 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 MLRA (Act No. 18 of 1998).

This has been essential in ensuring that non-compliant operations are communicated through proper channels such that the 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 2014, the DAFF conducted site surveillance of 10 marine aquaculture right holders and one experimental hatchery, including two Abalone (*Haliotis midae*) farms, three Oyster (*Crassostrea gigas* and *Striostrea mageritacea*) farms, five finfish (i.e. Dusky Kob (*Argyrosomus japonicus*)) and one experimental finfish hatchery, i.e. White stumpnose (*Rhabdosargus globiceps*), between Paternoster in the Western Cape and Mtunzini in Kwa-Zulu Natal.

This has been an ongoing exercise implemented in collaboration with site visits to marine aquaculture operations and has performed an integral part in evaluating the economic and food safety status of the sector. The department aims to work closely with industry to ensure the continuous open channel for communication from the marine aquaculture sector through the continued support provided in implementing continued site surveillance.



STATUS OF THE FRESHWATER AQUACULTURE 2014



4.1 Overview of Freshwater Aquaculture industry in South Africa 2014

South Africa's freshwater aquaculture industry is still developing even though it was introduced in the early 1800s. Its contribution in terms of production to the South African economy is minimal. This is due to lack of skills development, inadequate transformation and constraints associated with awareness around the aquaculture sector, thus creating major challenges in the development of the industry. Recently associations for certain sub-sectors have been developed namely: Tilapia Aquaculture Association of South Africa (TAASA) and the Catfish Growers Association (CGA) which will assist in the development of the industry as well as guide the department to have a clear vision of the aquaculture industry in South Africa.

Note that the production data analysed was based on data provided by the associations and may not be a true reflection of the entire aquaculture industry as not all freshwater farmers belong to an association. Production data for sub-sectors such as ornamental fish, Koi Carp and common Carp were not added in the aquaculture yearbook as there was insufficient information to present.

4.2 Freshwater aquaculture farms in 2014

Freshwater aquaculture has an advantage of location as it can take place in all nine provinces. During 2014, a total of 194 freshwater farms were recorded. The farms increased by one from 2013. Mpumalanga Province had the highest number of farms operating in 2014 with a total of 42 farms, followed by Gauteng Province with 37 farms and Western Cape with 28 farms. On fourth place was Limpopo Province with 25 farms, followed by North West Province with 23 farms and KwaZulu Natal with 16 farms. The bottom three provinces were Eastern Cape on the seventh place with 11 farms, Free State with seven farms and the last province was Northern Cape with five farms (Table 13). There is potential to increase the number of freshwater aquaculture farms as it is not technologically complicated.

Table 13: Total number of freshwater aquaculture farms operating in South Africa by sub-sector and province in 2014.

Number of freshwater aquaculture farms cultivating species in each province										
Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Tilapia	3	1	23	5	19	20	3	21	2	97
Trout	3	0	0	5	0	19	0	0	20	47
Catfish	1	3	1	0	3	0	1	1	0	10
Marron Crayfish	1	0	0	0	0	0	0	0	0	1
Carp	0	0	2	0	0	0	0	0	1	3
Koi Carp	1	2	6	2	1	3	1	1	1	18





Number of freshwater aquaculture farms cultivating species in each province										
Ornamental species	2	1	4	4	2	0	0	0	4	17
Whiteleg Shrimp	0	0	1	0	0	0	0	0	0	1
Total	11	7	37	16	25	42	5	23	28	194

4.3 Freshwater aquaculture species farmed in 2014

Seven sub-sectors were recognised in the freshwater aquaculture space in 2014, i.e. 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*), Whiteleg Shrimp (*Litopenaeus vannamei*) and a number of Ornamental species (i.e. Koi Carp etc.). Total of nine species were farmed, seven on commercial scale and two on pilot scale (Table 14).

Table 14: Freshwater Aquaculture species cultured in South Africa in 2014 and their operational scale.

Freshwater aquaculture species culture in South Africa, 2012		
Common Name	Scientific Name	Operational Scale
Rainbow Trout	<i>Oncorhynchus mykiss</i>	Commercial scale
Brown Trout	<i>Salmo trutta</i>	Commercial scale
Mozambique Tilapia	<i>Oreochromis mossambicus</i>	Commercial scale
Nile Tilapia	<i>Oreochromis niloticus</i>	Commercial scale
African Sharptooth Catfish	<i>Clarias gariepinus</i>	Pilot scale
Common Carp	<i>Cyprinus Carpio</i>	Commercial scale
Koi Carp	<i>Cyprinus Carpio</i>	Commercial scale
Marron (Freshwater crayfish)	<i>Cherax tenuimanus</i>	Commercial scale
Whiteleg Shrimp	<i>Litopenaeus vannamei</i>	Pilot scale

4.4 Freshwater aquaculture production in 2014.

South Africa's total freshwater aquaculture production in 2014 was 1792.01 tons. The Trout sub-sector was the highest contributing sub-sector in terms of production and recorded 1497.30 tons, followed by Tilapia and Marron Crayfish recording production of 289.71 tons and five tons respectively. There was no Catfish produced during



2014 (Table 15). The freshwater aquaculture sector production in 2014 decreased by 24.40 tons from 1816.41 tons in 2013, which is a decrease of 1.34% and contributed 34.40% to the overall aquaculture production. The Trout sub-sector contributed 82.43% to the freshwater aquaculture sector and showed a decrease of 24.40 tons (1.34%) from 2013. Tilapia contributed 17.94% to the freshwater aquaculture production, and was consistent with production in 2013 resulting in 0% increase followed by Marron Crayfish with contribution of 0.27% also showing consistency with 0% increase from 2013. Lastly, the Catfish recorded zero tons production and 0% increase from 2013 (Figure 11).

Table 15: Total production Freshwater aquaculture production per sub-sector and province during 2014.

Production (tons) per Species and Province										
Species	EC	FS	GP	KZN	LP	MP	NC	NW	WC	Total
Tilapia**	18.00	0.80	53.55	2.31	108.00	23.1	4.5	77.35	2.1	289.71
Trout	241.00	0	0	382	0	133	0	0	741	1497.00
Catfish	0	0	0	0	0	0	0	0	0	0.00
Marron Crayfish	5	0	0	0	0	0	0	0	0	5.00
Carp	0	0	0	0	0	0	0	0	0	0.00
Koi Carp	0	0	0	0	0	0	0	0	0	0.00
Ornamental species	0	0	0	0	0	0	0	0	0	0.00
Whiteleg Shrimp	0	0	0	0	0	0	0	0	0	0.00
Total	264.00	0.80	53.55	384.31	108.00	156.01	4.50	77.35	743.1	1792.01

**The Tilapia data was based on the data collected in 2013.

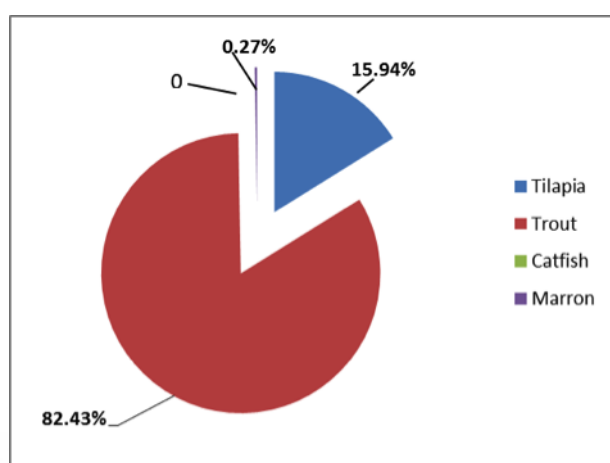


Figure 11: The percentage contribution of each freshwater aquaculture sub-sector to total production in 2014.

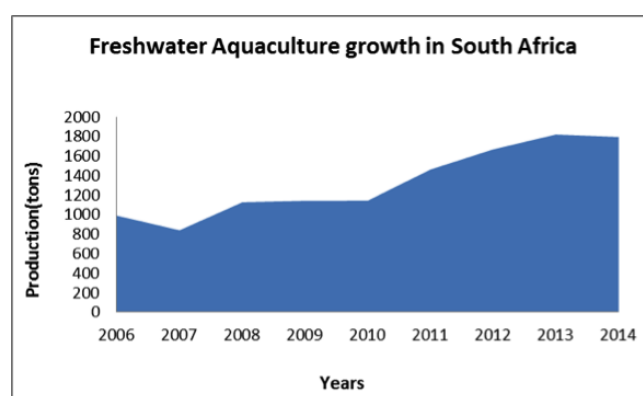


Figure 12: South Africa's freshwater aquaculture growth from 2006-2014.

4.5 Freshwater aquaculture authorisations in 2014

There are no recorded authorisations for the freshwater aquaculture sector. This is due to lack of overarching legislative tool by the lead government department, i.e. DAFF. The DAFF is addressing this challenge by the development of the proposed Aquaculture Bill.

4.6 Freshwater site surveillance undertaken in 2014.

There were no site surveillances recorded for the freshwater aquaculture in 2014. The DAFF is limited by the non-existent legislative tools. Farms that were visited were done on the basis of the Aquaculture Development and Enhancement Programme (ADEP) and are accounted for in the ADEP section of this report.

4.7 Freshwater Aquaculture Production (2006 – 2014)

Historical records of the freshwater aquaculture sector in DAFF's position are from 2006. Data prior to 2006 has not been formally submitted to DAFF. This could be due to lack of formal management structures on national level and dedicated legislative framework to collect such data. Since 2006, total recorded production of the freshwater aquaculture sector is 10170.53 tons (Table 16). Total freshwater aquaculture production has increased by 829.21 (45.65%) between 2006 and 2014 (Figure 12).

Table 16: South Africa's freshwater aquaculture production 2006-2014

	Year and production(tons)									Total production (tons)
Subsector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2006-2014
Tilapia	0	0	0	10	10	100	234.17	289.71	289.71	933.59
Trout	807	658	943	948.62	950	1199	1428	1521.7	1497.3	9952.62
Catfish	180	180	180	180	180	160	0	0	0	1060
Marron	0.2	0.4	0.4	0.4	0.8	0.8	3.5	5	5	16.5
Totals	987.2	838.4	1123.4	1139.02	1140.8	1459.8	1665.67	1816.41	1792.01	10170.53



4.8 Analysis of freshwater aquaculture industry

4.8.1 Trout Sub-sector

The Trout sub-sector has contributed 85.97% of South Africa's total freshwater production in 2014, recording a total production of 1497.30 tons (Figure 11). There was a decrease of 1.34% recorded between 2013 and 2014 (Figure 13). The Trout farms are currently located in the Western Cape, Mpumalanga, and Eastern Cape and KwaZulu Natal Provinces. Note production data was not obtained for KwaZulu Natal and Eastern Cape and thus not added into the total production for 2014. *Onchorynchus mykiss* and *Salmo trutta* are the two cultured species in South Africa. The technology used to cultivate these species includes raceway, pond, cage culture and recirculating systems. A total of 47 farms were recorded in the industry in 2014.

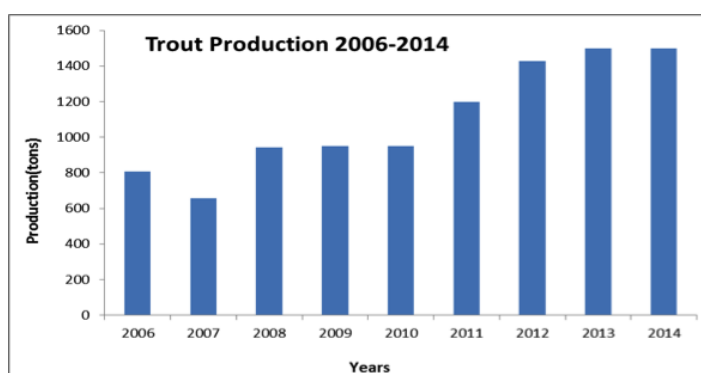


Figure 13: Trout production in South Africa from 2006-2014.

4.8.2 Tilapia Sub-sector

The Tilapia sub-sector in South Africa is based on a number of indigenous species; the two major species cultured are the Mozambique Tilapia (*Oreochromis mossambicus*) and Nile Tilapia (*Oreochromis niloticus*). This sub-sector contributed 15.94% to South Africa's total freshwater production, recording 289.71 tons (Figure 11). There was no increase in production recorded between 2013 and 2014 (Figure 14). Most Tilapia farmers are small scale farmers and they employ recirculation systems and pond culture methods, but recently farming Tilapia in green houses has been implemented. A total of 97 farms were recorded in the industry during 2014.

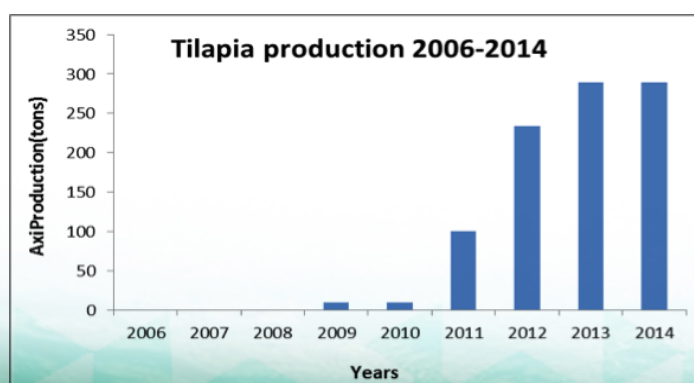


Figure 14: Tilapia production in South Africa from 2006-2014.





4.8.3 Catfish Sub-sector

The Catfish sub-sector in South Africa is based on the indigenous species sharptooth Catfish (*Clarias gariepinus*). In terms of 2014 production, the Catfish industry recorded zero production. The sector has not been recording any production since 2012 (Figure 15). Most of the farmers concentrated on producing fingerlings for the export market rather than growing the fish to market size on site. South Africa's technology for Catfish culture is well developed, and the majority of farmers utilize high density pond, raceway and recirculation systems. The industry comprised of 10 farms in 2014.

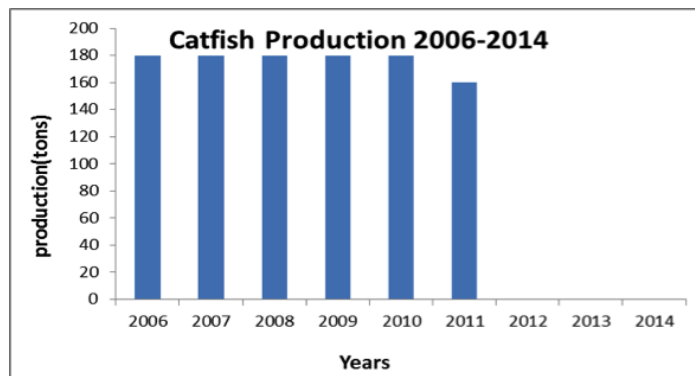


Figure 15: Catfish production in South Africa from 2006-2014.

4.8.4 Marron Crayfish Sub-sector

Marron Crayfish (*Cherax tenuimanus*) is exotic to South Africa. The sub-sector is still developing and there is only one farmer culturing the species in the country. A total of 5 tons was produced in 2014 (Figure 16). The current Marron Crayfish farm is located in the Eastern Cape. This species is primary cultured in tanks during the juvenile phase of production, and semi-intensive pond culture for the grow-out phase of production. The industry is set to become well established in the Eastern Cape.

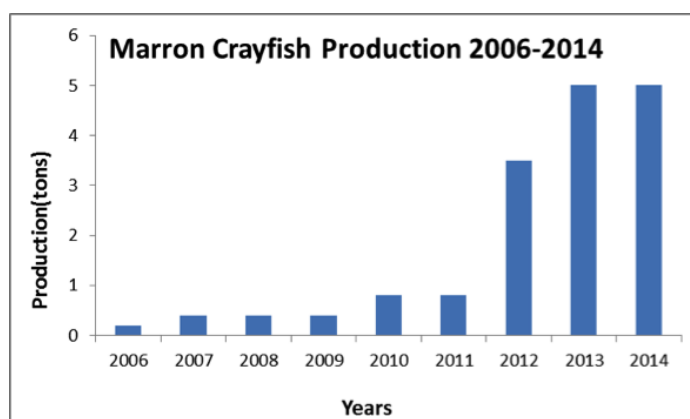



Figure 16: Marron Crayfish productions in South Africa from 2006-2014.



PROVINCIAL ANALYSIS OF SOUTH AFRICA'S AQUACULTURE SECTOR IN 2014





5.1 Eastern Cape

Eastern Cape is one of the four coastal provinces with the advantage of suitable environment to partake in both marine and freshwater aquaculture activities. In addition it has an advantage of access to ports for transportation of inputs and outputs.

Farms: In 2014, the Eastern Cape Province recorded a total of 18 farms which comprises of six marine farms and twelve freshwater farms. There was no change in number of farms when compared to 2013. They composed of one Abalone farm, three finfish farms, two Oyster farms, three Tilapia farms, three Trout farms, one Catfish farm, one Marron Crayfish farm, one Koi Carp farm and three Ornamental fish farms.

Species farmed: Species farmed in the Eastern Cape during 2014 included Abalone (*Haliotis midae*), Pacific Oyster (*Crassostrea gigas*), Dusky Kob (*Argyrosomus japonicas*), seaweed, both *Ulva spp* and *Gracilaria spp.*, Trout (*Onchorynchus mykiss* and *Salmo trutta*), Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Catfish (*Clarias gariepinus*), Marron Crayfish (*Cherax tenuimanus*), and a number of Ornamental species, i.e. Koi Carp.

Production: Even though there were number of species farmed and operational farms, not all of them produced fish during 2014. A total of 630.83 tons was produced in the Eastern Cape, contributing 12.10% to the overall aquaculture production. The total aquaculture production in the Eastern Cape increased by 231.28 tons (36.66%) from 399.55 tons in 2013. Freshwater aquaculture contributed 264.0 tons accounting for 5.07% to the overall aquaculture production (national), 14.73% of the total freshwater aquaculture (national) and 41.85% of the Eastern Cape aquaculture production. Freshwater aquaculture in the Eastern Cape increased by 241.0 tons (91.29%) from 2014. The marine aquaculture production in the province has recorded a production of 366.83 tons accounting for 7.04% of the overall aquaculture production (national), 10.73% of the national marine aquaculture production and 58.15% of the total Eastern Cape production (Figure 17).

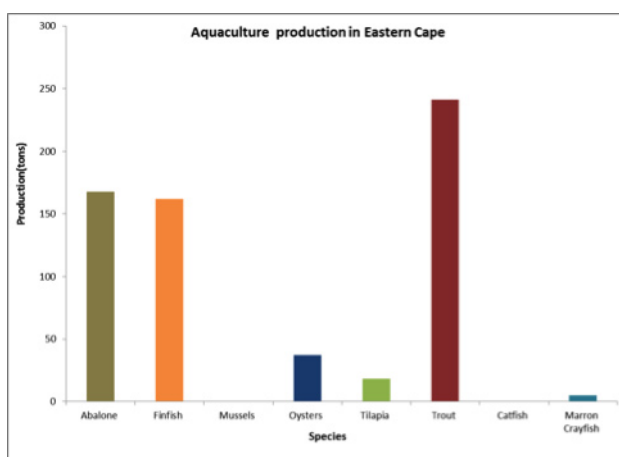


Figure 17: Aquaculture production and species cultured in the Eastern Cape Province during 2014.





5.2 Free State

Free State Province is privileged to have a facility that focuses on training and capacity building, technology demonstration, and aquaculture research. The China-South Africa ATCD is located in Gariep Dam.

Farms: In 2014, Free State recorded a total of seven farms freshwater aquaculture farm with no marine aquaculture farm due to its location. There was no change in number of farms when compared to 2013. They composed of one Tilapia farm, three Catfish farms, two Koi Carp farms and one Ornamental fish farm.

Species farmed: Species farmed in Free State during 2014 included Tilapia (*Oreochromis mossambicus*), Catfish (*Clarias gariepinus*) and a number of Ornamental species, i.e. Koi Carp.

Production: Of the three sub-sectors operating in Free State, only one produced fish in 2014. Production was realised in the Tilapia sun-sector totalling to 0.8 tons. Its contribution to the overall aquaculture production is minuscule at 0.05% (national), 0.04% to the overall freshwater aquaculture production (national) and 100% to the provincial freshwater aquaculture production. It remained consistent from 2013 showing no growth (Figure 18).

5.3 Gauteng

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

Farms: Despite its disadvantages in terms of availability of suitable land space, in 2014 Gauteng province was the third in terms of number of farms. A total of 37 farms were recorded, all of them being in the freshwater aquaculture sector. Two additional farms were operational during 2014. Total farms composed of 23 Tilapia farm, one Catfish farm, two Carp farms, six Koi Carp farms, four Ornamental farms and one Whitelegged shrimp farm.

Species farmed: Species farmed in Gauteng province during 2014 included Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Catfish (*Clarias gariepinus*), Carp (*Cyprinus Carpio* and *Ctenopharygodon idella*), Whiteleg Shrimp (*Litopenaeus vannamei*) and a number of Ornamental species, i.e. Koi Carp.

Production: Freshwater aquaculture sector was the only sector operating in Gauteng province and recorded a total of 53.55 tons in 2014 and was realised through the Tilapia sub-sector. Its contribution to the overall aquaculture production is minuscule at 1.02% (national), 2.99% to the overall freshwater aquaculture production (national) and 100% to the provincial production (Figure 19).

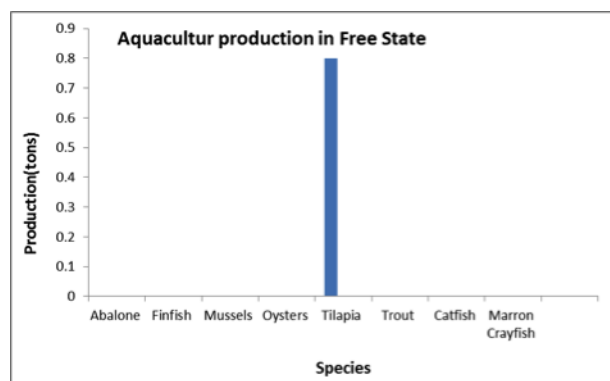


Figure 18: Aquaculture production and species cultured in the Free State Province during 2014.

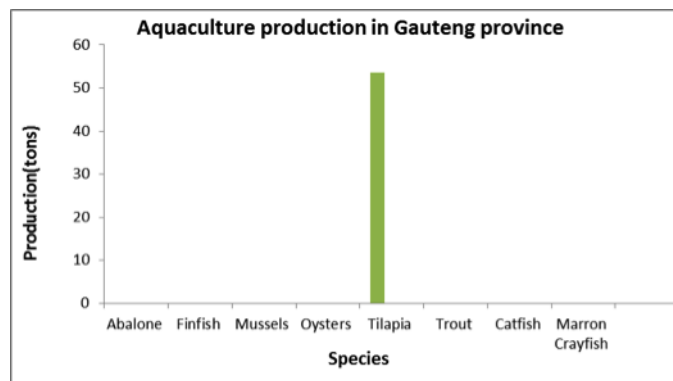


Figure 19: Aquaculture production and species cultured in Gauteng Province during 2014

5.4 KwaZulu Natal

KwaZulu Natal has an advantage in the aquaculture sector as it has the environmental that suits both marine and freshwater aquaculture. Its warm temperature can cut costs farming of the species that require warm waters as the temperature is warm and the winters are not extremely cold.

Farms: KwaZulu Natal recorded second lowest number of farms during 2014. Only 17 farms were recorded, of which once was a marine aquaculture farm and 16 were freshwater aquaculture farms. In the marine aquaculture space, there was one finfish farm, whilst in the freshwater aquaculture space there were five Tilapia farms, five Trout farms, two Koi Carp farms and four Ornamental farms.

Species farmed: Species farmed in KwaZulu Natal province during 2014 included Dusky Kob (*Argyrosomus japonicas*), Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Trout (*Onchorynchus mykiss* and *Salmo trutta*) and a number of Ornamental species, i.e. Koi Carp.

Production: Marine aquaculture did not record any production in 2014 and was consistent with the status in 2013. The freshwater aquaculture sector was the only sector contributing to production in 2013 with the entire production coming from the Tilapia and Trout sub-sector. The freshwater aquaculture contributed a total of 384.31 tons. It accounted for 7.37% (national), 21.45% to the overall freshwater aquaculture production (national) and 100% to the provincial production (Figure 20).

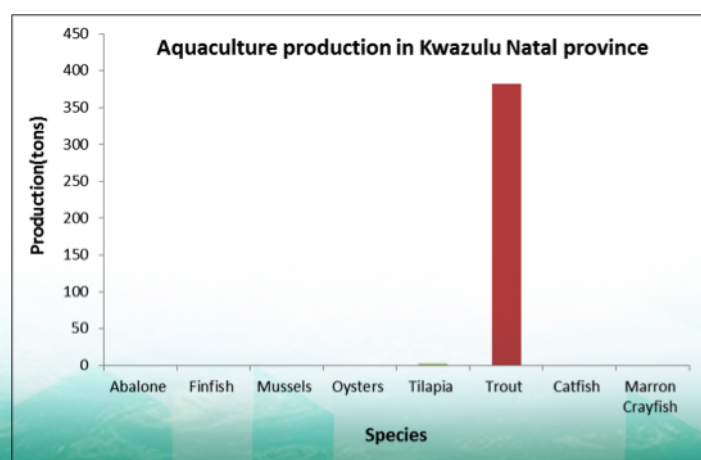


Figure 20: Aquaculture production and species cultured in Kwa-Zulu Natal Province during 2014.



5.5 Limpopo

Limpopo Province only hosts the freshwater aquaculture sector due to location. It has the support of the Turfloop State-owned hatchery and the University of Limpopo with research and development activities.

Farms: Limpopo came forth in terms of number of farms operational during 2014. A total of 25 farms were recorded from four sub-sectors and all of them were freshwater aquaculture farms. Of the 25 recorded farms, 19 were Tilapia farms, three were Catfish farms, one was a Koi Carp farm and two were Ornamental farms.

Species farmed: Species farmed in Limpopo province during 2014 included Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), and a number of Ornamental species (i.e. Koi Carp).

Production: Total production of recorded in Limpopo province during 2014 was 108.00tons which accounted for 2.07% of the total aquaculture production (national) and 6.03% of the overall freshwater production (Figure 21).

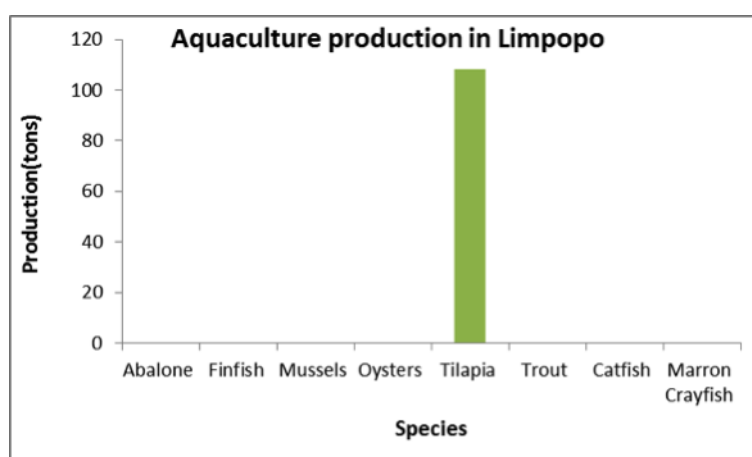


Figure 21: Aquaculture production and species cultured in Limpopo Province during 2014.

5.6 Mpumalanga

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

Farms: Mpumalanga was the second highest in terms of total number of farms 2014 and the highest in the freshwater farms. It had a total of 42 farms in of which all of them are in the freshwater aquaculture space. Operational farms were recorded in the three sub-sectors, i.e. Tilapia with 20 farms, Trout with 19 farms and Koi Carp with three farms.





Species farmed: Species farmed in Mpumalanga province during 2014 included Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Trout (*Onchorynchus mykiss* and *Salmo trutta*) and Koi Carp.

Production: Total production of recorded in Mpumalanga during 2014 was 156.01 tons which accounted for 2.99% of the total aquaculture production (national) and 8.70% of the overall freshwater aquaculture production (Figure 22).

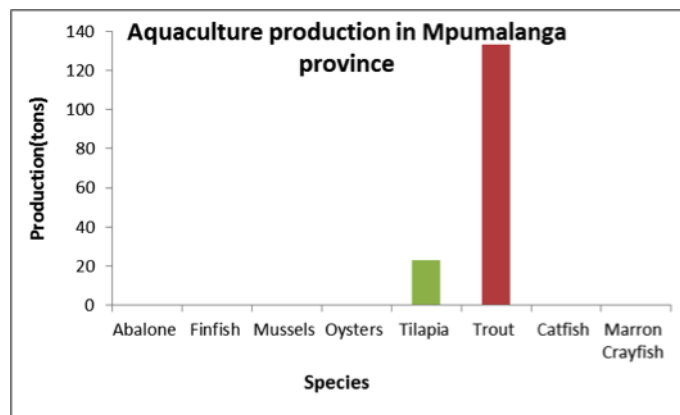


Figure 22: Aquaculture production and species cultured in Mpumalanga Province during 2014.

5.7 Northern Cape

Similarly to other coastal provinces, Northern Cape has an advantage of being able to partake in the marine and freshwater aquaculture space.

Farms: Even though the province has an environmental advantage in terms of the role it can play in the marine and freshwater space, the opposite is taking place. The province hosted only eleven farms during 2014, of which four were Abalone farms, three Tilapia farms, one Trout farms, one was Oyster farm, one was Catfish and one Koi Carp farm.

Species farmed: Species farmed in Northern Cape province during 2014 included Abalone (*Haliotis midae*), Pacific Oyster (*Crassostrea gigas*), Trout (*Onchorynchus mykiss* and *Salmo trutta*), Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Catfish (*Clarias gariepinus*), and Koi Carp.

Production: Northern Cape recorded the production when compared to other provinces was the second last with total production of 12.12 tons. This is an increase in production of 7.62 tons (62.87%). This production comprised of 7.62 tons (62.87%) of marine aquaculture products and 4.50 tons (37.13%) of freshwater aquaculture product. It contributed only 0.24% to the overall aquaculture production in the country. In terms of freshwater aquaculture, Northern Cape contributed 0.25% to the national freshwater aquaculture. In the marine aquaculture space, it contributed a minuscule with only 0.22% to the overall marine aquaculture products (Figure 23).

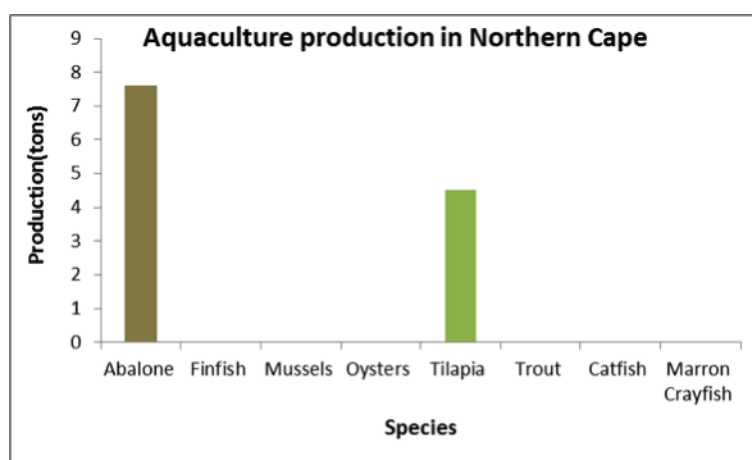


Figure 23: Aquaculture production and species cultured in Northern Cape Province during 2014.

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 its location within the country, North West can only successfully host the freshwater aquaculture industry and not the marine aquaculture industry.

Farms: In terms of number of farms, the North West province came fifth with a total of 23 farms in three sub-sectors, i.e. Tilapia with 21 farms, Catfish with one farm and Koi Carp with one farm. It hosted the second highest number of Tilapia farms.

Species farmed: Species farmed in North West during 2014 were Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Catfish (*Clarias gariepinus*), and Koi Carp.

Production: Even though there were three sub-sectors operating in the North West during 2014, only one sub-sectors yield production, i.e. Tilapia. Total production in North West was 77.35 tons contributing 1.48% to the overall aquaculture production and 4.32% to the freshwater aquaculture production (Figure 24).

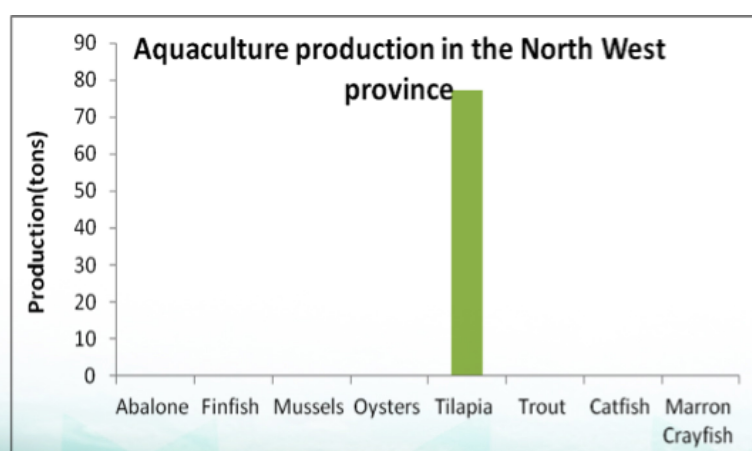


Figure 24: Aquaculture production and species cultured in North West Province during 2014.





5.9 Western Cape

Western Cape continues to enjoy the advantages of access to logistics and access to suitable environment for both marine and freshwater aquaculture activities. It has access suitable bays in the marine space and water bodies in the freshwater space. Over the years, this province has been the backbone of the aquaculture sector in South Africa.

Farms: Western Cape hosted the highest number of operational farms during 2014, with the 27.84% (54) of the farm. Of the 54 farms, 30 were freshwater farms and 24 were marine aquaculture farms. The highest number of Abalone farms were located in Western Cape with a total of thirteen farms, finfish with two farms, Mussels with four farms, Oysters with six farms, marine ornamentals with one farm, and Tilapia with two farms. The highest number of Trout farms was also located in Western Cape with a total of 20 farms. Furthermore there was one Carp farm, one Koi Carp farm and six freshwater Ornamental fish farms.

Species farmed: Western Cape had the most variety of species farmed during 2014. Species farmed in include Abalone (*Haliotis midae*), Pacific Oyster (*Crassostrea gigas*), Dusky Kob (*Argyrosomus japonicas*), seaweed, *Ulva spp* and *Gracilaria spp.*, Trout (*Onchorynchus mykiss* and *Salmo trutta*), Tilapia (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Tilapia rendalli*), Mussels (*Mytilus galloprovincialis* and *Choromytilus meridionalis*) and number of marine and freshwater ornamental species (i.e. Koi Carp).

Production: Total recorded production in Western Cape during 2014 was 3793.22 tons which is 72.81% of the overall aquaculture production. Both freshwater and marine aquacultures were the highest in the country with production of 743.35 tons (19.6%) and 3049.87 tons (80.6%) respectively. The Western Cape freshwater production contributed 14.26% to the overall aquaculture production and marine aquaculture contributed 58.54%. Western Cape freshwater aquaculture contributed 41.48% to the national freshwater aquaculture production and marine aquaculture contributed 89.24% to the national marine aquaculture production (Figure 25).

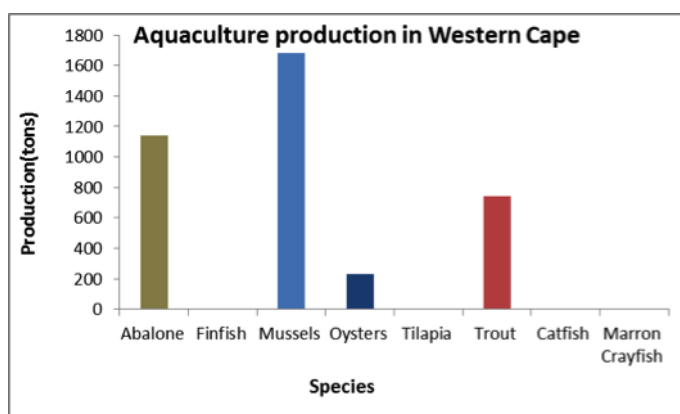


Figure 25: Aquaculture production and species cultured in the Western Cape Province during 2014.





ECONOMIC OVERVIEW OF SOUTH AFRICA'S AQUACULTURE SECTOR 2014

6.1 Introduction to the Economic overview of the aquaculture sector

The Aquaculture economic overview provides a summary of economic performance, growth and development in South Africa during the year 2014. The data was collected from different data sources referenced in this section. The main objective of this section is to provide aquaculture stakeholders with information, trade information and statistical trends of the aquaculture sector annually.

6.2 Supply Availability

South Africa's aquaculture production output continues to grow. In 2014, the local production of farmed fish excluding Seaweed, Carp, Ornamentals and Koi Carp was 5209.60 tons increasing production by 407.49 tons (8.5%) from 2013 and 2014. Marine aquaculture contributed 3417.59 tons towards the total production accounting 65.6% of the total production and increasing by 431.9 tons (14.5%) from 2013. The freshwater aquaculture industry contributed 1 792.01 tons of the total production accounting for 34.4% of the total production and decreasing by 24.4 tons (-13.4%) from 2013. The Mussel sub-sector was leading in terms of production with a total of 1682.48 tons followed by the Trout subsector with production of 1497.00 tons and Abalone with production of 1306.80 tons.

6.3 Aquaculture Investment

Aquaculture Development and Enhancement Programme (ADEP), which was launched in 2013 through collaboration between DAFF and the Department of Trade and Industry (the dti) has contributed significantly to stimulate and to promote the growth of investments in aquaculture. A projected capital investment of approximately R162 million (including crocodile farming) was achieved in 2014. The Abalone subsector invested R 46.2 million mainly for expansions. The Dusky Kob was the second highest with investments of R39 million followed by Tilapia with investments of 23 million. Table 17 below illustrates the sub-sectors and the capital investments made in 2014.

Western Cape Province contributed 45% to the total capital investments (Figure 26) this can be attributed mainly by the Abalone sub-sector since most Abalone farms are based in the province. Kwa-Zulu Natal contributed approximately 14% followed by Eastern Cape with 13% due to the Dusky Kob farms operating in each province. No investments were recorded in Northern Cape and the Free State during the reporting period.

Table 17: Capital Investment per Sub-sector during 2014

Sub-sector	Projected Investments
Abalone	R 46 187 957.00
Catfish	R 1 841 500.00
Crocodile	R 16 695 000.00
Dusky Kob	R 39 412 464.00
Oyster	R 4 950 000.00
Salmon	R 13 857 823.00
Tilapia	R 22 877 253.00
Trout	R 4 020 038.00
Trout and Salmon	R 7 175 000.00

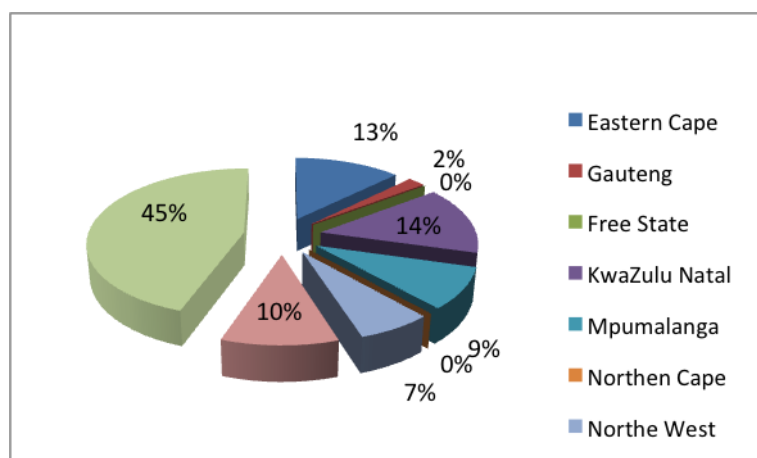


Figure 26: Capital Investment per province during 2014.

6.4 Marketing Structure

South Africa's aquaculture products are traded both locally and internationally. Trade of aquaculture products is influenced by wide range of factors such as the exchange rates, demand, supply availability and prices of competing products particularly sources of protein and substitutes.

In South Africa marketing system has developed among the primary processors of aquaculture products.

The companies have developed their own cold storages and distribution network mainly to support their primary farm operations. There are also fully integrated marketing and merchandising operations that handle distribution to the retail sector, and it's mostly used by new entrant particularly for fresh water species: Tilapia and Dusky Kob, whilst more advanced aquaculture companies make use of distributing agencies marketing companies or in-house marketing experts.



6.5 Export Market

6.5.1 Atlantic Salmon

During 2014 there were no commercial farms for Atlantic Salmon operating in South Africa. Atlantic Salmon was imported by the processor for value adding and exported to the respective countries at a premium price. Approximately 12.4 tons of salmon valued at R1.6 million was exported by South Africa (Table 18). Zambia was the main export destination followed by Namibia and Zimbabwe.

Table 18: Atlantic Salmon exported from South Africa in 2014

Species	Country	Quantity (Tons)	Value (ZAR millions-FOB)
Atlantic Salmon	Angola	1.254	0.1341
Atlantic Salmon	Botswana	1.179	0.2544
Atlantic Salmon	Democratic Republic Of Congo	0.2418	0.0205
Atlantic Salmon	Ghana	0.0029	0.0097
Atlantic Salmon	Malawi	0.995	0.127
Atlantic Salmon	Mozambique	0.0032	0.00331
Atlantic Salmon	Namibia	2.618	0.060
Atlantic Salmon	Nigeria	0.700	0.265
Atlantic Salmon	Zambia	3.980	0.6647
Atlantic Salmon	Zimbabwe	1.442	0.095744
Total		12.4	1.6

Source: South African Revenue Services, 2014

6.5.2 Carp

South Africa exported a total of 2.5 tonnes of Carp during the year 2014 valued at R0.36 Million (Table 19). The Carp was destined to only three African countries Botswana with the 2 tons, Mozambique and Zimbabwe with less than 1 tonne. Figure 27 represent the quantity exported monthly in 2014, with most product being exported during the month of May and June and decline significantly during the month of July and August.

Table 19: Carp exported from South Africa in 2014

Species	Country	Quantity (Tons)	Value (ZAR millions-FOB)
Carp	Botswana	2	0.019
Carp	Mozambique	0.4	0.0078
Carp	Zimbabwe	0.0675	0.0085
Total		2.5	0.036

Source; South African Revenue Services, 2014

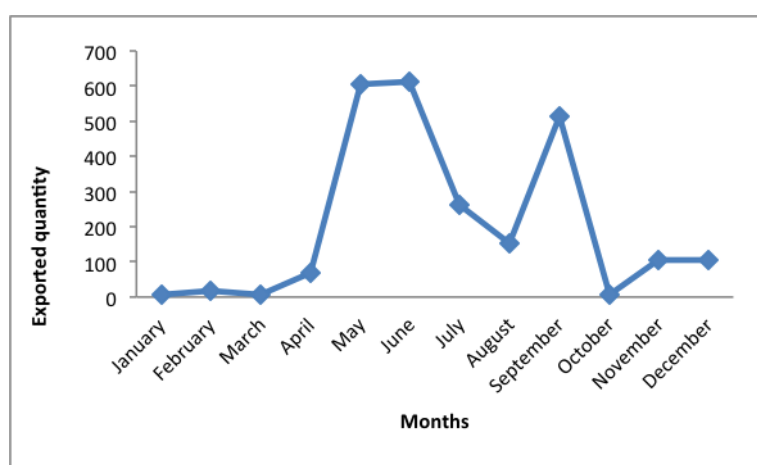


Figure 27: Carp quantity exported monthly in 2014 from South Africa

6.5.3 Catfish

South Africa exported approximately 56.3 tons of Catfish with an estimated value of R0.8 million in 2014. Table 20 below illustrates the countries imported Catfish from South Africa with Democratic Republic of Congo being the highest importer with 99.4% and Cote D'ivoire with only 0, 6%.

Table 20: Catfish exported in 2014 from South Africa

Species	Country	Quantity (Tons)	Value (ZAR millions-FOB)
Catfish	Democratic Republic Of Congo	0.369	0.0459
Catfish	Côte D'ivoire	56	0.84
Total		56.3	0.8859

Source; South African Revenue Services, 2014

6.5.4 Ornamentals

South Africa did not record any ornamental production in 2014, however, the assumption is that different marine ornamental species were imported from different countries in 2014. The export was worth R0.41 million. Table 21 below illustrates the country of import, exported quantity and the value of export. Figure 28 and 29 shows the quantity exported per month and the value of export respectively.

Table 21: Ornamentals exports in 2014 from South Africa

Species	Country	Quantity (Tons)	Value (ZAR millions -FOB)
Ornamentals	Angola	0.039	0.01
Ornamentals	Mozambique	0.07	0.0004777
Ornamentals	Namibia	1.78	0.3128
Ornamentals	Sierra Leone	0.001	0.000118
Ornamentals	Swaziland	8.8	0.0736
Ornamentals	Unclassified	0.04	0.0085
Total		10.94	0.4056

Source; South African Revenue Services, 2014

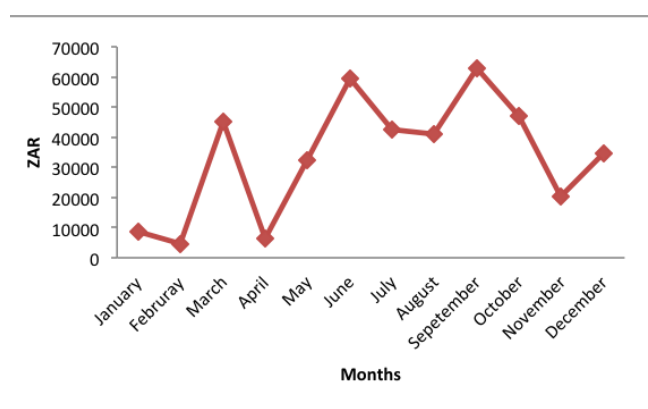


Figure 28: Ornamental quantity exported monthly in 2014

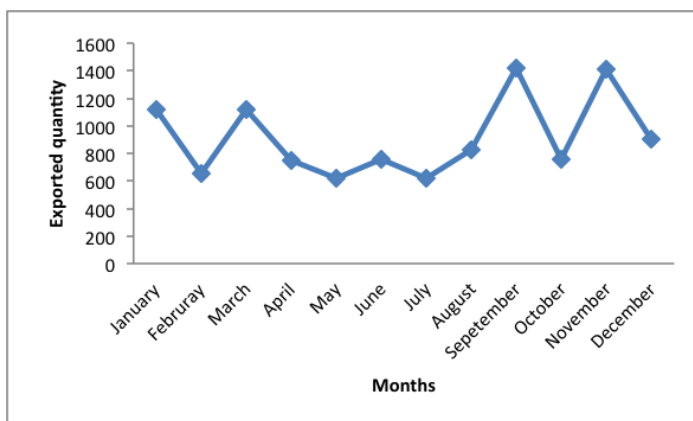


Figure 29: Value of export for ornamentals in 2014.

6.5.5 Pacific Salmon

During 2014 there were no Pacific Salmon commercial farmers in South Africa. However approximately 53 tons valued at R2.7 million was exported to 14 countries.

Table 22 below illustrates the export destination, the quantity exported and the value of export. The highest quantity was imported by Namibia with 26 tons followed by Zambia and Botswana with 10 tons and 8.6 tons respectively. Figure 30 shows the quantity exported by South Africa per month.

Higher quantity was exported in May with over 12 000 tons. Approximately 6000 tons was exported in February, November and December. With regards to value of export, figure 31 shows that despite higher volumes exported in May, higher export value was achieved in November with just over R0.5 million.

Table 22: Pacific Salmon exports in 2014 from South Africa.

Species	Country	Quantity (Tons)	Value (ZAR millions-FOB)
Pacific Salmon	Angola	1.7	0.3995
Pacific Salmon	Botswana	8.6	0.5
Pacific Salmon	Chad	0.151	0.05387
Pacific Salmon	Democratic Republic Of Congo	0.005	0.0016
Pacific Salmon	Equatorial Guinea	0.037	0.0074
Pacific Salmon	Ghana	0.4	0.1211
Pacific Salmon	Lesotho	0.45	0.0026
Pacific Salmon	Malawi	0.0383	0.0041
Pacific Salmon	Mozambique	0.894	0.5316
Pacific Salmon	Namibia	26	0.8652
Pacific Salmon	Saint Helena, Ascension an Tristan da Cunha	0.0452	0.0113
Pacific Salmon	Ship/Aircraft	0.012	0.0041
Pacific Salmon	Swaziland	0.027	0.0028
Pacific Salmon	Uganda	0.7	0.04766
Pacific Salmon	Zambia	10	0.3614
Pacific Salmon	Zimbabwe	3.45	0.2810
Total		53	2.7

Source: South African Revenue Services, 2014.

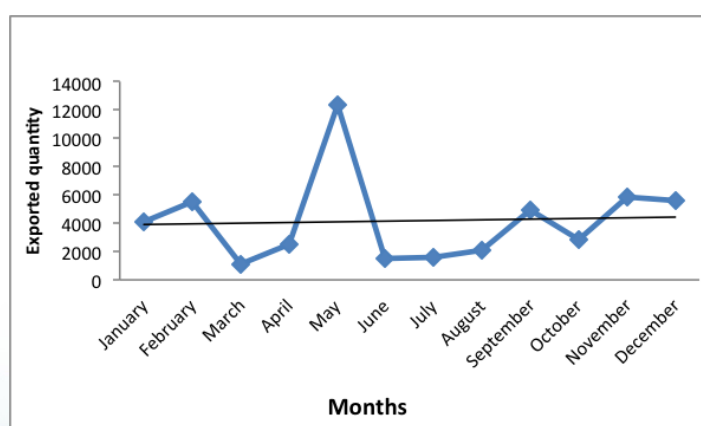


Figure 30: Quantity of Pacific Salmon exported monthly in 2014.

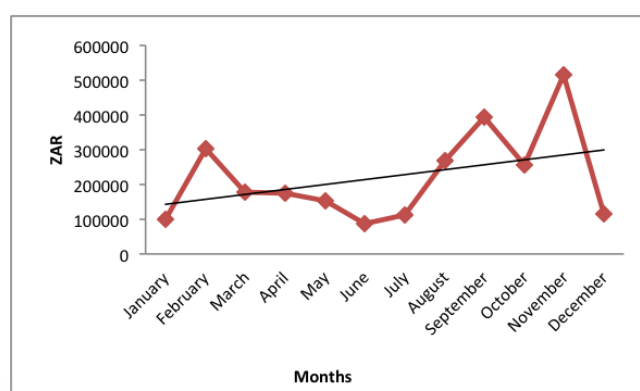


Figure 31: Value of Pacific Salmon exports from South Africa during 2014.

6.5.6 Tilapia

South Africa exported more than 77 tons of Tilapia valued R1.8 million with an average price of R57 per/kg in 2014. The top three export destinations were Zimbabwe with 36 tons, Botswana with 27.5 tons and Swaziland with 4 tons. Table 23 below represent export destinations, exported quantities and value of export during 2014. Exported quantity of Tilapia increased by 33.4% compared to 2013. This may be due to the fact that Tilapia farmers have increased in the country, a total of 97 farms was recorded in 2014. The high quantity volumes of Tilapia imports may also contribute to an increase in Tilapia exports.

Table 23: Tilapia exported from South Africa during 2014.

Species	Country	Quantity (Tons)	Value (ZAR million FOB)	Average Price/kg (ZAR)
Tilapia	Angola	0.7	0.049000	70
Tilapia	Botswana	27.46	0.673474	45
Tilapia	Ethiopia	4	0.476530	140.6
Tilapia	Lesotho	0.063	0.005289	77
Tilapia	Malawi	3	0.053700	18
Tilapia	Mozambique	0.258	0.014933	83
Tilapia	Namibia	0.02	0.001178	59
Tilapia	Swaziland	4.2	0.068525	22
Tilapia	Zambia	1.4	0.045975	32.6
Tilapia	Zimbabwe	36.1	0.464234	20
Total		77	1.8	57

Source; South African Revenue Services, 2014

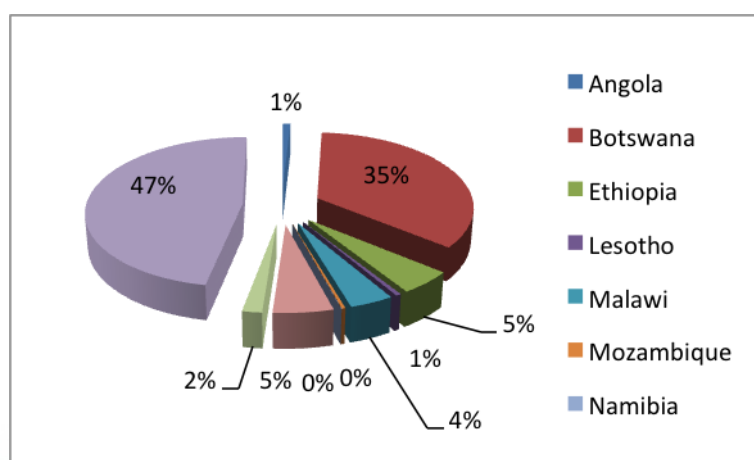


Figure 32: South Africa's Tilapia export 2014

6.5.7 Trout

In 2014 South Africa exported approximately 19.8 tons of Trout valued at R3.7 million. The main destination for export was Ethiopia and Botswana (Table 24). Despite the decline in local production, Trout export has increased by 49.5% as compared to 2013. The high export volumes can be attributed by higher Trout imports which increased by approximately 95% in 2014 when compared to 2013. Figure 33 and 34 shows the quantity exported each month and the value of export. Less than 4 tons was exported in July followed by May and October with 3.5 tons and 3 tons respectively. Highest export value was experienced during the month of July and May.

Table 24: South Africa's Trout exported in 2014.

Species	Country	Quantity (Tons)	Value (ZAR millions-FOB)
Trout	Australia	0.001	0.003419
Trout	Botswana	4.462	0.220523
Trout	Democratic Republic Of Congo	0.036	0.007843
Trout	Denmark	0.598	0.381746
Trout	Ethiopia	4.574	0.860141
Trout	Greece	0.026	0.024 110
Trout	Lesotho	2.95	1.118947
Trout	Mauritius	0.0394	0.010934
Trout	Mozambique	2.4	0.058157
Trout	Namibia	0.609	0.027623
Trout	Nigeria	1.073	0.0112684
Trout	Peru	0.322	0.804466
Trout	Swaziland	1.053	0.009372
Trout	Zambia	1.34	0.024931
Trout	Zimbabwe	0.283	0.030575
Total		19.8	3.7

Source; South African Revenue Services, 2014

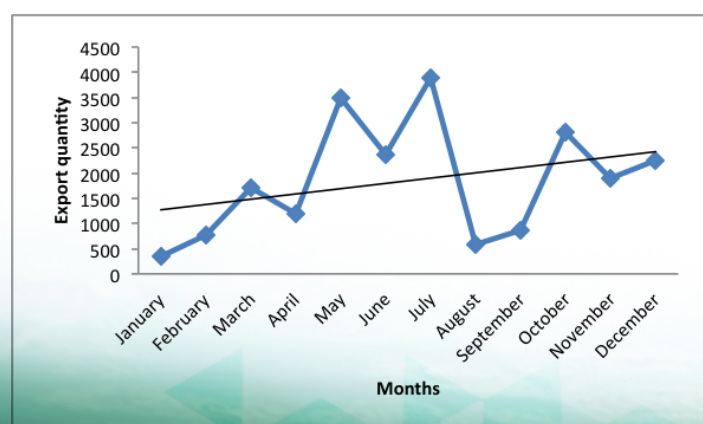


Figure 33: Trout quantity exported monthly in 2014

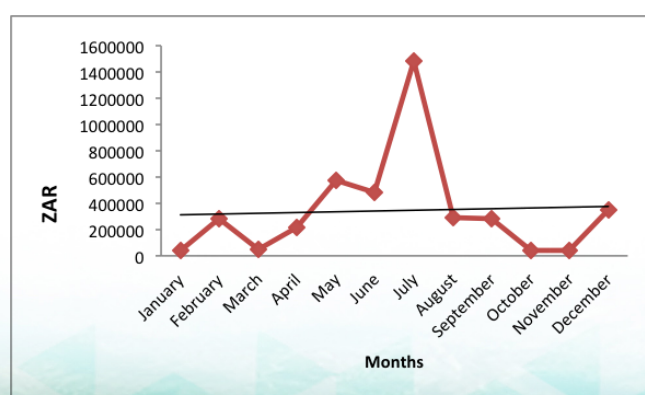


Figure 34: The Value of Trout export monthly during 2014 (Source; South African Revenue Services, 2014)

6.5.8 Abalone

During 2014 South Africa exported 785 tons of Abalone with an estimated value of approximately 428 million. Abalone products are exported in different forms often canned, dried and live. During 2014 bulk volumes of Abalone were exported to Hong Kong, Taiwan, Japan and Singapore. The exported quantity increased significantly by 23% as compared to 2013. The table below indicate the importers of Abalone as well as the quantity of exports and its value.

Table 25: Abalone exports during 2014.

Species	Country	Quantity (Tons)	Value (ZAR millions FOB)	Average price/kg(Rands)
Abalone	China	19.499	8.890565	420.0123
Abalone	Hong Kong	566.142	297.67964	554.7448
Abalone	Japan	35.572	41.339523	484.8661
Abalone	Malaysia	6.402	5.395693	1185.077
Abalone	Mozambique	0.1	0.0015	15
Abalone	Singapore	20.043	18.072097	759.2666
Abalone	Taiwan	136.828	56.451571	420.5856
Abalone	United States	0.22	0.090309	410.3462
Abalone	Viet Nam	0.49	0.248225	506.5816
Abalone	Zambia	0.366	0.017184	46.94569
Total		785.662	428.18631	4803.426

Source; South African Revenue Services, 2014

6.5.9 Oysters

In 2014 South Africa exported a total of 127 tons of Oysters with an estimated value of 8.4 million. 47% of the total quantity exported was destined to Asian market and 53% was destined to African countries. As compared to previous years the volumes of exports increased by 74%. Table 26 indicate the quantity of exports as well as the value of Oysters in the global market.

Table 26: Oyster exports during 2014

Species	Country	Quantity (Tons)	Value (ZAR- Millions FOB)	Average price/kg
Oyster	Botswana	1.113	0.028729	88.67801
Oyster	China	9.495	0.541964	57.07888
Oyster	Democratic Republic Of Congo	0.180	0.006453	35.85
Oyster	Equatorial Guinea	0.002	0.000550	275
Oyster	Hong Kong	52.668	6.472313	122.0136



Species	Country	Quantity (Tons)	Value (ZAR- Millions FOB)	Average price/kg
Oyster	Kenya	0.077	0.028118	228.7119
Oyster	Lesotho	0.573	0.089151	216.3255
Oyster	Malawi	0.124	0.001960	15.80645
Oyster	Malaysia	0.130	0.007755	59.65385
Oyster	Mauritius	2.500	0.224287	89.7148
Oyster	Mozambique	0.170	0.008132	72.88333
Oyster	Namibia	53.236	0.882864	41.58221
Oyster	Romania	0.025	0.001476	59.04
Oyster	Swaziland	5.210	0.115960	53.75321
Oyster	Zambia	2.088	0.055485	57.35989
Oyster	Zimbabwe	1.082	0.039138	1562.469
Total		127.677	8.404335	3035.92

Source; South African Revenue Services, 2014

6.5.10 Mussels

In 2014 South Africa exported a total of 515 tons of Mussels valued approximately 309 million. The bulk volume of Mussel was destined to Hong Kong 65%, Taiwan 20%, Japan 5%; Singapore 3% and 7% was destined to African countries. Mussel exports experienced a massive increase in 2014 as compared to previous years; this might be due to the increased volumes of imports. Table 27 indicate the importers as well as the value of the quantity exported.

Table 27: Mussel exports during 2014

Species	Country	Quantity (Tons)	Value(ZAR millions- FOB)	Average price/kg
Mussel	Botswana	0.824	0.057148	47.56841
Mussel	China	15.420	7.757814	487.4508
Mussel	Democratic Republic Of Congo	0.155	0.003138	20.24516
Mussel	Equatorial Guinea	0.002	0.000342	171
Mussel	Ghana	0.044	0.001933	45.76863
Mussel	Hong Kong	337.809	196.969488	617.0662
Mussel	Japan	26.578	38.161756	514.3526
Mussel	Lesotho	0.026	0.001556	144.9446
Mussel	Malaysia	5.498	4.990203	1308.425
Mussel	Mozambique	0.816	0.015969	25.96275
Mussel	Namibia	4.993	0.308700	76.23669
Mussel	Singapore	18.907	17.555939	822.2175





Species	Country	Quantity (Tons)	Value(ZAR millions-FOB)	Average price/kg
Mussel	Swaziland	0.030	0.002948	98.26667
Mussel	Taiwan	103.510	43.708025	427.9252
Mussel	Tanzania	0.023	0.000711	33.27377
Mussel	Viet Nam	0.490	0.248 225	R507
Mussel	Zambia	0.430	0.020707	64.84518
Mussel	Zimbabwe	0.061	0.005995	97.28805
Total		515.621	309.810597	5509.419

Source; South African Revenue Services, 2014

6.6 Import Market

6.6.1 Mussels

A total of 114 tons of Mussels were imported in 2014 with an estimated value of R2.59 million (Table 28). China was the leading exporter with 86%, followed by Namibia with 11%, Portugal 2% and other countries (Mozambique, New Zealand and South Korea) exporting less than 1% of the quantity to South Africa (Figure 35). During 2014, no imports were recorded from January to March; Mussels were imported on a monthly basis from April to December.

Table 28: Mussels imported to South Africa in 2014.

Species	Country	Imports quantity (tons)	Value (ZAR millions - FOB)
Mussels	China	98.048	1. 112
Mussels	Mozambique	0.542	0.0008
Mussels	Namibia	12.553	0.945
Mussels	New Zealand	0.75	0.385
Mussels	Portugal	2.030	0.150
Mussels	South Korea	0.01	0.001
Total		113.933	2.59

Source; South African Revenue Services, 2014

Imports quantity (tons)

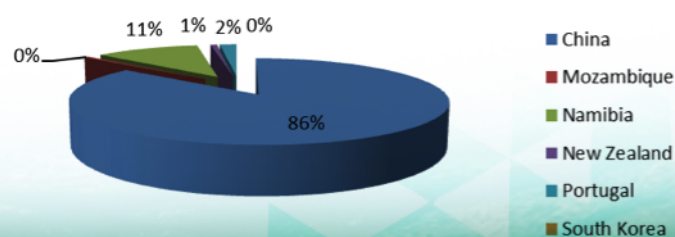


Figure 35: South Africa's Mussels imports in 2014

6.6.2 Atlantic Salmon

A total of 1683 tons of Atlantic Salmon valued at approximately R123 million with an average price of R74.00 per unit were imported into South Africa during 2014 (Table 29). This represents a 95% increase from the quantity imported in 2013. The main countries exported Atlantic Salmon to South Africa in 2014 were Norway with 93% of the quantity followed by United Kingdom with 6.36% and Chile with 0.33% (Figure 36). Figure 37 shows the Atlantic Salmon quantity imported in the country per month. High quantity volumes were imported in September with a contribution of 17% to the Atlantic Salmon total quantity volumes imported in 2014. Both Norway and United Kingdom exported Atlantic Salmon to South Africa on a monthly basis and Chile only exported in June.

Table 29: Atlantic Salmon imported into South Africa in 2014

Species	Country	Imports quantity (tons)	Value (ZAR millions - FOB)
Atlantic Salmon	Chile	5.5	0.306
Atlantic Salmon	Norway	1 569.311	115.352
Atlantic Salmon	United Kingdom	107.773	7.823
Total		1 683	123.5

Source; South African Revenue Services, 2014

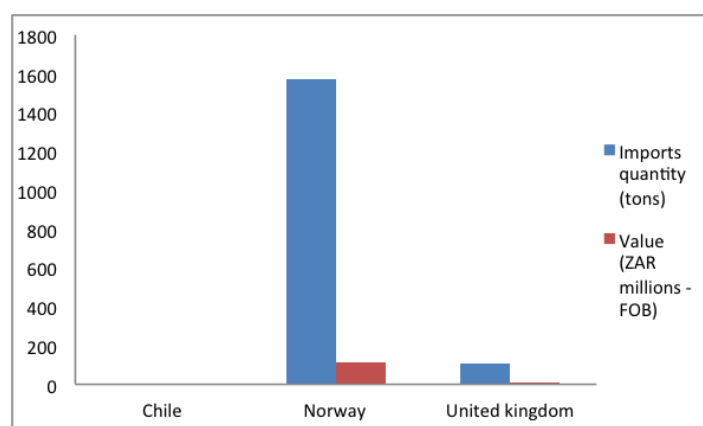


Figure 36: Countries of origin for Atlantic Salmon imported into South Africa in 2014.

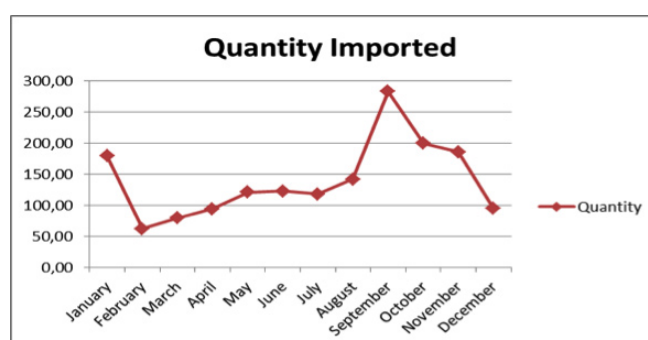


Figure 37: Atlantic Salmon quantity imported monthly.

6.6.3 Carp

During 2013, there were no imports of Carp recorded; however in 2014 South Africa imported 34 tons of Carp valued at approximately R1.8 million with an average price of R183.00 per unit. Table 30 shows the quantity of imports, value of import and three countries that exported Carp to South Africa. High quantity was imported from Mozambique with 97% followed by Japan with 2.3% and Myanmar with 0.8%.



Table 30: Carp imported into South Africa in 2014

Species	Country	Imports quantity (tons)	Value (ZAR millions - FOB)
Carp	Japan	0.776	0.179
Carp	Mozambique	32.726	1.593
Carp	Myanmar	0.28	0.00267
Total		34	1.774

Source; South African Revenue Services, 2014

6.6.4 Catfish

Thailand was the only country that exported Catfish to South Africa during 2014. Table 31 below illustrate that a total of 1.7 tons of quantity was imported with an estimated value of R0.0241 million and an average price of R14.00 during the year 2014. This represents a 92% decrease as compared to the quantity imported during the year 2013. The decrease in the quantity imported may be due to a decrease in the consumer demand or consumption for the product.

Table 31: South Africa's imported Catfish in 2014

Species	Country	Imports quantity (tons)	Unit price	Value (ZAR millions- FOB)
Catfish	Thailand	1.7	R14.00	0.0241
Total		1.7	R14.00	0.0241

Source; South African Revenue Services, 2014

6.6.5 Pacific Salmon

The main exporters of Pacific Salmon were Norway with 1379 tons followed by China with 3tons, United Kingdom with 2 tons (Table 32). In 2014, South Africa imported a total of 1386.5 tons of Pacific Salmon with an estimated value of R68 million and with an average price of R 74. This illustrates an 87% increase of the quantity imported by South Africa as compared to the year 2013 where only 176 tons were imported. Pacific Salmon imports were lesser than the Atlantic Salmon with approximately 297 tons indicating a slightly preference for Atlantic Salmon when compared to Pacific Salmon. Figure 38: below shows the quantity imported per month in 2014. The highest quantity was imported in December, contributing 12% to the total annual quantity imported.

Table 32: South Africa's imported Pacific Salmon in 2014

Species	Country	Imports quantity (tons)	Value (ZAR millions - FOB)
Pacific Salmon	Belgium	0.015	0.000049
Pacific Salmon	China	3.017	0.016904
Pacific Salmon	Congo	0.048	0.000571
Pacific Salmon	France	0.073	0.025
Pacific Salmon	Ghana	0.021	0.000836
Pacific Salmon	Namibia	0.323	0.021

Species	Country	Imports quantity (tons)	Value (ZAR millions - FOB)
Pacific Salmon	Nigeria	0.826	0.003753
Pacific Salmon	Norway	1379.11	67.426
Pacific Salmon	Sweden	0.033	0.006427
Pacific Salmon	Uganda	0.033	0.000028
Pacific Salmon	United kingdom	2.194	0.510
Total		1 386.5	68.012342

Source; South African Revenue Services, 2014

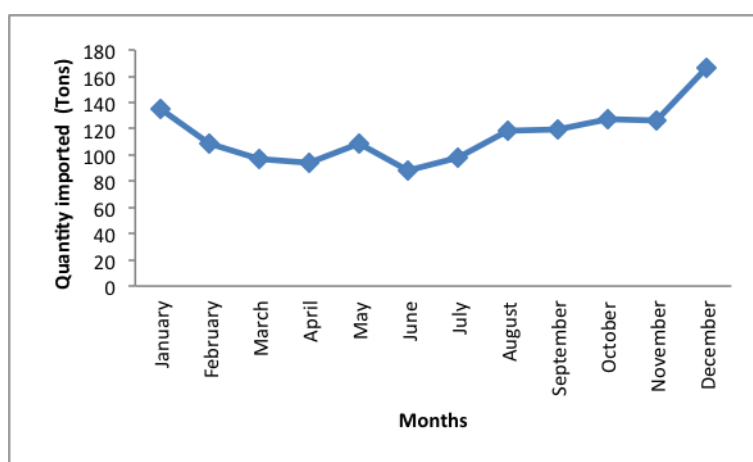


Figure 38: South Africa's Pacific Salmon imports per month in 2014.

6.6.6 Tilapia

An average of 101 tons of Tilapia was entering South Africa on a monthly basis, mainly from China. During 2014 a total of 1 768 tons of Tilapia with an estimated value of R21.3 million and with an average unit price of R13.60 (Table 32) was imported in South Africa. The major contributor to the total quantity imported was China with 68% followed by India with 27% and Myanmar 5%. This represents a 93% increase of the quantity imported by South Africa when compared to the year 2013 where only 117 tons was imported. Figure 39 below illustrates quantity imported and import value for Tilapia in 2014. The highest import was experienced in February and August where more than 200 tons of Tilapia was imported.

Table 33: Tilapia imported into South Africa in 2014

Species	Country	Imports quantity (tons)	Value (ZAR millions- FOB)
Tilapia	China	1 206.05	14.213
Tilapia	India	483.12	5.263
Tilapia	Myanmar	9.85	0.097
Tilapia	Thailand	1.56	0.017
Tilapia	Zimbabwe	67.79	1.759
Total		1 768	21.3

Source; South African Revenue Services, 2014

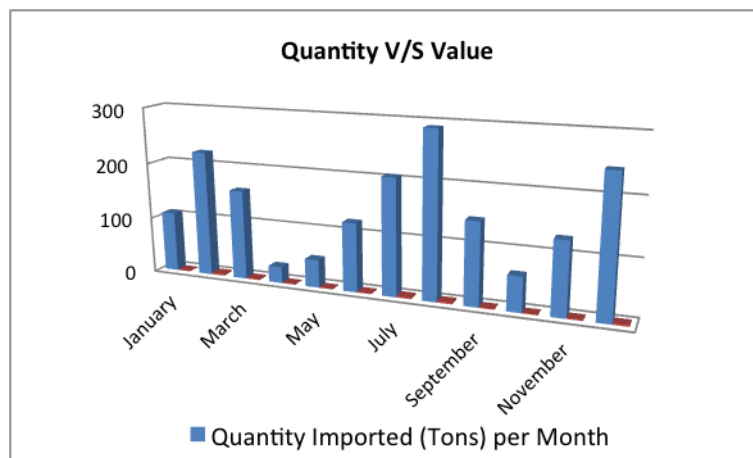


Figure 39: South Africa's Tilapia imports per month in 2014

6.6.7 Trout

South Africa imported an estimated quantity of 546 tons of Trout with approximately R37.3 million of value. Norway was the leading exporter with 331 tons, Lesotho with 179 tons, Chile with 35 tons and both Australia and Denmark with less than 1 tonne (Table 34). This illustrates a 95% increase of the quantity imported in 2014 when compared to 2013 where only 26 tons of Trout was imported. Figure 40 shows the Trout total quantity imported and value for import monthly in 2014. Higher quantity of Trout was imported in November and May.

Table 34: Trout imported into South Africa in 2014

Species	Country	Imports quantity (tons)	Value (ZAR millions - FOB)
Trout	Australia	0.282	0.024
Trout	Chile	35.425	1.829
Trout	Denmark	0.061	0.099
Trout	Lesotho	178.741	9.477
Trout	Norway	331.231	25.889
Total		545.74	37.319

Source; South African Revenue Services, 2014

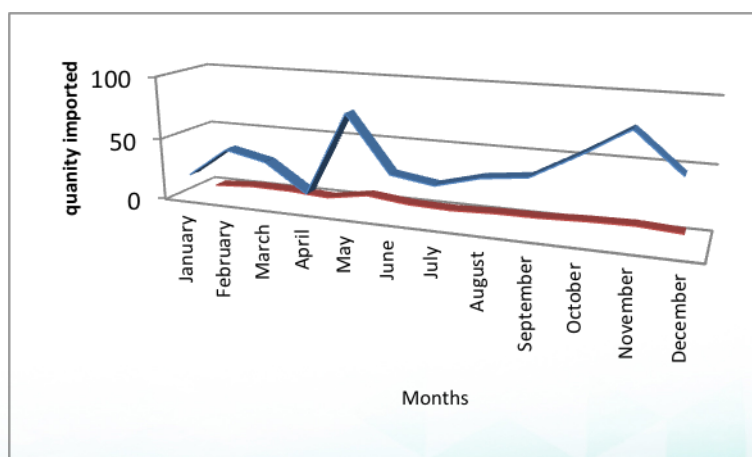


Figure 40: South Africa's Trout imports in 2014

6.6.8 Oysters

In 2014, South Africa imported a total of 296 tons of Oysters with an estimated value of R 7.4 million the quantity of Oysters imported increased significantly by 64% as compared to 2013, there increased trends indicate the high demand of Oysters in the local market. The table below shows the main exporters as well as the value of the quantity imported. The top importer of Oysters in 2014 was Namibia with 99% followed by Chile, Mozambique and china.

Table 35: Oysters imported into South Africa in 2014

Species	Country	Quantity (Tons)	Value(ZAR millions FOB)	Average price/kg
Oysters	Chile	1.008	0.330319	519.5736
Oysters	China	0.567	0.001 013	R2
Oysters	Mozambique	0.060	0.000900	15
Oysters	Namibia	294.378	7.076350	107.4687
Total		296.013	7.408582	643.8296

Source; South African Revenue Services, 2014

6.6 Import Market

South Africa achieved a negative trade deficit for both the quantity and value. The table 36 and 37 below shows the total export volumes for aquaculture products which was estimated at 1661.25 tons valued at R 754.7 million. Abalone was the main exported product contributing 47% to the total aquaculture export quantity followed by Mussels with a contribution of 31% and Oysters with 8%.

The total quantity imported was 5827.4 tons valued at 240.16 millions. The main imported product during 2014 included Atlantic Salmon with 1683 tons, Pacific Salmon with 1386 tons , Oysters with 296 tons and Tilapia with 1768 tons. Tilapia was mainly imported from China and salmon from Norway, making the two countries the highest exporters of fish products in South Africa.

Table 36: South Africa's aquaculture exports vs. imports during 2014

	Abalone	Oysters	Mussels	Ornamentals	Atlantic Salmon	Pacific Salmon	Catfish	Carp	Tilapia	Trout	Total
Exports	785.62	127.67	515.62	10.94	12.4	53	56.3	2.5	77.4	19.8	1661.25
Imports	0	296	113	0	1683	1386	1.7	34	1768	545.7	5827.4



Due to lowest quantity exported, Carp recorded the lowest export value contributing only 0.15%. Abalone and Mussels recorded the highest export value of R429 million and R309 million respectively. In terms of import value, Atlantic Salmon value contributed approximately 51.4% to the aquaculture products followed by Pacific Salmon and Trout with 28% and 15% respectively. Figure 41 illustrate South Africa's aquaculture exports versus and imports in 2014.

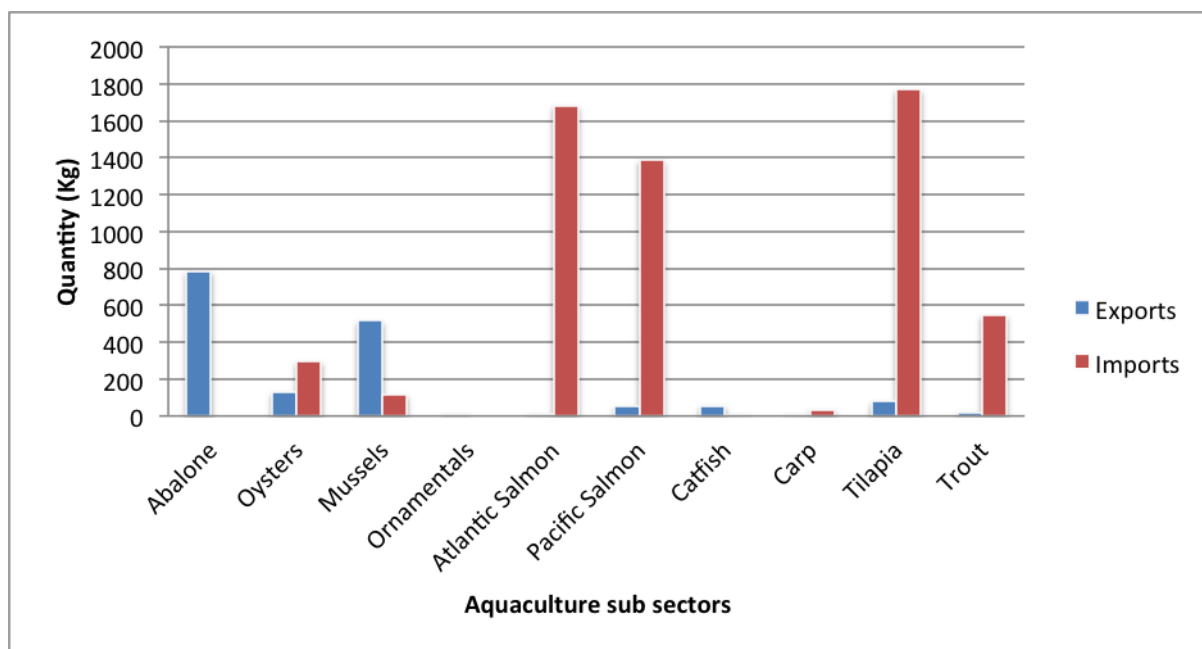


Figure 41: South Africa's aquaculture exports and imports in 2014

Table 37: Values of South Africa's aquaculture exports vs. imports in 2014

	Abalone	Oysters	Mussels	Ornamentals	Atlantic Salmon	Pacific Salmon	Catfish	Carp	Trout	Total
Exports	785.62	127.67	515.62	10.94	12.4	53	56.3	2.5	19.8	1661.25
Imports	0	7.4	2.59	0	123.5	68.01	0.024	1.774	37.32	240.618

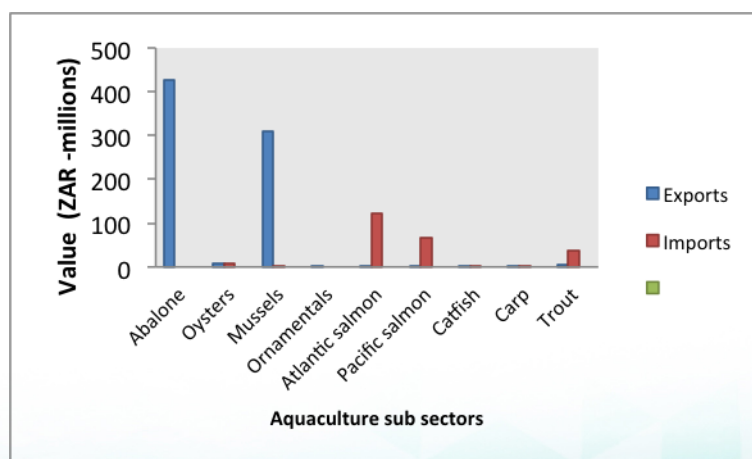
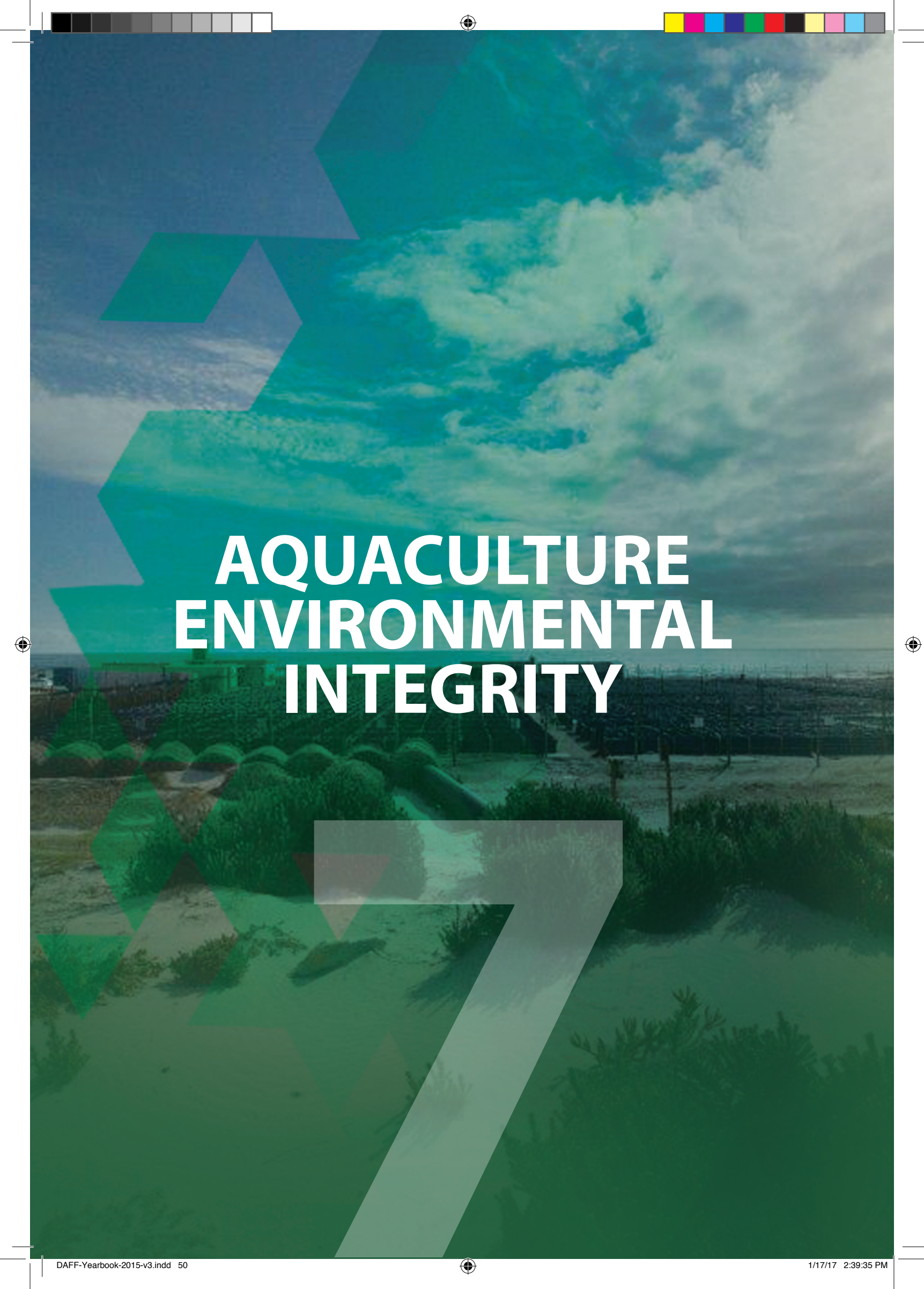


Figure 42: Value of aquaculture sub sectors.



AQUACULTURE ENVIRONMENTAL INTEGRITY



7.1 Aquaculture Environmental Impact Assessments

A number of legislative statutes which relate to aquaculture was amended during 2014, amongst these is the National Environmental Management Act 107 of 1998 Environmental Impact Assessment (EIA) Regulations and associated listing notices (GN R 983, R 984 and R 985) which came into effect on the 8th December 2014. The 2014 EIA Regulations are similar to the previous regulations in that the production thresholds that trigger the need for a Basic Assessment have remained the same. However under the new regulations aquaculture only triggers a Basic Assessment unless there are other activities which are triggered in Listing Notice 2 which require a full Scoping and Environmental Impact Reporting.

The National Environmental Management Act: Integrated Coastal Management Act 36 of 2014 allows for the Department of Environmental Affairs (DEA) as the issuing and administering authority to set regulations for the Coastal Waters Discharge Permits (CWDP) and General Discharge Authorisations (GDA) in terms of Section 69 of the Act. No person may discharge effluent that originates from a source on land into coastal waters except in terms of a CWDP or a GDA, and thus aquaculture facilities require authorisation for discharge into the coastal zone from the DEA in terms of this Act.

On the 1st August 2014, the Alien and Invasive Species (AIS) Regulations and associated lists were gazetted under the National Environmental Management: Biodiversity Act 10 of 2004. The AIS Regulations prescribe requirements for the farming of freshwater and marine alien species to be used for aquaculture purposes, however the listing of brown Trout (*Salmo trutta*) and rainbow Trout (*Oncorhynchus mykiss*) was omitted from the lists pending further consultation with between the DEA and the Trout industry.

The Directorate: Sustainable Aquaculture Management (SAM), Sub-Directorate: Aquaculture Animal Health and Environmental Interactions together with the provincial Department of Environmental Affairs and Development and Planning and the national Department of Environmental Affairs have 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 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 should be gazetted for public comment in 2016; however the Trout standards require further refinement.

The Directorate: Sustainable Aquaculture Management (SAM), Sub-Directorate: Aquaculture Animal Health and Environmental Interactions render technical advice regarding EIA's. The Sub-Directorate also provides review and comment on EIA's for aquaculture operations and any developments that may have an adverse impact on existing aquaculture farms.



AQUACULTURE ANIMAL HEALTH PROGRAMMES





8.1 Aquaculture and Animal Health

Aquaculture is regarded as the fastest growing food production sector in the world by the Food and Agricultural organization (FAO). Best management practices for aquatic animal health are fundamental to the sustainability of an aquaculture industry and commercial fishery. The approach to disease management needs to encompass both mechanisms of disease prevention and control. An important mechanism includes the maintenance of national aquatic biosecurity through import and export control; aquatic animal movement control; on farm biosecurity measures; and disease surveillance and monitoring.

With the increase in aquaculture trade, the importance of trans-boundary animal diseases (TAD's) is a growing concern due to its large socio-economic impact; potential public health impact; and potential loss in production. These are defined as epidemic diseases that are highly transmissible and which are capable of rapid spread through national borders. Examples of TAD's of international significance that have been isolated in South Africa to date, including Epizootic Ulcerative Syndrome (EUS) and Koi Herpes Virus (KHV).

8.2 Disease events in 2014

8.2.1 Abalone Tubercle Mycosis (ATM)

Cases of Abalone Tubercle Mycosis (ATM) were present on marine aquaculture farms in 2014. This disease is caused by a parasitic fungus, *Haliotis noduliformans* that affects Abalone (in addition to other marine invertebrates) causing high level mortalities in Abalone spat and lower level mortalities in older animals. Lesions comprise of multiple areas of necrotic and ulcerated tissue localised to the foot, epipodium and mantle. Lesions resemble "cigarette burns" with a black ring and white centre. To date this disease is known to be transmitted horizontally to susceptible hosts through the water supply. The implementation of basic biosecurity measures and good stock health management are important in managing and preventing future outbreaks. As per the Department's Standard Marine Aquaculture permit conditions, all marine aquaculture stakeholders are required to report suspect or confirmed cases of ATM.

8.2.2 Epizootic Ulcerative Syndrome (EUS)

A case of EUS (an OIE listed disease) was detected in North West Province from African Sharptooth Catfish (*Clarias gariepinus*) in October 2014. This is an infection caused by the fungus, *Aphanomyces invadans* or *A. piscicida* that infects wild and farmed freshwater and estuarine finfish. Other common name of EUS includes red spot disease (RSD), mycotic granulomatosis (MG), and ulcerative mycosis (UM). It has a wide, non-specific host range, and in South Africa this disease has been found in the following species: Rainbow Trout (*Oncorhynchus mykiss*), African Sharptooth Catfish (*Clarias gariepinus*), Bluegill Sunfish (*Lipomas macrochirus*), Largemouth Bass (*Micropterus salmoides*), Barehead Goby (*Caffrogobius nudiceps*) and unidentified Cichlid species.

Susceptible life stages usually include juvenile and young adults. This infection is transmitted horizontally to



susceptible hosts through the water supply. Clinical signs includes small pinpoint red spots; haemorrhagic spots; localized swelling and raised areas on the body surface; scale loss and protrusion; skin erosion; reddened areas of skin underneath the scales; small to large ulcerated lesions on the body; non-specific behavioural signs such as appetite loss; hyperpigmentation; flotation of fish near the water surface; and hyperactivity. Preventative measures that can be implemented on aquaculture farms are primarily focused on the water source, animal movement control and basic biosecurity measures implemented on a typical aquaculture farm. Aquaculture farms farming with susceptible species in endemic areas need to be extremely cautious of uncontrolled water exchange between their farms and natural water sources.

Important risk factors include: environmental conditions such as low water temperatures (~18-22 oC), heavy rainfall or flooding, acidic soils that lower the water pH, and the effect of ocean currents in disseminating infective zoospores. The movement of animals during live aquaculture and the ornamental fish trade from countries with EUS infections; the effect of fish migrations; shipping movements and ballast water; and any causes of skin trauma which may provide a portal of entry for zoospores.



8.3 National Aquatic Animal Health Working Group.

The National Aquatic Animal Health Working Group (NAAHWG) functions as a forum for communication and coordination amongst government and parastatal organizations to provide strategic guidance for the management, control and regulation of aquatic animal health and welfare in South Africa.

Further to this one of its key roles is to drive the development of a National Aquatic Animal Health and Welfare Implementation Plan (NAAHWP). The key objectives of this NAAHWP are as follows: to promote aquatic animal health and good farming practice; address aspects of veterinary public health; advance national proficiency concerning the diagnosis, treatment, prevention and control of aquatic animal diseases in South Africa; improvement in veterinary health certification services; safeguarding the aquatic industry and other users of aquatic resources from the adverse effects of aquatic animal diseases; contribute to the protection of the integrity of aquatic ecosystems; creating an enabling environment for the production and movement of disease free seed stock; provision of necessary animal health assurances to local and international markets thus facilitating trade; raising awareness and empowering both public and private sector, to make good and informed decisions for matters relating to aquatic animal health; contributing towards the fulfillment of the objectives of relevant of regional and international agreements and standards, to which South Africa is a signatory or member state; and to promote the welfare of aquatic animals in South Africa as it relates to animal health.



8.4 Aquatic animal health capacity development

The Department hosted a workshop together with key role-players including FAO, International Organization of Animal Health (OIE), African Union Inter-African Bureau for Animal Resources (AU-IBAR), New Partnership for Africa's Development (NEPAD), and Rhodes University on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa on the 05-07 November 2015 in Durban, South Africa.





The purpose of the workshop was to develop a long-term regional framework that will guide the Southern African Development Community (SADC) countries in strengthening biosecurity governance at the regional and national levels that will support the sustainable development of the growing aquaculture sector. A FAO Aquatic Animal Health Performance and Capacity Survey were undertaken prior to the workshop with the fourteen SADC member countries, including South Africa. This served as a gap analysis which was used to develop the Regional Biosecurity Strategy. This document can be made available by the Department upon request. Further to this the workshop also aimed at developing building blocks for the Tilapia (Trade and improved Livelihoods in Aquatic Production in Africa) Project.

A seven day Aquatic Animal Health course was held by the Department of Ichthyology and Fisheries Science at Rhodes University in Grahamstown, on the 14-21 July 2014. The training covered the aspects of anatomy and physiology of fish; fish necropsy; fish nutrition and nutritional pathology; production systems and infectious and non-infectious diseases. The course included both a theoretical and practical component and was initiated to raise awareness on aquatic animal health and to develop skills with state veterinarians and other aquatic animal health professionals. This course was approved for continuing professional development (CPD) and was organized by the Department of Agriculture, Forestry and Fisheries (DAFF), FAO, NEPAD and Rhodes University.



AQUACULTURE RESEARCH AND DEVELOPMENT





9.1 Finfish Nutrition and growth Experiment

Title: The combined effect of formulated Trout food, fishmeal and inactivated yeast, compared to selectively added probiotics or herbal stimulants on the growth performance of South African juvenile Dusky Kob (*Argyrosomus japonicus*).

Dusky Kob is a member of the family Sciaenidae, one of the largest perciform families, which have 70 genera and 270 extant species (Nelson, 1994). This fish family is becoming an increasingly significant to aquaculture worldwide (Fitzgibbon et al, 2007), and the mostly farmed marine fish family in China, the world's largest producer of aquaculture products (Hong and Zhang, 2003). This family occurs along the coast of China, South Korea and Japan (Griffiths, 1997a), and also along the eastern seaboard of Australia (Starling, 1993), South Africa and Mozambique (Griffiths and Heemstra, 1995). In South Africa, especially in the east coast, matured Dusky Kob is mostly found in the nearshore marine environment and visit estuaries more frequent (Griffiths and Hetch, 1995). Wild Dusky Kob is relatively fast growing during their juvenile phase and reaches sexual maturity at a length of almost one meter (Griffiths, 1996). Due to their value as commercial and recreational fish, Dusky Kob has been severely overfished (Griffiths, 1997c).

Wooley (2009) investigated four dietary treatments with protein content of approximately 45% and lipid content of approximately 11% in diets for juvenile *A. japonicas*. One of the formulation included gelatin as an additional binding agent and the second one did not. Either of the formulations was produced in soft and hard form. Commercial fishmeal (66% crude protein, 8% lipid) was included as the main protein source for the trial and vegetable starch was included as dietary carbohydrate. South African manufactured Trout feed (50% protein, 14% lipid) and an imported marine finfish diet (52% protein, 10% lipid) was also included in the feeding trial. The author reported that growth and FCR of Dusky Kob fed the experimental diets were similar to those fed the imported marine finfish feed, formulated for salmonid species. Fish fed experimental diets grew significantly better than the fish fed the South African produced Trout feed. The Trout feed also mediated poor FCR than the four experimental diets. The author concluded that the less costly Trout feed should not be recommended for South African marine finfish.

Objectives of the study:

1. Determine the combined effect of fish meal, formulated Trout pellets, as well as two inactivated yeast strains (83% *Candida utilis* and 16% *Saccharomyces cerevisiae*) on the 10 week growth performance of juvenile Kob (approximately 5.8g initial weight).
2. Determine if there is any SGR or FCR promoting effect when 2 selected probiotic strains (*Lactobacillus acidophilus* and *Bifidobacterium bifidus*) or four respective herbal stimulants are added to the formulation in point 1.

Table 38 summarises the basic composition of the 7 experimental diets that were manually prepared.



Table 38: Experimental diets composition

Diet 1	Diet 2	Diet 3
1213g Torula yeast	1213g Torula yeast	1213g Torula yeast
1213g Fish meal	1213g Fish meal	1213g Fish meal
1213g Trout food meal	1213g Trout food meal	1213g Trout food meal
40g Aquapro® (powder)	40g Live-Up® (granulated)	400 ml Live-Up® (liquid)
40g Vit/min mix	40g Vit/min mix	40g Vit/min mix
2454 ml water	2454 ml water	2028 ml water
Diet 4	Diet 5	Diet 6
1213g Torula yeast	1213g Torula yeast	1213g Torula yeast
1213g Fish meal	1213g Fish meal	1213g Fish meal
1213g Trout food meal	1213g Trout food meal	1213g Trout food meal
400ml Ultra Natural Plus PB-20	40g Probiflora 2 Strain	2454 ml water
40g Vit/min mix	40g Vit/min mix	40g Vit/min mix
2028 ml water	2454 ml water	
Diet 7		
1213g Fish meal		
1213g Trout food meal		
40g Vit/min mix		
2454 ml water		

Results and recommendation:

After 10 weeks of feeding (2.8% BW), There was no significant difference in juvenile Kob growth rates when fed with test diets 1,2,4,5 &6 ($p>0.05$) (Figure 43). Test diets induced a substantial average body growth of 43.3g, except for the growth limiting Live-Up®-liquid inclusion. None of the additives contributed gravimetrically to the achieved growth rate since the base experimental diet (Trout meal, fish meal & yeast; diet 6) alone performed equivalently and with a SGR that was about six fold more than the measured control (diet 7).



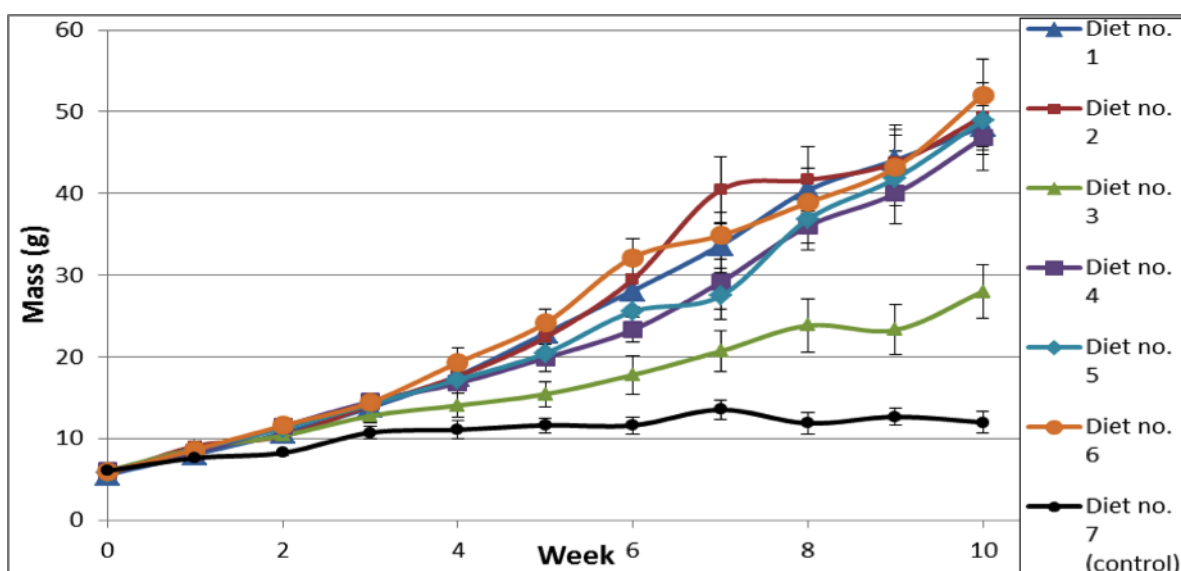


Figure 43: The mean (\pm SE) weekly juvenile Kob mass increase per respective trial based diet during the experimental period of 10 weeks.

Conclusion:

The best FCR was achieved with the UN-BP20® (FCR = 0.92) or Probi flora® (FCR = 0.95) additives and the variable and combined use thereof in follow up trials could further improve the FCR of juvenile Dusky Kob. The Inclusion of yeast in the diet significantly improved fish growth and FCR. The economic inclusion of yeast in commercial diets should be further investigated.

9.2 Octopus Growth Experiment

Title: Acclimation, feeding and growth of wild-caught *Octopus vulgaris* in flow-through tanks

Introduction:

Cephalopods are popular amongst seafood consumers, with several high-value products on offer. There is concerted effort into developing the technology for the culture of several octopus species (e.g. *Octopus maya*, *Octopus tetricus*, *Enteroctopus megalocyathus*, *Robsonella fontaniana*) while only a single cephalopod species is the subject of commercial aquaculture viz. *Octopus vulgaris*.

O. vulgaris is economically attractive as an aquaculture species for the following reasons: fetches high market prices; fast growth rates; ease of acclimation to rearing conditions; and good feed conversion rates. The industry currently relies on the on-growing of wild-caught sub-adults, since a challenge exists with the commercial production of juveniles. Contributing to this bottleneck in the early life stages are: long planktonic stages; low tolerance of variable water quality conditions; and dependence on live prey. Furthermore is the slow development of artificial feeds.

Since octopuses are short-lived, exhibiting high growth rates and high fecundity, the Department of Agriculture, Forestry & Fisheries considered it as an ideal species for exploitation, with the potential to develop a new fishery. A limited number of experimental fishing permits were then issued in demarcated areas. One such permit holder (Cape Town Octopus) operating in False Bay realised the potential value that the grow-out of sub-adults in their catches might yield and approached the Department for assistance in undertaking such a trial.

Objectives of the trial:

- 1.) Can *Octopus vulgaris* be acclimated to captive conditions?
- 2.) Can they be weaned onto a mono-specific diet of low-cost raw fish?
- 3.) To determine the subsequent growth potential.

Materials & Methods:



Figure 44: Test animals were obtained opportunistically, kept separately in bags and weighed individually on arrival.

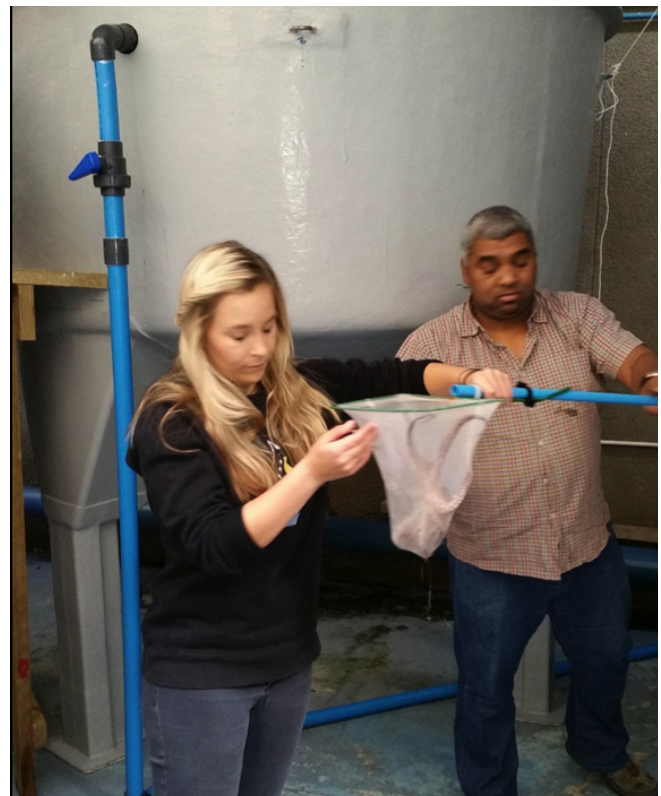


Figure 45: Animals being transferred.

Animals were segregated into two size groups ($<500\text{g}$ and $\geq 500\text{g}$) to mitigate against potential aggressive behaviour. Three cylindro-conical tanks with a capacity of 6m^3 each were supplied with pre-filtered $18\mu\text{m}$ sea water at a flow rate of $1\text{m}^3/\text{hour}/10\text{kg}$ of biomass.

Results:

Animals were introduced on 30 July 2014 and acclimated within 2-3 days, by accepting pilchard pieces placed close to individuals and assuming a feeding posture.

After 6 days animals would anticipate feed delivery by extending their arms and readily accepting feed presented

or dispersed in the tank.

The first growth trial was initiated on the 06 August 2014 where animals were removed, re-weighed and transferred to the appropriate tank. Animals that were handled would resume feeding the same day. The growth and feeding response of a particular group was monitored continuously and only interrupted when new animals were introduced.

Animals were kept for the duration of the trial and mortalities were minimal. Factors contributing to reduced FCR and growth in the latter period could be: lower mean temperature; sharp variations in temperature (4 degree drop over a 24 hour period following an upwelling event); reduction in somatic growth with increase in gonadal maturation (evidence of spawning in tank); possible interactions amongst mating individuals.

Conclusions:

The outcomes of the trial were favourable and variables such as water quality parameters, stocking density and feed can be optimised to improve the growth response.

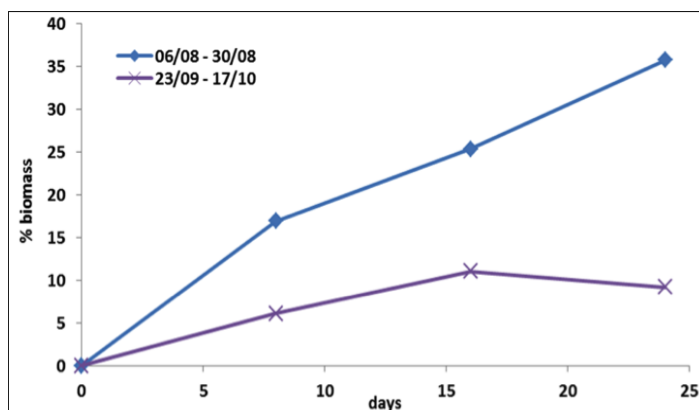


Figure 46: Proportional change in biomass at the start of each measure for discrete periods.

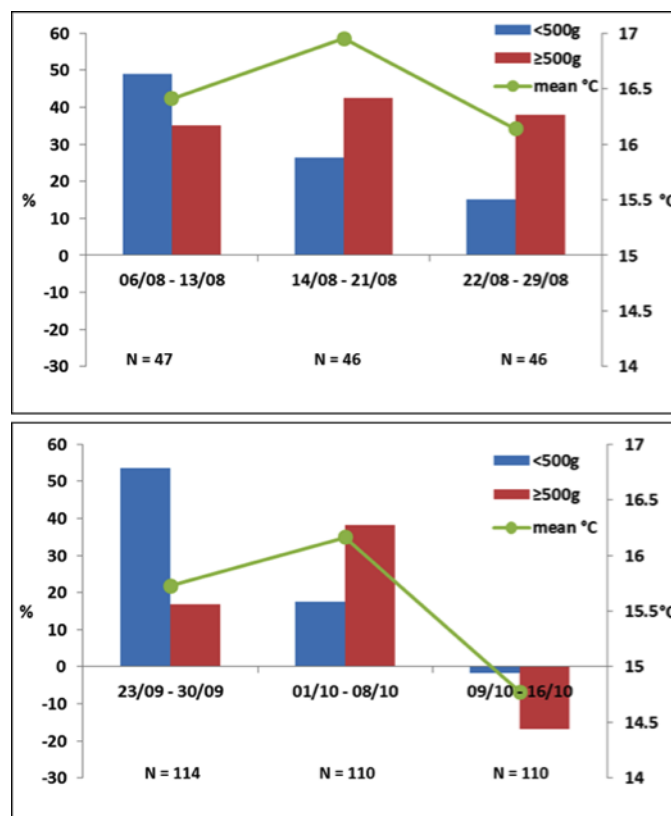


Figure 47: FCR values for the two size groups & mean temperature data for the two discrete periods. Combined population sizes are indicated.



Figure 48: Female guarding a clutch of eggs on the left and the eggs exposed on the right.



AQUACULTURE DEVELOPMENTAL PROJECTS BY THE DAFF





10.1 Aquaculture Development Zones

The Department aims to create an enabling environment to facilitate the development and growth of the South African aquaculture sector through the establishment of Aquaculture Development Zones (ADZ's). The locations of ADZ's are based on the availability of state-owned land, as well as suitable sea-space conducive to the cultivation of various aquaculture species, in and along coastal provinces. These suitable areas are subject to undergoing EIA processes and receiving Environmental Authorisation prior to being declared as ADZs.

10.1.2 The Qolora Aquaculture Development Zone

In 2012, the Qolora land-based ADZ in the Eastern Cape received a positive Environmental Authorisation (EA) from the Department of Economic Development, Environmental Affairs and Tourism which was extended to the 29th September 2017. 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. Hatchery offices and on site centralised processing facility will also be constructed. The Department has completed the management plans which need to be established prior to construction phase. The next phase will include the securing of funds for the construction phase of basic infrastructure.

10.1.2 Algoa Sea-based Aquaculture Development Zone

The EIA process for the establishment of a Sea-based ADZ in the Eastern Cape was initiated in 2011 and conducted by an independent, qualified Environmental Assessment Practitioner (EAP). Indigenous finfish species, such as Yellowtail, silver and Dusky Kob, white stump nose, white Steenbras, yellowfin tuna etc. will most likely be farmed in Algoa Bay ADZs. Should a future development wish to farm an alien finfish species, a risk assessment as specified in National Environmental Management Biodiversity Act 10 of 2004 will need to be undertaken? The DAFF received a positive Environmental Authorisation on the 13th August 2014 but the appeals process was initiated and the EA is suspended pending a decision from the Minister of Environmental Affairs. A total of 28 appellants lodged substantive appeals during the appeal period and a detailed responding statement was submitted to the DEA by the DAFF in December 2014.

10.1.3 The Amatikulu Aquaculture Development Zone

The Department is yet to appoint an independent, qualified EAP to conduct an EIA for an ADZ in Amatikulu located in KwaZulu Natal approximately 120km north of Durban. The site has an area of approximately 108.37 ha and is situated next to the Amatikulu estuary. The site was a thriving prawn farm in the 1990's, however the only remnants of the prawn farm are the unused earthen dams, water inlet channel (which are extensively covered by vegetation) and demolished pump house situated at the mouth of the Amatikulu estuary. The farming of indigenous and temperate water species with a production output of 20 000 – 30 000 tons is envisaged. The Department will establish infrastructure for the ADZ such as access roads, electricity, sea water pipelines, pump station, reservoir and fencing.

10.2 Collaboration between DAFF & the Aquaculture Research Unit, University of Limpopo

In 2012, the Department of Agriculture, Forestry & Fisheries (DAFF) entered into a partnership with the Aquaculture Research Unit (ARU) of the University of Limpopo. The aim of the partnership is to strengthen co-operation between the two institutions on a range of strategic issues including research and production of fresh water fish. One of these activities is the production of Catfish (*Clarias gariepinus*) fingerlings (5 - 8 cm) for fish centres under the auspices of DAFF. There have been recorded successes since the programme commenced in October 2013.

In January 2014, the programme supplied 13 200 Catfish fingerlings to the Gariep Breeding Station in the Free State Province. Another batch of fingerlings 11 000 were supplied to the station in May 2014. It is worthwhile to note that this programme also sold a total of 7 000 fingerlings to a Non-governmental Organisation based in the Free State Province in the same year. In June 2014, 5 000 fingerlings were purchased by the North West Provincial Department of Agriculture. Some of the fingerlings produced are kept for use for research by the honours, masters and PhD students. This has had a significant impact as Catfish does not breed naturally in captivity and this presents a huge challenge for students who want to collect fingerlings of the appropriate quantity and quality.

Attention should be drawn to the fact that aquaculture is still developing in most parts of South Africa. Therefore, the number of small scale fish farmers is expected to increase in the future and this is shown by the increasing number of fish famers visiting ARU to consult on range of issues about aquaculture. As this number grows exponentially, the Catfish breeding programme will play a critically important role to meet the demand for good quality fingerlings, not only in the Limpopo Province but the entire country.



Figure 49: Catfish fingerlings being sorted and counted in the newly built tunnel at ARU before being packaged and readied for transport to the Gariep breeding Station in the Free State Province.



Figure 50: Sorted and counted fingerlings in the tunnel ready to be packaged.



Figure 51: Fish being packed into styrofoam boxes; personnel wrapping and labelling boxes.

10.3 China-South Africa Agricultural Technology Demonstration Centre (ATDC): Gariep Dam, Free State

The Agricultural Technology Demonstration Centre (ATDC) project is implemented at Gariep Dam in Xhariep District of the Free State Province. This project is funded by the Chinese Ministry of Commerce (MOFCOM) following an agreement reached by the Chinese and the South African Governments through a signed Memorandum of Understanding (2006) and its subsequent Action Plan (2010). In pursuing the initiative, the MOFCOM, on behalf of the Chinese Government, has contracted the China National Agricultural Development Group Cooperation (CNADC), now called China Agriculture International Development Company (CAIDCO) while the Department

of Agriculture Forestry and Fisheries (DAFF), on behalf of the South African Government, has appointed the Free State Department of Agriculture and Rural Development (FSDARD) to roll-out the implementation of the project during both Construction and Technical Cooperation Phases. The construction phase of the project commenced in March 2009 through signed Exchange of Letters and it included erecting five (5) buildings and is now at the Technical Cooperation Phase (TCP) since February 2014.

The purpose of the ATDC project is to demonstrate and extend the technology of freshwater fish farming by providing training of aquaculture farmers and government officials at all levels and also to demonstrate breeding techniques and culture technology as well as conducting research and development activities by providing technical support to the six (6) fish farms within the Xhariep district;. During the TCP about nine (9) Chinese experts and technicians arrived in SA to start with the implementation of activities since February 2014 and SA has seconded three (3) interns/trainees to the project to provide support and assistance to the Chinese team.

When the ATDC technical co-operation phase had started a total number of 24 200 African Catfish fingerlings were purchased from University of Limpopo. The fingerlings were then introduced to the centre in two batches (the 1st batch was introduced on 29th of January 2014 which consisted of 13 200 fingerlings and the second batch consisted of 11 000 that was introduced on the 10th of June 2014). A total of 9000 of the introduced fingerling survived and reached adult stage (a total of 15 200 Catfish mortality was recorded). The ATDC then introduced 80 brood stocks of Common Carp, 5 Koi fish and 20 Goldfish (figure 52).

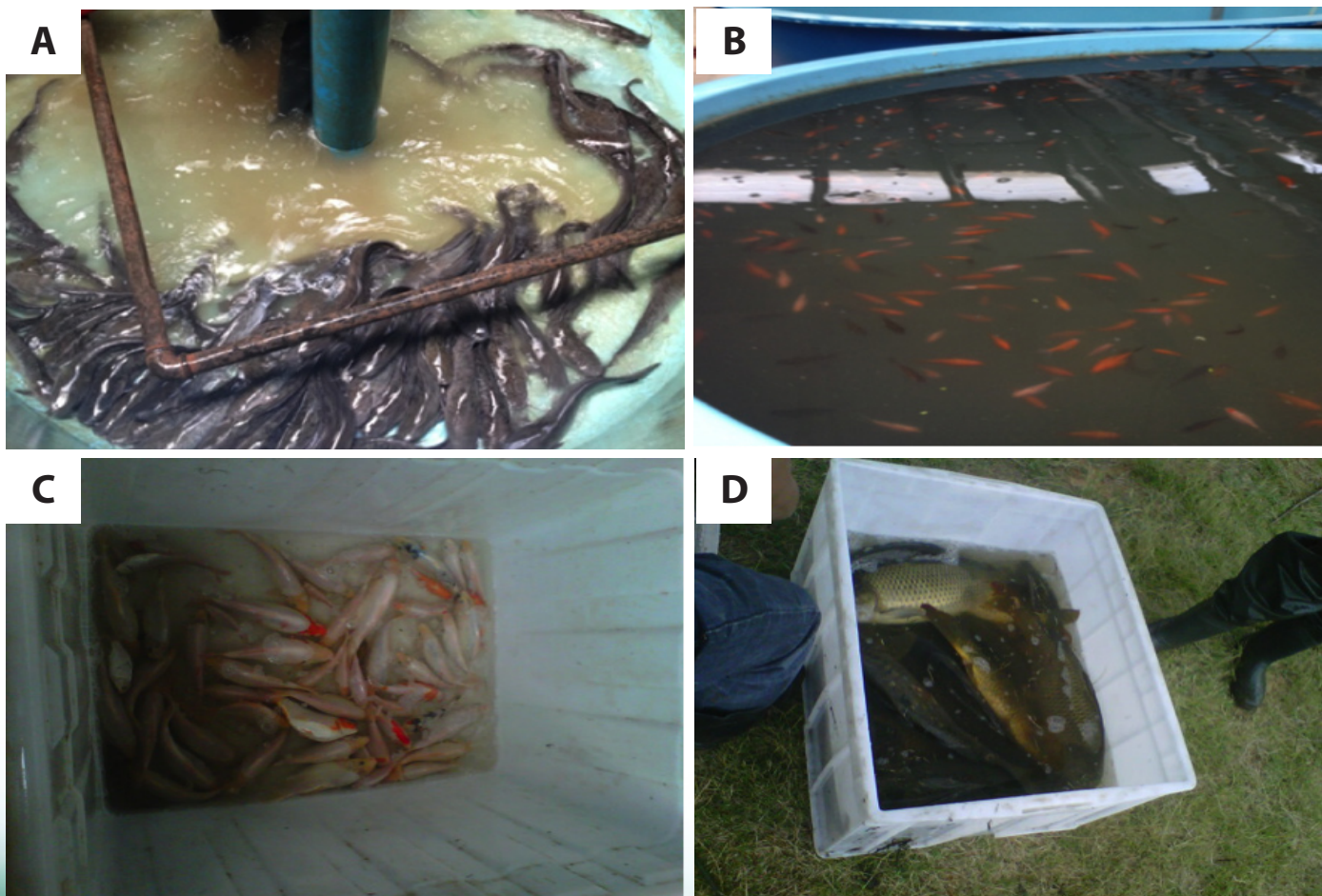


Figure 52: images of the type of fish farmed in the centre African Catfish (*Clarias gariepinus*) Goldfish (*Carassius auratus*) Koi (*Cyprinus Carpio*) Common Carp (*Cyprinus Carpio*).

ATDC Breeding Demonstration

The Chinese experts have been working closely with the South African conducting artificial breeding research on the African Catfish and the Common Carp, as well as natural breeding of the Goldfish and Koi. A total of three breeding cycles have taken place in 2014 (Table 37).



Figure 53 : A Image presenting the process of Catfish artificial breeding which took place early february in 2014 B Image is showing common Carp breeding and the harvesting of the fingerlings.



Figure 54: Image presenting natural breeding of the goldfish. During the mating season, when temperatures are favourable (20 0 C), a net is placed in the middle of the pond for the fertilised eggs -to stick to the net. The net with fertilised eggs is then transported in the hatchery for further hatching and larval rearing.

Table 39: Represent data of the breeding cycles that have taken place at ATDC

No. of breeding sessions	Breeding date	Fish species	Type of breeding	Brood stock No.	Estimate Fingerlings No.	Estimate Survival rate
1	2014/10/11	Common Carp	Artificial breeding	80	50 000	71%
2	2014/10/20	Koi	Natural breeding	5	500	62%
3	2014/09/09	Goldfish	Natural breeding	20	800	50%



Table 40: The total number of fish and the culture system used at ATDC

Species	Stage	Quantity (No of fish)	Culture system
African Catfish	Brood stocks	305	Fish hatchery
Common Carp	Fingerlings	0	Net cages Earthen pond
		7000	
	Brood stocks	79	Earthen pond Net cages
		200	
Koi	Brood stocks	20	Earthen pond
	Fingerlings	200	Earthen pond
Gold fish	Brood stocks	600	Fish hatchery
Mozambique Tilapia	N/A	0	N/A
Yellow fish	Broodstock	50	Fixed net cage culture





NATIONAL AQUACULTURE STAKEHOLDER ENGAGEMENTS





11.1 Aquaculture Stakeholder Engagement Forums

As in many sectors, stakeholder involvement plays a crucial role in sector development. The DAFF has identified several forums to serve as vehicles that need to drive the activities related to the aquaculture sector. The forums are focused and specialized to allow specific deliberations regarding the industry. To allow industry to provide input and communicate specific challenges they are experiencing, two forums were identified, which is the Aquaculture Industry Liaison (AIL) and Freshwater Aquaculture Industry Liaison (FAIL). Both these forums are chaired by the DAFF.

Aquaculture sector development is led by the DAFF and several government Departments in all spheres of government. National and provincial government plays a crucial supporting role. The roles of other government Departments in the sector needed to be coordinated to minimize duplication of efforts and to align activities towards one government goal and position on aquaculture development. To address this, two important forums have been formed on a national and provincial level, that is Aquaculture Intergovernmental Forum (AIF) and Provincial Aquaculture Intergovernmental Forum (PAIF) and both forums are chaired by the DAFF.

11.2 Aquaculture Industry Liaison

The AIL consists of Marine Aquaculture Rights and Permit Holders representatives, the DAFF under the Branch: Fisheries includes all Chief Directorates within the Branch, i.e. Aquaculture and Economic Development (AED) as a lead Chief Directorate; Fisheries Research and Development (FR&D); Monitoring, Control and Surveillance (MCS) and Marine Resources Management (MRM); and the Department of Environmental Affairs (DEA), Branch: Oceans and Coasts.

11.3 Freshwater Aquaculture Industry Liaison

The Freshwater Aquaculture Industry Liaison (FAIL) is a forum which will be established, hopefully in the next financial year. It will provide a platform for industry to engage and communicate with government on issues that affect the freshwater aquaculture industry. Its members will be DAFF officials from relevant Chief Directorates such as Fisheries Research and Development, Aquaculture and Economic Development, Monitoring Control and Surveillance, and Freshwater Aquaculture industry members.

11.4 Aquaculture Intergovernmental Forum

Aquaculture Intergovernmental Forum (AIF) was established to ensure better communication amongst national





government Departments that have a mandate in aquaculture management and development. This forum is led by the DAFF and its main objective is to provide better management and development of the sector through joint facilitation, planning, coordination, resource mobilization, monitoring and evaluation. In addition, the AIF ensures oversight for aligned implementation and reporting of all key programs of Government in order to achieve sustainable aquaculture development in the country. The targeted participants for the AIF are key national government Departments that have a role to play in aquaculture management. State-owned entities (SOE) and affected provincial Departments are invited when need arises. AIF participants included DAFF as the lead department for aquaculture development; Department of Trade and Industry (the dti), Department of Science and Technology (DST); the Department of Environmental Affairs (DEA) and the Department of Water Affairs (DWA).



11.5 Provincial Aquaculture Intergovernmental Forum

Provincial Aquaculture Intergovernmental Forum (PAIF) was established to ensure coordination between the aquaculture programmes within both national and provincial Governments especially with Freshwater Aquaculture being a concurrent function and shared mandate. The PAIF is also a key platform to information sharing and providing directions to the provincial Departments. Target stakeholders of the forum include DAFF, provincial Departments that have a role to play in aquaculture development.



11.6 Aquaculture Value Chain Roundtable

The Aquaculture Value Chain Round Table (AVCRT) aims to strengthen industry-government partnerships. It is a platform used by the government to consult with industry on issues/challenges that affect the aquaculture sector throughout the entire aquaculture sector value chain. The aim is for government to engage collectively with representatives of the aquaculture sector and identify solutions aimed at developing the sector. Representatives from all relevant stakeholders throughout the aquaculture value chain including hatchery representatives, producer representatives, universities, government Departments, relevant Councils, (such as the National Marketing Council), fish processors, wholesalers and feed manufacturers.





AQUACULTURE & OPERATION PHAKISA- OCEAN'S ECONOMY



Aquaculture has been prioritised by government and the recent Operation Phakisa method has provided guidance on how to take it forward. In his State of the Nation Address (SONA) in February 2014, President Jacob Zuma announced the launch of Operation Phakisa with the purpose of accelerating the delivery of South Africa's national priorities by using Delivery Labs problem-solving and performance monitoring management methodology. The first focus area of Operation Phakisa is an ambitious programme to unlock the economic potential of South Africa's ocean. At first step in this programme, the Oceans Economy Labs took place in Durban in July and August 2014. More than 200 full and part time participants came together to develop detailed implementation plans to unlock the economic potential of three economic sectors, i.e. marine transport and manufacturing, oil and gas exploration and aquaculture to secure integrated protection and governance of South Africa's oceans. In the aquaculture lab, focus included freshwater aquaculture which is practiced in both inland and coastal provinces.

An economic analysis undertaken in 2013 found that South Africa's oceans economy could generate an estimated Gross Domestic Production (GDP) of up to R177 billion by 2033, multiplying their contribution by 2.5 to 3.5 times in 20 years. Accordingly, the number of jobs linked to the ocean's economy could potentially employ one (1) million people by 2033 compared to 316 00 in 2010. The analysis also considered the geopolitical, environmental and security issues associated with South Africa's oceans and also the institutional and logistical requirements to advance the oceans economy.

The DAFF is the lead department for the Ocean's Economy Aquaculture lab and its deliverable. The lab concluded that South Africa's aquaculture sector has a high growth potential due to an increasing demand in fish in the face of declining fish stocks. Currently, the sector is at a very small scale and production is focused on a few high-value species. The Aquaculture Lab identified sector growth blockages as regulatory barriers, high cost of production, difficulty in accessing funding, poor access to markets and limited pool of skills; poor access to quality inputs, fragmented research and development and limited infrastructure in rural areas and inclusivity in the sector.

The main aim to grow the aquaculture sector in South Africa is to play a major role in supplying fish products and an enhancement role in job creation and contribution to the national income. The targets over the next five years (2014 – 2019) seeks to grow the 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.

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 section and implementation of production focused projects. Three initiatives relate to creation of an enabling regulatory environment and others focus on funding support, increasing skills pool and awareness, and improving access to market. To deliver this initiatives, Aquaculture Lab created a detailed implementation plans, government systems to take responsibility for initiatives and key performance indicators to help monitor delivery.



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

13



The DAFF is the lead Department for aquaculture development and management in South Africa. It is managed under the Branch Fisheries Management. There are three Directorates responsible for the sector. I.e. Directorate Aquaculture Technical Services and Directorate: Sustainable Aquaculture Management within the Chief Directorate: Aquaculture and Economic Development. The third unit is the Directorate: Aquaculture Research and Development under the Chief Directorate: Research and Development. In 2014, a special unit was established to deal with the Operation Phakisa – Aquaculture Lab called the Delivery Unit reporting directly to the Chief Director: Aquaculture and Economic Development.



13.1 Aquaculture Technical Services

The Directorate: Aquaculture Technical Services is responsible for:

a. Aquaculture Farmer Support

This section ensures that farmers are obtaining the necessary support. They are responsible for developing and implementing farm support programmes; provide technical advisory services; and facilitate training and capacity building within the aquaculture sector.

b. Aquaculture Development

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

c. Economic and Information Management

This section deals with economic assessment of fish farms under D: ATS. Amongst other functions, this unit 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 section is also established for driving information collection and dissemination; sector promotion through awareness programmes; development and dissemination of sector promotion material; and most importantly development and publication of the South Africa's Aquaculture Yearbook.



13.2 Directorate Aquaculture Research and Development

a. Aquaculture Reproduction, Nutrition and Genetics

This section 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, testing 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 section is also responsible for the developing techniques to optimize mass culture of phytoplankton and zooplankton required for commercial hatcheries, testing of IMTA (Integrated Multitrophic Aquaculture Systems) 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 are 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 aquatic animal health and diseases sub 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.

13.3 Directorate Sustainable Aquaculture Management

a. Aquaculture Authorisations

This section is responsible for receiving, processing and granting of aquaculture rights, ranching rights and exemptions, issuing of permits and licences; 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 section 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 section 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 programmes, the sub-unit collaborates with other agencies such as the National Regulator for Compulsory Specifications (NRCS) and Council for Scientific and Industrial Research (CSIR).





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