



World Organisation
for Animal Health



Launch of the Regional Aquatic Animal Health Laboratory Network for Africa (RAAHLN-AF)

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Perspective and laboratory needs of the aquaculture industry in South Africa

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Fishes represent by far the most species rich group of vertebrate animals

- 32 949 currently described species
- 7 389 species are in some way exploited by humans
 - 4 647 species are exploited by industrial and artisanal fisheries
 - 360 are used in aquaculture
 - 3 229 species are traded as ornamental fish
 - 1 318 as marine ornamentals
 - 1 911 as freshwater ornamentals
 - 712 ornamental fish species are commercially bred
 - 1 139 species exploited as sport fish
 - 205 species used as bait
- 2 100 species are threatened and on the IUCN Red List
- 911 species have been transferred and have become established in other countries

50% of aquaculture production by volume is constituted by just 12 species or species items including three seaweeds, **six finfish species**, two mollusks, and one crustacean (*State of the World's Aquatic Genetic Resources for Food and Agriculture*, FAO, [2019](#))

FishBase 2014

Virus diseases

- Viruses of fish represent some of the most serious diseases challenging sustainability of aquaculture.
- Virus diseases make up the majority of WOAHL-listed finfish diseases and are included in South Africa's National List of Aquatic Pathogens.
- Intensive fish production systems provide ideal conditions for epidemic outbreaks of disease.
- Diagnostic challenges relate to:
 - Asymptomatic carrier states that occur, and
 - Transmission may be horizontal and vertical.

Losses have been staggering with recent major disease outbreaks in aquaculture

- Chile – 2007, infectious salmon anaemia outbreak, US\$2 billion dollars loss to the Atlantic salmon farming industry, 20,000 jobs lost and challenges remain to this day
- Vietnam – 2011, early mortality syndrome or EMS (acute hepatopancreas necrosis syndrome, AHPNS), some areas losing as much as 90 percent of their shrimp crop. Collateral damage to employment, social welfare, and international market presence caused by EMS/AHPNS is estimated in the billions of US dollars.
- Mozambique – 2011, white spot syndrome virus (WSSV) virtually eliminated shrimp farming from Mozambique. Losses in SE Asian shrimp production run into hundreds of million dollars annually
- Indonesia – 2005, KHV caused economic losses within the first 3 months of an outbreak exceeding 15 million US\$ and affecting 5000 farms.

World Bank case studies

Identify disease as the main threat to sustainable development of aquaculture industries.

“World Bank. 2014. Reducing Disease Risk in Aquaculture. World Bank, Washington, DC. © World Bank.
<https://openknowledge.worldbank.org/handle/10986/18936>

Important to note that:

- South Africa plays an important role in the production of salmonids in many other countries through the export of SPF rainbow trout eyed-ova.

Disease is not simply a matter of the presence or absence of pathogens

Five conditions that lead to disease include:

- Close proximity among farming operations and/or shared water supply and discharge;
- Unregulated transfer of animals and/or gametes among farms and from sites outside of the farming area;
- Lack of adherence to on-farm sanitary protocols;
- **Inadequate diagnostic and veterinary services;** and
- Failure of farmers to share information and cooperate in collective action to respect best management practices and respond to crises.

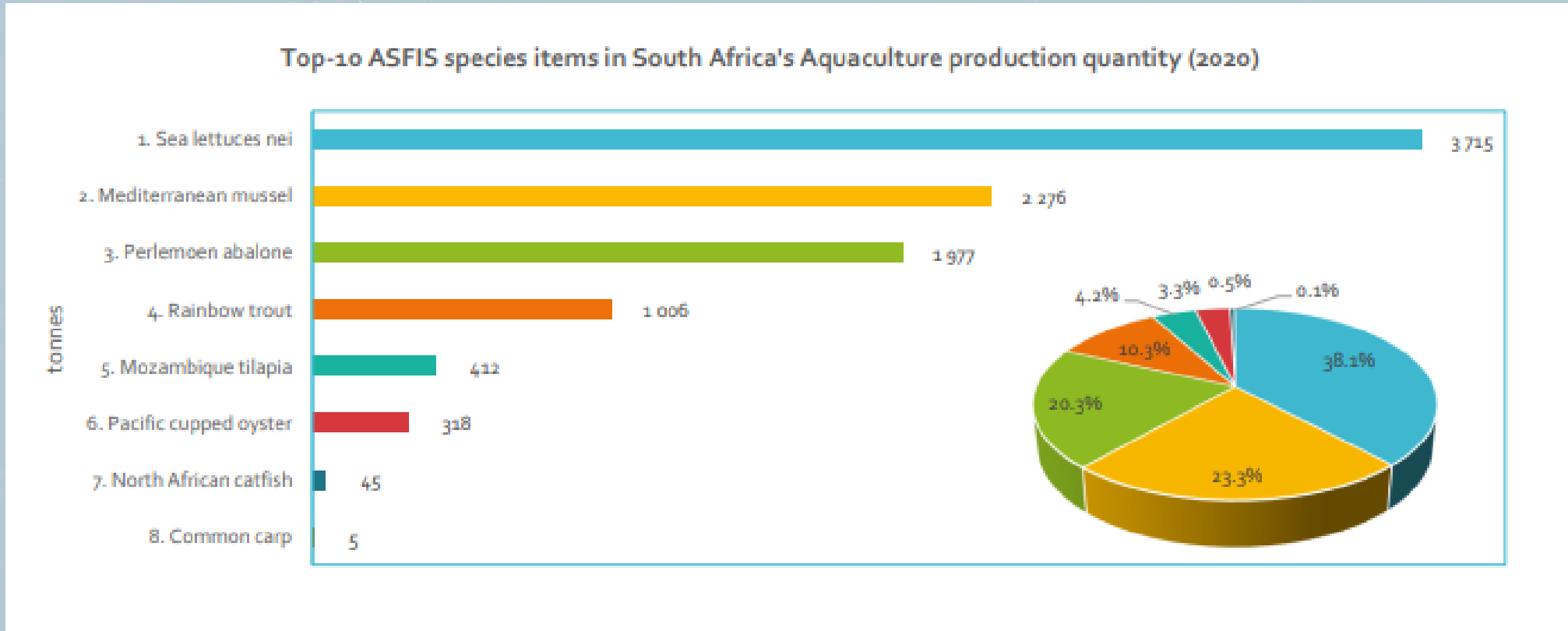
Corrective measures to avoid or moderate diseases in aquaculture respond directly to the causative conditions

“World Bank. 2014. Reducing Disease Risk in Aquaculture. World Bank, Washington, DC. © World Bank.
<https://openknowledge.worldbank.org/handle/10986/18936>”

Significance of South Africa's aquaculture production – “what are we missing”

- Aquaculture production in 2020 was reported as 9753 tonnes (FAO Fishery and Aquaculture Statistics. Global aquaculture production 1950-2020 (FishStatJ))
 - Marine aquaculture accounted for 85 percent of the country's aquaculture production in
 - Aquaculture production in 2020 was concentrated on molluscs and aquatic plants (algae).
 - The share of finfish (15 percent) was much lower than world average (46.9 percent) and regional average (84.3 percent).
 - Four species groups, i.e. Green seaweeds, mussels, abalones/winkles/conchs, and trout, contributed over 90 percent of the production.
 - Rainbow trout production is currently 650 tonnes per annum
- Production and export figures for embryonated specific-pathogen-free rainbow trout ova are NOT included in these statistics

Production statistics based on tonnages produced do not reflect the value of seed-stock



Data source: FAO. 2022. Fishery and Aquaculture Statistics. Global aquaculture production 1950-2020 (FishStatJ).
www.fao.org/fishery/statistics/software/FishStatJ/en

South Africa produced and exported 69 million specific-pathogen-free rainbow trout eyed-ova this year

- Europe
- Asia
- Middle East
- South America
- Africa



Farms registered to export ova rely heavily on the National Laboratory being able to do the required diagnostic testing.



South African aquaculture: Infections significant to trade or listed as notifiable to WOA

- Rainbow trout (*Oncorhynchus mykiss*)
- Brown trout (*Salmo trutta*)
- Atlantic salmon (*Salmo salar*)



| Disease agent | Type | Test | WOAH |
|---------------------------------------------|-----------|---------------------------|------------|
| <i>Aphanomyces invadans</i> (EUS) | Oomycete | Visual, histology, PCR | Listed |
| <i>Gyrodactylus salaris</i> | Parasite | Direct microscopy | Listed |
| Epizootic haematopoietic necrosis virus | Virus | Isolation on cell culture | Listed |
| HRP deleted infectious salmon anaemia virus | Virus | PCR | Listed |
| Infectious haematopoietic necrosis virus | Virus | Isolation on cell culture | Listed |
| Salmonid alphavirus | Virus | PCR | Listed |
| Viral haemorrhagic septicaemia | Virus | Isolation on cell culture | Listed |
| <i>Oncorhynchus masou</i> virus* | Virus | Isolation on cell culture | Not listed |
| <i>Renibacterium salmoninarum</i> * | Bacterium | PCR | Not listed |
| Infectious pancreatic necrosis virus* | Virus | Isolation on cell culture | Not listed |

South African aquaculture: Infections significant to trade or listed as notifiable to WOA



Abalone (*Haliotis midae*)

| Disease agent | Disease | Type | Test | WOAH |
|------------------------------------|--------------------------------------------------------|-----------------------|------------------------|-------------|
| <i>Haliotidica noduliformans</i> | Abalone tubercle mycosis (ATM)* | Fungus | Visual, histology, PCR | *Not listed |
| Abalone herpes virus | Abalone other than South African <i>Haliotis midae</i> | Virus | PCR | Listed |
| <i>Xenohaliotis californiensis</i> | Withering syndrome | Rickettsial bacterium | PCR | Listed |
| <i>Perkinsus olseni</i> | Other species of abalone | Protozoon | Culture and PCR | Listed |

WOAH Manual of Diagnostic Tests for Aquatic Animals 2023

South African aquaculture: Infections significant to trade or listed as notifiable to WOAHA

Carp and koi (*Cyprinus carpio*) -

- Koi herpesvirus
- Spring viraemia of carp virus

Nile tilapia – *Oreochromis niloticus*

- Tilapia lake virus
- Infectious spleen and kidney necrosis virus (ISKNV)

Oysters

- Ostreid herpes virus 1
- Perkinsus olseni

Specific-pathogen-free seed-stock

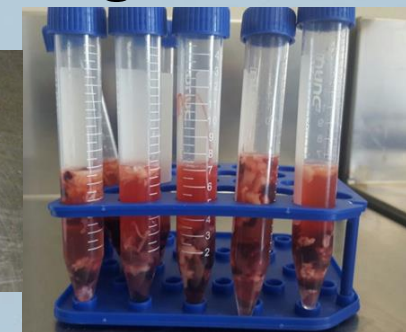
- Well established in:
 - shrimp farming.
 - salmonid farming.
- Urgently required for:
 - tilapia farming.
- Urgently needed for:
 - trade in ornamental fish
- Requirements for disease-freedom are based on:
 - Industry needs and requirements of trading partners.
 - International trade standards based on the WOAHL list of diseases, and
 - Requires national laboratories to develop the relevant diagnostic competencies.



Challenges that may be faced by national laboratories

Need to justify the cost of:

- Supplying relevant diagnostic tests for aquatic diseases according to the WOAHA Aquatic Manual:
 - Virus isolation
 - Molecular techniques (PCR)
- Validation of tests
- Proficiency testing



Demand may be limited (small number of large producers)

Based on demand, competing needs from other livestock industries may distract from the needs of aquaculture.

Responsibilities of an exporting country when facilitating trade

An exporting country should, on request, supply the following:

- Information on the aquatic animal health situation and national aquatic animal health information systems relative to WOAHL-listed diseases to determine :
 - Whether the country is disease free
 - has disease-free zones or
 - has disease-free compartments.
 - pathways followed to achieve disease freedom e.g.:
 - ❖ historical freedom,
 - ❖ absence of susceptible species or
 - ❖ targeted surveillance.
 - regulations and procedures in force to maintain the free status
- Regular and prompt information on the occurrence of listed diseases.
- Details of the country's ability to apply measures to control and prevent listed diseases.
- Information on the structure and authority of the CA.
- Technical information, particularly on biological tests and vaccines applied in all or part of the country.

These require necessary competency by the National Laboratory

History of SPF trout ova exports from South Africa – an example of compartmentalisation

- Rainbow and brown trout were introduced to South Africa through the importation of eyed-ova since the early colonial days, and a viable salmonid aquaculture industry developed.
- Strict import controls requiring disease-free guarantees have protected the South African salmonid industry from viral and bacterial diseases that have plagued aquaculture elsewhere despite frequent importations of eyed-ova.
- South African trout farmers have successfully exported specific-pathogen-free (SPF) trout ova to the Northern and Western Hemisphere since the late 1980's to enable year round production of table fish for consumption in these countries.



Prerequisites to providing disease-status guarantees

- National veterinary laboratories (in South Africa, Onderstepoort Veterinary Research Institute) need the capacity to isolate and diagnose the relevant salmonid diseases to the standards provided by the WOAHP Manual of Diagnostic Tests for Aquatic Animals.
- Farms wishing to export ova are required to commit to, and maintain, biosecurity practices appropriate to compartmentalization.
- Export farms need to be officially registered as an export facility with the CA responsible for fish health in the exporting country. In South Africa they are subject to annual inspection and are issued a unique export facility registration number that appears on the IAHC.

Ornamental fish

- Ornamental fish are highly traded commodities increasingly implicated in the spread of aquatic pathogens.
- Veterinary certificates of health are more often based on inspection and quarantine than on biosecurity and disease surveillance of the source populations.

Increase use, by medical and pharmaceutical research, of ZEBTECH facilities requires SPF *Zebra danio* fish based on specific laboratory testing



Importance of global aquaculture

- Aquaculture represents the fastest growing food production sector over recent decades with an average annual growth rate of 6.7% over the past three decades.
- On a global scale, aquaculture accounts for 49.2% of total aquaculture and fisheries production.
- Aquaculture production exceeds capture fisheries production for all sectors except marine finfish, which remains dominated by capture fisheries.
- Aquaculture has been the predominant contributor to meeting the demand created by the doubling of global per capita fish consumption since 1960.
- Aquatic food consumption is expected to continue to rise for the next decade at approximately 1.4% per annum, higher than that anticipated for red meat consumption (1% per annum).

[https://www.was.org/article/A-decadal-outlook-for-global-aquaculture.aspx#:~:text=The%20Americas%2C%20Europe%2C%20and%20Africa,decades%20\(FAO%2C%202022b\).](https://www.was.org/article/A-decadal-outlook-for-global-aquaculture.aspx#:~:text=The%20Americas%2C%20Europe%2C%20and%20Africa,decades%20(FAO%2C%202022b).)

THANK YOU FOR YOUR ATTENTION