NEPAD
TRANSFORMING AFRICA

AFRICAN UNION
INTERAFRICAN BUREAU
FOR ANIMAL RESOURCES

EUROPEAN UNION

WORKING PAPER: 4

ENHANCING TRANSBOUNDARY PRODUCTION, TRADE AND DISTRIBUTION OF AQUATIC ANIMAL SEEDS AND BROODSTOCKS IN AQUACULTURE SYSTEMS IN AFRICA

Executive Summary

Aquaculture in Africa contributes to the world fish supply with a contribution of 2.3% to world production in 2015. However, the sector fails to realize its full potential due to sub-optimal utilization and management of available natural resources for aquaculture, challenges in the supply and access to key inputs, use of inappropriate technologies, lack of finance, challenges of access to markets and inadequate physical and sectoral infrastructure. The problem of access to quality seed and brood stock are the major challenges that restrict production from aquaculture. A recent review revealed that 1.5 billion fish seed is produced in Africa annually but which does not satisfy existing demand estimated at around10 billion per annum.Almost all the countries in Africa produce less fry and fingerlings than are demanded by the particular country leaving no room for export. This includes Egypt which is the largest seed producer producing about 1,200 million Tilapia fingerlings and 250 million seed for other species per year.Very few seed is still exported to other countries like from Egypt to Cameroon but amidst the deficit in Egypt.There is therefore need for an urgent solution to this challenge to ensure that there is enough seed and broodstock supply to cover demand and also supply other countries which have low capacity in producing quality seed and broodstock.AU-IBAR support work through the Fisheries Governance project to formulate regional guidelines for the transboundary production, distribution and trade of aquatic animal seed and brood-stock. This work is sits in very well with the policy objective of promoting market-let aquaculture development of the Policy Framework and reform strategy for fisheries and aquaculture in Africa (PFRS). The guidelines included in the working paper are intended to provide guidance for aquatic animal seed production, distribution and trade in order to support aquaculture management and increase production of fish from aquaculture in Africa. It alsoprovides guidance for all stakeholders in the value chain from regional to national levels within public and private sectors for the application of policies, regulations and best

FISHGOV PROJECT
"Fish for posterity"

Strengthening Institution Capacity to Enhance Governance of the Fisheries Sector in Africa

management practices (BMPs). The working paper provides guidelines for proper accessibility to high quality disease free aquatic animal seed at regional level, improving compliance to international and regional standards for quality assurance and BMPs to facilitate transboundary distribution and trade of aquatic animal seed and brood stock, improving availability, accessibility and quality of institutional and human resources capacity to provide the required support and services.

Introduction and Background

Aquaculture contributes to the world's economy and has potential to contribute greatly if fully exploited. The production of marketable aquaculture products begins with stocking of good quality fry or juveniles into a rearing environment that assure optimum and rapid growth to allow harvest in shortest possible time. The quantity of fry or juveniles should also be adequate to fully utilize the available rearing environment and achieve high production. Where the supply is low, introduction of seed fromothersources for example,import should be used. With the use of high quality and adequate seed, production of high quality broodstock is assured leading to high aquaculture production.

Trends of fish production from Aquaculture

Within 15 years in the new millennium, aquaculture contribution to the world production of aquatic animals has increased from 25.7% in 2000 to 45.3% in 2015 (FAO, 2017) Figure 1.

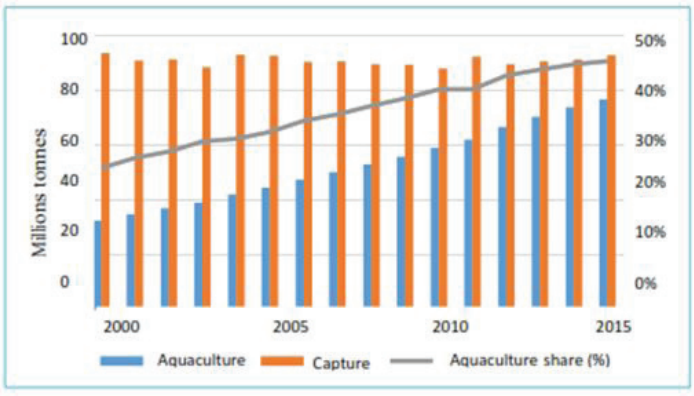

Figure 1: *Total production of aquatic animals World Capture and Aquaculture in the world (excluding algae) (Source: FAO 2017).*

Despite its low contribution to the total global aquaculture production at only 2.3% in 2015, African aquaculture demonstrated the highest annual growth percentage in the last 15 years averaging 10.4%, followed by Asia (6%) and Americas (5.7%), Oceania (2.9%) and Europe aquaculture growth was only 2.5%, respectively (Figure 2).

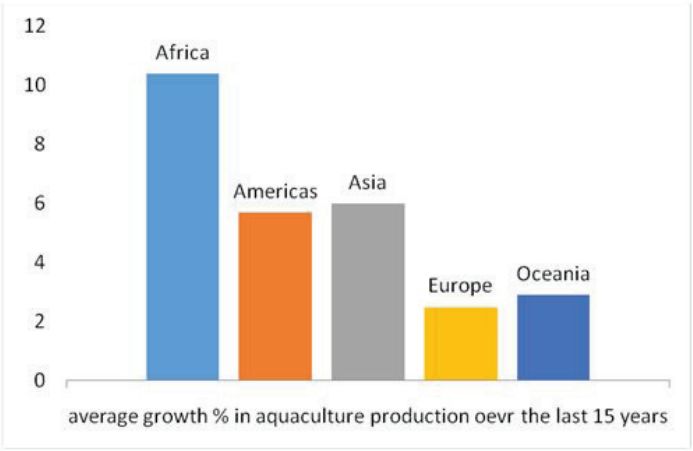

Figure 2: *Average growth % in aquaculture production from different continents over the last 15 years (Source: FAO, 2017)*

The growth of Africa's aquaculture industry, does not in any way fulfill the demand available for aquaculture products. Population is estimated at 1.2 billion and is growing at approximately 3% per annum (AUC-NEPAD, 2014). Additionally fishery yields are unlikely to change to meet the expanding demand for fish because most of the commercially important fish stocks are reported to be fully exploited or overexploited. Consequently Africa's average fish consumption rates are now estimated at 9 kg per capita per annum compared to the global average of 20 kg per capita per annum. The continent has also become a net importer of fish. The current scenario necessitates job creation for the youth and a shift in fish production ethos to supply to the local and regional markets so created if food, nutrition and livelihood goals are to be met in Africa and make way for production of fish for exports to other countries.

Seed and brood stock production in Africa

One of the major constraints of aquaculture development in Africa is inadequate fry and fingerling supply as and when needed. Availability of fish seed stimulates the expansion of aquaculture. Various sources show that around 1.5 billion fish seed are produced in Africa annually whereas estimated demand is over 10 billion, which reveals a huge deficit (Bhujel 2012). More importantly, aquaculture is expected to grow by 10% each year. If this is the case, demand for fish seed will double in 8 years' time. Therefore, fish seed can

be expected to be the main constraint for aquaculture development in Africa. Appropriate measures are urgently needed to implement an expansion in seed supply so that countries are able to produce more than what can be utilized by the country itself.

Although, several functional hatcheries as well as wild seed collection centres are active in some countries (e.g. Egypt and other countries), fingerling supply remains a problem. This problem is compounded by poor infrastructure, which makes seed supply difficult and costly. In addition, the lack of juvenile rearing techniques, systems and/or facilities can lead to mortality occurring before stocking into the grow-out systems and during the grow-out period. In the past, the majority of fish farmers in Africa used wild-caught juveniles to stock their ponds. However, wild captured fingerlings tend to be seasonal in their availability, have limited growth, and are usually made up of different strains which may be difficult to separate. In addition, the quality of seed currently available in various parts of Africa has been questioned by aquaculture producers as typically fish do not grow satisfactorily. Poor-quality seed affects the livelihoods of poor farmers and the entire aquaculture industry. Demand for high quality fish seed has always been enormous. Only few hatcheries that produce high quality seed are available leading tohigh cost ofseed since there is no competition.

Seed supply Network and status of seed production and supply in selected African countries

Access to quality seed has been a major bottleneck to the development of commercial aquaculture in Africa. Making high quality fry available throughout the year accelerates the development of the industry. Almost all African countries are suffering from seed quality and quantity problems. Because of inadequate production, most African farmers are compelled to purchase at higher prices. Fish seed production and supply network in Africa can be represented by a model (Fig 3).

A considerable amount of wild seed is harvested for use by the aquaculture industry. However, some success stories of aquaculture programs can be found in Africa. Most of the countries produce seed by themselves as the supply in most countries is lower

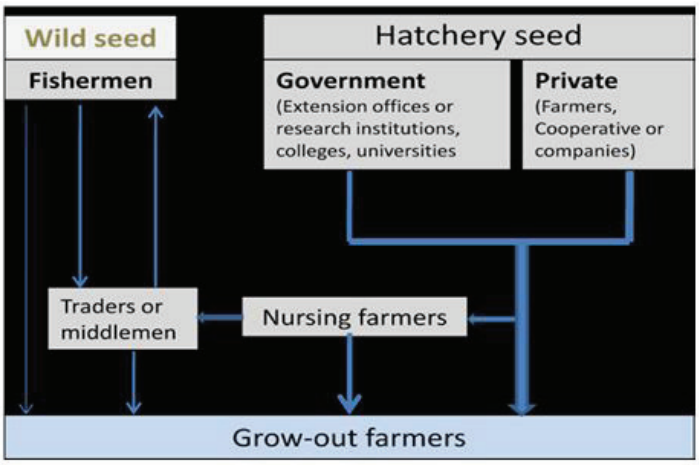

Figure 3: *General model of fish seed production and supply in Africa(Source: Bhujel, R.C., 2012)*

than the demand hence not giving room for export and at times exporting to other countries amidst the deficits within the exporting countries themselves. For example, Zambia has Royal Fish Farm in Benin, Tropo Farm in Ghana, Kafue Fisheries aquaculture Farms and Lake Harvest in Zimbabwe which are all small scale hatchery producers. Seed supply networks or supply systems in general are either non-existence or very weak. Specialized hatcheries and nursery facilities are almost non-existent or very limited.Egypt has the largest aquaculture industry amongst African countries and the Egyptian fish farms produced about 60% of the country's total freshwater and marine fish production, providing a cheap protein for its 80 million people. Such a big leap is possible mainly due to the success of mass-scale fry production techniques applying hormonal sex-reversal (Radwan I, 2008). Some farms produce their own fry but the majority of seed comes from specialized private hatcheries. Some government hatcheries produce fry amounting to around 10% of the total production capacity. Total fry production has been estimatedover 1 billion fingerlings per year, based on the aquaculture production (Brummett, 2007).

Demand for fish seed and supply is rapidly increasing because aquaculture has been adopted very rapidly as a result of strong support from the government and international organizations. A summary of seed production and supply in selected African countries as of the year 2012 is given in Table 1

SWOT analysis of seed value chain

Table 2 below presents the SWOT analysis for seed value chain to facilitate the understanding of the sector.

Table 1: *Summary of seed demand in major African countries as at 2012*

Countries	Existing seed supply (million per year)			Estimated seed demand (million per year		
	Tilapia	Catfish	Others	Tilapia	Catfish	Others
Cameroon	3	1		6	2	
Egypt	1,200		250	10,000		
Ghana	16	0		32	0	
Kenya	50	75		100	150	
Malawi	30	2		60	3	
Nigeria		30			500	
Uganda	8	139		450	277	
Zambia	15			30		
Zimbabwe	19	6		38	11	
Sub total						
Grand Total		1,668			10,590	
Seed Shortage (Million/Year)				8,923		

Source: Bhujel, 2012

Table 2: *SWOT analysis of seed value chain*

Strengths	Weaknesses	Opportunities	Threats
• Available expertise and technology within Africa • Abundant resources (land, water, climate)	• Poor quality broodstock • Low supply of high quality seed • High operating costs of hatchery • Poor management • Poor infrastructure • Poor marketing strategies (locally and between countries) • Logistical challenges • Poor standardization and certification systems	• High demand for seed • Political will • Regional and sub regional trade and available markets	• Inflow of unregulated imported seed • Wild collections • Diseases • Difficulty in accessing finance • High tariffs (import duty, taxes, etc.)

Fish seed value chain is the first segment or stage in the aquaculture value chain and the most important founding segment in the chain. Machena and Moehl (2001) identified the lack of fish seed as a serious restriction to aquaculture development in sub-Saharan African region. Aside availability, quality is also key when talking about seed.

Poor quality seed affects the growth, production and the survival of fish. Seed with low quality are also easily affected by diseases and other parasites. There are several factors which could contribute to the quality of seed. Some of the important ones which are perceived to have a significant impact on quality include:

- Quality of broodstock: a well fed, disease free broodstock tends to produce good egg and sperm quality with high fecundity and also brings out good quality and healthy fry
- Husbandry (hatchery and nursery): this is associated with poor management of the hatchery for example mixing fry and fingerlings of different sizes in one system hence affecting growth rates, allowing for inbreeding by employing spawning methods that encourage sharing of similar genetic makeup among brooders. Other practices such as disinfection, separation ofdead and unfertilized eggs, separation ofspawning andhatching units also affect the quality of the seed produced.
- Seed movements and availability: poor transportation means tend to stress fry and fingerlings affecting their resistance to disease hence their quality.Holding and distribution and also trans- boundary movements may compromise the quality of seed.

- Pathogens and diseases: parasitic, bacterial, fungal and viral diseases are also a bid challenge that affects quality of the aquatic animal seeds.

Problem in Relation to Transboundary Production, Trade and Distribution of Aquatic Animal Seeds and Broodstocks

The demand for aquaculture products has not yet been met despite the registered growth of the sector. The African Union Continental Aquaculture Plan of actions (2017) acknowledges that to meet the growing demand for fish in the face of static supplies from capture fisheries, there is need for increasing the productivity from Aquaculture. Among the issues affecting the growth of the sector are challenges associated with adequate supply and access to inputs like good quality feeds and seeds which is key for aquaculture growth (FAO, 2017). Some of the issues contributing to low seed supply include challenges of lack of Capacity for aquaculture management and lack of proper research. Africa also has weak systems for addressing ecosystem health and biosecurity issues especially for resources shared between Member States which also affect seed production.

However, sustainable aquaculture cannot be achieved without good control of reproduction of high quality broodstock and a reliable means of producing seed of the appropriate quality and quantity so that the surplus is used to supply other countries which are unable to meet the country's demand. So far, Africa faces low fry survival, insufficient funds to support research and seed production and low investment in seed production due to limited human resources. Due to these challenges, the region produces less than what is demanded by individual countries. Most countries in the region have not implement guidelines on environmental and biosafety issues hence are at risk of sharing diseases and disease outbreaks. There are no or limited facilities and protocols for quarantine to support on farm and trans boundary movement of live aquatic animals yet importation of seed cannot be avoided for countries that allow such to fill the existing gaps for seed supply in other countries. There is therefore an urgent need for addressing the stated challenges to ensure that seed and broodstock are efficiently produced. Where possible, strategies for distribution and trade should be put in place to ensure that the sector is sustainable to fully achieve its potential.

Guidelines for Enhancing Transboundary Production, Trade and Distribution of Aquatic Animal Seeds and Broodstocks in Aquaculture Systems in Africa

Most African countries produce less and low quality seed than what is demanded by the countries hence relies on countries supporting each other through distribution and trade. Subsequent sections discuss strategies to be implemented in order to promote increased production of fry to enable trans-boundary trade and also procedures to follow to ensure that properprotocols for on farm and trans-boundary distribution of live aquatic animals are followed.

Trans boundary production of aquatic animal seeds and broodstocks

Production of seed and broodstock involves several procedures which include selection, production and management.

Broodstock Selection and Management

A major key to the success of any hatchery is the selection and replacement of broodstock and the following factors must be taken into account when selecting broodstock:

- Select younger brooders (1-1.5 years) to ensure reproductive efficiency and prolonged life. The broodstock should also be renewed after every three years or at the age of 4-5 years.
- Select highly-vigorous, well-fed brooders, feeble or diseased brooders must be avoided.
- Broodstock must be replaced periodically so as to maintain their superior reproductive performance.
- The replacement and renovation program must outsource broodstock from different areas to avoid in-breeding which may result in problems in fry development

Management of broodstock also has critical impacts on the health status and subsequent performance of seed (Mair, 2002). Broodstock source, health, genetic

make-up, maintenance and spawning methods affect quality of seed and performance. Husbandry of broodstock during maturation of the gonads is also likely to affect seed quality. Increased frequency of spawning and out of season production may also result in poor quality seed hence these practices should be avoided.

Broodstock management for genetically improved Brooders

Use of genetic tools and domestication programs to improve quality in terms of growth and disease resistance is another area which is seen increasingly important towards contributing to quality seed. Specific pathogen free (SPF) and specific pathogen resistant (SPR) programs are making a significant positive impact in enhancing the quality of seed. When spawning a genetically-improved fish strains, the hatchery operator must have adequate management knowledge and skills to avoid in-breeding and to maintain the genetically-improved traits (e.g. rapid growth). In-breeding results in reducing the quality and immune response of fry, making them more susceptible to disease. In addition, the reproductive performance of the brooders is reduced and subsequently their ability to produce genetically-improved seed.

Seed production and management

Production of seed (Fry and fingerlings)

Seed are usually produced in the hatchery. Poor husbandry practices during seed production, nursing, holding or transportation are believed to negatively affect the quality of seed and later performance. Spawning and hatching techniques that promote production of high quality, disease-free eggs and larvae should be of priority consideration in any hatchery. To achieve this, the design of the hatcheries and nurseries should consider the following:

i. Biosecurity
   The following should be done to ensure prevention of infections:
   - Water for the hatchery should be filtered and treated to prevent entry of disease carrying organisms and any pathogens present in the source water
   - Avoid poorly prepared outdoor rearing/nursing systems
   - Procedures for disinfection of hands, feet and equipment should be strictly followed to prevent cross contamination.
   - Stock the correct number of larvae and maintain optimum water quality conditions throughout the larval rearing process.

ii. Routine health monitoring to ensure that any potential problems are recognized early and interventions employed to rectify the underlying causes and prevent further spread.

iii. Use of good quality feed of right kind and optimizing feeding regimes. This helps maintain good water quality whilst promoting growth and high survival.

iv. Use of the right chemicals in the seed production systems.

Management of seed (Fry and fingerlings)

In order to ensure production and supply of quality seed to grow-out farmers, it is necessary to establish a set of best management practices (BMPs) and should include the following:

- Presence of essential infrastructure
- A biosecurity system
- Adequate clean water
- Responsible use of chemicals
- Correct feeding practices
- The assurance of the health status of stocks through in-house and laboratory testing.

Similar BMPs should also be developed for broodstock. Considering the fact that countries fail to meet the demand for seed, countries should also support each other at regional level through establishment of centres of excellence for seed production to safeguard sustainable fish production from aquaculture and broodstock improvement. A summary of strategies for aquatic animal seed and broodstock is presented in Table 4 below.

Table 3: *Summary of major strategies and guidelines for aquatic animal seed and broodstock production in Africa.*

Category	Value chain component	Constraints/issues	Guidelines
Inputs and supplies	Broodstock availability, quality and management	• Lack of good quality broodstock • Inefficient broodstock production facilities and systems • Improper broodstock management plans • Inadequate/non availability of broodstock development technology and equipment • Inadequate expertise	• Develop and maintain Best Aquaculture Management Practices (BAMPs) for broodstock identification • Strategies in place for technology development and improve accessibility to the required inputs for broodstock production centers • Implement Regional broodstock certification protocols developed • Follow guidelines and protocols for establishing and operating regional gene banks for existing and potential farmed species. • Implement guidelines on environmental and biosafety issues • Develop and implement clear biosecurity management and disease management plans at farm level to prevent disease outbreaks • Facilities and protocols for quarantine should be developed and made available to support on farm and transboundary movement of live aquatic animals. • Develop regional programs for broodstock improvement • Developed and implement regional capacity building programs for the broodstock and hatcheries operators
	Chemicals (hormone, medications and antibiotics)	• Challenges in identifying and sourcing of appropriate chemicals, handling, administration and disposal • Weak Legislation and enforcement	• Develop and disseminate a regional list of approved drugs and chemicals for use in aquaculture • Encourage and provide technical guidance sourcing, use, handling and disposal of the approved necessary drugs and chemicals • Farms should align their practices with existing local regulations and international standards on Implementation of protocol on handling and disposal of chemicals • Restricted chemicals and drugs should be handled and administered by authorized skilled personnel.
	Feeds	• Non availability and high cost of specific feeds for early life stages and breeders.	• Remove different procurement barriers and obstacles associated with accessibility of the special fry feeds.
Hatcheries	Hatcheries	• High cost of investment • Lack/inadequate infrastructure	• Financial initiatives and incentives to attract and encourage investments in hatcheries • Develop and implement cost effective appropriate hatchery technology

Category	Value chain component	Constraints/issues	Guidelines
		• Lack/inadequate skills and expertise in hatchery management • Inadequate biosecurity measures • Inadequate and inefficient delivery of relevant supporting services (veterinary, genetics) • Quality control issues • Lack of appropriate regional policy and • Inadequate biosecurity measures • Inadequate and inefficient delivery of relevant supporting services (veterinary, genetics) • Quality control issues • Lack of appropriate regional policy and governance frameworks for aquatic animal seed and broodstock production	• Quarantine conditions and protocols of newly introduced seeds or broodstock (stock taking, traceability) • Train personnel on basic biosecurity measures and verify effectiveness of training • Guidelines on Environmental and Biosafety issues dealing with production and farming of hybrids and nonnative (exotic) species • Develop and implement clear biosecurity management and disease management plans at farm level to prevent disease outbreaks • Facilities and protocols for quarantine should be developed and made available to support on farm and transboundary movement of live aquatic animals. • Develop coherent certification procedures on seeds at regional level

Transboundary trade and distribution of aquatic animal seeds and broodstocks

Trade in seed and broodstock usually carries some inherent risk of moving aquatic animal pathogens. Irresponsible movements still constitutes the major reason for the spread of infectious pathogens. Stakeholders in importing and exporting countries must respond to such inherent risk by developing and implementing strategies to reduce that risk to an acceptable level. Global standards, codes of practice and guidelines exist and provide certain level of protection against pathogen/disease risks associated with trans-boundarymovement of live aquatic animals and their products. One good example in the Asia-Pacific region is the development and adoption of regional guiding documents which take into full consideration the provisions of the WTO's Sanitary and Phytosanitary Agreement (SPS Agreement), the OIE Aquatic Animal Health Standards, as well as the FAO Code of Conduct for Responsible Fisheries (CCRF). Responsible trading, with partnership and responsibilities shared between importing and exporting countries is a major task that will reduce the risks of serious aquatic animal pathogen introduction and spread. Stakeholders intending to move seed of exotic aquatic animals need to adopt more effective risk management measures, resulting from the risk analysis process.

Harvest and transport of seed should be done with great care and with minimum stress to minimize mortalities and transfer of diseases. The development of simple BMPs for actors in the seed distribution chain can be of significant value to minimize stated challenges. Development of local specific interventions to tackle the issue of handling and distribution would lead to some innovative practices, which can contribute to considerable improvements in quality and seed availability. Table 4 below gives a summary of major strategies and guidelines for aquatic animal seed and broodstock trade and distribution in Africa.

Table 4: *Summary of major strategies and guidelines for aquatic animal seed and broodstock trade and distribution*

Category	Value chain component	Constraints/issues	Guidelines
Trade and distribution	Imported seeds Trade	• Disease introduction • Poor delivery of veterinary services • Lack of quarantine infrastructures and skills • Uncertainty of the impact on indigenous species of the eco system (biodiversity) • Inadequate transportation • Policy and governance issues • Certification, identification and traceability of seeds specially veterinary certification system • Weak implementation of OIE standards/ Regulations • Intra and international trade issues	• Develop Regional functional quarantine and diagnostic facilities and skills • Restrictions to be prepared (fact sheets, flyers, etc.) and applied to the importation of exotic species • Adopt the international standards and guidelines related to fish movement (FAO, OIE, CODEX, AU-IBAR, WorldFish, etc.) • Harmonize (domesticate) standards to facilitate trade in the region • Implement provision of delivery of certification and traceability documents for the imported live aquatic animals • Build capacity of both public and private sectors on the interpretation and implementation of regional and international regulations and standards
	Distribution and transportation	• Inadequate live fish transportation and handling infrastructure • Transfer of disease • Lack of appropriate transportation policy guidelines • Authorization and permit • Lack of Standards on hauling and holding tanks • Lack of appropriate suppliers • Lack of best management practices	• Update appropriate transportation policy guidelines and BAMPs. • Facilitate access to permits and licenses to transport fish and fry in between different zones and regions • Declarations on movement of fry and fingerlings by the fish farmers associations and cooperatives. • Proper specification and characteristics of holding and transferring tanks clearly identified.

Conclusion

These guidelines for transboundary production, distribution and trade of fish have been formulated after rigorous consultations facilitated by AU-IBAR through the FishGov project. If implemented successfully, these guidelines and strategieswill increase production of fish from aquaculture in Africa and fill the demand that is growing.

References

1. ***Briggs, M., Funge-Smith, S., Subasinghe, R. & Phillips, M., 2004.*** Introductions and movement of Penaeusvannamei and Penaeusstylirostris into Asia and the Pacific. Bangkok, FAO Regional Office for Asia and the Pacific. RAP Publ. 2004/10, 92 pp.
2. ***FAO. 2017.*** Fishery and Aquaculture Statistics. Global aquaculture production 1950-2015 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2017. www.fao.org/fishery/statistics/software/fishstatj/en

3. ***Machena, C. and Moehl, J., 2001.*** African Aquaculture: A reginal summary with emphasis on Sub-Saharan Africa, pp. 341-356. In R.P. Subasinghe, P. Bueno, M.J. Phillips, C. Hough, S.E. McGladderyand J.R. Arthur (eds.). Aquaculture in the Third Millennium. Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000. Bangkok, NACA Rome, FAO.
4. ***Little, D.C., Satapornvanit, A. and Edwards, P., 2002.*** Freshwater fish seed quality in Asia, pp. 185-195. In P.Edwards, D.C.Little and H. Demaine (eds.). Rural Aquaculture. UK, CABI Publishing.
5. ***Mair, G. 2002.*** The supply of good quality fish seed for sustainable aquaculture. Aquaculture Asia 7: 25-27.
6. ***Rodgers, C.J., 2001.*** Risk Analysis in Aquatic Animal Health. Proceedings of an International Conference held in Paris, France, 8-10 February 2000. Paris, France, World Organisation for Animal Health. 346 pp.
7. ***El Naggar G.O., 2014.*** Regional Guidelines for the Production, transboundary distribution and trade of aquatic animal seed and brood-stock. Draft report, Agricultural Research Center (ARC), Egypt.
8. ***AUC-NEPAD. 2014.*** The policy framework and reform strategy for fisheries and aquaculture in Africa. Nairobi, Kenya: African Union – Interafrican Bureau for Animal Resources.
9. ***Bhujel, R.C., 2012.*** Partnership for African Fisheries (PAF) Aquaculture Working Group: Strategic review on aquaculture seed supply. University of Stirling, UK.
10. ***AU-IBAR (2017)*** African Union Continental Plan of Action for Aquaculture Development

Prepared by:
Professor Emmanuel Kaunda
Lilongwe University of Agriculture and Natural Resources (LUANAR)
P.O. Box 219, Lilongwe, Malawi
Email: ekaunda@bunda.luanar.mw

Note: This Working Paper is a synthesis of series of reports based on activities implemented by AU-IBAR under the project 'Strengthening Institutional Capacity to enhance governance of the fisheries sector in Africa', Project number: DCI-FOOD 2013/331 -056' funded by the EU.

Citation: AU-IBAR, 2018. Working Paper : Enhancing Transboundary Production, Trade and Distribution of Aquatic Animal Seeds and BroodStocks In Aquaculture Systems In Africa

African Union – Interafrican Bureau for Animal Resources (AU-IBAR)
Kenindia Business Park, Museum Hill, Westlands Road
PO Box 30786-00100 Nairobi, Kenya.
Tel: +254 (20) 3674 000
Fax: +254 (20) 3674 341 / 3674 342
Email: *ibar.office@au-ibar.org*
Website: *www.au-ibar.org*