Review of disease control in aquaculture in the Republic of South Africa

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Summary: The disease control measures in respect of domestic and wildlife aquatic species in the Republic of South Africa (RSA) are shared between two Directorates in the Department of Agriculture. The Directorate of Animal Health is responsible for disease control measures in respect of Salmonidae, while the Directorate of Plant and Quality Control regulates the introduction of exotic and unwanted aquatic species into the RSA. The activities and interests of commercial aquaculture are coordinated through the South African Aquaculture Organization and a national coordinating committee under the control of the national Department of Agriculture.

Four diseases of trout are notifiable under the terms of the Animal Diseases Act (Act 35 of 1984), namely viral haemorrhagic septicaemia, infectious pancreatic necrosis, infectious haematopoietic necrosis and bacterial kidney disease. The zoosanitary measures in respect of these diseases require State intervention after detection of occurrence. Sampling procedures for the diagnosis of diseases, maintenance of the disease-free status of trout farms accredited for export purposes and requirements for the import of ova are based on the standards recommended in the International Aquatic Animal Health Code of the Office International des Epizooties.

Zoosanitary control of other aquatic species not related to aquaculture – especially ornamental fish – may be unnecessary. An embargo, through existing legislation on the importation of unwanted species, has been the only means of protecting inland species.

The author concludes by evaluating the need for, and the feasibility of, additional legislation for the zoosanitary control of other aquatic species.


INTRODUCTION

During the 1980s, aquaculture became firmly established in the Republic of South Africa (RSA) as a small but dynamic industry. This followed a difficult teething period during the 1960s and 1970s (6).

In the past, a wide range of agencies have been involved in providing research, extension and other support services to aquaculture in the RSA, while others have

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performed certain regulatory functions to further the interests and needs of the industry. To rationalise the wide range of State and parastatal activities, and to provide the industry with a less formidable array of liaison points, an investigation into the servicing of the industry by the State was conducted by the Commission of Administration (4, 6, 7). This investigation resulted in the formation of a specific model to replace existing mechanisms which affected the industry and defined the nature of aquaculture in the RSA. Aquaculture as such is clearly a farming activity; like other farming activities, aquaculture emphasises the production of unrefined food products, produces animals or plants under controlled conditions, and manipulates both species and growth media to optimise production (9). Following the investigation, in 1990, by the then Commission of Administration, aquaculture was officially recognised as a farming activity and, as such, became the responsibility of the Department of Agriculture; trout producers thus gained access to the services available to other agricultural practices in their areas (4). Under the interim Constitution of the RSA, most of these functions – except statutory control over the import and export of live fish, ova or gametes – have been delegated or assigned to Provincial authorities.

**BRIEF OVERVIEW OF AQUACULTURE PRODUCTION**

Despite the relatively large size and long coastline (approximately 3,000 km) of the RSA, some geographical and climatic features impose severe restrictions on the development of both freshwater aquaculture and mariculture. Freshwater habitats in the RSA are relatively scarce, and the wide seasonal fluctuations in water temperature over most of the interior preclude the profitable culture of warm water species, while the summers are too warm for the year-round culture of salmonids (6). The environmental conditions for trout culture in the RSA are marginal. Ideal sites are largely restricted to high altitude areas with suitable year-round water temperature profiles (5).

At present, freshwater aquaculture in the RSA is dominated by the culture of fish, primarily rainbow trout (*Oncorhynchus mykiss*), which is produced in land-based or cage-culture production units (4). The farming of carp (*Ctenopharyngodon idella*), tilapia (*Oreochromis mossambicus*) and other species has never seemed to attain the same commercial vigour as the trout industry, while the culture of mussels and oysters may be more viable. At present, approximately eighty varieties of ornamental fish are produced and marketed in the RSA (6).

Commercial aquaculture in the RSA mainly involves fish, shellfish, crocodiles and aquatic plants. The total national retail value of aquaculture for 1989/1990 was estimated at R62 million (US$25 million) (6). Table I shows the relative contribution of each of the above categories, together with the number of producers and volume of production of the most important commercial aquaculture species.

**AQUACULTURE LEGISLATION**

Disease control *per se* in aquaculture in the RSA is applicable only to salmonids, while species of other aquatic animals are required to be ‘free from diseases and parasites’ in accordance with the import permits issued by the Directorate of Plant and
TABLE I

Production, retail value and number of commercial aquaculture species in the Republic of South Africa *

Adapted from Hecht and Britz (6)

<table>
<thead>
<tr>
<th>Species</th>
<th>Production (tonnes)</th>
<th>Retail value (as % of total value)</th>
<th>Number of producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ornamental fish</td>
<td>17</td>
<td>15.01%</td>
<td>11</td>
</tr>
<tr>
<td>(80 species)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trout (Oncorhynchus mykiss)</td>
<td>1,023</td>
<td>24.5%</td>
<td>36</td>
</tr>
<tr>
<td>Catfish (Clarias gariepinus)</td>
<td>438</td>
<td>4.2%</td>
<td>15</td>
</tr>
<tr>
<td>Shellfish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mussels (3 species)</td>
<td>1,960</td>
<td>34.4%</td>
<td>4</td>
</tr>
<tr>
<td>Oysters (Crassostrea gigas)</td>
<td>427</td>
<td>14.7%</td>
<td>10</td>
</tr>
<tr>
<td>Crocodiles</td>
<td>50</td>
<td>1.9%</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>(2,500 skins)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterblommetjies</td>
<td>300</td>
<td>3.4%</td>
<td>7</td>
</tr>
<tr>
<td>(Aponogeton distachyos)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* estimated figures for 1989/1990

Quality Control of the Department of Agriculture. This Directorate has no jurisdiction on animal health matters. Thus the permits issued for the importation of aquatic species (other than for salmonids) under the terms of the Agricultural Pests Act 1983 (2) are primarily aimed at preventing the introduction of, inter alia, any vertebrate member of an animal species – or eggs or gametes of such species – or any plants which are not indigenous or native to the RSA. This Act makes provision for a so-called ‘blacklist’ of prohibited species, while the health certification required by the Act is very vague and is not in conformity with any acceptable international code or guideline.

In each of the nine Provinces of the RSA, the Provincial Nature Conservation authority has the legal prerogative to accept or refuse the introduction or release of certain aquatic species within the waters of the territory under its jurisdiction. No specific health certification is required, however, except in respect of salmonids; permission to introduce salmonid ova is subject to health certification requirements issued by the Directorate of Animal Health.

The introduction of aquatic animal species or their eggs, intended for mariculture, is controlled by the Sea Fisheries Act 1973 (1) which is administered by the Department of Environmental Affairs, and contains the same vague health certification requirements as the Agricultural Pests Act. The Sea Fisheries Act excludes, by definition, species of aquatic animals intended for culture or farming in inland freshwater areas.
The Animal Diseases Act 1984 (3) defines fish, ova and the gametes of salmonids as an 'animal', and thus all zoosanitary requirements under the Act are equally applicable to salmonids. This legislation was initiated after the need for disease control in salmonids was identified by the South African Trout Farmers' Association during the early 1980s, when trout farming was recognised and accepted as an agricultural industry. The zoosanitary control measures thus formulated were intended to be preventive rather than restrictive, to enable a young and growing industry to gain momentum, while simultaneously protecting a fragile industry.

Four diseases of trout are notifiable in terms of this Act, namely viral haemorrhagic septicaemia (VHS), infectious pancreatic necrosis (IPN), infectious haematopoietic necrosis (IHN) and bacterial kidney disease (BKD). The zoosanitary measures in respect of these diseases require State intervention after detection of occurrence, quarantine, inspection, depopulation where necessary, etc. The Act also regards as notifiable - by default – any disease of salmonids which is foreign to the RSA. Sampling procedures for the diagnosis of diseases, maintenance of the disease-free status of trout farms accredited for export purposes, and requirements for the import of ova, are outlined in the Regulations of the Act. These requirements were drafted and formulated in accordance with the recommended standards of the OIE International Animal Health Code.

**RATIONALE FOR ZOOSANITARY CONTROL OF SALMONIDS IN THE REPUBLIC OF SOUTH AFRICA**

Surveys conducted in the major trout-producing areas, and on all farms involved in the export and import of ova, confirmed the absence of the four notifiable diseases (5). The primary aims of the current zoosanitary control measures are thus to prevent the introduction of these diseases into the RSA and to maintain the disease-free status of accredited trout farms. Without an official quarantine facility for imported ova, a high premium is placed on the integrity of the exporting country and its adherence to the ethics of export certification. Although a representative sample of imported ova is screened for the absence or presence of the notifiable diseases for salmonids, release of the ova is permitted pending the results of the screening tests. Although this can be regarded as a risk, imports are only allowed from countries which can meet all the import requirements.

The zoosanitary requirements of the OIE stipulate that all consignments of imported salmonid ova must be accompanied by a health certificate signed by an authorised veterinarian of the exporting country, dated no more than seven days before the intended date of export, and certifying that:

a) representative samples of the broodstock from which the imported eggs originate were inspected and tested for VHS, IPN and IHN during the current spawning season and for the previous two years, at intervals of approximately six months, in accordance with internationally-accepted sampling and diagnostic procedures

b) all the stock at the farm was found to be free of these diseases over the past two years

c) the ova to which the certificate relates have been incubated since fertilisation in water which was free from the spores of *Myxosoma cerebralis* (the causative agent of whirling disease)
d) the batch of ova was disinfected immediately before export, in accordance with internationally-accepted methods.

The issuance of an import permit for salmonid ova by the Directorate of Animal Health is also subject to a declaration by the applicable Provincial Nature Conservation authority, stating that it has no objection to the importation and release of the particular species of trout.

The fact that the major exporting countries of salmonid ova are in the northern hemisphere, together with the fact that - in the United Kingdom, Europe and the Scandinavian countries - they are restricted to exporting ova mainly during the summer months, creates unique marketing opportunities for potential exporters in the RSA. The South African Trout Farmers' Association immediately seized this opportunity, requesting the Directorate of Animal Health to exercise some form of control over the export of ova. Although it is the prerogative of the importing country to determine the conditions of export and to accept whatever health certification it may deem fit, the Association managed to establish a Code of Ethics for farmers intending to export salmonid ova.

A system for the accreditation of premises of potential exporters was initiated to support the established Code of Ethics. The aim of the scheme was to establish a nucleus of units producing trout ova which conform to OIE standards, and thus to facilitate the export of disease-free ova to other parts of the world and provide other trout farmers in the RSA with disease-free ova and fingerlings. The scheme is open to trout farmers who can fulfil the following requirements:

a) the facility must be supplied either by a closed water source (e.g. spring, fountain or borehole), or by a protected water source (e.g. river, stream or dam) with no feral (wild) fish upstream

b) all trout farms upstream must be of an equal or higher health status than the participating farm

c) no introductions of fish or ova originating from establishments with a lower disease status than the introducer should take place at any time

d) no fish or ova (for a hatchery) originating from lower disease status establishments will be kept on the premises of the participating producer at any time

e) facilities and management should be of a high standard, and full co-operation should be given to officials of the Directorate of Animal Health who collect samples and inspect the facility

f) all samples must be collected and despatched by an authorised official, and may be examined only at a laboratory accredited for that purpose by the Directorate of Animal Health

g) to attain certification status, the whole unit must be subjected to a minimum of two years of testing at six-monthly intervals (at least one test per year should be in the breeding season, to enable the sampling of broodfish or ovarian fluid)

h) if only one of these tests reveals the incidence or suspected incidence of disease, the producer will have to start the procedure anew

i) regular farm inspections must be conducted by an authorised veterinarian, the minimum being four inspections per year, two of which may coincide with visits to collect samples
after two years of negative testing, an ova-producing unit is issued with a certificate of good health by the Directorate of Animal Health – the status of the certificate is maintained by regular farm inspections and twice-yearly testing of the premises

A database of all accredited premises will be maintained by the Directorate of Animal Health and the accredited laboratories.

A total of eight producers were accredited in accordance with the above requirements. The severe drought experienced in Southern Africa between 1992 and 1995 has decreased the number of active participants in this scheme to only three at present.

CONCLUSION

The preventive rather than restrictive nature of both the import requirements and the accreditation scheme for export purposes was well accepted by all producers of trout ova. Similar requests were recently received from potential importers of grass carp (*C. idella*), while there is continued pressure to initiate some form of disease control for the importation of ornamental fish. The extension of the zoosanitary measures in respect of other farmed aquatic species should be evaluated if and when the need arises. However, the Directorate of Animal Health has always been hesitant to initiate or enforce zoosanitary control for the importation of ornamental fish, as it is doubtful whether this function can be executed in a way which guarantees the disease-free status of premises where ornamental fish are kept or produced.

The regulatory control instituted in South Africa during the late 1980s was a novel exercise guided by the sentiment and guidelines embodied in the OIE *International Animal Health Code* and the experience of countries such as the United Kingdom. Now, for the first time, an *International Aquatic Animal Health Code* (8) is available; this fulfils a need felt by all OIE Member Countries involved in aquaculture. This *Code* will be of enormous benefit and will help the establishment of zoosanitary control and the application of the principles and sentiments of the *Code* to aquatic species which are not yet subjected to such control measures.

*LUTTE CONTRE LES MALADIES SÉVISSANT EN AQUACULTURE DANS LA RÉPUBLIQUE D'AFRIQUE DU SUD. – G.K. Brückner.*

*Résumé*: Dans la République d'Afrique du Sud, la lutte contre les maladies des espèces aquatiques domestiques et sauvages relève de deux directions du ministère de l'Agriculture. La direction de la santé animale est responsable des mesures de prévention des maladies des salmonidés tandis que la direction phytosanitaire et du contrôle de qualité réglemente l'introduction d'espèces aquatiques exotiques et indésirables dans la République. Les activités et intérêts de l'aquaculture commerciale sont coordonnés par l'Organisation sud-africaine d'aquaculture et un comité national de coordination placé sous l'égide du Département national de l'agriculture.
Quatre maladies des truites doivent faire l'objet d'une déclaration aux termes de la Loi sur les maladies animales (n° 35 de 1984), à savoir la septicémie hémorragique virale, la nécrose pancréatique infectieuse, la nécrose hématoïétique infectieuse et la rénibactériose. Les mesures zoosanitaires relatives à ces maladies impliquent une intervention de l'Etat dès l'apparition d'une maladie. Les procédures de prélèvement pour le diagnostic des maladies, le maintien de la qualification « indemne » pour les élevages de truites agréés aux fins d'exportation et les conditions applicables à l'importation d'œufs se fondent sur les normes recommandées dans le Code sanitaire international pour les animaux aquatiques de l'Office international des épidizooties.

Les contrôles zoosanitaires des espèces aquatiques non liées à l'aquaculture (notamment les poissons d'ornement) ne sont peut-être pas indispensables. L'embargo imposé en vertu de la législation existante sur l'importation d'espèces indésirables a été le seul moyen de protéger les espèces nationales.

L'auteur évalue, en conclusion, la nécessité, et la possibilité pratique, de proposer des textes de loi supplémentaires pour étendre le contrôle zoosanitaire à d'autres espèces aquatiques.


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PROFILAXIS EN ACUICULTURA EN LA REPÚBLICA DE SUDÁFRICA. – G.K. Brückner.

Resumen: En la República de Sudáfrica, dos Direcciones generales del Ministerio de Agricultura comparten responsabilidad en cuanto al control de las enfermedades de las especies acuáticas, tanto salvajes como domésticas. A la Dirección de Sanidad Animal competen las medidas de control sanitario relativas a los salmonídos, mientras que la Dirección de Plantas y Control de Calidad regula la introducción en el país de especies acuáticas exóticas e indeseables. Las actividades e intereses de la acuicultura comercial son coordinados por la Organización Sudaficana de Acuicultura (South African Aquaculture Organization) y por un comité nacional de coordinación, dependiente del Departamento nacional de Agricultura.

Según establece la Ley de Enfermedades Animales (Ley 35 de 1984), las enfermedades de declaración obligatoria que afectan a la trucha son cuatro, a saber: septicemia hemorrágica viral, necrosis pancréatica infectiosa, necrosis hematopoética infecciosa y renibacteriosis. Las normas zoosanitarias relativas a estas cuatro enfermedades exigen la intervención de la autoridad pública apenas se detectan los primeros casos. Los procedimientos de muestreo para el diagnóstico de enfermedades, los requisitos para que se mantenga el estatuto de «libre de enfermedad» en los viveros de truchas acreditados para la exportación y las normas reguladoras de la importación de huevos se basan en las normas recomendadas por el Código sanitario internacional para los animales acuáticos de la Oficina
Internacional de Epizootias. El control zoosanitario de especies acuáticas no relacionadas con la acuicultura –en especial el de los peces ornamentales– puede resultar innecesario. Un embargo, aplicado a través de la legislación existente sobre importación de especies indeseables, ha constituido hasta ahora el único medio de protección de las especies nacionales.

El autor concluye con una evaluación de la necesidad y viabilidad de disposiciones legislativas adicionales para el control zoosanitario de otras especies acuáticas.


REFERENCES