

# Simulated aquatic animal disease outbreaks: a tool for improving responses to emergencies

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## Summary

Simulated disease outbreaks are vital tools for preparing administrative and functional responses to emergencies. Three aquatic emergency response exercises conducted in Australia are summarised. The principal lesson learned from these exercises was the need for coordination, improved communication and a whole-of-government approach. An enhanced understanding of the legislative instruments required for a response, insights into human factors such as staff rostering, training, counselling and provision of assistance packages were also obtained. Developing a sense of overconfidence about preparedness arrangements (as a result of having tested specific, planned scenarios) must be avoided. Emergencies occur infrequently and erratically; conducting exercises is a vital component of planning processes that ensure that responses to emergency events are effective.

## Keywords

Aquatic biosecurity – Aquatic animal disease outbreak – Australia – Emergency response exercise – Simulation exercise.

## Introduction

In an environment of increased world trade, passenger movement and the threat of climate change, nations face new challenges from pests and diseases (19, 38). Diseases and pests can decrease production, cause loss of trade opportunities, pose risks to human health and animal welfare and degrade environments (10). Australian aquatic industries are at high risk from diseases: some industries are geographically concentrated, making disease transmission or pest infestation of an entire industry possible; industries are often located in isolated areas, making responses logistically difficult to mount; and key species are often endemic and have unknown disease susceptibility, making risks difficult to assess. The costs associated with managing diseases and invasive species are high (1). Evidence suggests, however, that the effects of

even the most serious emergencies can be mitigated by preparedness and appropriate responses (46), which should be proportional to risk. Economic evaluation of the costs of emergency response programmes for managing serious diseases shows that such programmes are cost-effective (40), even for large-scale responses (41), and form a valuable part of sustainability frameworks (47). Immediate response, therefore, is economically the best option, increases confidence in management agencies and minimises long-term losses. It is clear that emergency disease response is a vital part of management systems that safeguard animal production and the social, economic and environmental values that these systems support.

Mounting effective responses is supported by planning and rapid decision-making (17). Governments in Australia have acknowledged their key role in managing

emergencies (2) and have developed systems to coordinate responses to aquatic animal health emergencies. AQUAPLAN is Australia's strategic plan for aquatic animal health and incorporates strategic aspects of emergency response. AQUAPLAN is in its second phase, with the current AQUAPLAN 2005-2010 following on from AQUAPLAN 1998-2003. AQUAVETPLAN (7) complements AQUAPLAN and is a series of technical response plans that describe the proposed approach to aquatic disease emergencies in Australia. AQUAVETPLAN provides guidance based on risk analysis and links policy, implementation, coordination and emergency management plans. These plans undergo broad review and endorsement to ensure that a consistent approach to responses is adopted nationally.

Relatively few disease events with broad socio-economic or environmental impact have occurred in the Australian fishing and aquaculture industries. As a result, government and industry staff have had relatively little real-life experience in implementing AQUAVETPLAN and other emergency management policies and procedures (23).

Emergency response simulation exercises are a relevant way to test emergency response plans in the absence of real emergency events. This article will review the development of simulation exercises as emergency planning and preparedness tools and describe, with reference to three exercises that have been conducted in Australia, how the lessons learned from these have changed aquatic animal health emergency management in Australia. Terminology used throughout this document is from the glossary of the AQUAVETPLAN Control Centres Management Manual (14).

## Planning simulated aquatic animal disease outbreaks

This article does not describe in detail how to plan, conduct and review simulation exercises, as this information is available elsewhere (15). It is important, however, to note that substantial effort is required to plan and conduct such an exercise. Building the scenario, outlining the key decisions that should be made and defining criteria for assessment are vital for successful exercise outcomes. It is important that the aims of the exercise are clear prior to attempting to describe the scenario. Elements of the exercise that must be clearly defined include:

- the purpose of the exercise (51)
- the procedures and plans that are being tested (and those that are not being tested) (12)

- the monitoring and assessment methodology to be used (25).

It is important that the scenario is well defined and that the scope of the exercise is clear before it begins. The timeframe in which the exercise is to be conducted needs to be judiciously considered; it is stressful for staff to be required to undertake a large number of tasks in a very short space of time, but it is also unrealistic to assume that a real emergency will always unfold slowly (12).

The exercise must be conducted in a manner that ensures that exercise communications and actions are not mistaken for real events and so that any real events that occur are not mistaken for exercise components. Such 'Rules of engagement' are required for all exercises, so that clarity is maintained for the duration of the scenario. It is critical that the exercise is monitored and assessed throughout by staff who are not participating in the exercise. The most appropriate responses of participants to scenario events (based on the plans that are being tested) should be noted for the exercise control and assessment staff in the preparatory material (9).

It is also important to consider the style of simulation exercise. The most appropriate style of exercise will depend on the aims and objectives of the exercise, and a combination of styles can be used to address different elements of the scenario. The three main styles are:

a) Discussion exercises – These exercises are focused on discussing and exploring a scenario, and as such can be more open and flexible than other styles of exercise. Discussion exercises can be conducted with fewer people, usually at a lower cost, and it is possible to hold this type of exercise away from the operating environment (15).

b) Functional exercises – These exercises take place in the operational environment and require the participants to perform their roles. In this way, the exercise can provide good insight into how trained participants perform under pressure, and whether protocols and procedures which are agreed on paper work well in practice. This style of exercise is sometimes called a desktop exercise or a 'tactical exercise without troops' (15).

c) Field exercises – These exercises involve participants implementing response actions 'on the ground'. Participants in this type of exercise perform their role as in a functional exercise; however, where their role calls for response work (such as collecting samples) the work is actually done (15). Field exercises are useful in testing the logistics of a response, e.g. access to services required to support an emergency response, such as transport links and computer hardware, can be tested.

All principal aspects of emergency management can be simulated and tested in an exercise with sufficient

planning, scenario-building and participants and assessors that are sufficiently trained in the required roles. These aspects include:

- adequacy and integration of plans at the local, inter-jurisdictional and international level
- the administrative and logistical arrangements in existence to support the response and response planning
- communication
- disease control and risk assessment policies
- trade management arrangements, including reporting
- recovery processes, including socio-economic relief, counselling and finalisation of emergencies (i.e. the point at which the Competent Authority declares the emergency over; generally when either the disease has been eradicated or it has been decided that the disease is ineradicable and ongoing management measures aimed at containment, including quarantine and zoning, have been established) (33).

Laboratory aspects of emergency response can be tested through ring tests using known infected and control materials to assess the efficacy of diagnostic tools for specific pathogens (6). In emergency management systems that are in the early stages of development, exercises are extremely useful for defining roles and responsibilities, training designated officers in their roles, managing communication and testing support systems such as administrative assistance, information management systems and organisation of personnel.

## The Australian experience

Since 1998, Australia has conducted a series of aquatic animal disease simulation exercises. The exercises were first prioritised in the initial phase of AQUAPLAN (1998-2003). Programme four of this plan, Preparedness and Response, sought to improve the emergency disease response capability and capacity of Australia's state and territory authorities through the development and testing of effective arrangements to manage aquatic animal disease emergencies (23, 52).

The initial exercises involved individual states and addressed a range of issues, from the state-wide coordination of an emergency aquatic animal disease event to the response at the individual property level (23). Following these exercises, a national exercise was held. The following three examples describe the organisation of different simulation exercises in Australia. Note that the information below describes simulation exercise events only; the events are fictional.

### Exercise Acheron

Exercise Acheron was named after the River Acheron ('river of pain'), which according to Greek mythology was one of the five rivers that separated Hades from the world of the living. The exercise was a two-day functional exercise involving participants from the Western Australian (WA) government and from the marron (*Cherax tenuimanus*) and yabby (*C. destructor*) industry. As a functional exercise, Exercise Acheron provided participants with the opportunity to practise the roles and actions they would be expected to undertake during a response.

This exercise was aimed at increasing capability within the Department of Fisheries WA and the WA crayfish industry to manage emergency disease incidents by:

- increasing participants' knowledge and understanding of communication channels and operational procedures that should be implemented in an emergency disease response
- clearly defining the roles and responsibilities both within and between government agencies and industry associations
- identifying key areas for improvement in emergency management procedures (52).

The scenario for this exercise was a fictional outbreak of crayfish plague (*Aphanomyces astaci*) on a fictitious marron farm in the Margaret River area of WA and involved the simulated spread of the disease to a population in an adjacent natural waterway (52). Crayfish plague is exotic to Australia.

Exercise Acheron also provided an opportunity to integrate two existing crayfish plague projects: the development of a standard diagnostic test for crayfish plague, and the development of an AQUAVETPLAN disease strategy manual for crayfish plague (52). AQUAVETPLAN disease strategy manuals address specific diseases that have been identified as important to the Australian aquaculture industry, in this instance crayfish plague. The manuals contain information on the nature of the disease and the principles of control and eradication. Each manual also includes the preferred strategy that would be implemented to control and eradicate an outbreak of the disease in Australia. The development of the crayfish plague manual involved consultation with governments and industry public meetings (52). The simulation exercise provided an opportunity to demonstrate that this type of consultation is beneficial for the planning process and that government implementation is heavily dependent on ensuring the viability of plans prior to their finalisation.

## Exercise Bubbling Goose

South Australian Government emergency response exercises have been entitled 'Exercise [Name] Goose' for some time. This system of naming exercises was chosen by Garry MacPhie, the Department of Primary Industries and Resources South Australia (PIRSA) Emergency Management Coordinator, to aid in avoiding confusion between exercises and real events. Exercise Bubbling Goose was a discussion exercise held in Adelaide to examine the administrative aspects of responses to two fictitious outbreaks of iridoviral diseases, namely, an outbreak of gourami iridovirus in native freshwater fish in a billabong (oxbow lake) adjacent to a river, and an outbreak of red sea bream iridoviral disease (RSIV) in marine finfish grown in sea-cage aquaculture. Gourami iridovirus and RSIV are exotic to Australia. In both cases, the scenario involved an alert phase with suspicion of disease followed by the detection of the pathogen and the potential spread of disease to wild populations of fish.

The principal aim of the exercise was to test the PIRSA Emergency Response Documents: Aquatic Health (the PIRSA Aquatic Health Plan) (21) and its interaction with components of AQUAVETPLAN. The PIRSA Aquatic Health Plan had been drafted based on an existing state emergency response framework and the AQUAVETPLAN Control Centres Management Manual (14). Other considerations were to increase awareness of roles in emergency response and the need for communication in a response involving a large management team. The discussion exercise led participants through the scenarios and participants described the outcomes that could be achieved and the actions that would be required to achieve those outcomes. This was followed by an analysis of the discussions and a debriefing.

## Exercise Tethys

In Australia, marine and freshwater environments cross state and territory boundaries, and effective inter-jurisdictional cooperation and communication is critical for successful disease control and eradication. As these issues had not been addressed in the previous state-based simulation exercises, Exercise Tethys was conducted as Australia's first multi-jurisdictional simulation exercise focused on the aquaculture industry (23). The simulation was named after the Greek goddess of fresh water.

Participants in Exercise Tethys represented the Australian Government, several states and territories and three aquaculture industry associations. The exercise was intended to be a major test of the emergency management framework developed under AQUAPLAN and the participants' understanding of, and familiarity with, this framework (23).

The scenario for this exercise was a disease event on a fictitious silver perch (*Bidyanus bidyanus*) aquaculture facility within the Murray-Darling Basin. The scenario was designed to ensure the need for inter-jurisdictional communication. The Murray-Darling Basin was ideal for such an exercise because it extends over five eastern and south-eastern states and territories, including several hundred kilometres over which the Murray River marks a political border between states. The Basin is one of Australia's most important agricultural regions. Forty-one percent of the value of the nation's gross agricultural production is derived from the Basin, much of which is produced using irrigation water from the Basin's rivers (43). Management of the Basin is overseen by a special commission and associated ministerial council (44). By focusing on a native fish species, Exercise Tethys also provided an opportunity to examine the engagement of government agencies responsible for management of the Australian freshwater environment (23).

To imitate information accumulation during disease detection, Exercise Tethys was preceded by a short lead-in phase. During this lead-in phase, participants received daily information bulletins containing information about the central incident and fictitious response actions taken as the fictitious events unfolded (for example, the results of a visit to the farm by a government aquaculture officer). These bulletins provided valuable background information on the initial activities that participants could draw on during the exercise proper. The exercise was held over two days, with both days representing different times during a response: day one was the time at which the first laboratory results indicated the presence of an exotic disease, and day two was a time four days later when laboratory results confirmed the presence of the disease (23).

## Lessons learned: putting them into practice

As a result of conducting these (and other) simulation exercises, a number of lessons have been learned about the management of emergency aquatic animal disease incidents. Exercises result in an increased awareness among participants of the potential impacts of these incidents, an improved understanding of what emergency preparedness, planning and response activities really involve, and a deeper appreciation of how important they are.

### Inter-jurisdictional coordination

Diseases can spread rapidly in aquatic environments, and in open systems there are few viable means of control.

Political boundaries are not relevant for the spread of aquatic diseases. Coordination of a response across political boundaries is critical if a disease agent is transmitted across those boundaries; if no transboundary spread occurs, coordination is still required to implement consistent approaches to quarantine and containment.

Australia is a federation: the Commonwealth has responsibility for quarantine, trade and international affairs and coordinates national emergency responses. Under the Constitution of Australia Act 1901 (the Australian Constitution), the states are responsible for emergency management within their borders. In the event of an aquatic animal disease emergency, however, the international community and trading partners will assess Australia's disease control efforts, reporting and transparency about the event by its national response, not the response of state or territory governments or individual agencies (18). This administrative arrangement and potential repercussions make inter-jurisdictional coordination critical for management of disease events and maintenance of export markets. To aid in the national coordination of emergency responses, the Aquatic Consultative Committee on Emergency Animal Diseases (AqCCEAD) was established in 1998 and coordinates the national technical response to aquatic animal health emergencies in Australia (53). This committee was modelled on the existing consultative committee for terrestrial animal diseases and is chaired by the Australian Chief Veterinary Officer. In the event of a disease event, AqCCEAD can be brought together quickly to provide a link between the Australian Government and states and territories, sharing information about an event and providing technical advice on proposed response measures.

The Australian Government Department of Agriculture, Fisheries & Forestry (DAFF) has conducted training courses in the operation of AqCCEAD (53). These courses were attended by state and territory government officers and members of aquaculture industry associations who could be invited to participate in AqCCEAD in the event of an emergency in their industry sector. Through a series of presentations and short exercises, the facilitators explored how jurisdictions work together through AqCCEAD to respond to different types of aquatic animal disease emergencies. The courses also provided guidance on the role and responsibility of each member, and the involvement of industry as observers and technical experts (53).

The involvement in AqCCEAD of state and territory governments has been tested through the state-based simulation exercises, and the full AqCCEAD framework was tested during Exercise Tethys. The outcomes of these exercises have been an improved understanding of the AqCCEAD framework and the responsibilities of the

committee and improved involvement of members in the committee operations. The functionality and support structure of the committee were also reviewed, and recommendations for enhancing the committee have been addressed by DAFF, who provide the CCEAD secretariat.

In working together to provide a multi-jurisdictional (simulated) response, the working relationship between government agencies is enhanced, and officers in all agencies improve their understanding of the roles and responsibilities of each agency (52). In large organisations, staff from a single administrative division may encounter staff from other areas of the same division who they have not worked with previously (52).

### **Whole-of-government approach**

It has been noted that integration of all government activities is essential for achieving satisfactory outcomes in emergencies (12). In many Australian states, local governments have a formal role in emergency management and develop local government emergency risk management strategies and emergency management plans. Local governments are an integral part of the national agricultural emergency arrangements. This is coordinated through various state government departments and through the state emergency management arrangements. Local government activities are sometimes outside the scope of exercises; however, they form a vital part of the nationally integrated response and therefore need to be included in emergency arrangements (18). Through Exercise Bubbling Goose, the involvement of local government provided vital fine-scale knowledge of relevance to all aspects of the proposed response.

Emergency management exercises have shown that during a response, issues may go beyond the actions needed to directly manage the disease. Repercussions are likely to extend into industries and regions beyond those directly affected, for example social recovery and the tourism industry (8). Broad coordination of all levels of government is required and has been improved by emergency management exercises. As a result of these exercises, were a major emergency to occur in an Australian aquatic environment, there would be a whole-of-government response to the event, linking Commonwealth, local and state governments in a coordinated manner.

The potential impacts of aquatic animal diseases on environments are enormous. For example, the effects of crayfish plague – where it has established – on lentic and lotic ecosystems have been disastrous (3, 39). Therefore, crayfish plague is listed as one of the hundred worst invasive species by the World Conservation Union (36). Despite the potential impacts on the aquatic environment,

it is difficult to attract representatives from key conservation agencies to participate in simulation exercises (52) and to participate in aquatic animal health planning and management in general. This aspect of participation should be examined further and methods to engage with these and other environmental stakeholders must be developed. Government agencies whose responsibilities include environmental protection and management are critical contacts for aquatic emergency responses. More environmental contacts were added to the PIRSA Aquatic Health Plan following Exercise Bubbling Goose.

## Communication

The importance of communications in all emergency responses cannot be underestimated: in all the aquatic animal exercises described above, as well as in several exercises run in terrestrial animal sectors, it was consistently identified as the most critical factor for success. In an emergency response, there are two types of communication to consider. Firstly, there are inter-agency and inter-jurisdictional communications (23). The measures that enhance inter-jurisdictional coordination described above cannot function without adequate communication. Secondly, communication with the public and the media is also important, as emergency disease responses generate significant public and media interest (18). The exercises described above indicated that it is vital to have an effective and agreed media strategy during a response. A strategy must take into account multiple audiences and levels of communication, the public interest and psychological effects on society. Communication methods employed during crises are based largely on case studies and experience (24), although more formal theories are beginning to be used to develop communication systems, including the use of chaos and group psychology theory to manage the evolution of rumours during crises (13, 42). The use of such measures was investigated in the communications plan that was developed during Exercise Bubbling Goose. Consideration of psychological effects is particularly important when response and control measures are required that may be viewed by some as drastic (12).

As a result of Exercise Tethys, government agencies with responsibility for aquatic animal health have been integrated into the National Communications Network (NCN). The NCN members are communication managers from all Australian government agencies with responsibility for agriculture, including Commonwealth, state and territory governments, the Australian Local Government Association, key national industry groups and the Commonwealth Science and Research Industry Organisation.

In a disease event, the NCN is able to respond quickly to the direction set by the National Emergency Animal

Disease Management Group (NMG), a high-level management group that establishes the national approach to disease response. The NCN then establishes a strategy for communications for the emergency response. The NCN also shares information (for example, management and response decisions, draft media releases and disease fact sheets) across the nation, making efficient use of existing resources to potentially reach hundreds of agencies in a fast moving response (20).

Exercise Tethys provided an opportunity to review the established operating guidelines for the AqCCEAD. This review affirmed that the guidelines were appropriate and ensured the effective organisation of committee operations, although it was suggested that the secretariat investigate alternative methods for distributing information to different authorities and agencies during a response, for example the use of secure Internet sites. These actions will ensure that AqCCEAD members receive information in a timely fashion and templates for documents commonly used in emergency responses (e.g. situation reports) have been developed to ensure consistency in information collection across jurisdictions and responses.

## Legislative instruments

The mortalities of sardines (*Sardinops sagax*) observed in Australasia in 1995 (32) and 1998 (27) highlighted insufficient preparedness for aquatic animal health emergencies in Australia and elsewhere. In Australia, these events were a precipitating factor for the development of AQUAPLAN 1998-2003. One significant factor that was observed to diminish the efficacy of the response to the sardine mortalities and the responses in the exercises described above is legal responsibility and the applicability of legislative instruments. Government administrative units that manage fisheries, livestock, ocean environments, water and control of the use of agricultural and veterinary chemicals are all vital in responding to aquatic animal health emergencies, but without adequate preparedness and awareness of responsibilities under legislative controls, the efficiency of the response is diminished (48). It is vital that response agencies have a clear definition of what measures can be taken in a response and what instruments empower the agencies to implement these measures (52). Emergency exercises are valuable for defining requests for legal advice about emergency response and may point to areas where legislative and policy reform could enhance the efficiency and efficacy of a response. Exercises conducted in Australia have shown that in an emergency it is vital for combat agencies to operate pursuant to legislation that permits:

- zoning of surveillance and control areas
- access to areas of interest

- identification of all farms and farmed stock within zoned areas
- control of stock and wildlife movement within and between zones (even if water currents or other such movements may spread an infectious agent naturally)
- destruction and disposal of stock where necessary
- control of wildlife (animals that are not farmed) where necessary
- access to information about stock movements, farm management and husbandry practices.

In addition, adequate staff with the necessary delegated powers must be available and those staff must be aware of their legal powers and obligations.

Subsequent to Exercise Bubbling Goose and other aquatic emergency response exercises, PIRSA Aquaculture, PIRSA Fisheries and PIRSA Animal Health developed a consolidated summary document of legal powers of relevance to aquatic emergencies. Delegated powers under the Livestock Act 1997 (South Australia) were also reviewed and additional staff were trained and given formal approval to act as Livestock Inspectors for aquatic species. It has also been requested that relevant administrative divisions external to the lead agency investigate the legal requirements in their areas of responsibility for activities that may need to be carried out in emergencies, e.g. exclusion of the public from government owned land (Crown Land), isolation of farmed or wild stock, and destruction, disposal and decontamination.

The ability to manage risks posed by disease outbreaks on the environment is also vital. It is often overlooked because protection of valuable farmed and commercially fished resources takes precedence during a response. The risks posed by disease to aquatic environments also differ from the risks in terrestrial environments; wild-capture fisheries are often of equal or greater value than farm operations. Furthermore, many cultures regard waterways as common property with considerable social value for recreation, aesthetics and even national identity; the response framework must be adequate to protect these values.

## Human resources

It has been acknowledged that emergency response situations are stressful for staff. Responders can experience trauma through being rapidly and abruptly moved to tasks associated with an emergency response. Lasting psychological trauma can be induced by remaining in such situations for an extended period (5, 37). Implementation of staff changes for surge capacity can also be extremely disruptive to agencies and businesses. Managing these

issues is critical when staffing an emergency response. In aquatic systems, responses often extend over a lengthy period because of the limited options for containment and control (16). Emergency management exercises can identify an agency's surge capacity (including the number of staff required to mount an effective immediate and ongoing response), provide some information to gauge the cumulative impact that managing an emergency situation can have on personnel and point to steps that can be taken to ameliorate the stress and psychological impact of participating as an emergency responder (26). It is difficult to test surge capacity due to the planned nature of exercises (i.e. when they will occur is known), but this can be achieved by planning exercises and drawing staff into the scenario without prior notice. It is often difficult, however, to remove staff from their normal tasks if the emergency is not 'real'.

## Counselling and assistance packages

Another aspect of human resource management during emergencies involves stakeholders affected by the event. It is important to recognise that the effects of an event will extend beyond the actual response to the event (29). The destruction of stock and impediment to business activity (sometimes for extended periods) are known to be stressful. This stress may affect the ability of an individual to cope with the situation and plan for the challenges that must be faced (28). Emergency management exercises can be used by responding agencies to develop access to counselling and psychological support resources that may not normally be a part of their operation.

Emergency management exercises can be used to investigate the long-term effects and recovery-phase activities of emergencies, such as the need for industry assistance, the impact of the event on growth and investor confidence and competition from unaffected producers (29). Many of these issues were examined in Australia's banana growing industry after Cyclone Larry (34), and these case studies could be used to develop a model for rebuilding aquatic industries after an emergency.

## Increasing and enhancing technical expertise

Disease simulation exercises provide an opportunity to increase the number of staff trained in response planning and procedures, providing a larger pool of staff to draw on during a 'real' response. Integration of generic emergency management processes across agencies is a valuable way of increasing staff availability for a response (50). Exercise Bubbling Goose identified that staff trained in any type of emergency management adapted to an aquatic emergency response role more quickly than untrained staff, even those who had specific aquatic animal health expertise. After a

number of aquatic emergency response exercises, PIRSA Aquaculture is developing a training programme for aquatic emergency response, emphasising awareness across all relevant agencies, specific technical skills in local disease control centre (LDCC) staff and refining the principles of field level response using AQUAVETPLAN.

Exercise Bubbling Goose highlighted the lack of knowledge about iridoviruses among South Australia's aquatic health experts. In particular, even among experts, it was not known which laboratories had validated diagnostic tests for specific viruses. The capacity of laboratories with validated tests to receive large numbers of samples in a short period of time was also unknown. Australia's aquatic animal health expertise base is small and specific expertise is generally found in only one or two places. The only laboratory with specific expertise for a disease event could be more than 5,000 km from the site of an emergency, which would create associated logistical problems caused by the need to transport diagnostic material. These issues have led to a proposal for a National Network of Aquatic Animal Health Laboratories. Such a network could assist authorities in responding quickly to an emerging (21) or significant disease agent because the network would quickly identify the most appropriate laboratory facility to receive diagnostic material, i.e. in terms of diagnostic expertise, location, appropriate transport links and established sample submission protocols.

### **Industry involvement**

The involvement of industry in simulation exercises and all emergency response training exercises is essential. The confidence that stakeholders have in management agencies is influenced by their real and perceived preparedness for an emergency (38). The need for close liaison between government and industry was highlighted during Exercise Acheron, when some farmers were surprised to find that the proposed government response would immediately affect their farming enterprises, despite the (fictional) outbreak being some distance from their own properties (52). While they may not always agree with government decisions, it is important that industry members understand and appreciate the decision-making process and its legal basis. The support and cooperation of industry in successfully managing an aquatic animal disease event are essential (11, 23). The report from Exercise Tethys supported the involvement of relevant industries in future exercises at both the state and national level (23).

To make response and disease management decisions that can be effectively implemented in the field, governments need to have a good understanding of the technical and operational aspects of industries affected by the response.

Industry involvement provides an opportunity for government officers at all levels to enhance their knowledge of industry production technologies, farming or harvest timetables and other important aspects of industry operations, and how these parameters affect the choice and implementation of appropriate response measures (52). Simulation exercises have also highlighted to these groups how rapid reporting of disease events contributes to a more efficient and effective response, providing benefits to the aquaculture sector as a whole (52). They have also demonstrated governments' ability to manage these responses, and their commitment to continuous improvement of Australia's emergency preparedness and response capability. Exercises also serve to build trust and foster working relationships between government departments and industry associations (52).

The involvement of observers from other government authorities or relevant non-government organisations (for example, volunteer organisations that may be enlisted to aid in a response) in both simulation exercises and general preparedness and awareness activities should also be encouraged.

### **Training prior to exercises**

The exercises discussed above indicated that more general emergency response training should be held in participating jurisdictions prior to future exercises. Awareness of the local and national emergency management arrangements varied prior to the exercises. Each exercise indicated that more training and education would improve exercise functionality and enhance the efficiency of real responses. Education must also be provided to staff in senior management positions (23). This requirement has been observed in other sectors. In the lead-up to Exercise Eleusis (on avian influenza), a series of preparatory events were held nationwide. These preparatory activities provided an opportunity to identify and focus on key issues for a response prior to the main exercise, allowing time to address gaps or problems (18). Some emergency management experts consider these exercises to be of equal, if not greater, importance than the major exercise, as it provides an opportunity to heighten awareness of and address deficiencies in emergency arrangements (personal communication, P. Koob, Department of Agriculture, Fisheries and Forestry, Australia). It is important not to consider previous exercises as lead-up exercises for different or larger events, except in the broadest sense. This is particularly valid if the previous exercises were held a significant time period (years) earlier, or if the earlier exercises tested different objectives and plans. Subsequent to a range of emergency response exercises, the South Australian Government has initiated a process of ongoing formal and informal training for staff in nominated emergency response positions.

## The greatest benefit

One of the greatest benefits that result from conducting simulation exercises is that staff receive training in the roles and responsibilities in an emergency environment before they are required to respond to a real event (23). Preparedness of this type is vital in a real emergency (46) and can help alleviate stress. Participants of Exercise Acheron and Exercise Bubbling Goose identified the clarification of the events that would occur during a major aquatic animal disease emergency as the most significant positive outcome of those exercises. Prior to these exercises, many members of staff at State Disease Control Headquarters had not participated in a real emergency response or a simulation exercise (52). The perceived assistance from exercises, however, may differ significantly between staff at dissimilar levels of responsibility. The additional confidence and understanding of processes may also only be apparent when a real emergency is faced.

## Implementing change

Making recommendations is of little value unless they are implemented (4). Lasting improvement requires changes to be put into practice using defined guidelines and with a broad base of understanding and support (30). It is important to consider whether the outcomes of specific emergency response exercises are more broadly applicable and if they are, whether it is practical to enact those recommendations. In particular, disease eradication is not always possible, practical or cost-effective. Guidelines have been produced for risk based emergency management and these were used as a basis for AQUAVETPLAN (49). AQUAVETPLAN Disease Strategy Manuals emphasise a range of specific outcomes (eradication, containment, zoning and surveillance) as options in emergencies. It is important when undertaking an emergency response that this range of options is available and considered within a functional, planned emergency response framework, irrespective of which options 'worked' in exercises.

Systems and personnel in emergency management roles are usually well adapted to managing change and recommendations arising from simulation exercises are typically implemented effectively. It is still important to manage changes in the approach taken to emergency response efficiently and this is often best achieved using small working groups (22). In agencies whose involvement in specific emergency responses is peripheral, it is important to maintain regular contact so that an over-reliance on the planning process, associated documents and having conducted exercises do not hinder the ability to respond (35, 45). In particular, there is a natural tendency even in lead agencies to assume that the existence of a plan and prior conduct of exercises equate with preparedness.

The planning process can be severely undermined by a lack of resources, trained staff and good decision-making. Similarly, while it is important to recognise the benefits that proactively testing different disease scenarios provide, it is impossible to know whether these scenarios will occur and unfold as predicted. It is common to derive overconfidence from having tested specific scenarios, and training should be tailored so that this is avoided (29). The emphasis on ensuring that an appropriate response framework exists should not overshadow the importance of risk mitigation, planning and prevention activities. These are also vital for reducing the overall level of risk. Prevention remains a more effective biosecurity tool than response, particularly in aquatic environments where the challenges for mounting a successful response, as outlined above, are considerable.

Issues associated with implementing the outcomes of emergency management exercises often involve the allocation of resources, rather than a lack of in-principle support for the activities. Resource needs for emergency management should be documented and continually reviewed if effective response mechanisms are to be activated in a real event. The recommendations from Exercise Bubbling Goose included the development of a schedule of resources required to maintain aquatic animal health response capabilities and a proposed outline for accessing the South Australian State Biosecurity Fund.

It is obvious during exercises whether planning and other strategic documents require updating. Following Exercise Acheron, the WA Department of Fisheries updated their emergency response plan and the Aquaculture Council of Western Australia recognised the need to develop a plan for its role in industry communication during a major disease emergency (52). PIRSA's Aquatic Health Plan is reviewed annually, but a number of specific salient changes were made as a result of Exercise Bubbling Goose. One prominent change was the development of an informal staff briefing document containing criteria for initiating investigations, classification of events as emergencies, practical instructions on many aspects of emergency response and a checklist for activities during different phases of a response.

Emergency response exercises that are well planned and analysed often show that while crisis management is handled well, the long-term, strategic decisions are often handled poorly or put aside until later (12, 31). The long-term impacts of disease outbreaks, pest incursions and other aquatic emergencies can be momentous, and the value of designing hierarchies for decision-making that can both respond to the immediate crisis and plan strategically for the future cannot be overstated.

## Conclusions

Continuous improvement in managing aquatic animal diseases is vitally important to maintain the viability of fisheries and aquaculture industries and to protect environments and native fauna. Simulation exercises are valuable tools for enhancing the effectiveness of responses to disease outbreaks and incursions, by training, testing and improving people, plans and frameworks. Simulation exercises provide an effective mechanism to continually improve emergency response capabilities, increase awareness of biosecurity and aid in addressing risks posed by threats.

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## Exercices de simulation de foyers de maladies des animaux aquatiques : un outil pour améliorer la réponse face aux urgences sanitaires

M.R. Deveney & K.J. Scott

### Résumé

Les exercices de simulation de foyers de maladie sont des outils essentiels pour préparer correctement les réponses aux situations d'urgence sanitaire, tant au niveau administratif qu'opérationnel. Les auteurs présentent brièvement trois exercices conduits en Australie pour tester la réponse en cas d'urgence sanitaire affectant les animaux aquatiques. Le principal enseignement de ces exercices est la nécessité d'avoir une bonne coordination, d'améliorer la communication et d'adopter une approche gouvernementale intégrée. Les exercices ont également permis de mieux comprendre la nécessité d'encadrer ces réponses au moyen d'instruments législatifs appropriés et d'élucider les facteurs humains tels que les problèmes de répartition des tâches, de formation et d'orientation et les programmes de soutien destinés au personnel. Il convient d'éviter que le fait de tester des scénarios spécifiques et planifiés d'avance n'entraîne une confiance excessive dans les procédures de réponse. Les urgences surviennent de manière espacée et imprévisible ; la conduite des exercices est un aspect crucial des opérations de planification visant à garantir l'efficacité des réponses en cas d'urgence.

### Mots-clés

Australie – Biosécurité du milieu aquatique – Exercice de réponse en cas d'urgence – Exercice de simulation – Foyer de maladie affectant les animaux aquatiques.



# Simulación de brotes infecciosos en animales acuáticos como instrumento para mejorar la respuesta en caso de emergencia

M.R. Deveney & K.J. Scott

## Resumen

La simulación de brotes infecciosos es una herramienta básica para preparar la respuesta administrativa y operativa en caso de emergencia. Los autores describen brevemente tres ejercicios realizados en Australia para responder a emergencias sanitarias en animales acuáticos. La principal conclusión que se extrajo de ellos es que se requieren coordinación, una mejor comunicación y un planteamiento unificado de todas las instancias gubernamentales. Los ejercicios sirvieron también para entender mejor los instrumentos legislativos necesarios para responder a este tipo de emergencias, así como la influencia del factor humano (turnos de personal, formación, asesoramiento y suministro de paquetes de asistencia). Conviene evitar un exceso de confianza en los mecanismos de preparación (lo que suele derivarse del hecho de haber ensayado el dispositivo en determinadas situaciones hipotéticas, concretas y planificadas). Las emergencias surgen de modo infrecuente y errático, por ello la realización de ejercicios es un componente vital de los procesos de planificación que deben garantizar una respuesta eficaz en caso de emergencia.

## Palabras clave

Australia – Bioseguridad acuática – Brote infeccioso en animales acuáticos – Ejercicio de respuesta de emergencia – Ejercicio de simulación.



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