

Water and the environment

A manual for fish kill investigations in SA

South Africa's first comprehensive fish kill manual is now available from the Water Research Commission (WRC).

Background

Large-scale fish mortalities have become a common phenomenon that occurs world-wide. Although such large-scale mortalities can be as a result of natural phenomena and life cycle-related activities, human-related influences such as pollution and terrestrial and aquatic modifications are increasing the scale and magnitude of such events.

As fish are regarded as sentinel species and are an important food source for many local communities, fish mortalities are often interpreted by the public as a measure of the health of the aquatic resource, and large-scale mortalities are inferred as a failure of regulatory mechanisms to ensure the maintenance of a healthy ecosystem.

Large-scale fish mortality events are very visible when they occur in well frequented locations, and as a result often cause considerable public interest and concern, particularly with anglers, land owners, government departments and the media, and evoke an emotional response in many communities.



As a result, an understanding of the causes and mechanisms of mortality events and why they occur is fundamental in order to implement preventative measures that will reduce their frequency and magnitude, particularly in the case of anthropogenically-influenced mortalities.

The WRC fish kill guide

In essence, a fish kill investigation is a tool that is available to the water resource manager, water pollution control officer or land owner to use in determining possible management actions that are required to ensure the maintenance of a sustainable aquatic ecosystem.

It is, however, important to understand that it is often difficult to determine the exact causal mechanism of a fish kill event definitively without undertaking large-scale experiments and artificially manipulating various factors so as to understand how different stressors interact.

Instead, investigators are often required to infer possible causal links and mechanisms following field-based observations and utilising the correct laboratory-based procedures and available scientific literature to reduce uncertainty and increase accuracy of the inference through a multi-disciplinary approach.

The aim of a fish kill investigation protocol is to streamline the investigation and reporting of an incident so as to limit delays in terms of appropriate management decisions and prevention of future incidents. Such a protocol should also ensure that key information and data gathering is not neglected when urgently responding to a situation.

The WRC fish kill manual adapts and refines current internationally-applied minimum protocols and local guidelines for fish kill investigations specifically for the South African

context. It also seeks to set out recommended minimum requirements for each stage of a fish kill investigation, including preparedness (pre-incident phase), determining the need for further detailed investigation (trigger phase), the detailed investigation and reporting activities (investigation phase) and post-event requirements (closure phase).

In summary, the report provides:

- Guidance as to the common or potential causes of fish kills in South Africa
- A standardised minimum protocol to fish kill investigations in South Africa
- A field guide to the interpretation of results obtained during fish kill investigations and
- Standardised field-based information capturing and reporting templates for fish kill investigations in South Africa.

Causes of fish mortalities

The study includes detailed descriptions of the common causes of fish kills in South Africa, including natural and anthropogenic causes, and the role of infectious agents in fish kills, thereby highlighting the complexities associated with fish kill investigations and aiding in the determination of the causal mechanisms of such events.

Proposed national protocol for fish kills

A fish kill investigation protocol should follow a logical process, aim to streamline the investigation and reporting of the incident, and promote a consistent national approach in response to such incidents so as to limit delays in terms of appropriate management decisions and prevention of future incidents. It should also ensure that key information and data gathering is not neglected when urgently responding to a situation.

The following steps are proposed:

- Pre-incident phase
- Trigger phase
 - ♦ Collection of relevant information
 - ♦ Identification of lead party
 - ♦ Determining the need for further investigation
- Investigation phase
 - ♦ Collection of site-based information
 - ♦ Sample collection

- ♦ Chain of custody
- ♦ Preliminary investigation report
- ♦ Detailed incident investigation
- ♦ Site cleanup
- Stand-down phase

Field and laboratory techniques

Analytical chemical analysis of water sampled has made, and continues to make, valuable contributions to the field of aquatic science and fish kill investigations. However, assessment of chemical composition only provides information on the chemical makeup of the water at the precise time of sample collection.

As such, it must be understood by the investigator that although direct toxicological examination of the water forms an integral part of the investigation, the causal mechanism may no longer be present at the time of investigation.

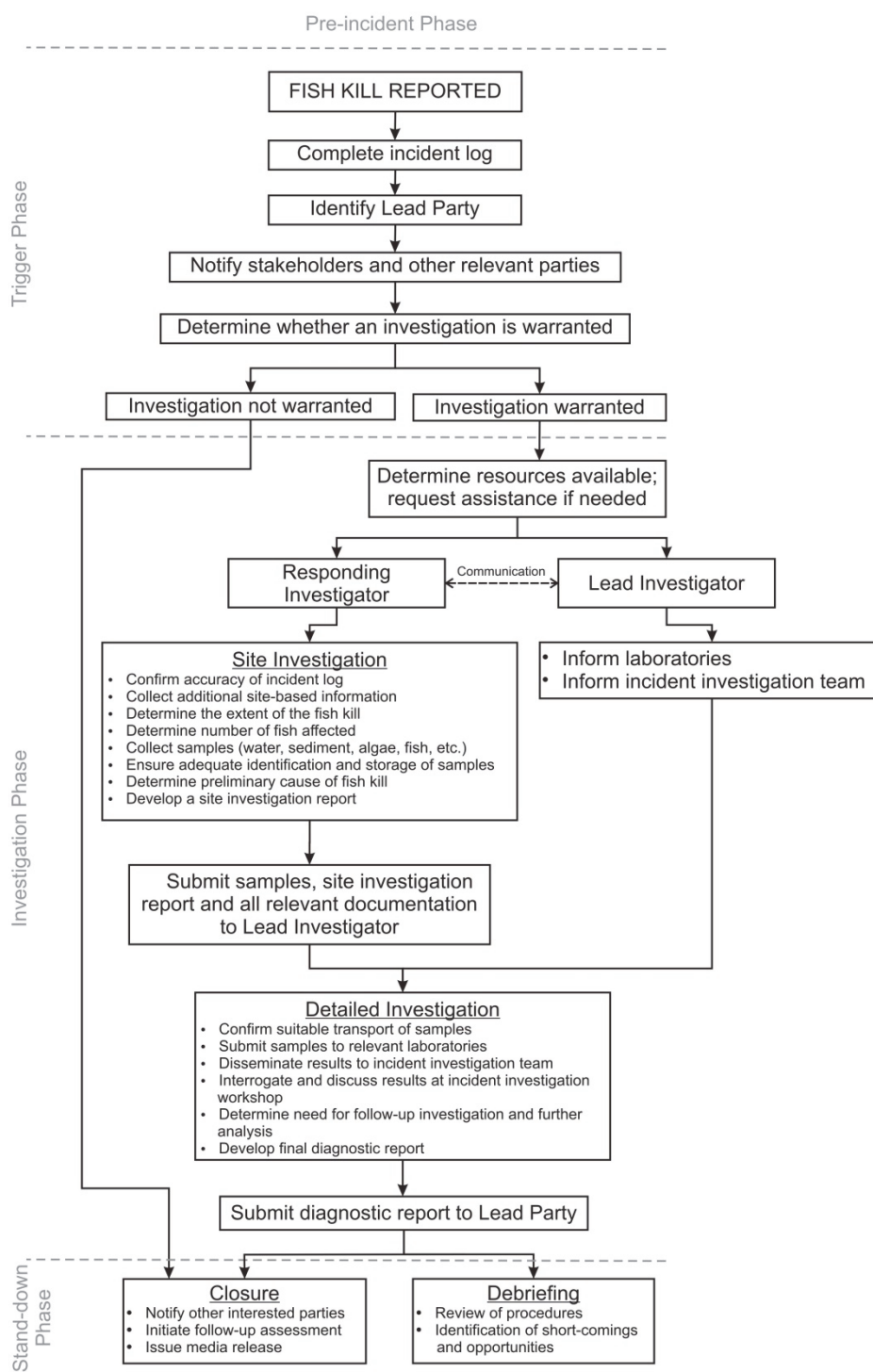
In all cases, as many different types of samples as is possible/practical must be collected from within, upstream and downstream of the area associated with the fish kill in order for subsequent laboratory analyses to provide as much relevant information as possible to help the investigator differentiate between naturally occurring events and those connected to anthropogenic activity.

In addition to sampling techniques, the manual also provides the recommended contents of a fish kill investigation kit, a standardised fish kill investigation form to be completed during the site investigation so as to ensure that all the information necessary to determine the causal mechanism is captured, a dichotomous key for the preliminary diagnosis of the mechanism of the fish kill, and a list of suitable techniques for the preservation, storage and transport of samples collected during a fish kill investigation.

The study further provides a list of analytical and veterinary laboratories that may be contacted in the event of a fish kill, including contact details.

Further reading:

To order the report, *A Manual for Fish Kill Investigations in South Africa* (Report No. TT 589/14) contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.



Fish kill investigation protocol.