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Spring viraemia of carp (SVC) in the UK: The road to freedom

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ABSTRACT

Spring viraemia of carp (SVC) is a disease of international importance that predominantly affects cyprinid fish and can cause significant mortality. In the United Kingdom (UK), SVC was first detected in 1977 with further cases occurring in fisheries, farms, wholesale and retail establishments throughout England and Wales (but not Scotland, where few cyprinid populations exist, nor Northern Ireland where SVC has never been detected) over the subsequent 30 years. Following a control and eradication programme for the disease initiated in 2005, the UK was recognised free of the disease in 2010. This study compiles historic records of SVC cases in England and Wales with a view to understanding its routes of introduction and spread, and assessing the effectiveness of the control and eradication programme in order to improve contingency plans to prevent and control future disease incursions in the cyprinid fish sectors.

Between 1977 and 2010 the presence of SVC was confirmed on 108 occasions, with 65 of the cases occurring in sport fisheries and the majority of the remainder occurring in the ornamental fish sector. The study found that throughout the history of SVC in the UK, though cases were widely distributed, their occurrence was sporadic and the virus did not become endemic. All evidence indicates that SVC was not able to persist under UK environmental conditions, suggesting that the majority of cases were a result of new introductions to the UK as opposed to within-country spread.

The control and eradication programme adopted in 2005 was highly effective and two years after its implementation cases of SVC ceased. Given the non-persistent nature of the pathogen the most important aspect of the control programme focused on preventing re-introduction of the virus to the UK. Despite the effectiveness of these controls against SVC, this approach is likely to be less effective against more persistent pathogens such as koi herpesvirus, which are likely to require more stringent measures to prevent within-country spread.

1. Introduction

Spring viraemia of carp (SVC) is a disease of international importance that predominantly affects cyprinid fish and is principally associated with mortality in carp (*Cyprinus carpio*). The disease is caused by a rhabdovirus that was first identified in Europe, but has been the cause of significant mortality events in populations of susceptible species around the world (Ahne et al., 2002). According to the International Database on Aquatic Animal Diseases (http://www.cefas.defra.gov.uk/idaad/) the virus has been detected with varying incidence in 14 European Union (EU) member states and 25 countries outside of the EU. Four subgroups of SVC virus (SVCV) are known to exist, and these can be separated based on their genotype

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and geographic origins. Three are regarded as European subgroups and the fourth as an Asian subgroup (Stone et al., 2003; Miller et al., 2007).

The virus is listed by the World Organisation for Animal Health (Office International des Épizooties – OIE), and until 2006, was listed under EU legislation (Council Directive 1991/67/EEC) allowing Members States (MS) to establish a control programme for the disease. Under later EU legislation (Council Directive 2006/88/EC) that was transposed into UK legislation in 2009, SVC is no longer listed. However, under article 43 of this directive, MS can maintain controls if they are declared free, or are undergoing a control and eradication programme, and consequently can restrict imports of susceptible species from countries with a lower health status for SVC. The United Kingdom (UK) is one such country that has successfully controlled the virus and has been recognised by the EU (using the criteria specified under 2006/88EC and other related directives) as having freedom from SVC. This recognition of freedom relates to all fish populations residing within the country, though was largely based on the results of active surveillance on farmed populations holding susceptible species, with other populations (fishery and ornamental fish) generally only being tested if there was suspicion that the pathogen may have been introduced.

The UK cyprinid industry is complex, with several interesting interactions between sectors (Peeler and Taylor, 2011). It is predominantly based in England and Wales and can be broadly divided into two main sectors: sport (coarse) fish and ornamental fish. Within these sectors the following subgroups can be recognised: dealers,[1] farms, recreational sport fisheries (which are normally enclosed lakes with little or no connection to the river network), wholesalers[2] and retailers.[3] All currently have different levels of responsibility in terms of recording movements of fish on or off their sites, and movements between sectors occur for a variety of reasons.

In the UK, SVCV was first detected in England in 1977 in a batch of mirror carp held at a university facility (Bucke and Finlay, 1979). In 2005 the UK officially entered a programme of control and eradication for the virus (EC Decision 2004/453/EC). This was implemented by the Fish Health Inspectorate (FHI) based at the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and involved: restrictions on imports of susceptible species from SVC positive countries, a targeted surveillance programme for SVC on fish farms and imported fish, and investigation of sites with reported disease outbreaks or suspicion of SVC.

Surveillance of fish farms was conducted in accordance with European Council directive 91/67/EEC (until superseded by directive 2006/88/EC), which required the routine testing of farm sites once every two years. In order to maximise the likelihood of detecting the pathogen, this directive required surveillance to be conducted during the high risk period for SVC disease, when water temperatures were between 10 and 17 °C (Ahne et al., 2002). Active surveillance was not conducted on fisheries, which were only tested if mortality was reported, or they were known to have received fish from (or be connected to) sites suspected of having, or testing positive for SVC. Sites under suspicion of infection were automatically issued a temporary statutory notice prohibiting the movement of fish on or off the site until the results of diagnostic testing were known. These restrictions were also placed on any water not deemed as being epidemiologically distinct from a suspect site. Testing was conducted on susceptible fish species (as listed by the OIE) using cell culture with confirmation by reverse transcription polymerase chain reaction (RT-PCR) (Stone et al., 2003), as described and validated in accordance to the standards documented by the OIE (Office International des Epizooties, 2009). In line with the criteria set out under EU directive 2001/183/EC (and 92/532/EEC prior to that), 30 samples, each comprised of pooled tissues from five individual fish would be taken by a Cefas Fish Health Inspector from units across the site, focussing on moribund and diseased fish. This approach provided a 95% chance of detecting the pathogen if present in the population at $\geq$10%, assuming the test method is 100% sensitive and specific.

Sites confirmed as being SVC positive (by cell culture and PCR), were required to cull their entire stock and disinfect the premises to the satisfaction of the FHI before restrictions were lifted. Culling was not required to occur within a specified time period, but positive sites (and those associated with them) were not able to trade until its satisfactory completion. For sites choosing not to cull and disinfect by the end of the temporary restrictions notice (normally 30-days), or for those sites for which this was not practical (such as in the case of extensive fisheries), a long term statutory order restricting the movement of fish onto and off a site would be applied and information detailing the location of the affected site put in the public domain. Such controls prohibited movements of susceptible species on to sites for a minimum of one year and not prior to the site testing negative for SVCV. Sites would be tested during the high risk period for SVC disease, and movements of fish off the site were prohibited until three consecutive negative annual tests had occurred. After this time the statutory regulations were lifted on approval from the UK governments Department for Environment, Food and Rural Affairs (Defra). Any sites known to have supplied, or received susceptible species to or from a confirmed SVC positive site were also tested by the same methods as suspected sites. Since 2007, no further cases of the disease in open water systems (fisheries and farms) were observed, and in 2010 the UK achieved disease freedom for SVC (EC Decision 2010/221/EC). However, in 2011 there was a single isolated SVC case in an enclosed fishery (a lake not connected to the river network). This was successfully eradicated and spread prevented through the prompt culling of fish stocks, the disinfection and fallowing of the site, allowing the UK to retain its SVC free status.

Due to the complex industry structure and long period between the introduction of SVC and achieving freedom

[1] Dealers that collect and move fish from a fishery to another fishery, possibly via a holding site.

[2] Supply retail premises with fish that will be sold to hobbyists. Fish held by wholesalers are either imported or supplied by farms.

[3] Supply fish to the public for stocking in tanks or ponds.