

Testing for the occurrence of pilchard herpesvirus (PHV) in South African sardine *Sardinops sagax*

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Abstract

Catches of South African sardine *Sardinops sagax* have declined in recent years from about 200 000 t harvested annually during the period 2002–2006 to less than 100 000 t. Consequently, some companies are now importing sardine from sources elsewhere in the world to meet local demand for canned sardine and bait. This importation has the potential for the introduction of sardine pathogens, in particular the pilchard herpesvirus (PHV), which could have a negative impact on the currently small South African sardine population. The aims of the current study were to determine whether PHV is present in the local sardine population and to assess the extent to which sardine is being imported into the country and whether imported fish are from countries where the virus is known to be endemic. Fish sampled from South Africa's western ($n = 150$), southern ($n = 182$) and eastern ($n = 96$) putative stocks of *S. sagax* were analysed for the presence of PHV using real-time quantitative polymerase chain reaction (qPCR). The origin and amount of potentially infected material imported into South Africa during the period 2010–2014 was also assessed. None of the South African sardine collected during this study tested positive for PHV, suggesting that active PHV was not prevalent in the local population of *S. sagax* at the time of this study. Between 56 000 and 71 000 t of frozen sardine was imported annually into South Africa from countries where *S. sagax* occurs, including some from areas (Australia and New Zealand) where sardine infection by PHV is known to be endemic. Hence, it is plausible that the PHV pathogen, capable of perpetuating infections in local sardine populations, could be imported into South Africa along with the importation of frozen sardine. Should local sardine be naïve to the virus, as suggested by this study, then the population is at risk of infection and precautions against such must be taken.

Introduction

Sardine or 'pilchard' *Sardinops sagax* is a small pelagic fish species, the global distribution of which includes southwestern Africa, where it is the main target species of the South African purse-seine fishery and has been harvested since the late 1940s (Beckley and van der Lingen 1999). Annual sardine catches have ranged from 16 000 to 410 000 t, with catches in excess of 200 000 t per year taken during the periods 1959–1965 and 2002–2006. Since 2008, however, annual sardine catches have declined to below 100 000 t, following a reduction in the sardine population size (DAFF 2014). Mass mortalities of *S. sagax* and other clupeid species have been recorded globally from as early as the 1900s (Jones et al. 1997).

imported frozen clupeiform species are used as the main source of feed in bluefin tuna *Thunnus thynnus* farms in the region (Tudela 2005). The origin and amount of potentially infected material imported into South Africa during 2010–2014 showed that approximately 65 000 t of frozen sardines were imported annually into the country from countries off which *Sardinops* occurs, primarily Namibia, New Zealand, Taiwan, China, the USA and Japan. Although neither *Sprattus* nor *Sardina* co-occur with *Sardinops*, *Sardinella* does so in some instances (e.g. off Namibia, Taiwan and Japan), so it is unlikely that all of the frozen sardines imported from those countries consisted of *Sardinops*. Nonetheless, it appears highly likely that considerable amounts of this species are imported from locations where sardine infection by PHV is either known (Australia and New Zealand; Whittington et al. 2008) or suspected (USA, Peru and Japan; Jones et al. 1997; Whittington et al. 2008). Hence, it is plausible that the PHV pathogen, capable of perpetuating infections in local sardine populations, could be imported into South Africa in association with frozen sardine. Given the import volumes concerned, such imports could represent a realistic risk. Furthermore, the use of imported sardine as bait, as well as the probability of infective sardine material entering the sea from processing establishments, provides plausible pathways for infection of the potentially susceptible local sardine population. Should local sardine be naïve to PHV, as suggested by this study, then the population is at risk of infection should this pathogen be introduced to the South African marine system, by whatever means, and precautions to avoid such must be taken. Further resolution regarding the likelihood and scale of the risks currently being posed by the importation of frozen sardine could be obtained through the assessment of the PHV status of imported consignments from countries where sardine populations are suspected or known to be infected. An expanded pathogen-import risk assessment is recommended to provide a qualitative assessment or estimate of the likelihood of the pathogen being imported into South Africa in association with frozen sardine (release assessment) and its potential to spread to local sardine populations (exposure assessment), in accordance with Gaughan (2002). *Acknowledgements* — We thank DAFF staff who collected sardine during the 2009 and 2011 pelagic biomass surveys and Mr Brent Chiazzari (University of KwaZulu-Natal) who collected and supplied the 2012 sardine run samples. Thanks are due to Dr Melanie Crockford for providing the PHV-positive DNA (plasmid) sample required for the quantitative real-time PCR assays.

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