Microparasites of Invasive Lionfish, *Pterois* spp. from St Kitts

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ABSTRACT

Scorpaeniforme fish from the genus *Pterois* are native to the Indo-Pacific, but have been rapidly increasing in numbers in the western Atlantic and Caribbean Sea since they were accidentally released into the marine environment in the mid-1980s. They are now recognized as one of the most significant invasive species throughout the entire Caribbean region and their high numbers and feeding behavior are having a serious impact on coral reef biodiversity. Little has been documented about pathogens and parasites from these fish in their invasive Atlantic range, therefore, the aim of this study was to evaluate parasite load from fish that have been removed from the waters around St Kitts. Lionfish were speared by divers and taken directly to the laboratory for necropsy. All organs were examined for signs of gross pathology and fresh tissue preparations made to screen for the presence of microparasites using a compound microscope. Tissues that were observed to contain potential pathogens or parasites were prepared for histological examination and also preserved for DNA analysis, to assist in identification. Two microparasites were observed that are currently being identified. Apicomplexan gammonts were observed in the urinary bladder, but no sporulated oocysts were present. Mature spores of a myxosporean were found in the gallbladder of some fish, which had a Zschokkella-like form. This data will be presented and discussed with respect to histopathological findings and initial microparasite identifications.

KEYWORDS: *Pterois*, invasive, parasite, biological tag, myxosporean

INTRODUCTION

Lionfish from the genus *Pterois* are native to the Indo-Pacific, but have been rapidly increasing in numbers in the western Atlantic and Caribbean Sea since they were accidentally released into the marine environment in the mid-1980s. They are now recognized as one of the most significant invasive species throughout the entire Caribbean region, and their high numbers and feeding behavior are having a serious impact on coral reef biodiversity (Albins and Hixon 2008, Morris and Akins 2009). Little has been documented about pathogens and parasites from these fish in their invasive Atlantic range, and the potential impact that parasites can have on a novel/introduced hosts is of fundamental importance. Whilst some macro-parasites have recently been identified infecting invasive lionfish (Fogg et al. 2016), there is a lack of knowledge on protozoan and other micro-parasites from these fish. Such parasites can potentially be useful as biological tags for population studies and stock assessment of fish species (Cantatore et al. 2016). Therefore, the aim of this study was to look for the presence of, and identify, micro-parasites from lionfish that have been sampled from the waters around St Kitts.

METHODS

Lionfish were speared by divers and taken directly to the laboratory for necropsy. All organs were examined for signs of gross pathology and fresh tissue preparations made to screen for the presence of microparasites using a compound microscope. Tissues that were observed to contain potential pathogens or parasites were prepared for histological examination and also preserved for DNA analysis, to assist in identification. PCR were performed on tissues found to be infected with parasites, using methods previously described (Freeman et al. 2008, Kristmundsson et al. 2011). Positive PCR amplicons of the expected sizes were sent for DNA sequencing. Sequencing was conducted using BigDyeTM Terminator Cycle Sequencing chemistry utilising the same oligonucleotide primers that were used for the original PCRs and was performed on all PCR positive samples. Both directions of each amplicon were sequenced for all products and compared to sequences available in the GenBank databases using nucleotide-nucleotide BLAST searches to verify a parasitic origin.

RESULTS

Two microparasites were observed that are currently being identified. Apicomplexan gammonts were observed in fresh tissue preparations from urinary bladders and in the epithelium of bladders in histological section. However, no sporulated oocysts were present which prevents further identification. Small subunit ribosomal DNA (SSU rDNA) sequence data from this parasite revealed a 99% identity to an unidentified coccidian infecting marine fish in Hawaii and a 96% identity to numerous *Goussia* and *Eimeria* spp. infecting a range of host fish.

Mature spores of a myxosporean were found in the gallbladder of 30% of fish examined, which had a basic *Zschokkella*-like form (Figure 1). SSU rDNA from these myxosporeans had a 92 - 99% identity to various *Zschokkella* spp. from marine fish.

DISCUSSION AND CONCLUSIONS

To our knowledge, this is the first time that myxosporean and apicomplexan parasites have been observed and reported from invasive lionfish in the Caribbean. Final description of the apicomplexan is hampered as no sporulated oocysts are present in our samples and we assume that sporulation is exogenous (outside of the fish host), a phenomenon known to occur in fish coccidiosis (Bartošová-Sojková et al. 2015). The myxosporean spores have a very general morphology and recently discovered phylogenetically related species have been described as *Zschokkella* spp. (Heiniger and Adlard 2013,

Kalatzis et al. 2015). However, we are reluctant to describe this parasite in this genus, as true *Zschokkella* spp. are found in the renal system of marine fish and they occupy a very distant phylogenetic clade to the one containing the myxosporean parasite from lionfish in this study. More work is required for formal identification of these parasites to be completed. However, we hope that the molecular data provided from this research will catalyze further research into the feasibility of using micro-parasites as biological tags, in order to study invasive lionfish population movements in the Caribbean region.

Figure 1. Mature spore of a myxosporean found infecting the gallbladder of invasive lionfish in St Kitts

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