

Utilising pathology codes to detect increases in aquatic animal disease occurrence: a retrospective case study

L. M. Hall*, S. Duguid and P. A. Noguera

Marine Scotland Science, Aberdeen, AB11 9DB, UK

Abstract

A case study utilising an alert-generating algorithm to detect increased disease occurrence in aquatic animals is described. The algorithm comprises a Generalized Linear Model to identify anomalous high occurrences and/or increasing trends over time. Its utility is explored with a retrospective analysis of summary pathology codes associated with the emergence of Amoebic Gill Disease in Scotland. The algorithm detects moderate to large increases in occurrence emphasising the continuing role of pathologists in identifying unexpected disease events.

Introduction

The World Organisation for Animal Health requires notification by member countries of the occurrence of pathogenic agents of disease with a significant impact on aquatic animals or public health (World Organisation for Animal Health, 2016). Syndromic surveillance (Hoinville et al., 2013) uses health-related information to detect such diseases. Pathology is suited to syndromic surveillance because examinations generate multiple observations capable of identifying unexpected disease.

Syndromic surveillance, using a variety of statistical approaches (Unkel et al., 2012), has been described in a human and terrestrial farm animal context over several years (eg Farrington et al., 1996; Kosmider et al., 2011). It is less usual in an aquatic animal context with only one published case study (Dórea et al., 2015). This report describes a retrospective application of an alert-

generating algorithm focussing on the occurrence of Amoebic Gill Disease (Munday, 1986; Kent et al., 1988) in Scotland between 2004 and 2016.

Materials and methods

Surveillance terminology is used as defined by Hoinville et al. (2013) and statistical significance categorised as an event with an estimated p -value of no greater than 0.05. Analyses were carried out within the R statistical environment version 3.2.3 (R Core Team, 2015) utilising the supplementary R package 'sn' 1.3-0 from cran.r-project.org/package=sn.

Diagnostic data held by Marine Scotland Science (MSS) include pathology codes arising from laboratory examinations of tissues sampled from aquaculture farm-sites. Samples are collected by government appointed Fish Health Inspectors, hereafter referred to as 'inspectors', during routine and intelligence-initiated inspec-

* Corresponding author's email: malcolm.hall@gov.scot