A 12- year retrospective study on pattern and relative frequency of preventable canine diseases in Morogoro

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SUMMARY

A retrospective study was undertaken to determine the occurrence and relative frequency of canine cases admitted at the University Animal Hospital located at Sokoine University of Agriculture (SUA). The study involved examination of canine cases recorded for the past 12 years starting from 2005 to 2016. A total of 2,288 canine cases were evaluated and grouped based on disease condition matching with the hospital records. The top five most frequently admitted cases were found to be worm infestation (19%), parvo viral diarrhoea (15%), wound (13%), canine distemper (7.7%) and bacterial diarrhoea (7.6%). Worm infestation showed a high and steady occurrence; parvo viral diarrhoea and canine distemper cases were on the increasing trend whereas rabies and canine transmissible venereal tumour were on the decreasing trend. Interestingly, majority of cases reported were those which can be prevented through adequate veterinary care such as vaccination, routine deworming, and sanitation. The findings in this study call for further follow-up studies and re-assessment of the current strategies used in disease control in order to have a comprehensive understanding in the existing gaps which limit progress in the control of some diseases identified in this study.

Keywords: Parvovirus, Rabies, Canine Distemper, Diarrhoea, Transmissible Venereal Tumor

INTRODUCTION

Domestic dogs are associated with human in nearly in all parts of the world for various reasons ranging from security, companionship, transport, food acquisition or religious belief (Hart, 1995). Because of the established close relationship between human and dogs, several diseases and clinical conditions that adversely affect the health and well-being of dogs also threaten human health. Both endemic and emerging health threats are usually monitored through a coordinated surveillance efforts between veterinarians and human health personnel. Although there is a significant development in surveillance systems for human and livestock diseases, in companion animals such development is limited to only few diseases which are significant to human health such as rabies (Michael *et al.*, 2012). Among the major constraints in companion animal specific disease surveillance is inadequate coordination system and poor reporting (Halliday *et al.*, 2012). These and other factors make the traditional passive surveillance system to become inefficient in facilitating capture of syndromic data from veterinary health facilities (Dórea *et al.*, 2015; Kass *et al.*, 2016). Such gaps can be filled by integrating the traditional surveillance system and the use of pre-diagnostic health data obtained at veterinary point of care centres. The importance of pre-diagnostic health-related data in complementing the traditional passive surveillance in veterinary and public health has been recently described (Kuker *et al.*, 2018). For instance, such data can be used for validating proactively collected data including clinical observations at veterinary point of care such as veterinary clinic, health centres, hospitals and diagnostic laboratories (Kluger *et al.*, 2001). This study therefore aimed at establishing the pattern of disease occurrence and relative frequency based on clinical records at SUA animal hospital for the past 12-years. Ultimately, the results will be used for the review of current strategies of disease control and a baseline for future investigations.

METHODOLOGY

The study was conducted at Sokoine University of Agriculture, College of Veterinary and Medical Sciences. Retrospective study design was employed where data were retrieved from clinical records at SUA Animal hospital. Canine clinical data were collected from case registration books at SUA Animal Hospital targeting cases recorded from 2005 to 2016. The specific data obtained from case registry were recorded for each disease condition and entered into Microsoft excel according to month and

year of occurrence. Data were organized using Reshape2 R-package and plotted using R-package ggplot2 with cowplot extension (Team, 2013; Wickham, 2007, 2009; Wilke, 2017) in R studio platform (Racine, 2012). The relative frequency (RF) was calculated using the formula: RF=n /N x 100, where n=number of specific disease condition, N= Total number of all canine cases.

RESULTS

Analysis of clinical records revealed that total number of diarrhoea cases alone accounted for 964 cases, equivalents to 42% of the 2,288 canine cases encountered during the 12 years period (Table 1).

Table 1. Number and relative frequency of canine cases recorded over 12 year period

SN	Condition	Cases (n)	%(N=2288)
1	Bacterial Diarrhoea	173	7.6
2	Canine Distemper	177	7.7
3	Conjuctivitis	25	1.1
4	Demodicosis	59	2.6
5	Ehrlichiosis	32	1.4
6	Flea Bite Dermatitis	145	6.3
7	Fracture	48	2.1
8	Canine Infectious Tracheobronchitis (Kennel cough)	33	1.4
9	Liver Cirrhosis	30	1.3
10	Otitis	26	1.1
11	Parvoviral Diarrhoea	347	15.2
12	Pneumonia	51	2.2
13	Rabies	58	2.5
14	Tick Neurotoxicosis (Tick paralysis)	50	2.2
15	Canine Transmissible Venereal Tumor (CTVT)	62	2.7
16	Other Tumour types	18	0.8
17	Diarrhoea related to worm infestation	444	19.4
18	Open and closed wounds	302	13.2
19	Miscellaneous cases	208	9.1
	TOTAL	2288	100.0

Large proportion of diarrhoea cases were those caused by gastrointestinal worms (444 cases) followed by parvovirus (347 cases) and bacterial infection (173 cases). Records of nervous system disorders showed that canine distemper cases were the most frequently reported compared to rabies and tick paralysis (Table 1). Furthermore, when cases were categorized based on aetiology, the most frequent viral disease was parvovirus diarrhoea followed by canine distemper while rabies was the least reported disease. Notably, parvo viral diarrhoea and canine distemper cases showed increasing trend from the year 2011.

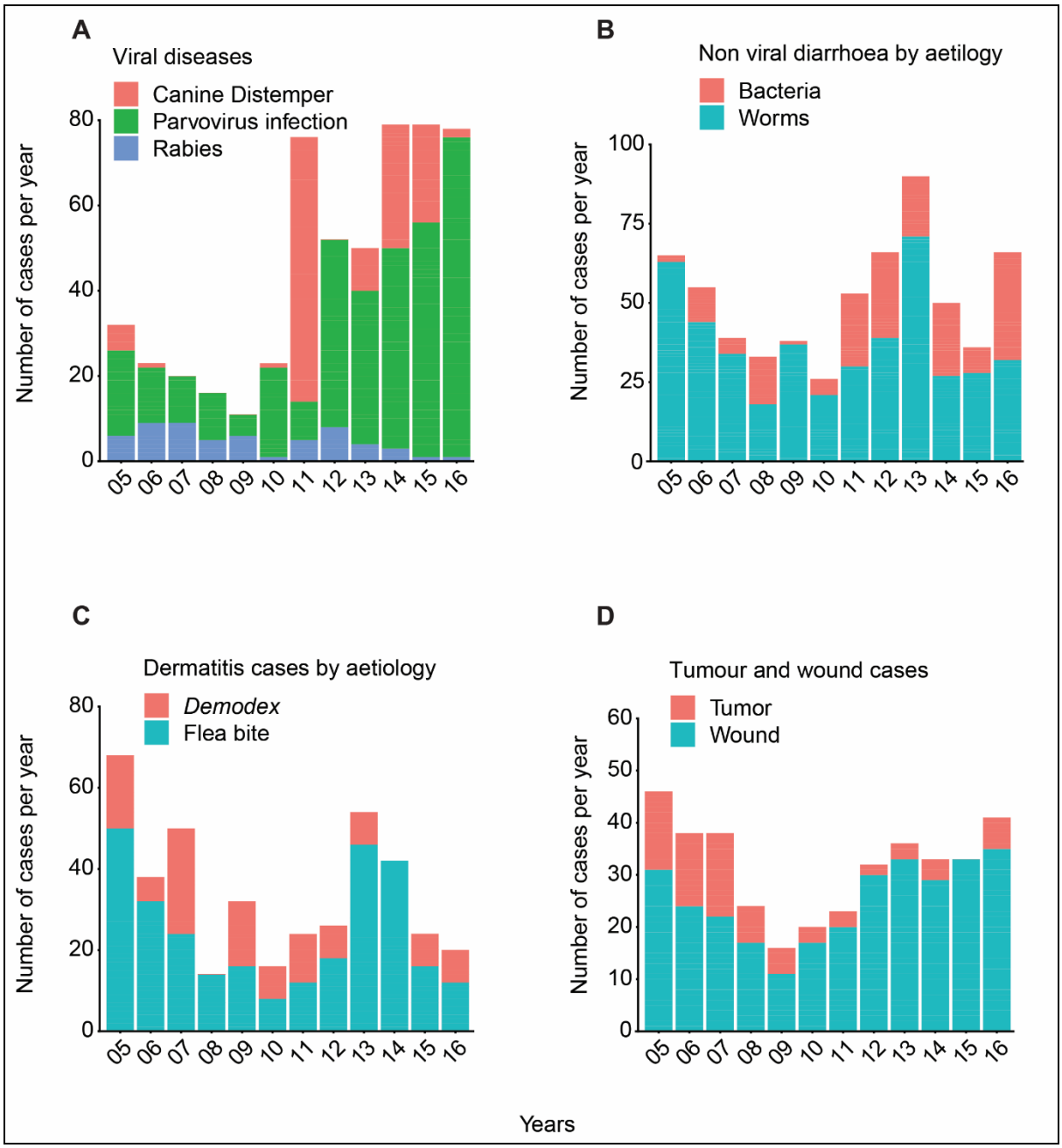

Figure 1. Stacked bar charts representing number of canine clinical cases recorded per year. (A) Cases of viral diseases, (B) Non-viral diarrhoea cases, (C) Dermatitis cases, (D) Tumours and wound cases. The number in x-axis represents a short form of the years: 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015 and 2016 respectively.

In contrast rabid canine cases were declining especially in the year 2015 and 2016 (Figure 1A). The increasing trend was also observed in bacterial diarrhoea (Figure 1B). In addition, the declining trend was also observed in the number of dermatitis cases associated with *Demodex canis* infestation (demodicosis) (Figure 1C). Similar finding was observed in the number of tumor cases especially canine transmissible venereal tumour (CTVT) (Table 1 and Figure 1D). Not only that, but also there were no notable yearly variations in terms of the number of cases received in other conditions such as diarrhoea due worm infestation, flea bite dermatitis and wound cases (Figure 1B-D). Furthermore, when cases were grouped on monthly basis to establish if there was a seasonal pattern of occurrence, all evaluated canine cases did not show a clear seasonal pattern of occurrence (Supporting figure 1-4).

DISCUSSION

This research highlights the dynamics of canine clinical cases recorded for the past 12 years including those cases of high public health interests. Parvovirus diarrhoea occur as a result of Parvo viral infection, causing highly contagious acute enteritis associated with high morbidity with very low survival rates in untreated dogs. The disease control mainly depends on regular vaccination and maintenance of hygienic environment. This study shows the decrease in number of canine parvovirus diarrhoea from 2005 to 2009 before the sharp increase in number of recorded cases between 2012 and 2016 (Figure 1A). The changes in number of parvo viral diarrhoea recorded can be influenced by a number of factors including increased reporting of disease due to its nature of clinical manifestations which is usually accompanied with fetid bloody diarrhoea. Other reasons could be an increased awareness, failure to present the dogs for regular vaccination or vaccine failure (Miranda and Thompson, 2016). With the exception of clinical manifestations, the above reasons can also apply to the observed surging of canine distemper cases between the year 2011 and 2016 (Figure 1A and Supporting Figure 1).

Interestingly, cases of rabid dogs were observed to show a steady decreasing trend during the same period. This is contrary to the previous reported results from a 10-year retrospective study in northern Tanzania (Swai *et al., 2011*). The positive development in decreased number of rabid dogs can be attributed to the relative importance and increased awareness on public health risks posed by rabies. In addition, the cost of rabies vaccination per dog is relatively cheaper compared to the cost of parvovirus and canine distemper which is usually available in a cocktail of four vaccines combining canine distemper virus, hepatitis virus, leptospira and parvovirus vaccines. High vaccination costs and social economic status of dog owners can be a limiting factor in accessing vaccination services and therefore predispose dogs to canine distemper and other preventable diseases (Lembo *et al.*, 2010). In agreement with this notion, previous study showed that vaccinating dogs can reduce clinical cases of canine distemper in wild and domestic carnivores (Viana*et al.*, 2015). Nonetheless, further studies will be required to prove or disprove the hypothesis whether there is any causal relationship between the number preventable viral diseases and vaccination trend.

Among the non-viral diseases recorded, gastrointestinal worm infestations were found to be the most frequently encountered cases (Table 1 and Figure 1B). This finding is compatible with similar study covering 10 years period between 1994 and 2003(Muhairwa *et al.*, 2008). The reasons for the lack of improvements in gastrointestinal worm control are not known. However among the proposed factors associated with steady gastrointestinal helminths infestations include inadequate awareness among dog owners (Muhairwa et al., 2008) and relatively unaffordable costs of regular deworming practices. This is due to the fact that, majority of dogs are owned or routinely managed by children below 18 years (Unpublished data).

Furthermore, the increasing number of cases of bacterial diarrhoea (Figure 1B) suggests existence of poor hygienic conditions which may contribute to exposure and infestation with gastrointestinal helminths (Satyal *et al.*, 2013). However, because regular deworming using anthelmintic drugs is a routine practice in helminth control, drug resistance as a factor of persistent high number of gastrointestinal helminth cases cannot be ruled out as it has been shown elsewhere (Kopp *et al.*, 2007). The relatively lower number of demodicosis cases can be attributed to regular dipping practices facilitated by a subsidized dipping services offered at SUA animal hospital. However, dipping alone is not effective in flea control as it require additional flea control in the dog environment (Carlotti and Jacobs, 2000). It is therefore not surprising to have relatively larger proportion of flea bite dermatitis as opposed to demodicosis (Figure 1C).

In addition, this study also reports the decreasing trend of occurrence of CTVT (Figure 1D). Among the factors known to contribute to the increased transmission of CTVT include lack of confinement leading to an increased interaction between sexually active male and females (Batamuzi *et al.*, 1992). The decrease in number of CTVT is likely to be caused by increased awareness and decreased number of stray dogs (Batamuzi et al., 1992) or decreased reporting due to high costs of chemotherapy based treatments which is considered to be the most efficient treatment option for CTVT (Dar *et al.*, 2017). Other factors likely to influence the results in this study include number of cases reported per year and misdiagnosis as some of the cases were diagnosed based on clinical symptoms that are likely to introduce bias based on the opinion of the clinician. On the other hand, some cases that does not

have severe symptoms are likely to be un-reported by the dog owners, as shown in the detailed monthly cases reports which shows absence of reported cases in some periods of the year (Supporting Figures 1-4). None of the cases reported showed specific seasonal occurrence (Supporting Figure 1-4), suggesting season independent occurrence of the reported cases. Finally, the study uncover the increase in preventable diseases which call for re-assessment of the current strategies used in disease control and further follow-up studies in order to have a more understanding and take appropriate action to overturn the current trend of lack of progress in the control of some diseases identified in this study.

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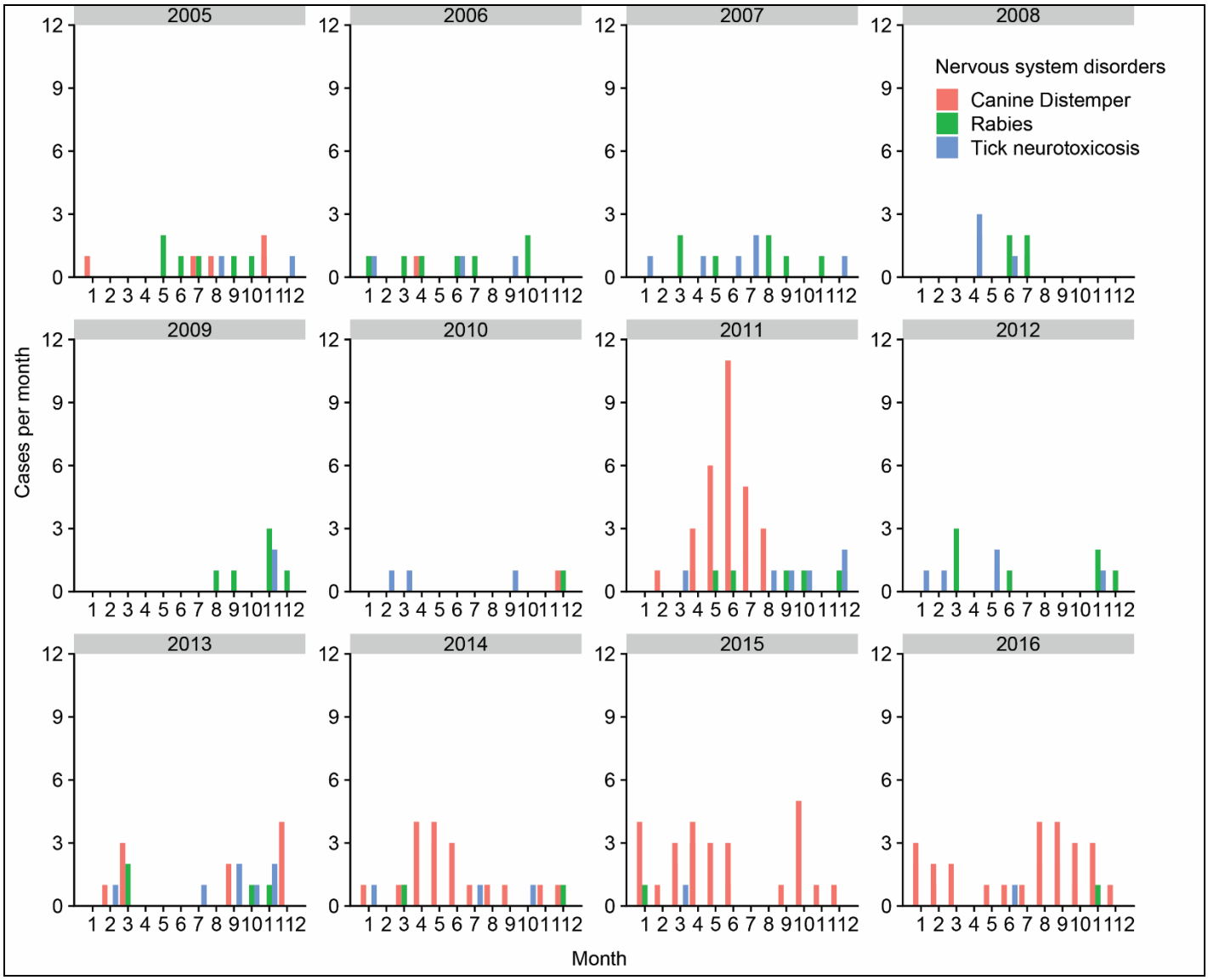
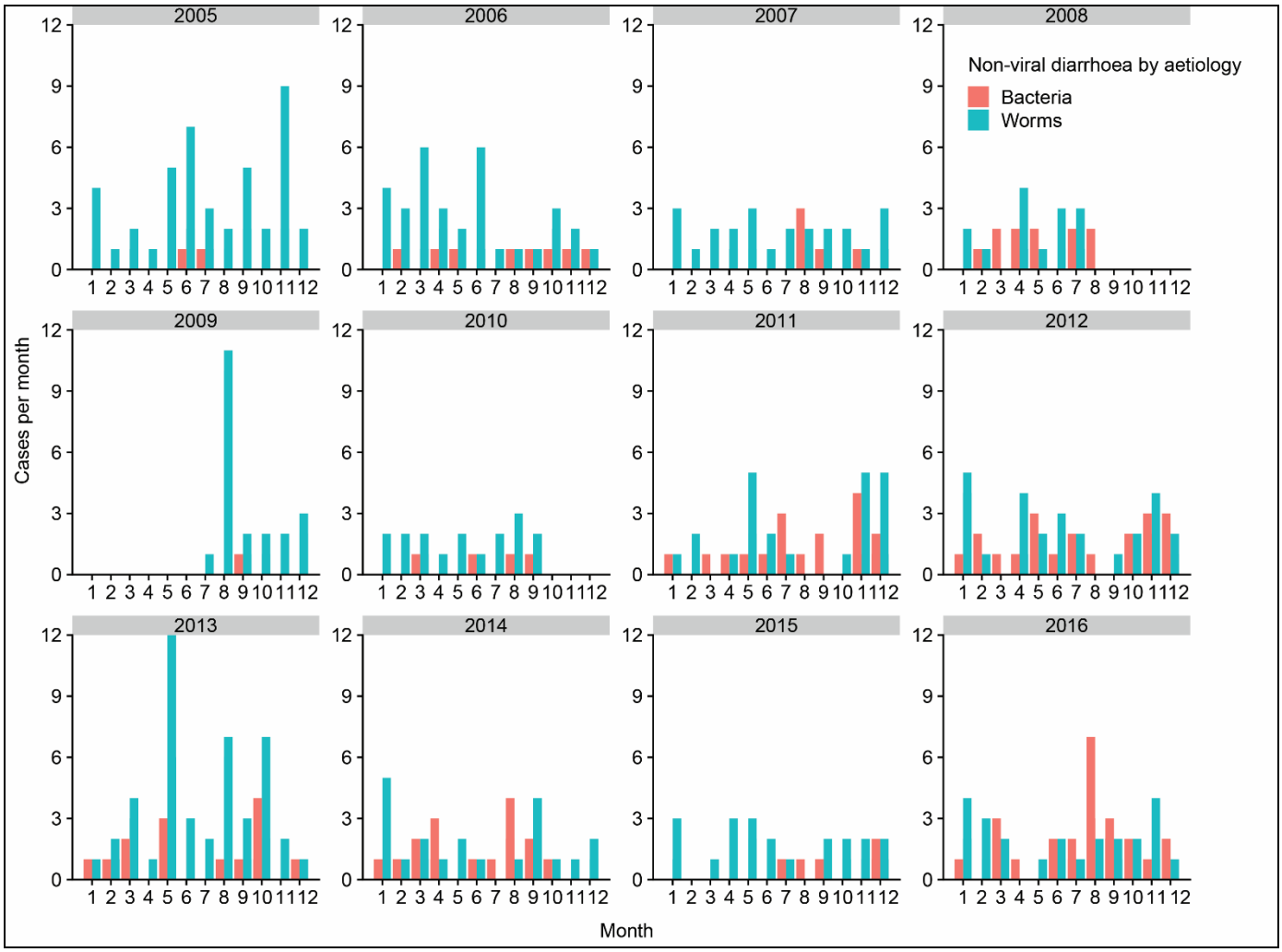
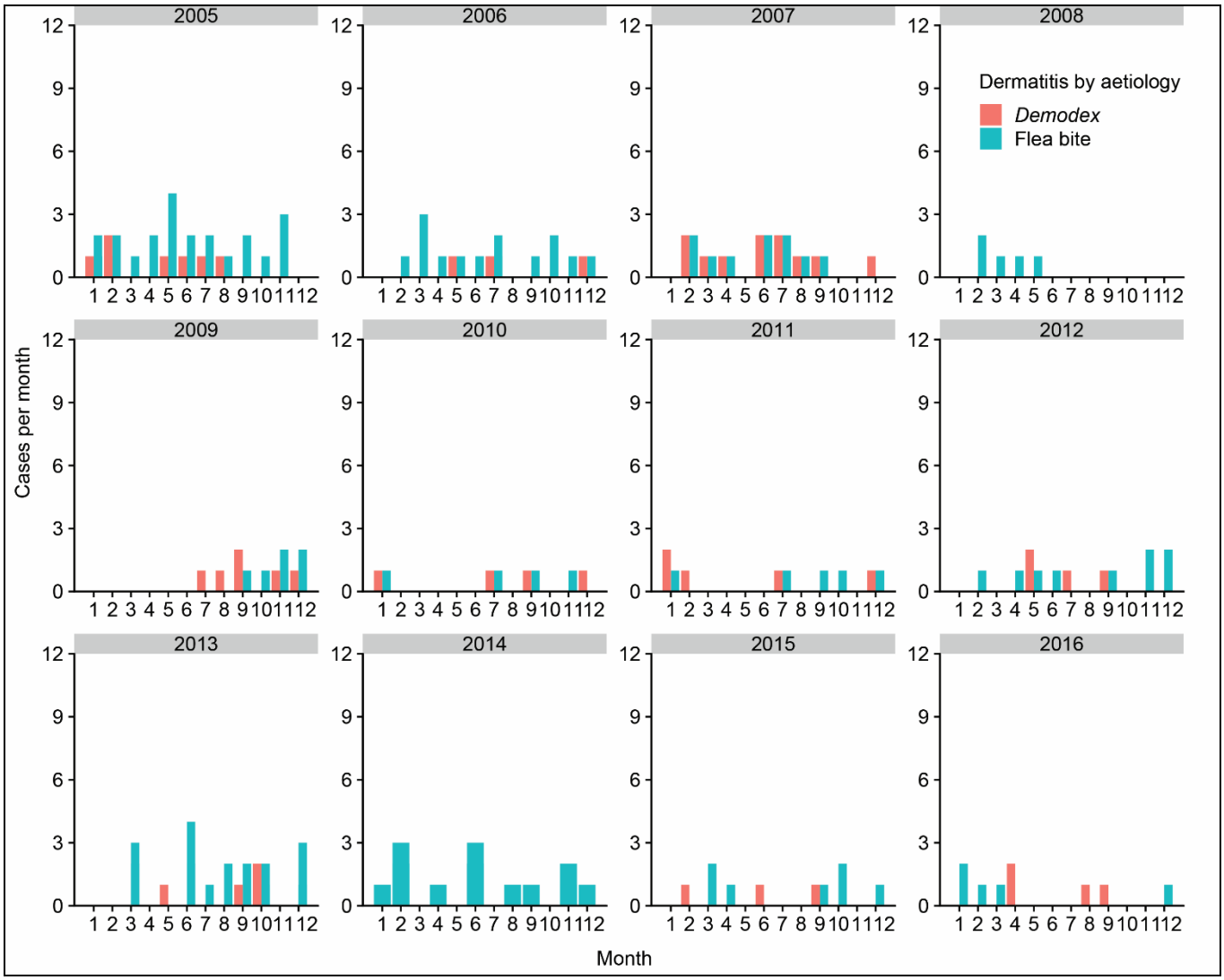
SUPPORTING FIGURES



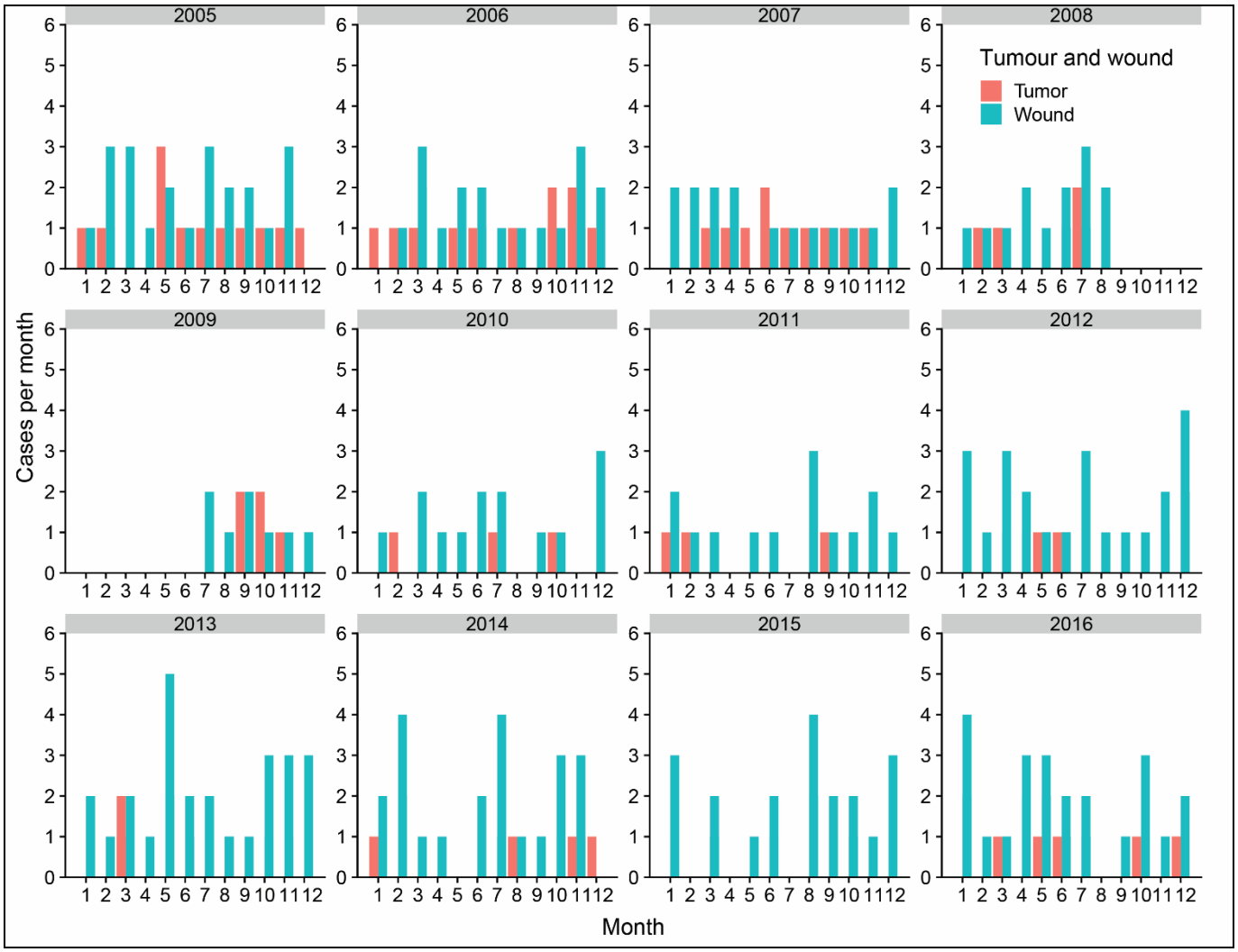
Supporting Figure 1. Monthly cases of nervous system disorders for each record year. Higher number of Canine distemper cases from the year 2011



Supporting Figure 2. Monthly cases of non-viral diarrhoea for each record year. Worm infestation related diarrhoea were more frequently encountered compared to Bacterial diarrhoea



Supporting Figure 3. Monthly cases of canine dermatitis for each record year. Flea bite dermatitis (red bars) was highly frequent compared to demodicosis (blue bars)



Supporting Figure 4. Monthly canine tumours and wound cases for each record year. Reduced frequency of Transmissible venereal tumours and other types of tumors(red bars).