

Wildlife disease passive surveillance: The potential role of wildlife rehabilitation centres.

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Abstract:

Wildlife rehabilitation centre records are an often unexploited source of crucial information on species morbidity and mortality. Analysis of these records can be used to assess and improve rehabilitation techniques. Moreover, it has been suggested that wildlife admitted to wildlife rehabilitation centres may act as sentinels of ecosystem health (Aguirre and Else 2001, Burton and Doblar 2004).

An overview of the role of European and North American wildlife rehabilitation centres in the wildlife disease surveillance will be presented.

As a case study, records of birds, reptiles and amphibians admitted to Kanyana Wildlife Rehabilitation Centre Inc. (KWRC) between 1997 and 2005 have been analysed, in order to determine the most common causes of morbidity and mortality, and to compare the results with those obtained from other studies. The data collected by KWRC, provides valuable information about the free-ranging populations of wild animals in the Perth metropolitan area. Risk factors for these populations are described and compared with data from other wildlife rehabilitation centres reported in the literature. The knowledge gained from database analysis is not only extremely useful for the specific wildlife rehabilitation centre, but it can also be evaluated in a broader context. The possibility of increased participation of wildlife rehabilitation institutions in national wildlife disease surveillance programs is contemplated and discussed.

In conclusion, this study provided insight into the possible effects of certain risks factors on wildlife populations and species distribution, and at the same time raised important questions on rehabilitation management practices.

Keywords : Wildlife disease monitoring, Wildlife rescue centre databases, passive surveillance

Introduction:

Research on wildlife mortality and morbidity has been recognized as a crucial aspect not only of wildlife conservation projects, such as reintroduction and translocation programmes (Gilmartin, Jacobson et al. 1993), but also of disease surveillance schemes for domestic animals and humans (Mörner, Obendorf et al. 2002). Likewise, it has been widely accepted that wildlife health in most cases can be considered an indicator of ecosystem health (Aguirre and Else 2001).

The increasing number of emerging infectious diseases is regarded as a serious threat to some endangered wildlife populations (Daszak, Cunningham et al. 2001). Human landscape changes, chemical pollution, encroachment with a growing human and domestic animal population along with climate change are some of the factors that further threaten endangered wildlife populations worldwide.

Wildlife admitted at wildlife rescue centres may act as sentinels of environmental conditions. In fact, wildlife rehabilitation centre records are an often unexploited source of crucial information on species morbidity and mortality in urban and suburban areas.

The potential role of wildlife rescue centres in wildlife health monitoring:

In the past wildlife rehabilitation and wildlife disease surveillance were not often linked one with another. However, wildlife rehabilitators take in care so many wild animals that their records, especially when considered on a national level, might be easily integrated in a national wildlife health surveillance programme. In the UK, for example, more than 15000 animals are admitted in rescue centres each year (Kirkwood and Sainsbury 1996).

Even though passive surveillance may lead to underreporting of disease, and wildlife rehabilitation centres mainly treat common and widespread species, the information obtained through a systematic report by wildlife carers to national wildlife disease networks and governments, or even single descriptions of an unknown disease in individual animals may be of incredible importance (Mörner, Obendorf et al. 2002). Wildlife rehabilitators may be the first to detect emerging wildlife diseases or monitor enzootic diseases (Sainsbury, Kirkwood et al. 2001), e.g. information obtained by wildlife rehabilitators was fundamental during the West Nile epidemic in North America (Eidson, Komar et al. 2001). Besides, this opportunistic and inexpensive method of data collection may encourage more thorough epidemiological studies, which generally imply higher costs.

Not only infectious diseases are indirectly monitored by rehabilitation centres but also the extent of human disturbance to wildlife and their habitats. Wildlife carers in the US and Europe for instance, were notably involved in the controversy over lead shots and its effects on wildlife and finally succeeded in legally restricting the use of lead shot for sport hunting (Porter 1992).

Also, simple analysis by causes of admission may draw attention to important management issues. Torreferrussa, a rescue centre in Catalonia (Spain) identified dangerous powerlines and areas with high incidence of illegal hunting simply by looking at geographic clusters of electrocution and gunshot injuries (Departamento de Medio Ambiente y Vivienda 2006).

Aural Abscesses in eastern box turtles admitted to the Wildlife Rescue Centre in Virginia were linked to high body burdens in turtles of organochlorine (OC) compounds (e.g. insecticides, PCBs). OC's are hypothesized or have been linked to several human diseases and consequently this example also clearly illustrates the link between human and wildlife health, as well as the sentinel role of wildlife (Sleeman 2007). The Wildlife Centre in Virginia is now even developing a system to monitor and identify emerging wildlife diseases as possible indicators of bioterrorism or other biosecurity threats (Sleeman and Clark Jr 2003).

Wildlife rescue centre records: advantages and limitations

Wildlife treatment and rehabilitation centres range from large, modern and well equipped veterinary hospitals with highly qualified paid staff to small organizations with little equipment and completely run by volunteers with limited resources (Kirkwood 2003). Undoubtedly, these differences within the wildlife rehabilitation institutions will greatly influence the type of data collected as well as the quality and possible value. This has been clearly shown in a recent study in Canada on wildlife disease data collection on Vancouver Island, which found great variation in the quality of the records submitted by rescue centres. However, of all the groups that regularly encounter wildlife, wildlife rehabilitation centres admitted the largest number of animals from the greatest variety of taxa over the widest geographic area (Stitt, Mountfield et al. 2007).

Although the knowledge that is obtained from rescue centers mainly relates to the common wildlife species, this can be important because often unforeseen threatening factors (e.g. emerging infectious diseases, bush fires) can result in significant and rapid population declines (Munson and Karesh 2002), causing a previously common species to become endangered (Aitken 2004).

It is critical to acknowledge limits and biases of rescue centres' databases, so that the results of any analyses can be correctly interpreted.

Firstly, wildlife admitted in care necessarily has to be considered a non-random and biased sample of the population because:

1. some species may be more represented due to public perceptions or sentiments
2. species that live around or within urban, suburban areas are more commonly admitted
3. anthropogenic causes are considered to be overestimated
4. most natural deaths of wild animals remain undetected
5. injuries causing rapid death will generally not be included in the sample

Secondly, wildlife rescue centre databases tend to be more incident focused (e.g. orphaned, cat attack) rather than being diagnostically orientated.

Thirdly, in wildlife rescue centers with a high number of different volunteers recording data into the database the possibility of recording errors is not unlikely.

Lastly, lack of access to diagnostic services and/or low economic resources to use these services causes that infectious diseases are generally under represented (Deem, Terrell et al. 1998).

However, any epidemiological study on wild population is inherently more difficult than in domestic animals. And, even though passive surveillance using wildlife rescue centre records may show a biased picture, it can be still part of a bigger wildlife health surveillance plan. Multiple studies and a multidisciplinary approach are necessary to fully understand the role of diseases in free-ranging wildlife (Spalding and Forrester 1993).

A case study: the Kanyana wildlife rehabilitation centre database

This study reviews the records of 9138 birds and 1173 reptiles admitted at the Kanyana Wildlife Rehabilitation Centre (KWRC) from January 1, 1997, to August 31, 2005.

KWRC started to record the data into a computerized database since the beginning of 2003. The primary cause of admission was determined by the attending carer, but a second cause of admission was inserted in the original database whenever wildlife causalities presented multiple injuries/diseases. In addition to the more general category of cause of admission, a more specific category with the condition, characteristic symptomatology or more specific diagnosis was inserted, when the information on the database was sufficient (2003-2005).

156 bird species, belonging to 17 orders were taken into care at KWRC during the study period; however, only 15 bird species represented 74% of the total.

On the other hand, reptilian records included 13 different species of which the most represented were the shingleback lizards (*Tiliqua rugosa*) (86.6%).

Evaluating the causes of morbidity of rescued birds it is clear that most of the cases are trauma-related (47%). Trauma of unknown origin, motor vehicle collision and cat attack are the three most frequent trauma categories. Human contributed to at least 48% ($n=1830$) of all the trauma cases. Musculoskeletal injuries and more specifically wing fractures were the most common condition in birds admitted at KWRC.

The second most common admission category is "orphaned" ($n=2440$, 30%).

Infectious diseases, on the other hand, constitute only 4% ($n=324$) of all the recorded cause of morbidity and mortality. Psittacine Beak and Feather Disease (PBFD) and Avian Gastric Yeast (AGY) were the most common infectious diseases recorded in the database.

The relatively low frequency of infectious diseases is probably due to multiple morbidity and mortality factors: sublethal infections may predispose the bird to trauma associated morbidity-mortality (Porter 1992) but may remain undetected in

wildlife rehabilitation centres (Wendell, Sleeman et al. 2002). Moreover, the lack of routine post mortem examination will certainly cause an underestimation of non-traumatic diseases. Notably, 43.5 % of the total cases of infectious diseases were recorded as a secondary cause. It is therefore necessary to incorporate multiple causes of admissions in the database, as otherwise infectious diseases might be extremely underestimated.

It has also to be considered that part of the admissions with unknown cause of entry (15%), are very likely attributable to infectious diseases, toxicosis or metabolic disorder without a clear symptomatology.

Similarly to birds, a significant percentage (35.5%) of reptile admissions was related to anthropogenic factors. Almost one fourth (22.2%) of all admitted longneck turtles were hit by cars. The behaviour of turtles (such as seeking warm areas which include bitumen roads or female turtles crossing roads whilst searching for nesting sites), and habitat choices are responsible for this high prevalence of motor vehicle collisions. Other studies have also reported similar findings (Hartup 1996; Brown and Sleeman 2002).

Analysis of data for shingleback lizards indicated the presence of an epidemic of a respiratory disease. This condition increased from 1999 and, in 2001 it represented the most frequent cause of admission.

In addition to the more general morbidity/mortality analysis, analysis for length of stay and outcome revealed very important information for the rescue centre's management. This analysis also helped to improve and integrate their electronic database.

Conclusion:

The knowledge gained through statistical analysis of rescue centre databases is crucial not only for the successful management of every single institution but also for wildlife disease monitoring programs, ecosystem health assessments and advances in wildlife medicine. So, even though significant information can be obtained from examining reported caseload in one single rescue centre similar studies should be replicated also on a state or national level. To facilitate broader analysis and facilitate comparison, wildlife rehabilitation centres should be encouraged to use common codes and categories.

Our study demonstrated that infectious diseases are often associated to other common admission causes. Thus the need for various sections in the database to facilitate the entry of multiple causes of admission is a critical feature for accurate disease monitoring.

Standardization of the database (on a regional or national level), integrated pull-down menus to reduce recording errors and a more diagnostically oriented approach, may not only facilitate the use of wildlife rehabilitation records for wildlife disease surveillance programmes, but possibly also increase the information exchange among different wildlife rehabilitation centres. In Spain, for example, as an result of increased collaboration and communication among wildlife rescue centres a document was produced that analysed the data from 26 different centres (Salinas and Carrasco 2007).

The biases inherent in a retrospective study of this type, on data obtained from rescue centres, are acknowledged. However enhanced standardization of record keeping and health screening with the help of in-house ancillary diagnostic tests or regular post-mortem examination may enormously improve the quality of wildlife rehabilitation

databases and the obtained information may be easily integrated in wildlife disease assessment programs.

On the other hand, anthropogenic causes of morbidity and mortality, such as road mortality, can be determined even with less sophisticated databases.

It is strongly recommended to regularly perform similar statistical analysis of wildlife rehabilitation centre records and share the gained information not only with other wildlife rehabilitation centres but also governmental institutions and conservation agencies.

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