

A Retrospective Study on Data from Animal-Related Complaints, Abuse, Cruelty, Trafficking and Trade Received by Animal Welfare Organizations in Singapore in 2016

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ABSTRACT

Introduction: Singapore is a first-world country, protected by an advanced police force, competent in investigating crime against human citizens. Little is known about crime against animals and what Singapore does in these instances. **Methods:** This research considered data from reports of various animal crime that occurred in 2016 as recorded by the three animal welfare organizations appointed to investigate crimes against animals (AVS, SPCA and ACRES). Details of the cases collected were sorted using eight parameters: date, location, perpetrator, victim, type of crime or complaint, case outcome, organization, and punishment. The type of crime or complaint were divided into the categories: abandoned, allowed to roam, barking animal, caged, poor conditions, sick and untreated, physically abused, poisoned, deceased, taken from the wild, illegal possession, illegal sale, smuggling, and licencing. **Results:** In 2016, a total of 831 cases committed by 839 perpetrators were reported, for a total of 2357 minimum number of animals involved, comprehensive of animal parts and items made from animals. The largest proportion of the cases occurred against domestic animals and in housing districts. Despite these high numbers, only perpetrators in 11 cases were charged with fines and/or imprisonment time. **Conclusions:** This research paints, for the first time, a picture of what animal crime looks in the Singaporean society. Results are of pivotal importance to identify criminal hot spots, most common type of crimes, and animal categories that are most often victimised, aiming to facilitate the work of the organizations involved in investigating animal-related crime in Singapore.

KEYWORDS: Veterinary forensics, animal crime, wildlife forensics, AVS, SPCA, ACRES.

INTRODUCTION

Forensic crime scene investigation involves the use of different disciplines of scientific fields applied to law to process a crime scene in order to help determine the outcome of a court case [1]. Recently, a new arena of forensic science has emerged. While the perpetrators of a crime are typically humans, the victims might not always be. As the significance of animals in the human world has dramatically increased over the years, from farming to pet trade, mistreatment of animals has also risen. Hence, animal crime has caught and attracted the attention of forensic crime scene investigators, with regards to the abuse, neglect, doping, and trade of animals (or their parts) – either domestic, exotic, or other forms of wildlife. Within forensic sciences,

“veterinary forensics” and “wildlife forensics” grow along with the importance of animals, especially in developed countries, where citizens fight for justice to be served not only for humans, but also animals [2]. At present, several countries show their commitment to wildlife conservation and fighting crimes against animals through conservation programs, management, education and enforcement of investigation and research in this area. Examples of these are accredited laboratories such as the National Wildlife Forensic Laboratory (Malaysia), Clark R. Bavin National Fish and Wildlife Forensic Laboratory (Oregon, USA), Centro di Referenza Nazionale per la Medicina Forense Veterinaria (Italy) and the Australian Centre for Wildlife Genomics (Australia) [3].



Founded in 1965, Singapore is a young but thriving country that is already completely urbanised [4]. Occupying 719 km², it measures 50 km east to west, and 27 km north to south. Singapore is multiracial and multi-religious, supporting a dense population of 5.78 million people (data from the Department of Statistics of Singapore [5]). Singapore has developed an effective police force, ensuring the safety and security of her citizens. Forensic science has been practiced since 1885, when it was used for analysis of medical products, toxicological, and food specimens (data from the Singapore Health Sciences Authority [6]). Since then, forensics in Singapore has ventured far and wide into disciplines of many kinds, especially forensic pathology (e.g. Singapore contributed to the pathophysiology of the SARS virus through autopsies of suspected deaths due to SARS in 2003), molecular biology [7], firearms, tool marks, trace evidence and toxicology through laboratories of the Singapore Police Force [8] and from the Toxicology divisions [9, 10]. Furthermore, it has also been active in lending aid for victim identification during disasters in other countries [11]. While these forensic techniques have been advanced for the use of human-related crime, not much is known about how crime with victimised animals are managed. The three most popular organizations dealing with animal welfare in Singapore are the Animal and Veterinary Service (AVS, formerly AVA, Agri-Food and Veterinary Authority of Singapore), the Animal Concerns, Research and Education Society (ACRES), and the Society for the Prevention of Cruelty to Animals (SPCA) [12, 14].

The Animal and Veterinary Service (AVS) is a government organization that oversees the biosecurity and health of animals in Singapore [12]. The AVS manages six main regulatory programmes and operations, one of which is the Animal Management Group that takes charge of animal welfare and management. Furthermore, it responds to animal-related issues, oversees pet licensing and investigates into animal crime, enforcing the laws.

Through their 24-hour Wildlife Crime Hotline, the Animal Concerns Research & Education Society (ACRES) [13] rescues and safely relocates wildlife animals that may have come into contact with members of the public or are causing people distress. The ACRES

rescues, treats, and rehabilitates wildlife animals found sick or injured. Animals native to Singapore, are released back into the wild once they have recovered. Non-native animals are either kept with ACRES or rehomed to facilities able to provide appropriate care for them. ACRES also conducts regular undercover investigations and collaborates with government bodies to stop illegal wildlife trade in Singapore.

The Society for Prevention of Cruelty to Animals (SPCA) [14] is an animal welfare organization not funded by the Government, that rely on fund-raising activities and donations to run their various animal welfare services. Upon receiving alerts from the public, the SPCA conducts animal cruelty and welfare investigations to intervene for animals in need of help where possible and aid in investigations for cases requiring action from higher authorities. Accompanying that is their 24-hour emergency animal rescue, which ventures around Singapore to bring sick and injured animals to the SPCA to be attended to with veterinary care. The SPCA is also a shelter that fosters lost and found pets until their owners claim them, as well as abused, abandoned animals, where members of the public can adopt them.

Despite the efforts of these organizations, Singapore still experiences occurrences of animal crime. When animals become victims, they draw a great media coverage and attention. Several news reports in Singapore include animals physically abused and killed, domestic animals abandoned, neglected, poisoned, smuggled, and not licenced. To note, a licence (e.g. Animals and Birds (Dog Licensing and Control) Rules of the Singapore Statute, 2007) makes sure that specific obligations toward the animals are met, preventing possible abuse and cruelty. For example, a man was charged in court for abusing his pet dog to death [15] and a woman was fined for abandoning her pet cat [16]. A stable was also fined for neglecting a mare and causing it unnecessary suffering [17]. A Singaporean couple was caught smuggling leopard geckos into the country from Malaysia [18] and a woman was fined for operating an unlicensed and therefore illegal dog-breeding farm [19]. Furthermore, the news of a poisoned native wild otter echoed around the world *via* online news and social media [20].

The present research aimed to gather data with regards to animal crime in Singapore over the year 2016 (January-December) as collected by AVS, SPCA and ACRES, and analyse them for any trends that may be present, thus painting a picture of what animal crime looks like in the Singaporean society. As this is only a one-year study, comparison cannot be made on trend of cases over the years in Singapore. However, results of this research are of pivotal importance in beginning identifying criminal hot spots (geographical and temporal), as well as the animal categories most victimised throughout the years, aiming to facilitate the work of the organizations involved in investigating animal-related crime in Singapore [21, 22].

MATERIALS AND METHODS

Data detailing the complaints and reports of animal crime, cruelty, and welfare issues within January and December 2016 were collected from the three animal welfare and conservation organizations in Singapore – AVS, SPCA, and ACRES. Cases from the year 2016 were chosen based on the fact that all of them are currently closed and the information has been made publicly available.

Details of the cases collected were sorted using eight parameters: *date*, *location*, *perpetrator*, *victim*, *type of crime or complaint*, *case outcome*, *organization*, and *punishment*. The date was recorded by day, month, and year. The details of the location recorded included the district in Singapore (North, South, East, West, and Central districts) and type of crime scene. Details of the perpetrator – if available – were recorded as *nationality*, *gender*, *age*, and *number of perpetrators* involved in the case. Details of the animal victim were recorded as the *species*, *breed*, *number of animals involved* in the case, and the classification of the animal – *domestic* (companion animals and livestock), *wildlife* (undomesticated animals of species native to Singapore), or *exotic* (undomesticated animals of species non-native to Singapore). The type of complaints (considered “offences” or “crimes” only after a complete investigation) committed against animals and described in the animal welfare organizations reports were also considered in the research. Similarly with the reports, the complaints

were divided into the following categories: *abandoned* (domestic animal deliberately abandoned by human owners from their home); *allowed to roam* (domestic animal deliberately left unsupervised by owners outside its home); *barking animal* (animal calling until it became a noisy nuisance and raising suspicion of an abusive situation); *caged* (animal confined with of inadequate space); *poor conditions* (animal’s needs inadequately met based on the Five Freedoms/Welfare Aims: freedom from thirst and hunger, freedom from pain, injury and diseases, freedom from fear and distress, freedom from discomfort, freedom to display natural behaviour [23]); *sick and untreated* (left without veterinary attention when needed); *physically abused* (human intentionally causing physical hurt or trauma to an animal); *poisoned* (treated with chemicals with intention to kill eg. pest control); *deceased* (animal found dead under suspicious circumstances, possibly due to bad welfare, i.e. abused to death, malnutrition, lack of veterinary attention); *taken from the wild* (wildlife illegally taken into captivity); *illegal possession* (unlawful possession of an animal or parts of an animal); *illegal sale* (unauthorised sale of animals); *smuggling* (illegal import of animals); and *licencing* (pet without proper licence).

To note, in order to maintain consistency in the assessment that could be potentially be too subjective (e.g. different assessors can judge “poor conditions” in different ways), the animal welfare organizations train their assessors on the specific evidence and parameters to be considered in their report. Furthermore, it is important to underline that some complains are specific of a certain category of animals (e.g. “allowed to roam” considered only domestic animals). Finally, in case reports of more than one complaint (e.g. poor conditions together with sick and untreated), it is reported considering the most comprehensive category.

Where illegal wildlife items of trade were involved in the cases, the items were separated into seven categories: *animal parts* (when not specified), *teeth*, *tusks*, *claws*, *bones*, *skin*, and *taxidermy*. The details of all cases analysed were recorded according to the organization that acted as the first responder to the complaint or crime against the animal. If available, the following information were also collected: the names of other organizations (where external intervention was

necessary), help or support provided to the first-responding organization; the case outcomes, how the victim was handled after the investigation; any punishment handed down to the perpetrator by Singaporean authorities. Using Microsoft Excel®, data were plotted to identify the general trends.

RESULTS

i) Number of cases

A total of 831 cases were investigated by AVS, ACRES, and SPCA in 2016. The number of cases varied from a minimum of 57 (January and June) and a maximum of 89 (March), with an average of 70 cases/month (Figure 1). When the data were sorted according to the first-responding organizations that dealt with them, it is noticeable that the largest portion of the cases were investigated by the SPCA (n=753, 89%), followed by ACRES (n=56, 7%) and AVS (n=34, 4%) (Figure 1).

ii) Crime scenes

The majority of the crime scenes were located in physical districts of Singapore. However, 2% of the

crime took place online (n=20, 2%). Cases with unknown physical locations (missing information in the report) made up 5% of the total number. Animal crime/complaints come from all five districts in Singapore, with the highest number coming from the East (n=319, 38%), followed by the North and West (respectively n=162, 20% and n=157, 19%), the Central (n=95, 12%), and with the least number of cases coming from the South of Singapore (n=34, 4%) (Figure 2).

To further analyse the location where animal crime took place, details of the types of places where animal crime occurred were also recorded (Figure 3). The greatest proportion of the cases (n=614, 73.9%) of the cases occurred in housing districts across Singapore. The next largest proportion of cases come from animal centres (n=38, 4.9%), followed by industrial districts (n=15, 1.8%), outdoor places (n=13, 1.6%), public transport (n=13, 1.6%), religious centres (n=5, 0.6%), business districts (n=7, 0.8%), commercial places (n=26, 3.1%), dining districts (n=6, 0.7%), education/care centres (n=4, 0.5%) and farming districts (n=8, 1.0%).

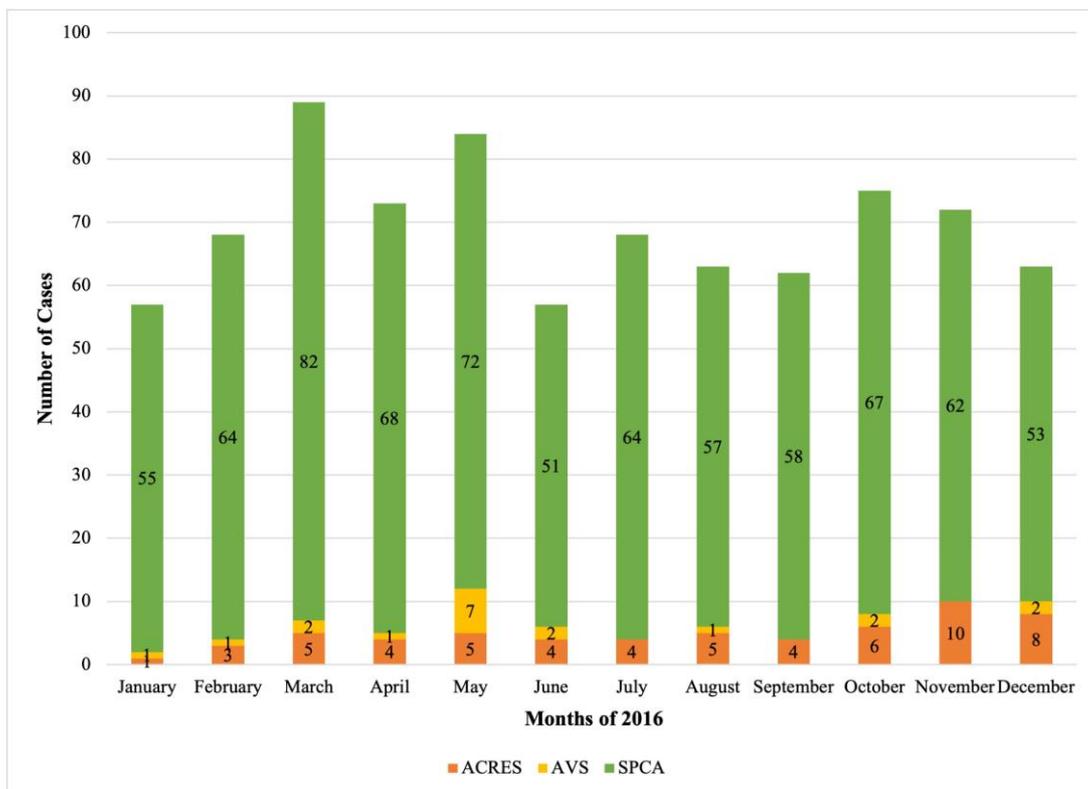


Figure 1 Number of cases of animal crimes investigated in 2016, divided by months and by the organization in charge with the initial investigation (AVS, ACRES and SPCA)

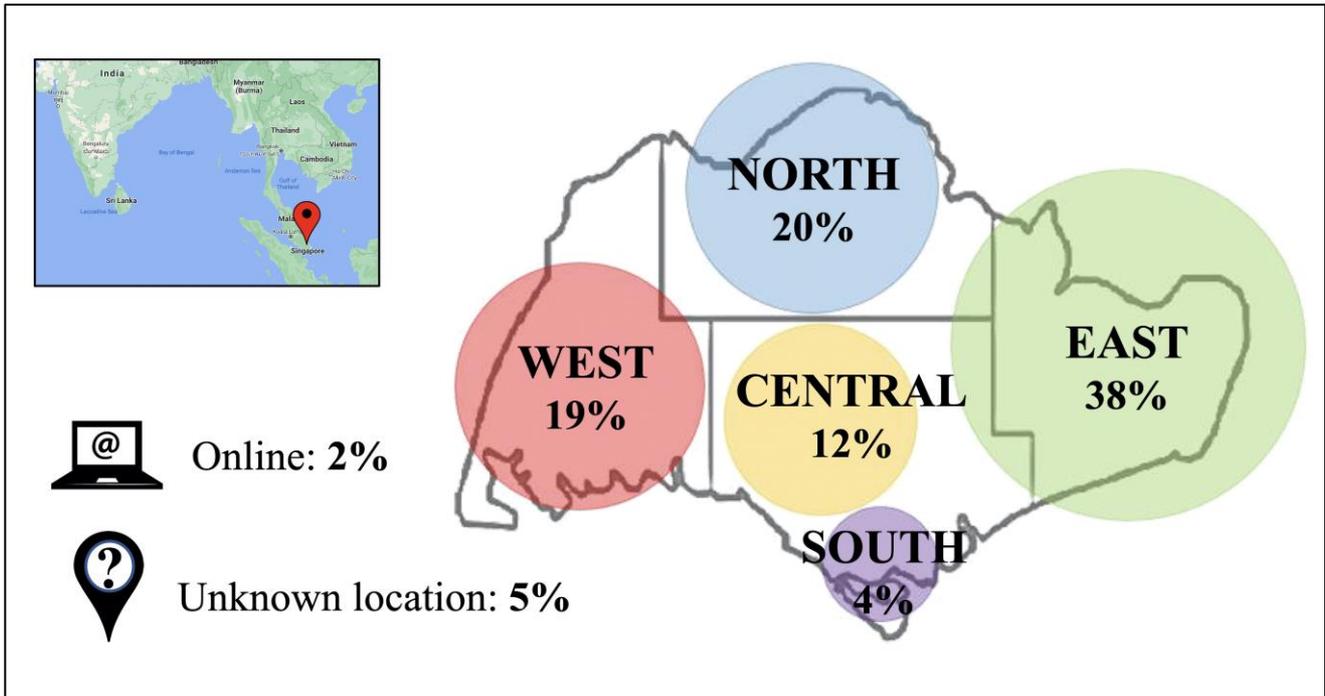


Figure 2 Percentage of animal crime and complaints received in the year 2016 from the five districts of Singapore, identified online and at non-recorded location. According to the Singapore District Guide, the North district consists of 9 districts: Ang Mo Kio, Bishan, Marymount, Seletar, Sembawang, Sungei Kadut, Woodlands, Yio Chu Kang, and Yishun. The South district consists of 5 districts: Bukit Merah, Outram, Queenstown, and Sentosa. The East district consists of 17 districts: Aljunied, Bedok, Bugis, Changi, Geylang, Hougang, Marine Parade, McPhearson, Mountbatten, Paya Lebar, Punggol, Sengkang, Serangoon, Simei, Tampines, and Woodleigh. The West district consists of 10 districts: Boon Lay, Bukit Batok, Bukit Panjang, Choa Chu Kang, Clementi, Dover, Jurong, Lim Chu Kang, Teck Whye, and Tuas. The Central district consists of 9 districts: Bukit Timah, Downtown Core, Holland, Newton, Novena, River Valley, Rochor, Tanglin, and Toa Payoh. Online platforms were social media (i.e. Facebook, Twitter, Instagram and SnapChat) and sale communities (i.e. Carousel, Gumtree, and other unclassified websites)

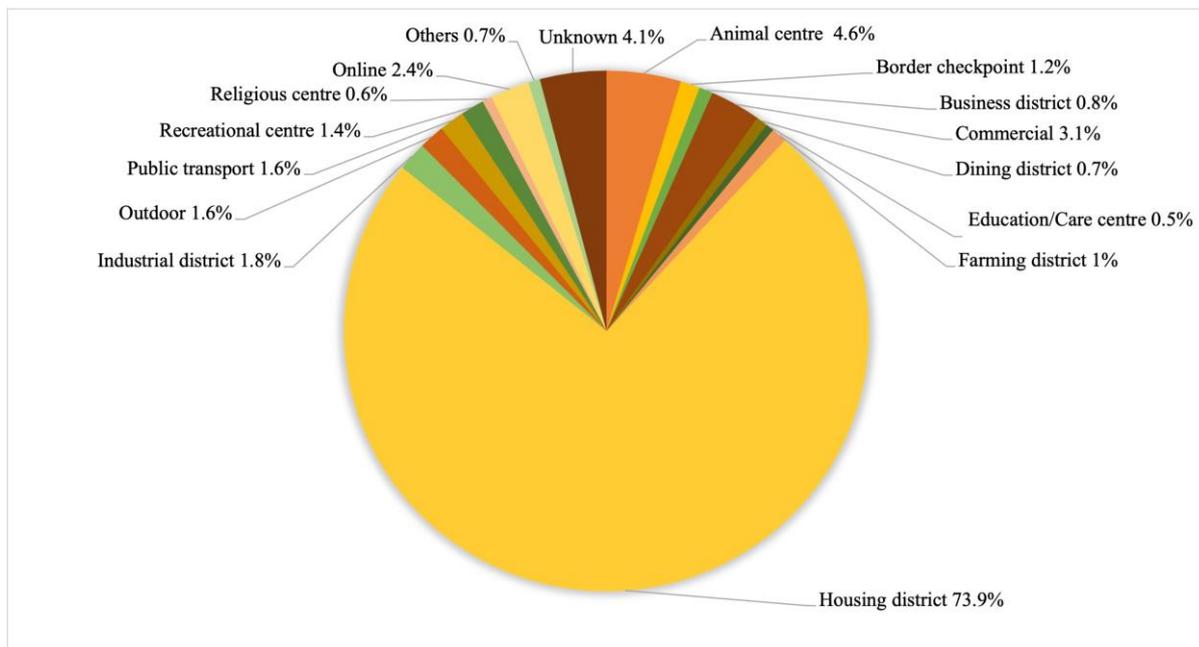


Figure 3 Percentage of locations where animal crimes took place in Singapore in 2016

iii) Victimised animals

Number of animal victims

Out of the 831 cases investigated in Singapore in 2016, a total of 2356 animals were involved. Most of the cases involved one species or one category of animal only (clarified throughout the manuscript).

Type of animals

Several reports described the animals in layman terms such as “tortoise”, “terrapiin”, “turtle”, “lizard”, or “snake”, therefore it is not possible to provide a breakdown of all the species involved. Nearly half of the cases (n= 1116, 47.3%) involved mammals, specifically dogs (n=721), cats (n=287), small mammals (n= 104; category comprehensive of mammals small enough to “fit into pockets” e.g. rodents, hedgehogs, sugar gliders), hoofstock (n=3; category consisting of ungulates), and non-human primates (n=1, a macaque). Most of the dogs that fell victim to crime were of unknown breeds (n=453, 62%), cross breeds (n=59, 8.1%) and generally of small size (below 10 kg). Herptiles (reptiles and amphibians),

were victimised in large numbers of cases (n=1113, 47.2%) affected individuals accumulated to 1070 turtles (= aquatic testudines), 43 terrapins (= semi-aquatic testudines) and tortoises (= terrestrial testudines), and 4 frogs. Overall, birds represented a much smaller count of cases (n=104, 4.40%). Specifically, n=37, 35.6% were wildlife birds (= undomesticated bird species native to Singapore), n=34, 32.7% were domestic birds (= bird species classified under companion animals and livestock) and n=27, 26.0% were exotic birds (= bird species non-native to Singapore). Fish represented the smallest number of cases (n=6, 0.254%), with most of the species unknown (7 out of 8 species). Data are shown in Figure 4.

Animal parts

Considering cases involving animal parts (n=16), the majority were animal parts obtained from tigers (n=9) (Figure 5a). The most popular items object of crimes were teeth, followed by animal parts, claws and skin (Figure 5b).

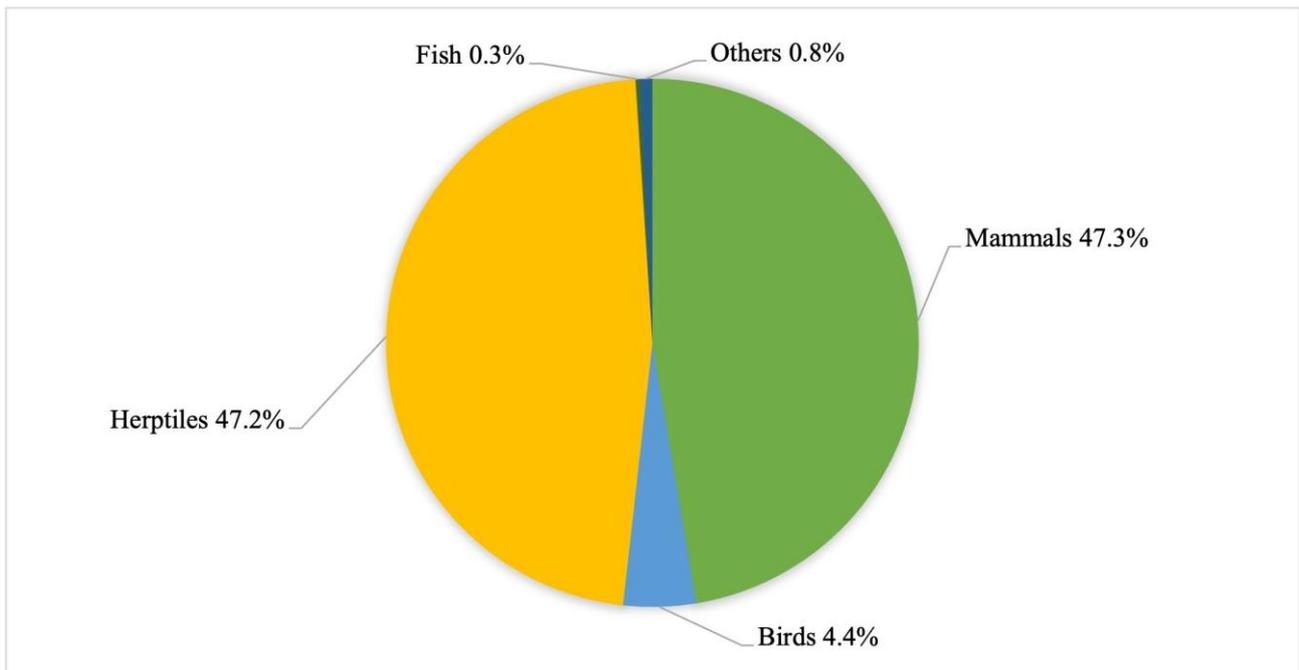


Figure 4 Percentage of animal groups involved in animal crimes cases in Singapore in 2016

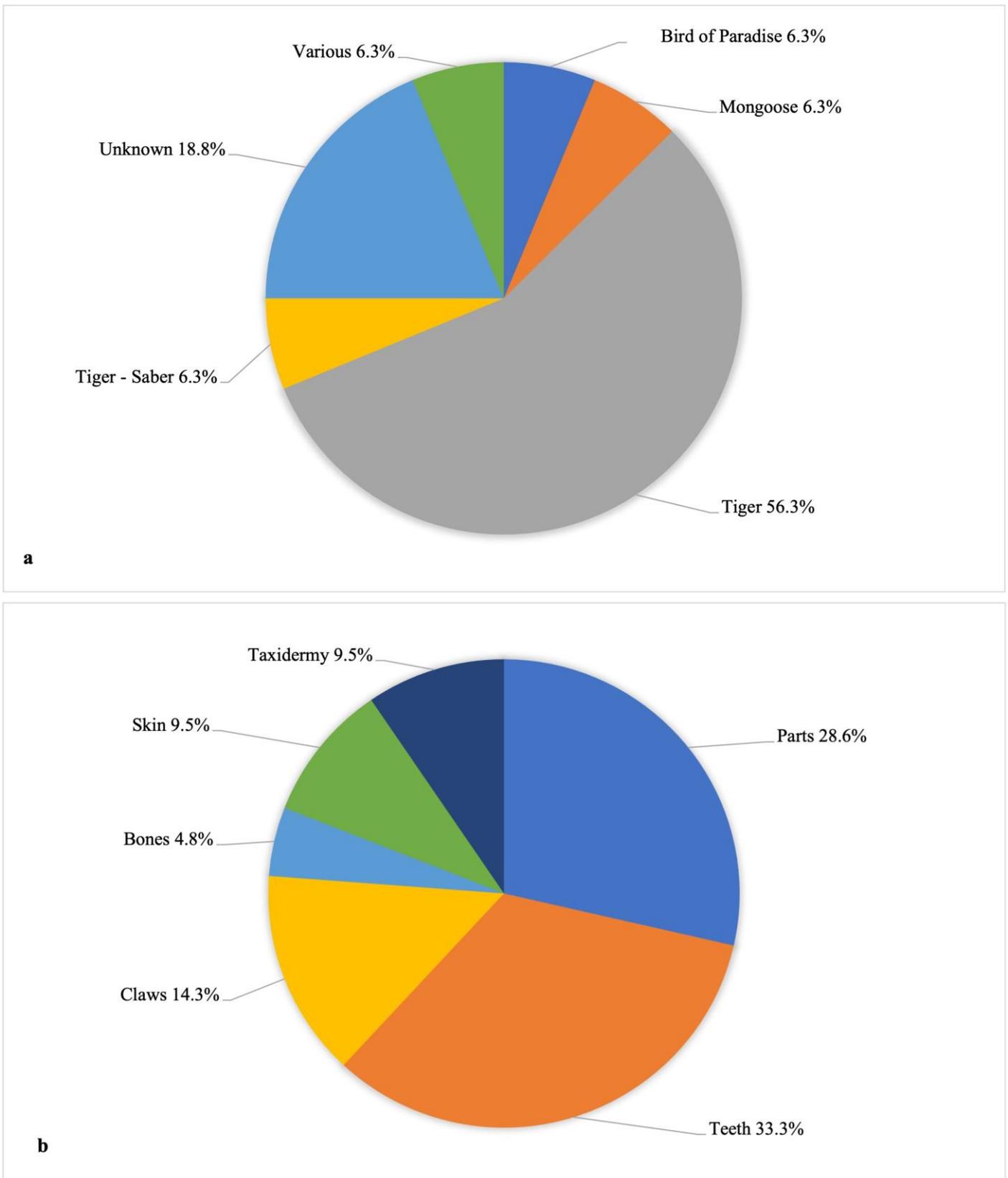


Figure 5 Percentage of animals identified in cases involving the detection of illegally possessed animal parts (a) and percentage of animal parts found in such cases (b)

iv) Type of crimes or complaint

Out of the 17 different types of animal crimes committed and categorised in Singapore for the year 2016, the highest proportion of cases fell under *poor conditions* [23], which accounts for 37.3% of the cases (n=310). Cases involving animals that have been *caged*, *physically abused*, and *tied up*, appear at a higher frequency than the other types of crime, accounting for 11.7%, 9.6%, and 11% of the cases respectively. Less frequent crimes included *sick and untreated* (6.7%), *abandoned* (6.1%), *deceased* (4.8%), *barking animal* (3.9%) and *illegal sale* (3.2%). The least frequent crimes include *taken from the wild* (1.6%), *allowed to roam* (1.1%), *illegal possession* (1.0%), *poisoned* (0.7%), *licencing* (0.6%), *smuggling* (0.6%) and *poaching* (0.1%) (Figure 6).

With regards to the first-responding organization that dealt with the crimes, AVS investigated 7 out of the 17 types of crime, SPCA 13 out of the 17 types and ACRES 12 out of the 17 types (Fig. 7). *Physical abuse* (n = 35; 11%) and *smuggling* (n = 9; 29%) were the largest proportions of case scenarios in which AVS was involved, while for SPCA the largest proportion of cases investigated consisted mostly of companion animals living in *poor conditions*, followed

by cases in which animals were *caged*, *tied up*, and victimised by *physical abuse*. ACRES, instead, was more involved in the investigation of *illegal sale* cases, followed by cases in which animals were found in *illegal possession*, and animals were *taken from the wild* (Figure 7).

The victimised animals were also divided into exotic, wildlife, and domestic animals, and analysed for the proportion the different types of crime accounted for. Out of the 17 different types of crimes, exotic animals were involved in n = 8; 47.1% types (7.12% of total cases), wildlife in n = 10; 58.8% types (6.26% of total cases), and domestic animals in n = 14; 82.4% types (86.6% of total cases) (Fig. 8). The vast majority of cases involving exotic animals were from *illegal sale* (47%), followed by *illegal possession* (12%) and animals living in *poor conditions* (12%) (Figure 8, 9a). Cases involving wildlife animals were mostly from animals being *taken from the wild* (39%) followed by animals were found *living in poor conditions*, *physically abused* or *deceased* (11%) (Figure 8, 9b). Domestic animals, instead, were mostly involved in welfare issues such as *poor conditions* (40%), *caged*, *tied up* and *physical abused* (12%) (Figure 8, 9c).

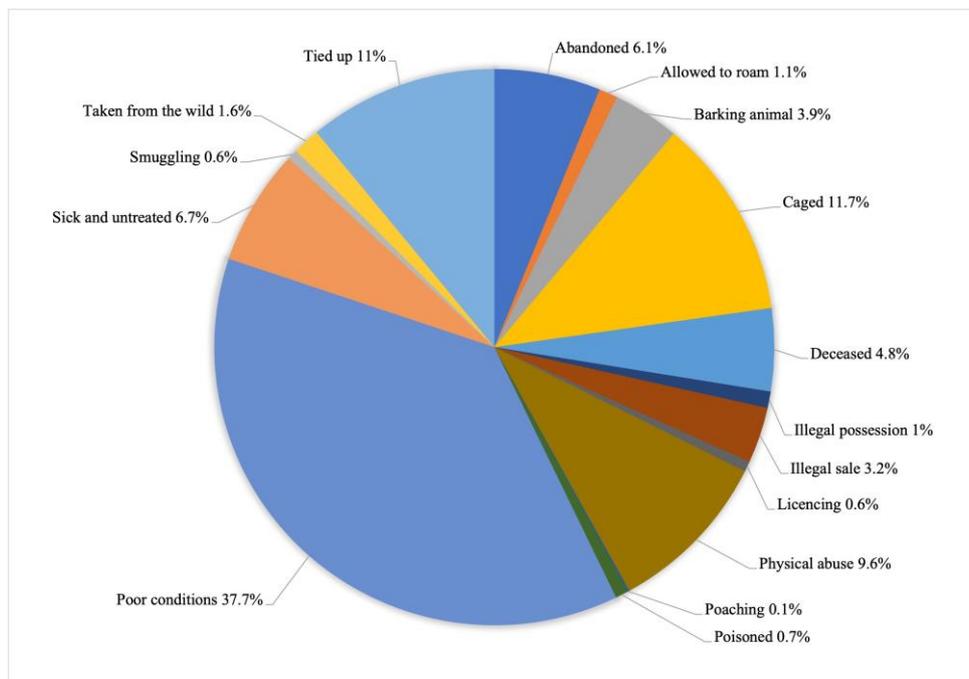


Figure 6 Percentage of type of crimes committed against animals in Singapore in 2016

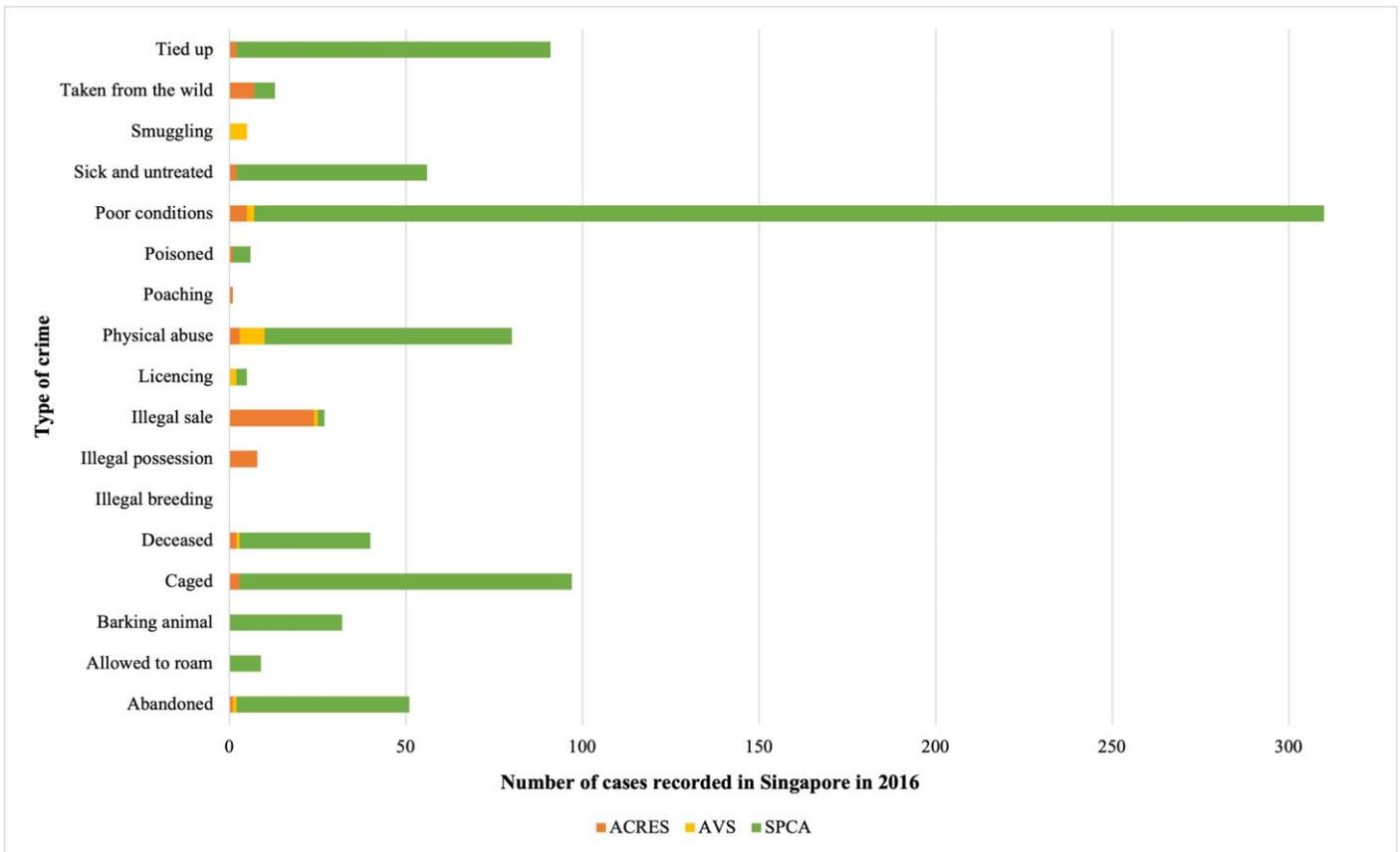


Figure 7 Number of animal crimes committed in Singapore in 2016 subdivided into categories and by first-responding organizations

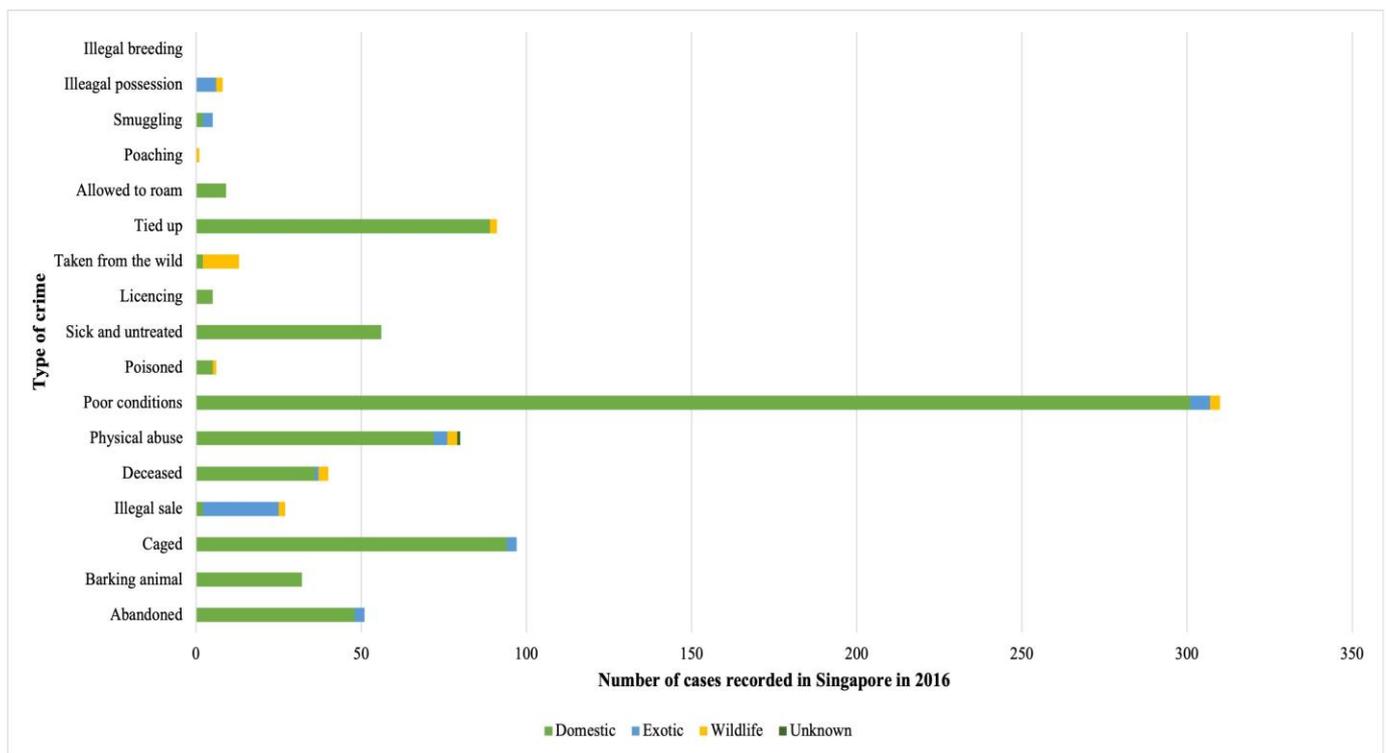
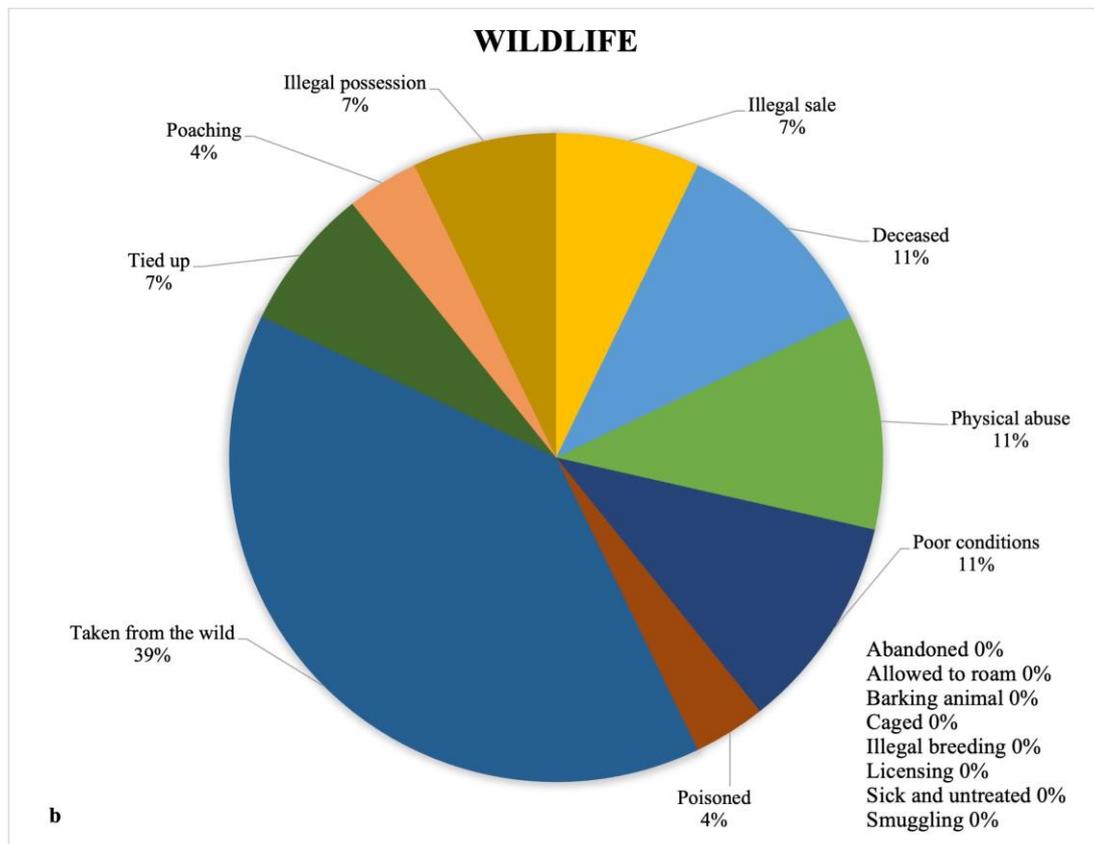
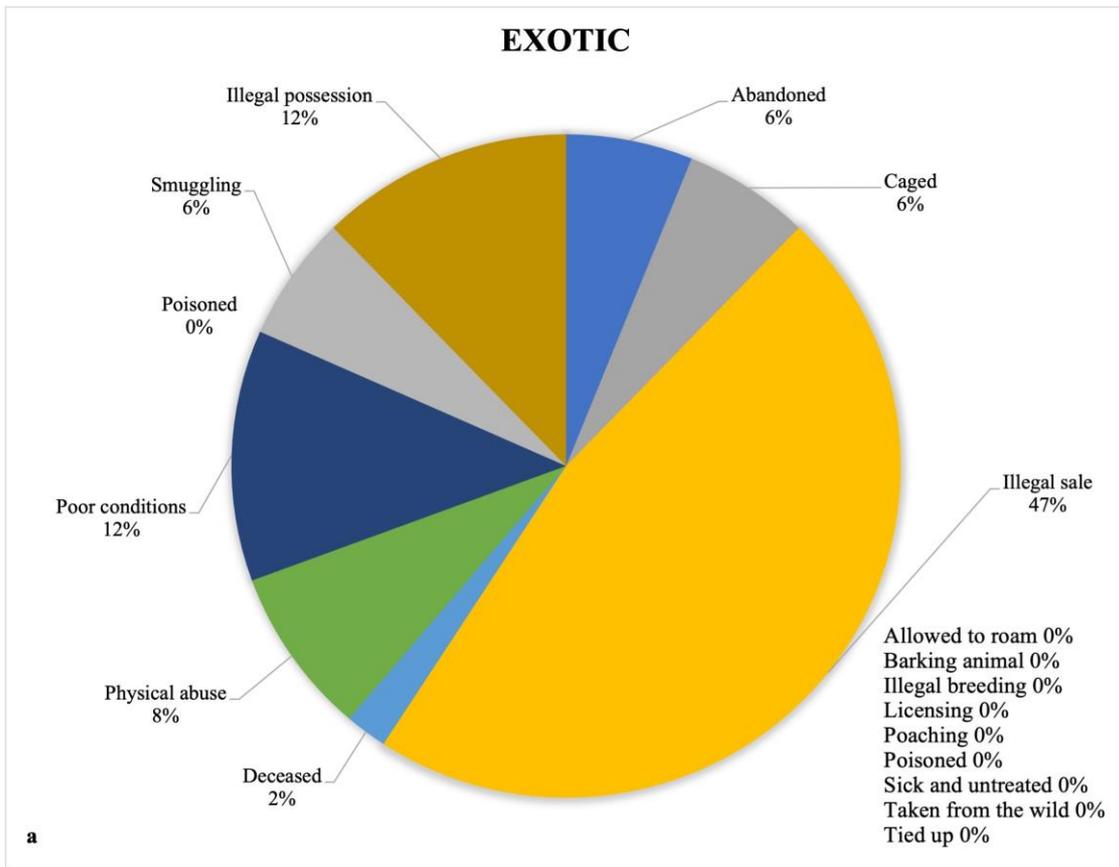


Figure 8 Type of animal crimes committed in Singapore in 2016 subdivided into categories of number of victimised animals: exotic (a), wildlife (b) and domestic (c)



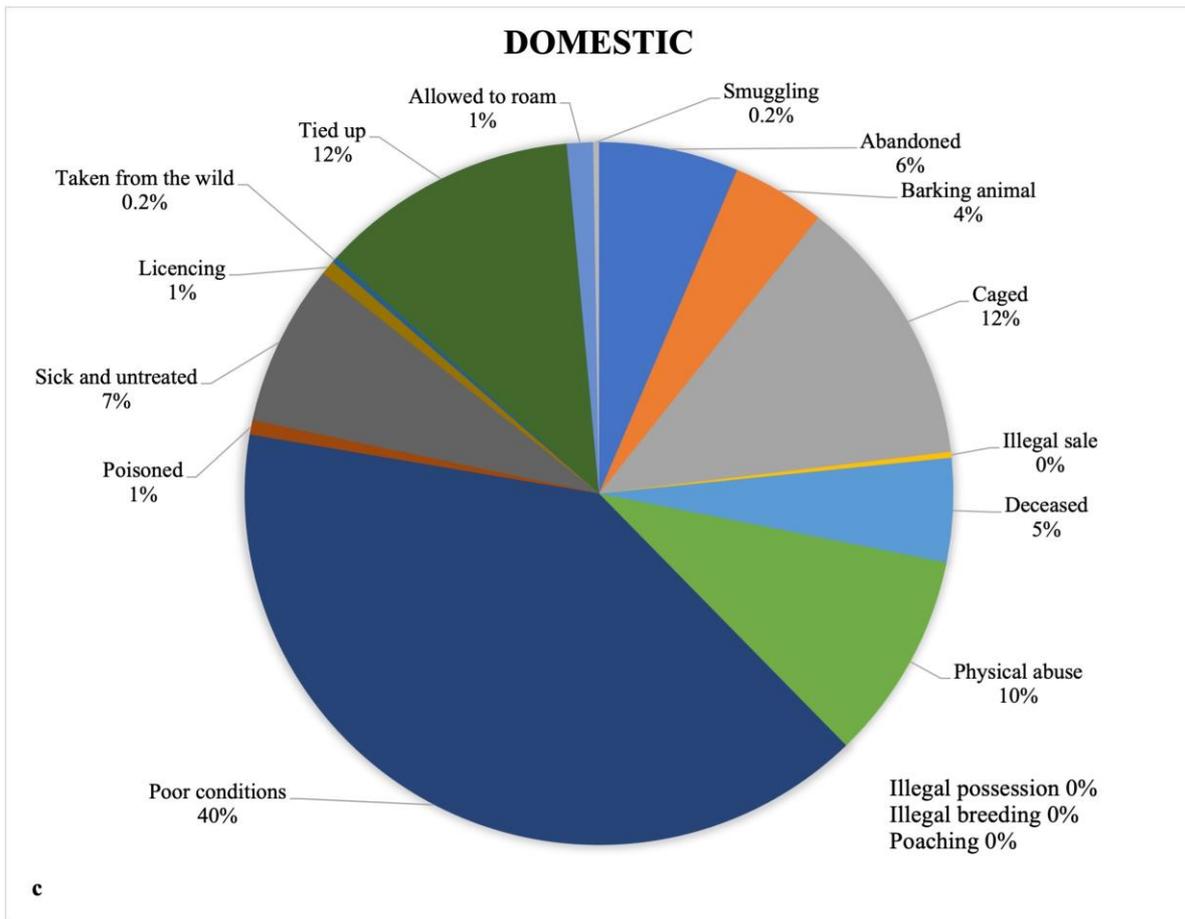


Figure 9 Percentage of types of crimes committed against different types of animals in Singapore in 2016: (a) exotic, (b) wildlife, (c) domestic

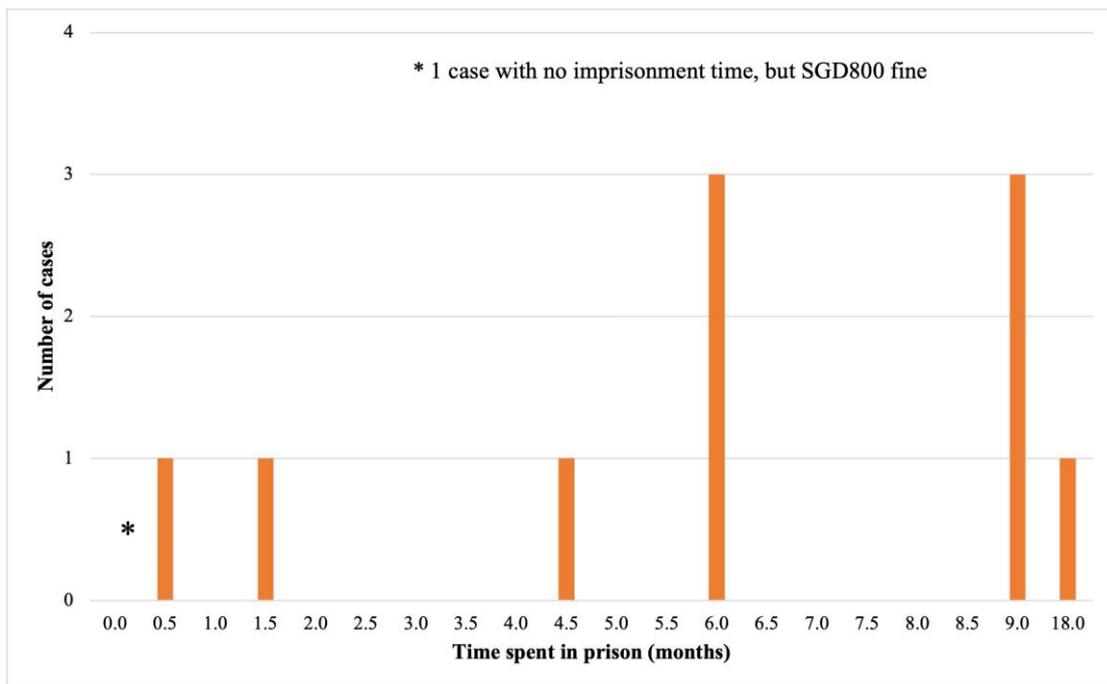


Figure 10 Time spent in prison (in months) or fine applied as punishment based on number of cases committed by a single perpetrator

v) Perpetrators and punishment

Out of the 831 cases, 839 perpetrators were identified. However, in most of the reports (66%) the gender of the perpetrator was not reported, but where the information was reported, 20% were males and 14% females. The reports also failed to identify most of the nationalities of the perpetrators (97% unknown). Only 1.7% were identified as Singaporean, and 0.8% as non-Singaporeans. Out of the three organizations, reports with the most complete information were generally provided by AVS, followed by ACRES, and SPCA.

With regards to punishment, there were a total of 11 cases in which perpetrators were charged with imprisonment, and only in two of these cases the perpetrators were punished with both imprisonment and fines. Imprisonment sentences ranged from less than one month to a maximum of 18 months, with typically longer charges if the perpetrator was accused of more than one case (Figure 10).

DISCUSSION

Singapore has a population density of 7909 people/km², ranking her the third most densely populated country worldwide [5]. These tightly clustered neighbourhoods increase the occasions of witnessing a potential case of poor animal welfare, due to the close physical proximity in which households are living in. While some complaints are genuine, others could merely have resulted from feud between neighbours, or a premature judgement based on incomplete observations, in which cases the animals involved were in good or acceptable care upon investigation. One example includes an article shared on social media in January 2021 of a domestic cat allowed to roam spotted clad in a Hawaiian T-shirt. Although the animal was in good physical condition with no injuries or illness, the article was shared over 600 times, *via* news reports and social media. People reading about the news were leaving several different and sometimes comments, e.g. some commented the clothing was funny or harmless; others worried the clothing would cause the animal to overheat or get tangled. As a result of this observation/personal opinion, several complaints to the authorities were lodged [24].

The three animal welfare organizations appointed to investigate crimes against animals – SPCA, AVS and ACRES – dealt with complains/crimes against animals in different proportions, as each is more specific for certain issues. SPCA investigates the largest portion of cases because it is mainly focused on animal welfare for domestic animals [25] – that numerically are the most victimised. SPCA takes on cases such as *poor conditions*, animals that are *caged*, *tied up*, *physically abused*, and *sick and untreated* (Fig. 7). SPCA is in charge of conducting investigations, intervening when necessary or possible, advising offenders on how to better care for their pet, or handing the case over to AVS if higher authority intervention is required [26]. ACRES deals specifically with wildlife and exotic animals [13] and is focused on taking in *injured* wildlife, investigations of *illegal sales*, *illegal possession*, and cases where animals were *taken from the wild*. Meanwhile, AVS deals with more serious crimes, in which often the perpetrators are charged in court, fined, and imprisoned. AVS is also the only organization possessing authority to thoroughly investigate by searching the scene for evidence or even entering a suspect's home. Due to the sensitivity of such cases, AVS only allowed the use of their closed cases that were publicly available as reported news on their website. Therefore, comparing all three organizations, the proportion of cases allowed to be obtained for use in this study, which were investigated by AVS, are much lesser than the complaints received from ACRES and SPCA.

The percentage of cases of crimes committed against animals appears to be higher in the smaller, yet more densely populated districts of Singapore. The North, East, and West districts are mostly populated by housing estates, while the Central district has a smaller concentration of housing estates as it is mostly populated by reservoirs, or rather, water catchment areas. The South district has the least number of housing estates as it is the central business district of Singapore. Hence, this area registered the smallest percentage of such crimes, while the 74% of the crime/complaints come from housing districts (Fig. 3). These circumstances resulted in 90.4% of the animals that were victimised being (small) pets, and a total of 59.2% of the cases (Fig. 7) being the crimes stemming from welfare issues such as *poor conditions*, *caged*, and *tied up*.

Offences from animals kept in *poor conditions* consisted of the widest variety of animals (Fig. 6-9). Domestic animals were generally victims due to owners neglecting their pets by omission or lack of care. Signs of neglect included dental disease, overgrown hooves, horns, or claws, dehydration, heavy ectoparasite infestation, emaciation, failure to treat adverse medical conditions, and severely matted fur [27]. Comparatively, animals of all kinds were that were exotic to Singapore but kept as pets and housed in poor conditions, were a result of owners lacking knowledge to provide adequate care for them, leaving them in an artificial environment with the lack of suitable diets and habitats, specific to their needs of their species that are necessary for them to thrive in captivity [28].

Overall, the highest number of the animals reported to be deceased were cats (cause of death not reported) (Figure 8). The high number of deaths could be due to the roaming behaviour of cats, displayed in the owned, stray, and cats allowed to roam [29, 30]. This often ends with death by car accidents, or attacks by other stray animals (especially dogs) [29]. The cats' roaming behaviour is also explanatory for opportunistic abuse [27] as such behaviour increases their chances of encountering people who see them as victims in densely populated Singapore, presenting them as easy targets. With regards to animals' physical abuse, despite the number of cases investigated by SPCA, only a small number made their way up to the court through AVS. This could be because only AVS has the authority to thoroughly search the scene. However, it could also be due to a lack of understanding of the definition of abuse by the pet owner, and the lack of knowledge of using "positive reinforcement" when training an animal. In several circumstances, when the owner was asked why they conducted an act to hurt their animal, the owners merely claimed that they were punishing their pet to train them into obedience [14].

With regards to wildlife, these animals were mostly victimised by *illegal sale* and *illegal possession*, accounting for illicit trade and smuggling of wild animals. The victimised species generally found to be those native to neighbouring Southeast Asian countries. For example, birds like red-whiskered bulbuls are native to southern China and the Indian continent [31], while the Chinese hwamei is distributed widely across

southern and central China, Taiwan, Hainan, and northern Indochina [32], and star tortoises are native to India and Burma [33, 34]. All smuggled animals are brought *via* the Woodlands checkpoint in the North through cars [35, 36], or *via* airplane through Changi airport [37], and even more rarely *via* sea, coming from the Changi coastlines in the east on a yacht [38]. The smuggling offences were committed by Singaporeans, foreigners from Vietnam, and Malaysia, and in some cases, a team made up of Singaporeans and a foreigner. Considering this, it can be inferred that the foreign perpetrators either acted on their own or conspired with Singaporeans. In these cases, the perpetrators were charged as animals imported into Singapore failed to meet the AVS's conditions, including licencing, health certification, and vaccination requirements [38].

From this research, a large variety of animals were found *illegally possessed* and *illegally sold* in Singapore (Figure 8). Generally, these were small mammals and the herptiles kept as pets, or small ivory items and pieces of skin [39, 40]. Their small sizes made them easily hidden, hence also easy to pass through the border undetected [41]. Therefore, most of the discovery happens online, where they are advertised and sold through the major social media platforms (i.e. Facebook, Twitter, Instagram, and SnapChat) or online sale communities (i.e. Carousel, Gumtree, and other unclassified websites) (Figure 2). Although many of these animals are legally kept as pets in other countries (e.g. Malaysia, Australia, The United States of America), Singapore considers them "Invasive Alien Species" (IAS) - plants, animals and microorganisms that are exotic, non-native, introduced or non-indigenous, with respect to a particular ecosystem – and a threats leading to biodiversity loss [42]. Therefore, it maintains a strict ban on them as they can potentially become invasive by being able to survive, reproduce, and spread diseases to domestic animals and humans, causing medical and veterinarian issues, and a negative impact on local biodiversity [26, 43]. As the animal is not in its native environment, the owners' lack of knowledge to properly care for the animal, unsuitable diet and living conditions would compromise the animal's welfare.

With regards to animal parts, items derived from tigers were the most commonly *illegally sold* and

ACRES did several major investigations into this issue [39, 40]. Due to superstition and religious beliefs, tiger parts are desired for jewellery, lucky charms, and traditional medicinal purposes [40]. These parts include teeth, claws, either sold on their own, or embedded with silver and gold. These items are believed to bring power and good luck and ward off evil. Amulets are also manufactured from tiger skin pieces to form religious lucky charms that are believed to bring protection and authority to its owner [40]. From these reports, shopkeepers are aware that selling tiger parts and other ivory is illegal in Singapore, and that tigers are a critically endangered feline species [40]. Despite being aware of that, there were shopkeepers that continued to openly display tiger products [38]. Customers would purchase these items, encouraging the shopkeepers to stock up on them, from neighbouring Asian countries such as China, Indonesia, Cambodia and Laos, Indonesia, and Myanmar, especially during the Zodiac Year of the Tiger [40]. Such mindsets from the customers and the shopkeepers account for tiger products being the most common type of illegal wildlife trade with regards to animal parts.

Overall, importing animals or their parts into Singapore without a permit from AVS is against the law, and perpetrators can face imprisonment up to one year and/or a penalty of SGD10,000 [36]. Under the Animals and Birds act, any person guilty of animal cruelty can be imprisoned up to 18 months and/or fined up to SGD 15,000 for their first offence. In the case of second or subsequent offences, they can be imprisoned up to three years and/or fined up to SGD 30,000 [44]. From the publicly released case reports by AVS that were analysed in this study, many of the sentences were based on one or more charges, such as *illegal import*, *animal cruelty* (subjecting animals to unnecessary suffering or pain), keeping dogs *without a licence* etc. Each charge resulted in an imprisonment period ranging from two weeks to 8 months (Fig. 10). Multiple charges would result in an accumulation of imprisonment periods. The imprisonment period allocated for each charge is less than half of the maximum sentences that a perpetrator could be charged for. In some cases, the charge was merely a fine or a fine on top of a period of imprisonment. In 2016, a fine of SGD 8,000 was allocated to a case in which a man found abusing his

own pet dog with punches and kicks, without any imprisonment time [45]. In another case happened in the same year, a man was charged with an SGD 65,700 fine and one-and-a-half month imprisonment for failure of duty to care, abandoning his animals, and non-compliance with dog licensing and control [46].

The results of this research show that all three welfare organizations make huge efforts in fighting crimes against animals in Singapore. However, out of the large number of cases investigated, only small portion is brought to court. Like many other countries, there is a huge gap between the amount of manpower, resources, authority, and equipment invested into crime in which animals are the victim, and in those where humans are victimised. Furthermore, the law is generally less prepared in enforcement with regards to investigating animal crimes as compared to crimes in which human are victimised. In veterinary and wildlife forensics, procedures from the different forensic disciplines used to investigate crime involving victimised humans have also been applied and adapted to cases in which animals are victims. Considering that animals involved in crimes are of wide variety, experts with the professional knowledge of handling such crimes are in a smaller number, thus guidelines and investigative techniques are not as developed as for humans, and veterinary forensic cases can therefore be extremely complex to solve.

A great benefit in justice served in animal crime in Singapore would be improving in knowledge used to training people involved in the law enforcement, as well as through educating of members of the public, *via* activities from ACRES, AVS, SPCA on the different type of crimes, the charges for the perpetrators and consequences of the crimes for the people and the environment.

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Conflict of Interest

Authors declare none.

Author contribution statement

E.X.C. performed the research, completed the analyses of the data and wrote the first draft of the manuscript. P.A.M. designed the study and supervised the work of E.X.C. The final manuscript is a common effort of P.A.M. and E.X.C.

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