

Suiform Soundings



**Newsletter of the IUCN / SSC Wild Pig,
Peccary and Hippo Specialist Groups**

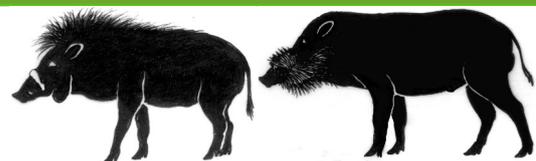
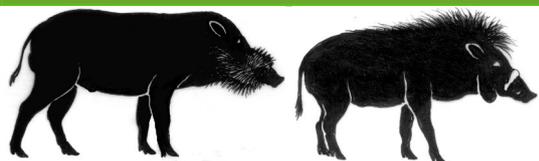


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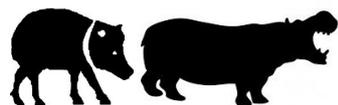
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Photo front page:

Eurasian wild boar (*Sus scrofa scrofa*), one of the few wild pig species with increasing populations. Photo: Thiemo Braasch.

Please email all contributions to future issues to Thiemo Braasch, email: salvanius@gmail.com. Articles, photos and comments are welcome and appreciated. **Please follow the guidelines for authors**, which can be found on the website listed above.



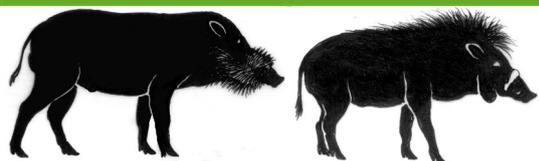
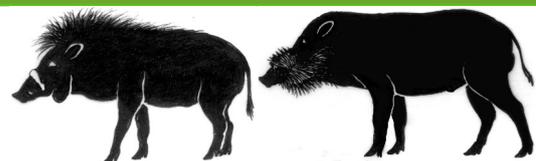
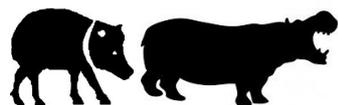
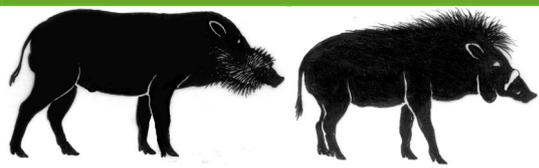


Table of Contents

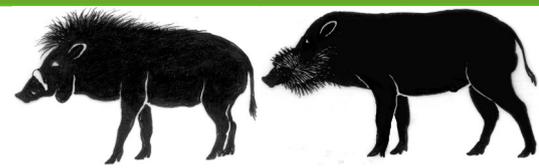


EDITORIAL <i>by Erik Meijaard</i>	4
An obituary for Colin Groves <i>by Erik Meijaard</i>	5
IUCN Red list of Threatened Species Update for wild pigs, peccaries and hippos <i>by Thiemo Braasch and Rafael Reyna-Hurtado</i>	8
First traces of the husbandry of Babirusa (<i>Babirusa</i> spp) <i>by Alastair A. Macdonald</i>	13
II Jornada Internacional do Javali. Santana do Livramento, Rio Grande do Sul, Brasil <i>by T. X. Reis DOS, N. Molinos, M. Wallau and L. H. Medina Filho</i>	23
Notes on the Physical and Reproductive exams of Chacoan Peccaries (<i>Catagonus wagneri</i>) at the Chaco Center for Conservation and Research (CCCI) <i>by Juan M. Campos Krauer and Jeff Holland</i>	27
Collared peccaries (<i>Pecari tajacu</i>) respond to the death of a member of the herd <i>by Dant de Kort and Mariana Altrichter</i>	29
Taxonomic observations on Eurasian wild boar in Tajikistan <i>by Mario Melletti</i>	32
NEW LITERATURE ON SUIFORMES	35
NEW BOOKS ABOUT SUIFORMES	57
ARTICLES IN THE NEWS	61

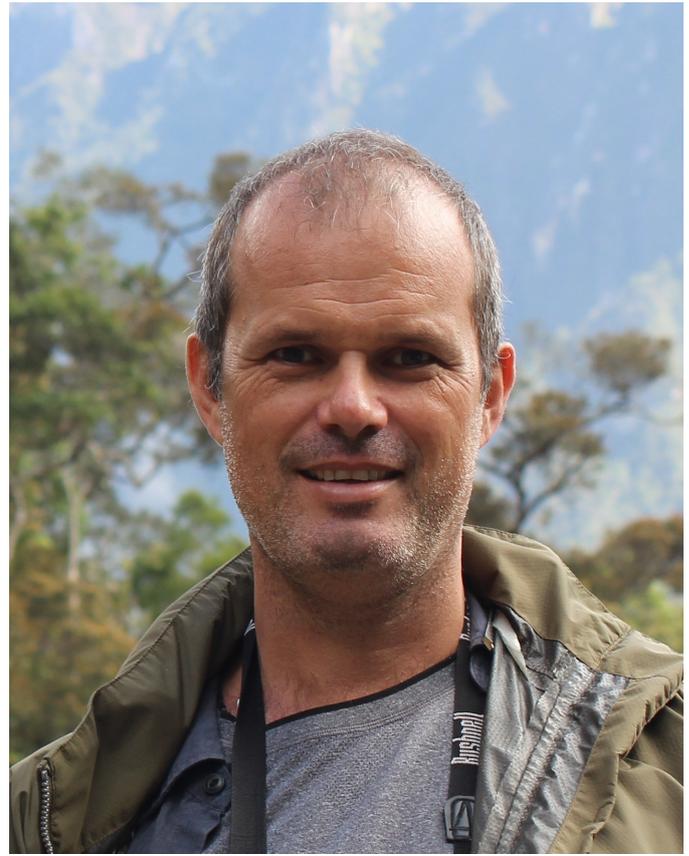




Editorial



A wintery welcome to you all – at least those on the northern and non-tropical parts of the globe – and my warmest wishes for 2018. In front of you is another great issue of our newsletter. I am amazed it is already 16 years ago since we published the first issue, then still called Asian Wild Pig News. How time flies, even in pigs, peccaries and hippo land. I am pleased to see though that under the skilled management of our chief editor Thiemo Braasch we have another excellent Suiform Soundings. It is also great to see that we still receive many enthusiastic contributions from around the globe. Obviously there are still plenty of people who want to share their insights, views, and data on everything to do with the conservation of hippos, peccaries and pigs. And there are also still plenty of consumers of that information. With some 1,000–1,500 downloads of each new issue, we are reaching quite an audience around the globe with an interest in these species. The legacy of this newsletter is also made clear in the many citations to its articles in the recently published seminal book on the “Ecology, Conservation and Management of Wild Pigs and Peccaries”, which is discussed in the book review in this issue. It is obvious now that, despite not quite equaling Nature or Science in readership, Suiform Soundings has some real standing in the scientific world and fills an important knowledge niche.



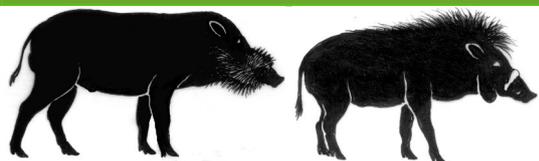
The newsletter opens with an obituary for Professor Colin Groves, easily the most influential taxonomists for the Suidae. It was very sad to hear of Colin’s sudden passing and as I express in the obituary not only will I miss him very much, but I also fear that our conservation work has been weakened just that little without his unwavering support. It is up to all of us now to step it up and do that extra bit for the continued conservation of hippos, peccaries and pigs. This newsletter is a great place to start that extra effort. The articles in this issue highlight the most recent studies, for example, on husbandry of babirusa, mourning behaviour in peccaries, and the unresolved taxonomy of the large *Sus scrofa* group and its many subspecies. These stories both show how much work is being done by the many people who care about hippos, peccaries and pigs, but also how much there still is to do.

I hope that this issue inspires everyone and inspires us all to work even harder on the survival of many threatened suiformes.

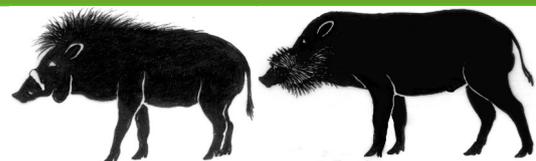
With my warmest regards

Erik Meijaard
Chair, IUCN/SSC Wild Pig Specialist Group and Editorial Advisor to Suiform Soundings





Obituary



An obituary for Colin Groves



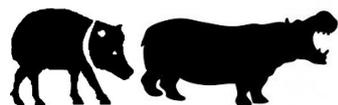
World-leading zoologist and friend Professor Colin Groves died peacefully on November 30, 2017.

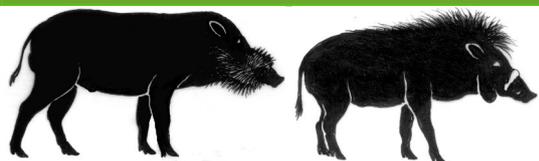
Colin will be sorely missed by our community of wild pig conservationists. He has been the most influential pig taxonomist by far (see his long list of pig publications below). Our current list of 19 wild pig species is largely based on the research Colin conducted since he started to focus on pigs in the late 1970s. Colin's morphological and later genetics-based research played a key role in highlighting how much more diverse the living Suidae were than previously thought.

Among others, Colin's research discovered and rediscovered several new species of pig in the Philippines and Indonesia that had previously been lumped together with other species. As such, his research revealed the incredible evolutionary diversity of pigs in these two South-East Asian countries, and much of the current conservation work on pigs has built on the recognition of this diversity.

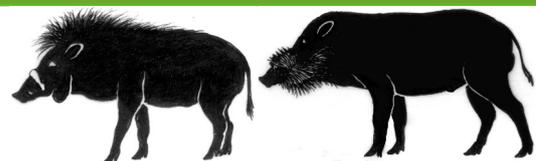
Colin was also involved in the description of *Sus bucculentus* of the Annamite Mountains in Laos and Vietnam in an important paper in *Nature*. Later, when new genetic analyses were conducted, the description of the species was questioned. What we do not know is whether *Sus bucculentus* never existed or whether it did exist but was outcompeted in recent times and absorbed into the gene pool of *Sus scrofa* which also occurs in the region.

Colin always liked such discussions. Is it a species, or is it not? What happened to the species in evolutionary terms? What even is a species? He was a thought leader in this field, although considered too provocative by many. Not everyone liked what Colin came up with in taxonomy. He was accused of taxonomic inflation and dilution of conservation efforts, because Colin's approach to taxonomy resulted in more species than people liked.





Obituary



But people forgot that current taxonomic inflation followed severe taxonomic deflation that, for example, reduced the total number South-East Asian pig species from 38 in the 1930s to three species two decades later. I am personally glad that our pig species in SE Asia are back to a respectable 10 species, although more study is needed to ensure the taxonomy we use reflects the evolutionary diversity of pigs. Unfortunately, Colin is no longer around to ask for his thoughts and input, something I will greatly miss.

I conducted my PhD research on the evolution of mammals in the Malay Archipelago with Colin Groves at the Australian National University, and couldn't have wished for a better supervisor. Whereas many fellow PhD students had to make appointments with their supervisors weeks if not months in advance, Colin's door was always open. Whenever I wanted, sometimes several times a day, I could walk in for a chat about data we were working on or papers we were writing, or some obscure piece of literature, which Colin invariably had somewhere in his library. His enthusiasm for the fields of mammal taxonomy and evolution and biological anthropology was unrivalled, and his willingness to discuss it with anyone unmatched.

I will deeply miss Colin as the kindest, brightest, funniest and most fearless mentor, collaborator and friend I could have ever had. He was the kind of man who grew a beard, because, in his words, "it had taken the human species 200,000 years to develop these secondary sexual characteristics, so why shave?". Intelligence, insight, humour, and the courage to be himself, in a nutshell.

Colin taught me how to humbly battle for objective truth and a better world. And he didn't just teach me what it means to be a good scientist, but showed how to be a good and kind human being. The world will move on, but will be just that little emptier without Colin. I will fondly remember Colin, and will continue to apply the many lessons he taught me in my own life, and try to pass on the torch of his learning to others. Hopefully Colin's spirit will remain with us in our conservation research for many years to come.

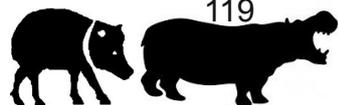
Erik Meijaard

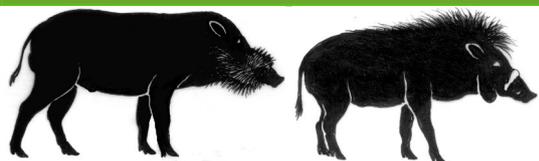
Chair, IUCN/SSC Wild Pig Specialist Group

A list of publications by Colin Groves on wild pigs

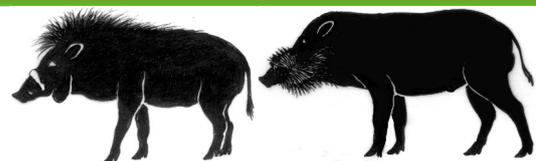
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119

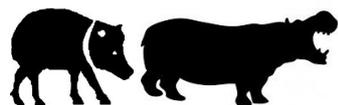


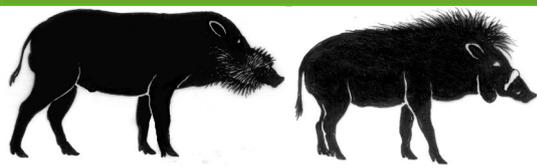


Obituary

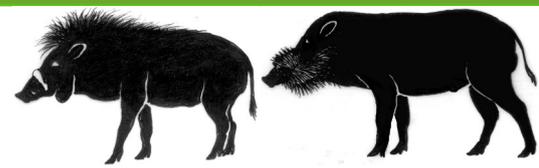


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Ecology and Conservation



IUCN Red list of Threatened Species Update for wild pigs, peccaries and hippos



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The IUCN Red List of Threatened Species is the maximum reference for the conservation status of the taxonomic units that conform the biodiversity. This list was first published in 1994 and it was developed to classify species at high risk of global extinction. This list is updated in a regular interval. Therefore, the status of all listed species are reviewed by experts and changes are applied according to the latest definitions of the different IUCN Red List categories ranging from LC (least concern) to EX (extinct). Here, we present the most recent status of all wild pigs, peccaries and for the two hippo species based in the 2016 update of the Red List.

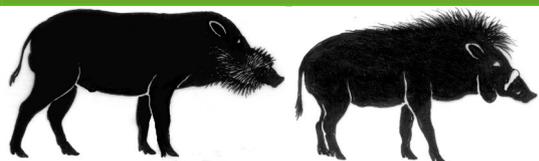
African pigs

The latest IUCN Red list updates for all five African wild pigs (Common warthog, Desert Warthog, Bushpig, Red River Hog, Giant Forest Hog) were done in 2016. All these species are considered least concern (d'Huart & Reyna-Hurtado 2016; de Jong et al 2016a,b; Reyna-Hurtado et al 2016; Seydack 2016). However, four of the five species (with the exception of the bushpigs) are considered presenting a decreasing trend due to hunting and habitat loss. For example, the forested species such as the forest hog is divided in three subspecies of which two are clearly decreasing in range and in population size, the eastern African subspecies (*Hylochoerus meinertzhageni meinertzhageni*) and the Western African subspecies (*H. m. ivoriensis*) (d'Huart & Reyna-Hurtado 2016). Although considered a common and abundant species (Oliver 1995), the Red River Hog is one of the preferred species for subsistence hunters across its range in Africa. Tropical Africa has changed dramatically in recent years (Malhi et al. 2013) and increasing human densities are correlated with increasing rates of hunting. As a result, Red River Hog is also one of the primary prey species harvested for commercial purposes within the bush meat trade in most of Central Africa. Together with the duikers, it is one of the most hunted species in the Congo Basin where a 79 % density decline was estimated from 1.7 individuals /km² in non-hunted areas to 0.36 individuals/km² in hunted areas (Lahm 1994 in Reyna-Hurtado et al 2016). A significant effect of hunting on Red River Hog densities was observed in southern Gabon (Laurance et al. 2006 in Reyna-Hurtado et al 2016). The two warthogs are decreasing mainly due to competition with humans and its cattle for suitable habitat and for drinking water sites. This situation is more intense in the desert warthog, which have a more limited distribution (de Jong et al 2016a,b).

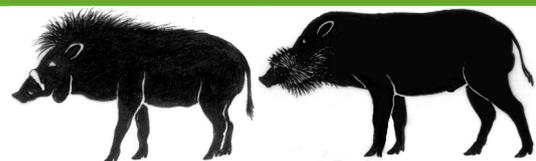
Eurasian pigs

The Pygmy Hog's last classification as critically endangered in the IUCN Red List of Threatened Species dates back to 2008 (Narayan et al. 2008) and no update on its status has been done so far. Although the captive population in the conservation breeding centre is rising and a project to release Pygmy Hogs in its native habitat is successful (Banerjee 2016), Pygmy Hogs remain one of the most endangered pig species. Similarly, there are no status updates for Moluccan Babirusa (last update 2008: vulnerable, MacDonald et al. 2008), Sulawesi Warty Pig (last update 2008:





Ecology and Conservation



near threatened, Burton & MacDonald 2008) and Eurasian Wild Pig (last update 2010: least concern, Oliver & Leus 2010). If the new taxonomy for Eurasian wild Pigs following Keuling et al. (2017) is used, the status for some of the new proposed species in the IUCN Red list of Threatened Species will change (e.g. for *Sus riukiuanus* and for *S. taevanus*).

The status of two babirusa species were assessed 2016. Both, Sulawesi Babirusa and Togean Babirusa have remained in their IUCN Red list category: vulnerable (Leus et al. 2016) and the latter one endangered (MacDonald et al. 2016) since the last review. According to the latest assessment by Heaney and Meijaard (2017) the Philippine Warty Pig remains listed as vulnerable due to its currently undergoing drastic population decline inferred from the apparent disappearance of several populations and the effect of over-hunting, habitat loss and hybridization with domestic pigs. Due to the same reasons but a stronger proposed population decline of more than 80 % over a period of three generations, the Visayan Warty Pig remains listed as critically endangered in the most recent assessment (Meijaard et al 2017). The status of the Mindoro Warty Pig was downgraded from endangered in the year 2008 to vulnerable 2016 (Schütz 2016). This positive change in the IUCN Red list of Threatened Species category The species was downgraded because the estimated current range of the species exceeds the threshold of 5,000 km² (one of the criteria listed as “endangered”). Nevertheless, the range of this species is restricted and heavily fragmented on Mindoro Island. The most important threats for the species are habitat loss, habitat degradation, hybridization and over-hunting.

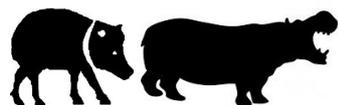
In Indonesia, the recent update for the Javan Warty Pig lead to the ongoing categorization as endangered (Semiadi et al 2016) because of a decline in suitable habitat, especially stands of teak *Tectonia grandis* forest or similar forest plantations, and due to high hunting pressure. The Bawean Warty Pig (*Sus blouchi*) is still considered a subspecies of the Javan Warty Pig on the IUCN Red list of Threatened Species (*Sus verrucosus blouchi*). Its first assessment for the list led to the categorization as endangered (Rademaker 2016) because it has a very small and restricted population on Bawean Island north of Java with less than 250 mature individuals.

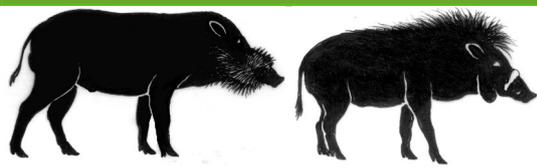
Bearded Pigs were again categorized as vulnerable in the most recent Red list update (Luskin et al. 2017) due to an estimated population decline of more than 30 % over the last three generations. Its threats are over-exploitation, shrinkage in distribution, habitat destruction and degradation. The Sumatran Bearded Pig (*Sus barbatus oi*) lost 62 % of its potential forest habitat (extent of occurrence) between 1990 and 2010 and its occupied range contracted by 76 %.

Finally, the Palawan Bearded Pig was downgraded from vulnerable to near threatened in the recent update (Meijaard & Widmann 2017). Its extent of occurrence is considerably bigger than 20,000 km² (threshold for being listed as vulnerable) but could almost be qualified for as vulnerable. In future assessments it could be listed again as vulnerable.

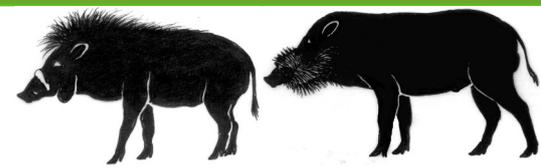
Peccaries

The three extant species of peccaries were classified as Endangered (Chacoan peccary, *Catagonus wagneri*), Vulnerable (White-lipped peccary, *Tayassu pecari*) and least Concern (Collared peccary, *Pecari tajacu*). For Chacoan peccary the situation is not improving and numbers are decreasing. This is a species with a very restricted distribution to the Xeric environments of Argentina, Paraguay and Bolivia but apparently cattle ranching and hunting pressure is increasing and posing a serious risk for the species (Altrichter et al 2015). The white-lipped peccary despite having a much more extend distribution than the Chacoan peccary is also facing serious threat due to hunting pressure. This is one of the most sensible species to hunting





Ecology and Conservation



and habitat loss and now is classified as Vulnerable in all its distribution range (Keuroghlian et al 2013) but efforts are being done to raise its status to Endangered at the regional level (Mesoamerica; See: Reyna-Hurtado et al 2017 Suiform Soundings) due to the rapid decline of its populations. This is the species of tropical large mammal probably more sensible to human disturbance (Keuroghlian et al 2013 and Reyna-Hurtado et al. 2017). Lastly, the Collared peccary despite having the largest distribution and being more tolerant of human perturbation some of its populations are considered decreasing due to hunting pressure mainly and care must be taken to assure its survival at the long term (Gongora et al 2011).

Hippos

The last assessment of Pygmy Hippos was done in 2015 (Ransom et al. 2015). The species remained listed as endangered and very few is know about the remaining populations. The Common Hippopotamus has recently been categorized again as vulnerable (Lewison & Pluháček 2017). Over the last eight years since the last assessment, its populations have largely remained stable. The latest estimation of the population size is 115,000 130,000 hippos. However, several populations have been depleted. For example in DRC the common hippopotamus population of Virung National park was reduced from almost 30,000 in the 1970s to about 630 at the last official count in 2006 (WWF 2005).

Conclusions

Overall, there seems to be a general trend of decreasing for almost all mentioned species, with few species remaining stables for example the Eurasian Wild boar, the African bush pigs, or the Collared peccary in America. More worrisome is that some are still close to extinction like Pygmy Hogs, Pygmy Hippos, Visayan Warty Pigs, Togean Babirusas or Chacoan peccary. New taxonomic species separations will lead to more species on the Red list, such as *Sus riukiuanus*. The assessments are a good tool to focus on endangered species and to reveal threats to their survival. This new assessment of the Red List is sending an important message to the conservation community and that is that the whole group of Suids, Peccaries and Hippos are not doing well and conservation actions must be taken immediately to assure the survival of the species that are at risk now and to reverse the decreasing trend that most of the species are showing.

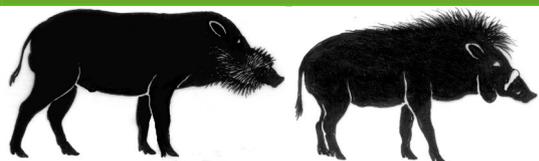


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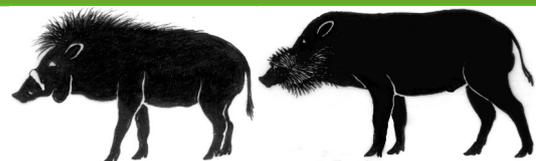
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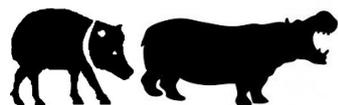


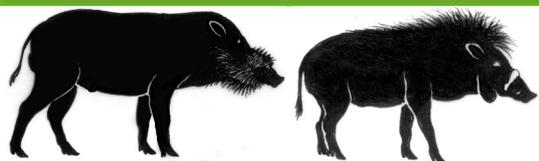


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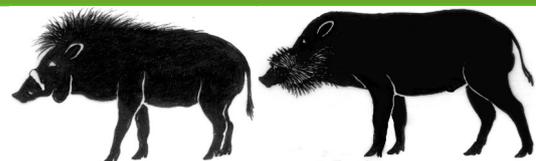


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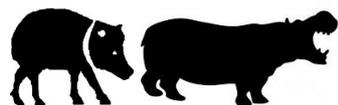


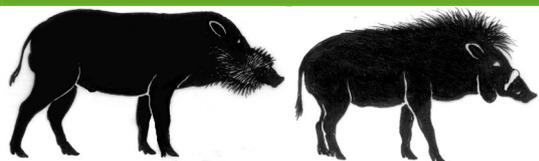


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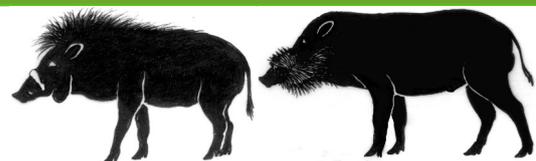


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Ecology and Conservation



First traces of the husbandry of Babirusa (*Babyrousa* spp)

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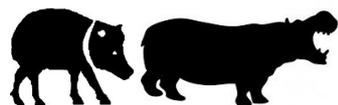
Introduction

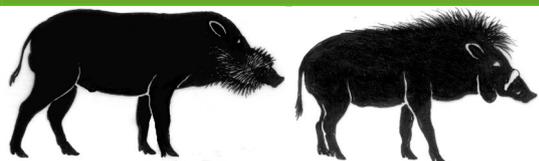
The babirusa (*Babyrousa* spp.) is an unusual wild suid living in the tropical rainforests of Sulawesi, the Togian Isles, the Sula Isles and Buru in Indonesia (Macdonald, 2017a, Ito & Melletti, 2017; Sheherazade, Hesdianti, Indrawan, 2017) (Figure 1). Relatively little detailed information is known about its biology with most of our knowledge based on the study of zoo animals (Macdonald, 2017a). Very few aspects of its life in the wild have been studied (Selmier, 1978; Patry et al, 1995; Macdonald and Pattikawa, 2017). Although some effort has gone into examining the extent and timing of outsider awareness of the animal (Deninger, 1909; Mohr, 1958, 1960; Tjiu and Macdonald, 2016; Macdonald, 2017b), the details of an early history of human husbandry of the babirusa have been largely lost from sight. What remains is often little more than a collection of ambiguous fragments. However, a recent series of studies has been carried out to assist the long-term husbandry of the babirusa and these have focused on its nutrition and digestion, reproduction and breeding (Leus, 1996; Leus 2000; Clauss et al, 2008; Macdonald et al, 2008; Ogle and Macdonald, 2008; Ziehmer et al, 2010, 2013; Rode-Margono et al. 2017). Recently, following international discussion in Europe and Indonesia, a Global Conservation Action Plan was established to guide the coordinated management of the species throughout the world (DKKH, 2015; Leus et al, 2017).



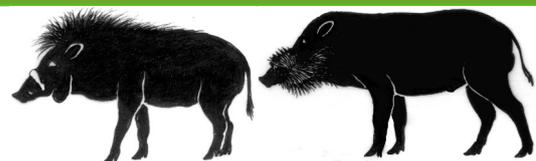
Fig. 1: Map of the 'East Indies' illustrating the islands and cities mentioned in the text.

It has been acknowledged that the first arrival of the babirusa (*Babyrousa babyrussa*) in Europe was at the Jardin de Plantes, Paris, France in 1829, and in North America at the Bronx zoo, New





Ecology and Conservation



York, a century later (Quoy and Gaimard, 1930; Holland, 1999). However, this is some considerable time after the animal was first described in some detail (Ferrari, 1582; Piso, 1658; Nieuhof, 1682), and even longer after the 1512 arrival of Europeans and much earlier arrival of Chinese in the Mollucan islands in search of the source of the spices, clove and nutmeg (Tjiu and Macdonald, 2016; Macdonald, 2017a).

A search through the publications of the period between 1500 and 1900 revealed that there are many scattered references to fragments of information about babirusa that indicated that they had been kept in personal or zoological collections for some time. In addition, there are both published and unpublished reports of their presence in zoological collections in more recent times that have gone largely unnoticed. For over a century there has been concern that the status of the babirusa in the wild has been under threat, and recent studies have reinforced the view that the species is becoming extinct in significant areas of its range (Manansang et al, 1996; Tjiu & Macdonald, 2016; Macdonald and Johanson, 2017; Macdonald and Pattikawa, 2017; Leus et al, 2017). In this paper data has been gathered from the earliest sources in order to give a foundation to a chronological account of the history of husbandry of this interesting and threatened wild pig.

The earliest depicted references to babirusa, dated to 35,400 or more years ago, are to be found as paintings of male and female images of babirusa on the walls of caves east of Maros, in the southwest peninsula of Sulawesi island (Heekeren 1952, 1972; Eriawati 2003; Aubert et al. 2014). It is not clear whether these solely represented wild babirusa or might have included animals kept and husbanded by these people. A 40,000 year old human migration path, through Sulawesi to the New Guinean coast of Sahul, had been suggested by Birdsell (1977) and was recently updated by Kealy et al (2016, 2017). The Sula islands and Buru might have been part of that route as these islands lie within sight of one another (Figure 1). The observation that the babirusa on Buru are the same species (*Babirusa babirusa*) as those on the Sula Islands would suggest that this short sea voyage could have been the route taken to bring babirusa to Buru. Dammerman (1929) deduced from his analyses of babirusa skull anatomy that the Buru babirusa could once have been domesticated. It is currently unknown how early or late that might have occurred. Likewise, it remains a matter of speculation how they were fed, and how they were transported over the sea.

In the sixteenth and seventeenth centuries, as more Europeans took up residence in the East Indian archipelago, the published depictions of the babirusa became more 'true to life' and less like artist's impressions based on traveler's tales and seaman's sketches (Raat, 2010; Tjiu and Macdonald, 2016). The first competent illustration of a babirusa drawn from life appears to have been made in Batavia, Java, on 1st January 1650 (Bartholin, 1654). The adult male was somewhat 'robust looking', which clearly hinted at over-nutrition in someone's garden (Figure 2). In addition, the animal was illustrated without hair, suggesting that it had probably come from somewhere on Sulawesi (Deninger, 1909). At about the same time, further east, in Maluku, babirusa 'as large as a deer' were observed in the gardens of the town of Ambon (Figure 1) by

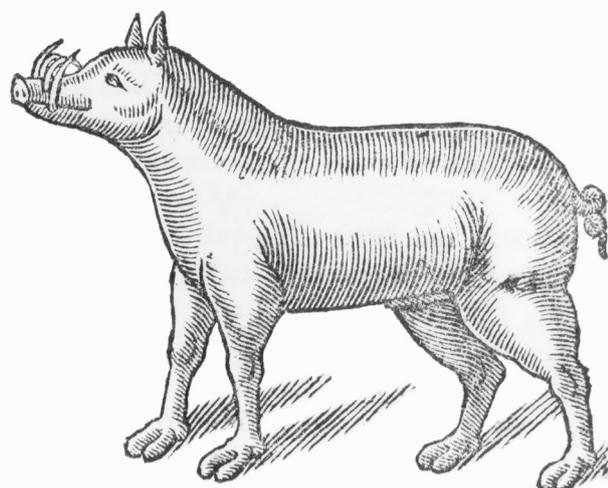
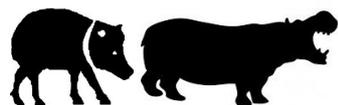
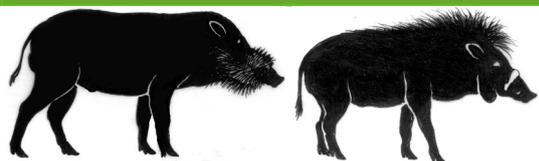
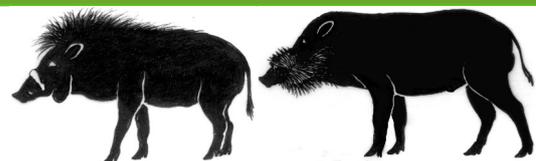


Fig. 2: Drawing of the overweight 'Sulawesi' babirusa in Batavia (Bartholini, 1654)





Ecology and Conservation



Volkert Evertsz who visited the island between 1655 and 1668 (Olearius, 1670). The two illustrations, of what may have been one of these animals, seem to be the artist's representations of an animal described at second hand (Piso, 1658; Tjiu and Macdonald, 2016); it has even been suggested (Geoffroy Saint Hillaire & Cuvier 1842) that these drawings may have been derived in part from the 6th century illustration by Cosmas (see later). The earliest, most true to life illustration of the babirusa from Buru Island was published by Valentijn (1726) and reprinted in 1770 by Jan Monterre (Meijaard et al, 2016). It showed an adult male covered in short hair (Figure 3). When Stavorinus (1797) compared the print with a babirusa caught on Buru (sometime between 1774 and 1778) his comment was that the legs in life were longer than those illustrated.

In Valentijn (1726) there are accounts of babirusa from Buru being kept privately in various gardens on Amboin; one was so tame it was able to respond to its name. We also find here the earliest report of dietary studies having been carried out; the babirusa was fed on a range of local produce, including rice, sweet potato, leaves, canari nuts and fish. It is believed that much of this information about the biology of the babirusa had been assembled earlier by Rhumphius (1627-1702) and had been written in his

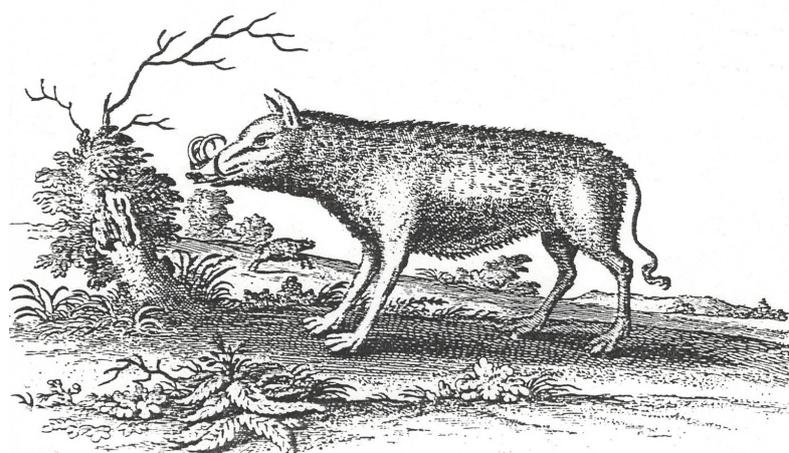


Fig. 3: Drawing of the Buru babirusa (Valentijn, 1726)

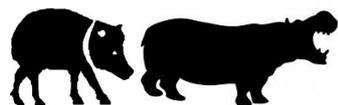
unpublished, and now lost, 'Amboinsch Dierboek' (Beekman, 1999). A number of illustrations of the babirusa from Buru Island were published in the 18th century (Tjiu and Macdonald, 2016), several of which were clearly 'drawn from nature' such as that depicted in 1729 by T.C. Philips (Seba, 1734). Soldiers stationed in Cayeli bay on northeast Buru were reportedly able to hunt and catch babirusa easily (Bergen, 1753). Available evidence has indicated that in 1757, Pieter Cornelius de Bevere painted from life the young recumbent male babirusa (Figure 4), listed as

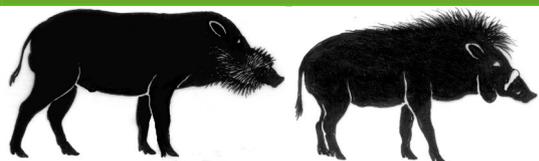


Fig. 4: Drawing, entitled Buru (sic) babirusa, made in Batavia by Loten in 1755 (BHM Loten Collection, No. 106).

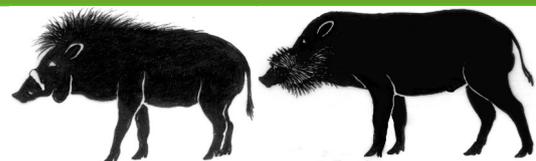
'Buru babirusa' (Natural History Museum Loten Collection 106), when he was resident in the Dutch administrative town of Batavia, on Java (Raat, 2010). The animal's anatomical appearance suggested that it is more likely to have come from Sulawesi.

Batavia was not the only place outside the range of endemism of the babirusa that reportedly held the animal. Surabaya, at the east end of Java has had a long history of association with the babirusa (Figure 1). Mr Van Middelkoop owned a piece of ground that was effectively an open-air museum of plants and animals, and it contained casuaris and babirusa from the Moluccan islands Oliver (1827). Lesson (1827) said that he and his colleagues had examined many babirusa in Surabaya, males, females and many more young. Marsden (1784) had earlier reported that





Ecology and Conservation

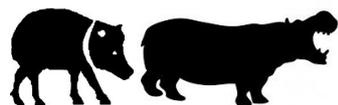


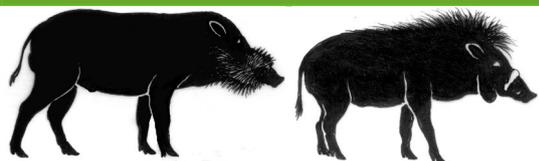
babirusa were also present on the island of Sumatra. Indeed, Oliver (1827) had suggested that babirusa were numerous on that island. Two skulls in the Senkenberg (Frankfurt) collection (16164 – AAM0295 and 16165 – AAM0296) were donated in 1846 by the surgeon, Dr Doebel, and were catalogued as coming from Sumatra; one of them (16164) has a bullet hole in its frontal bone. Bougainville (1837) saw two babirusa in pens on the island of Sumbawa (Figure 1). He tried to purchase them, but the local people refused to sell them to him. Captain Lang kept a young male babirusa for a year (1827-1828) in Ambon (Dumont d'Urville, 1833). The local advice at the time was to take young animals if the wish is that they should be kept, as 'these will show recognition, gratitude and affection'. Captain Lang had done just that, raising a youngster from before the time of maxillary canine tooth eruption (Quoy and Gaimard, 1830). The Rajas of Sulawesi were reported to make a big fuss about babirusa as objects of curiosity, and providing food to these animals and giving them as gifts to others (Dumont d'Urville, 1833).

At about this time there were also indications, in various reports of expeditions to the region, that efforts were being made to bring the babirusa to Europe. For example, one adult male, a sub-adult male and two females were seen on the Javan estate of the governor general of Indonesia, Van der Capellen (Lesson, Garnot & Guerin-Meneville, 1826). The descriptions given of these suggested that they had come from Sulawesi. They were due to be sent to the Netherlands but failed to arrive as each one had died during the voyage (Anonymous, 1833). There is also the story of the Dutchman, Mr Vandenberg, who had purchased an adult babirusa at great expense; it too had died on the way to Europe, and he was left with 'a rather badly prepared skin in the end' (Dumont d'Urville, 1833). In another account, two babirusa that were being shipped from the Moluccan islands (Ambon?) to Batavia, broke out of their pen at night and jumped overboard (Olivier, 1827). The young male babirusa donated to the French by Captain Lang was loaded on board the *Astrolab* on 16th July 1828 and placed in a prepared cage. Unfortunately it became ill and died very soon after coming onto the ship (Quoy and Gaimard, 1830). The suggested cause of death was said to have been due to exhaustion following frequent copulation with a female domestic pig (*Sus scrofa*).

The average duration of the voyage (13,400 miles) from Batavia to the Netherlands was 235 days under sail, including a (compulsory) stop at the Cape of Good Hope averaging 33 days (Bruijn et al, 1987). Changes in ship design (copper-plating hulls, together with incremental improvements in sails, rigging, and hull profiles) meant that by the second quarter of the nineteenth century travel between Europe and Batavia could be reduced, but still took about five months (Solar, 2013; O'Grada and Kelly, 2014). The sea journey to bring the first pair of babirusa to Europe took 235 days (Dumont d'Urville, 1833). They sailed from Manado on the 2nd August 1828; six weeks later it was reported that the babirusa had suffered little from the voyage so far, and continued to bear up very well. They arrived at the Cape of Good Hope on Christmas day. Six days later, on the 31st December, they set off again for France and arrived in Marseilles on the 25th March 1829. Throughout the journey they travelled under the specific nursing care of Jean Francois Guillaume Berre, an 'infermier' and 'quartier-maître de manouvre de deuxième classe' on the corvette *l'Astrolabe* (Dumont d'Urville, 1830, 1833, Quoy and Gaimard, 1830).

The pair of babirusa (Figure 5) had been a gift from Mr Merkus, the governor of the Moluccas, The following animal husbandry observations were noted down during and after the voyage (Dumont d'Urville, 1833; Quoy and Gaimard, 1830). The animals had been kept in Manado for over one month before the *Astrolab* arrived and were given to the French on the 27th July. They were then





Ecology and Conservation

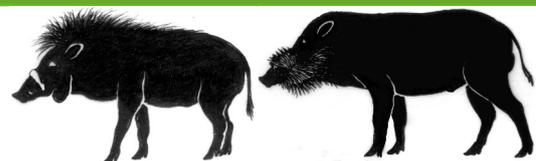


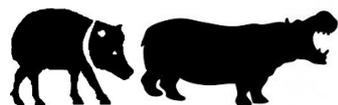
Fig. 5: Drawing of the pair of Sulawesi babirusa gifted to the French by Mr Mercus (Dumont d'Urville, 1833)

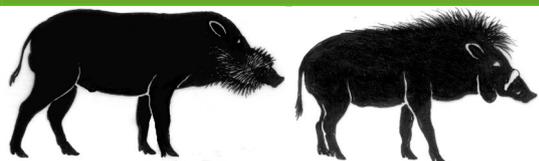
placed in a cage and transported onto the ship, 'where they made themselves comfortably at home'. It was noted that the male was older than the female, and was easier to handle; the female had a more fierce character than the male, for whom she appeared to show great affection through caresses, teases and sometimes bites. It was also noted that she appeared to be jealous (protective?) of him, coming from behind to try to bite and pull the clothes of those measuring him. It had also been noted that these animals could clearly identify those who cared for them; to these people they showed 'affection and gratitude'. For example, Captain Lang's young male babirusa was observed to recognise him and 'although almost dying came to caress his master, wagging its ears and tail'. When the *Astrolab* passed the Cape of Good Hope, the babirusa were cautiously placed in

the ship's hold [to protect them from the heat]. If the temperature subsided, they could be seen shivering and crouching. (It was noted later in France, in the summer itself, that the babirusa would seek to put themselves under straw). When the *Astrolab* arrived in Marseille the babirusa were left there until the season became warmer.

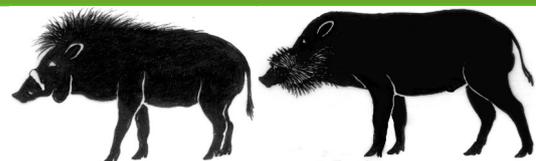
The babirusa were fed the same foods as domestic pigs, that is to say, they consumed everything, even meat, which they ate from the bones by holding them between their forefeet, just like dogs. Early in the voyage, on the 14th August, it was reported that the two babirusa 'ate well, slept very well, and were doing wonderfully'. They were treated with the utmost care by Monsieur Berre, and besides the remains of vegetables and roots which were given to them, in the evening and in the morning they were also fed a large ration of wheat flour soaked in water. Later in the voyage it was noted that in addition to the wheat flour 'porridge' the babirusa were found to like potatoes. On the 8th January Dumont d'Urville (1833) reported that the babirusa were doing well. 'Their fierce character has even been softened in a sensible way. This morning their keeper Berre had forgotten to close the door of their cage, so that they began frolicking in the hold. We began to worry about how they might use their liberty; but after a certain amount of walking about, they were reasonable enough to make their own way back to their cage where they were again enclosed'. It was also noted that to defend themselves, or to attack, these animals suddenly and very often raised the muzzle, one of the series of agonistic poses described in more detail almost two centuries later (Macdonald et al, 1993). The sound made by the babirusa was reported to be not exactly like that of the domestic pig; it was less strong and more continuous (Quoy and Gaimard, 1830).

The attempts to bring babirusa into European-managed zoological institutions that had begun in the 1820s were gradually successful after the arrival in Paris in 1829 of the pair from North Sulawesi (Dumont d'Urville, 1833). From zoo records it is apparent that the next babirusa to arrive in Europe, sex unrecorded, was presented to the Zoological Society of London on 18 Feb. 1841, by Capt. Sir Edward Belcher, R.N. Thereafter a series of four babirusa arrived in Amsterdam from 1841-1843. In 1844 a female babirusa arrived in London zoo (Flower, 1929). The next babirusa to arrive was the gift of Mr A.J. Duymaer van Twist to Amsterdam zoo (Johannes, 1855). In December 1859 van Bemmelen (1869) reported the arrival at the *Rotterdamsche diergaarde* of two babirusa; these were gifts from R.W. Besier of Soerabaya, and W. Ruys Jun. of Rotterdam.





Ecology and Conservation



Some years later, von Martens (1863) reported that the steamboat, which returned from the Moluccas to Java, always brought with it several parrots, frequently blue-crowned pigeons from New Guinea, babirusa from Buru, and casuaris from Seram. When he made the journey, a young animal, said to be a young babirusa, without enlarged teeth, was on board. Shortly thereafter, Bickmore (1868) reported that while he was at Kayeli (NE Buru) a young babirusa was caught by some of the local people. The controleur of Buru was going to Limbi [Lembah], an island five or six miles north of Kema, in NE Sulawesi, to try to catch some living babirusa for the governor-general's garden at Buitenzorg [Bogor], in the foothills south of Batavia. He was not successful. Hickson (1889) reported that at the village of Koa, Talisei Island (Figure 1), off the north coast of the NE Sulawesi, Mr Cursham had a fine specimen of the babirusa in a bamboo kraal. Later again, the Sarasin brothers reported holding a pair of Sulawesi babirusa in Kema (Figure 1), that produced twins, one of which died shortly after birth Sarasin and Sarasin (1905).

And finally, the earliest European references to babirusa appeared at first to be somewhat confused. However, Prell (1954) and Burnstein (In a footnote in *Agatharchides*, 1989) published clarifying analyses of the words used for the animals in the ancient literature. The pig with prominent [canine] teeth reported by Dinon of Colophon (c. 360–340 BCE), Agatharchides of Cnidus (c. 145 BCE), and Aelian (Claudius Aelianus c. 175-235CE) was probably the Aethiopian warthog (*Phacochoerus aethiopicus*) rather than the babirusa, as had sometimes been suggested (e.g. Quoy and Gaimard, 1830; Woelk, 1965). However, the report that Calpurnius (Titus Calpurnius Siculus) saw the babirusa in the Colliseum at the end of the third century CE, may be true, and if so, might be the first evidence of European husbandry of the babirusa (Loisel, 1912). Also, around 550CE, Cosmas Indicopleustes wrote in his copiously illustrated *Christian Topography* that he had seen and eaten the *Chaerelaphus* (hog deer, or babirusa) (Figure 6). Cosmas had travelled from Greece as far as India and Ceylon (Sri Lanka), and if his account were true, it would mean that the babirusa had indeed been transported from Indonesia to one of these countries, about 1500 years ago.

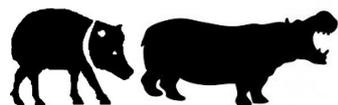
Concluding comment

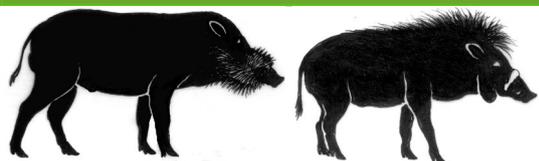
The early history of babirusa husbandry is fragmentary and often hidden away in travelogues and Zoological Society proceedings. Given the large numbers of people who sailed back to Europe from Batavia in the 17th and 18th centuries after a stay with the Dutch East India Company, (VOC) of at least three years but usually longer (over 100,000 voyagers returned to Europe in the 17th century and over double that number returned in the following century), it is likely rather more observations await discovery in museum, library and archive collections of letters, reports, dagregisters, personal manuscripts, diaries,

ship's logbooks, drawings, paintings, church records, and missionary organisation reports (Bruijn et al, 1987). It has also been demonstrated, by means of pictorial evidence, that the babirusa recorded came from Sulawesi and possibly the Togian Isles as well as from Buru and the

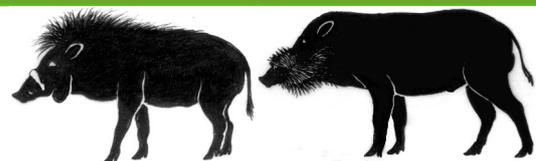


Fig. 6: Drawing of *Chaerelaphus* (hog deer, or babirusa) from *Christian Topography* published in 550CE by Cosmas Indicopleustes.





Ecology and Conservation



neighbouring Sula, and possibly Banggai, Isles. It would also appear that any differences in the external appearance of these babirusa were not large enough to draw particular attention among those that saw them in South-east Asia during the 17th and 18th centuries.

Acknowledgements

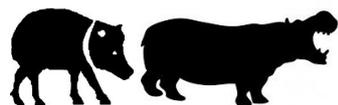
The author is grateful to the staff of the following libraries for research access: Artis Bibliotheek; The British Library; The British Museum (Natural History) Library; Edinburgh University Library; National Library of Scotland; Leiden University Library; Naturalis Library Leyden; Scottish National Museum Library; State University Utrecht Library. The image entitled 'Buru Babirusa' from the Loten Collection, No. 106 (Figure 4), was supplied courtesy of the NHM Library and Archives for which the author is also very grateful.

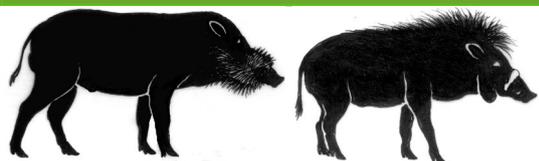
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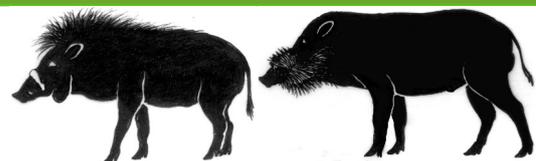
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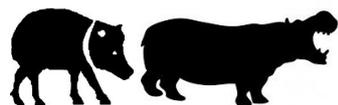


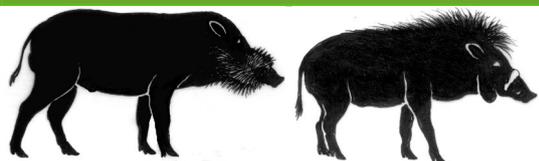


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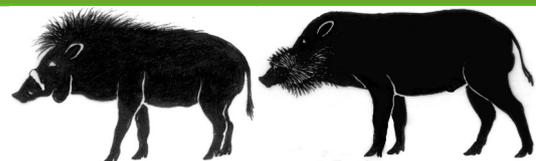


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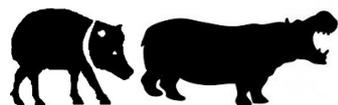


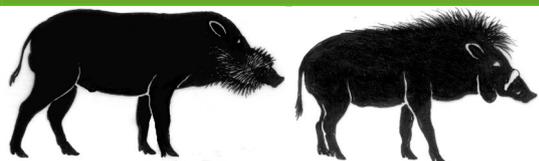


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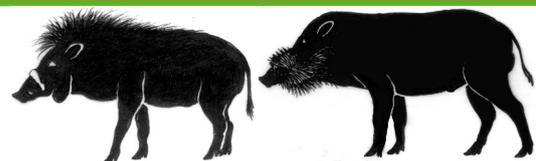


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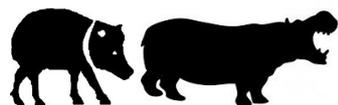


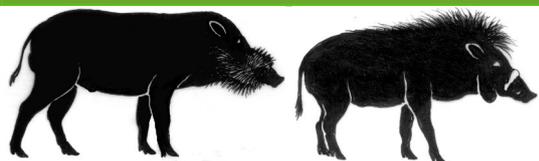


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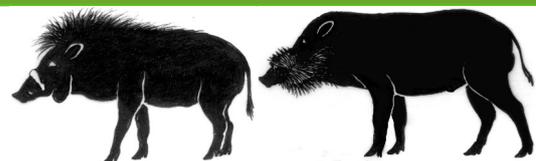


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Ecology and Conservation



II Jornada Internacional do Javali. Santana do Livramento, Rio Grande do Sul, Brasil

dos Reis, T. X.¹, Molinos, N¹, Wallau, M¹ e L. H. Mendina Filho¹

¹Equipe Javali no Pampa

Resumo

A disponibilidade de informação nacional sobre os danos e, principalmente, sobre os métodos e estratégias de controle e manejo da expansão dos javalis (*Sus scrofa* L.) e seus híbridos no estado do Rio Grande do Sul são carentes, tendo embasamento basicamente na literatura estrangeira, (Mendina Filho et al., 2015). Nos últimos anos tem-se observado um grande crescimento populacional tendo em conta o aumento de visualizações e registro de prejuízos econômicos acarretados nas produções agropecuárias que se multiplicam à mesma escala. Frente a isto, a Equipe Javali no Pampa, juntamente com a Prefeitura de Sant'Ana do Livramento, Intendência Departamental de Rivera - ROU e o Sindicato Rural, promoveram o II Seminário Internacional do Javali. O evento deu sequência à primeira edição realizada em 2016, realizada em Artigas, Uruguai. Com objetivo central de promover o debate entre as diferentes classes envolvidas no tema em busca por soluções a este problema, o seminário contou com palestrantes e expositores vindos da Austrália, Estados Unidos, Uruguai, Argentina e Brasil. Ao final, foi criado o grupo de trabalho que irá formar a comissão organizadora para a terceira edição, a ser realizada na região da Patagônia Argentina.

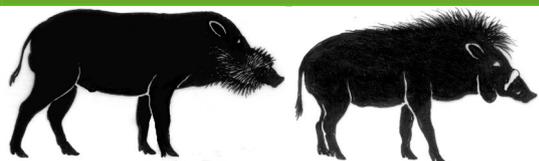
Introdução

O javali foi trazido para a América do Sul no início do século XX, e se expandiu na Argentina, e posteriormente no Uruguai. No Brasil, os primeiros relatos são da década de 80 (Debredt e Scherer, 2007). Atualmente a espécie está introduzida em diversos países, classifica-se dentre as 100 espécies mais nocivas pela União Internacional para a Conservação da Natureza – IUCN, (Lowe et al, 2000). As características comportamentais da espécie permitem alta adaptabilidade, impactando severamente o ecossistema, seja por competição de recursos ou por predação de animais nativos. Participando de diferentes ciclos biológicos, o Javali pode hospedar vários tipos de patógenos, colocando em risco, não só a saúde dos ecossistemas, mas também dos rebanhos, e com isso, impactar negativamente as cadeias produtivas, afetando os mercados com perdas econômicas expressivas, como a vinculação de zoonoses que afetam a saúde humana. Sua alta capacidade reprodutiva e hábitos alimentares severos agravam o potencial nocivo da espécie (Mendina Filho et al., 2015). A falta de informação ou de experiência dos produtores a cerca do problema com a presença dos javalis nas propriedades por vezes contribui para seu agravamento quando, por exemplo, a criação de porcos domésticos soltos contribui para o cruzamento com porcos de vida livre, tendo em vista ser a mesma espécie, já que o javali é o ancestral do porco doméstico, gerando destes cruzamentos, animais com maior necessidade energética, portanto, o produtor pode em função disto, estar dificultando o manejo das varas selvagens e potencializando os prejuízos na sua produção.

Metodologia

O II Seminário Internacional do Javali foi continuidade a primeira Jornada que ocorreu na cidade de Artigas, Uruguai nos dias 9 e 10 de dezembro de 2016. O objetivo principal é o intercâmbio de





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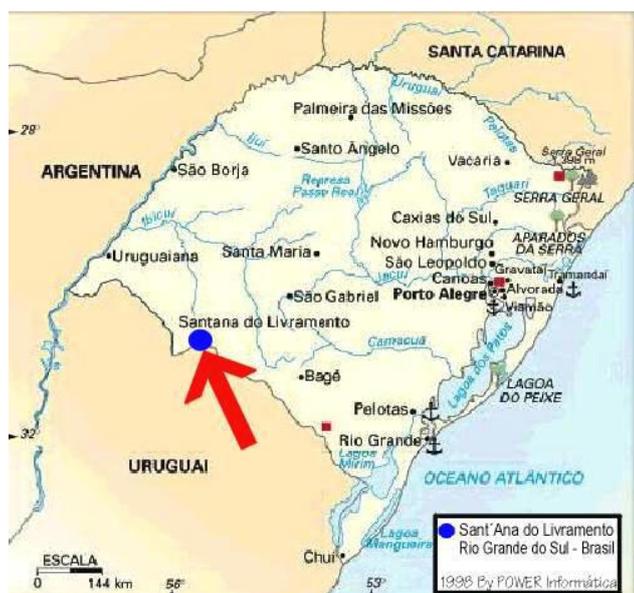
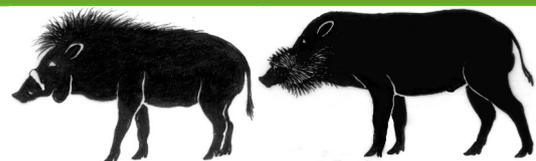


Fig. 1: Localização geográfica da cidade de Santana do Livramento, Brasil;
http://www.achetudoeregiao.com.br/rs/santana_do_livramento/localizacao.htm

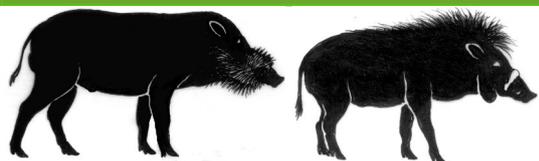
conhecimento da potencialidade dentre as mais variadas formas negativas da espécie, estudos e técnicas de controle para elaboração de métodos integrados de controle. Foi realizado nos dias 12 e 13 de dezembro de 2017 em Santana do Livramento (Fig. 1) nas dependências do Sindicato e Associação Rural.

O evento contou com palestrantes de diferentes países (Austrália, Uruguai, México, Argentina e Brasil), governamentais e pesquisadores promovendo a troca de informação e integração com os participantes. Estiveram representados diferentes órgãos na ocasião, tanto do Brasil quanto dos demais países, propiciando a interação entre os representantes e a apresentação das abordagens das diferentes instituições e suas atribuições referentes ao assunto, discutindo ações e métodos de controle como os riscos sanitários acarretados pela espécie. Dentre espectadores esteve reunido o mais variado público composta por agentes públicos, produtores, acadêmicos, profissionais, controladores e interessados pelo tema (Fig. 2).



Fig. 2: Folder de apresentação do Seminário.





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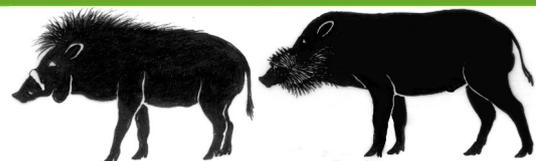


Gráfico com as apresentações realizadas no evento:

II JORNADA INTERNACIONAL DO JAVALI

Programação do primeiro dia – 12 de dezembro

Horário	Tema	Palestrante	Instituição/País
08:00 - 08:30	Credenciamento		
08:30 - 08:45	Solenidade de Abertura		
Contextualização: Situação da invasão dos javalis e perspectivas nacionais de mitigação			
08:45 - 09:15	Controle e manejo dos javalis e ações do governo Australiano	Teshena Nash	Acadêmica de Medicina Veterinária Univeristy of Queensland
09:15 - 09:45	Plano Nacional de Prevenção, Controle e Monitoramento do Javali	Rodrigo Dutra da Silva	IBAMA/Brasil Chefe de Divisão Técnico-Ambiental da SUPES/RS/Brasil
09:45-10:15	Situação atual e perspectivas do controle do Javali no Uruguai	Rosana Berrine	DINAMA/Uruguai
10:15 - 10:30	Coffee Break		
Impactos decorrentes da invasão e alternativas de manejo e controle do javali			
10:30 - 11:00	Impacto ambiental em cursos d'água causados por javalis.	Claíssa Alves da Rosa	Instituto Alto Montana Universidade Federal de Lavras / Brasil
11:00 - 11:30	Impacto negativo do Javali em a vida livre, em la producción animal de la Patagonia Argentina	Sergio Abate	Universidad Nacional de Rio Negro/ Argentina
11:30 - 12:00	Estratégias de controle – Experiências da equipe Javali no Pampa	Tiago dos Reis	EJP/Brasil.
12:00-12:15	Perguntas e debate		
12:15 - 14:00	Intervalo almoço		
Continuação: Impactos decorrentes da invasão e alternativas de manejo e controle do javali			
14:00 - 14:30	Tipos de cevas e técnicas de aproximação	Pablo Bayardo	Uruguai.
14:30 - 15:00	Controle dos javalis com cães de pastoreio	Javier Frade	Secretariado Uruguayo de la Lama/ Uruguai
15:30 - 16:00	Perguntas e debate		
16:00 - 16:15	Coffee break		
16:15 - 16:30	Plano piloto de controle do javali em Artigas	Martin Altuna	Dirección General de Servicios Ganaderos (MGAP)Uruguai
16:30 - 17:15	Programa de controle fronteiriço	Luis Lecuona	USDA/APHIS México
17:15-17:30	Perguntas e debate		
17:30	Encerramento do primeiro dia		

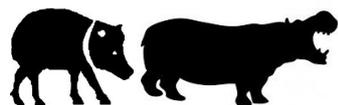
Conclusão

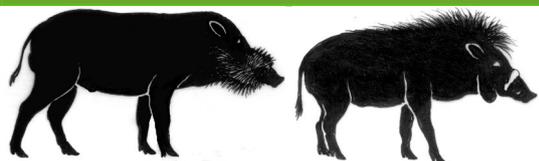
O evento mostra-se de repercussão múltipla dentro os países que de forma conjunta discutirão na possibilidade da elaboração de um plano de controle sanitário dentre as fronteiras principalmente voltadas à região da campanha que faz divisa de forma seca com o Uruguai. O controle sanitário destes animais que podem hospedar diversos tipos de zoonoses implica diretamente no mercado interno principalmente no setor primário. A busca do conhecimento sanitário destes animais em vida livre torna-se de suma importância no rebanho nacional, tendo em vista que este espécie torna-se um bioindicador que pode prevenir (via vacinação) como, por exemplo, algum surto que pode ter sido disseminada por ela mesma.

Dentro de um contexto geral, durante esses dois dias foi possível conhecermos os que estão a cargo dos trabalhos envolvidos no controle e a proliferação de javalis em vida livre tendo como ganho a melhoria de comunicação afetas a essa problemática. Este evento foi organizado pela

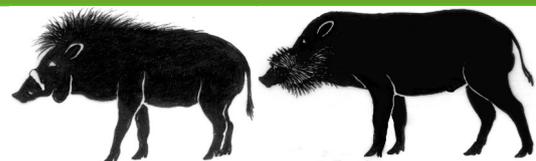
Programação do segundo dia – 13 de dezembro

Horário	Tema	Palestrante	Instituição/País
08:20 - 08:30	Abertura e apresentação dos objetivos do painel	Raul Paixão	ICMBio
Painel: Papeis regulatórios do Manejo e monitoramento sanitário dos javalis			
Moderador: Raul Paixão/ ICMBio			
08:30 - 08:50	Ações e marcos regulatórios para monitoramento sanitário dos javalis no Brasil	Lia Treptow Coswig	Divisão de Sanidade dos Suídeos- DAS- MAPA/Brasil
08:50 - 09:10	Ações e marcos regulatórios para monitoramento sanitário dos javalis no Uruguai	Gustavo Castro	Dirección General de Servicios Ganaderos (MGAP)/Uruguai
09:10 - 09:30	Ações e marcos regulatórios para monitoramento sanitário dos javalis na Argentina	Bruno Carpinetti	Universida Nacional Arturo Jaureche / Argentina
09:30 - 09:50	Normalização estadual relativa ao manejo e monitoramento sanitário dos javalis no RS	Juliane Webster	SEAPI – RS – Brasil
09:50 - 10:05	Perguntas e debate		
10:05 - 10:20	Coffee Break		
Painel: Monitoramento sanitário e ações de vigilância de javalis asseajados – Resultados e perspectivas.			
Moderador: Lia Treptow Coswig – DSA/MAPA			
10:20 - 10:40	O Javali como transmissor de enfermidades para animais domésticos, fauna silvestre e pãa o homem	Soledad Barandiaran	Argentina
10:40 - 11:00	Trichinellosis y sus scrofa: una zoonosis endêmica em uma espécie exótica. Actualidad y futuras investigaciones	Marina Winter	Universidad Nacional de Rio Negro/Argentina
11:00 - 11:20	Monitoramento sanitário dos javalis no Uruguai.	Gustavo Castro	MGAP/ Uruguai
11:20 - 11:40	Hepatitis E	Natalia Ramos	Facultad de Ciencia /Uruguai
11:40 - 12:00	Monitoramento sorológico dos javalis no Brasil _ Resultados do RS	Virginia Santiago Silva	EMBRAPA/Brasil
12:00 - 12:20	Tuberculose e Leptospirose do animal ao homem	Anna Luisa Gisler Maciel	UFRGS/Brasil
12:20- 12:40	Perguntas e debate		
12:40 - 14:00	Intervalo almoço		
Mesa Redonda: Possibilidades de Cooperación internacional frente à ocorrência de doenças em javalis em regiões de fronteira internacional			
Moderador: Virginia Santiago Silva/Embrapa			
14:00 - 14:30	Hemoparasitos detectados em perros relacionados a la caza	Jose Venzal	FVET/Uruguai
14:30 - 15:00	Questões sanitárias que demandam colaboração internacional, estrutura e capacidades disponíveis - Percepção do Brasil	Lia Treptow Coswig	Divisão de Sanidade dos Suídeos- DAS- MAPA/Brasil
15:00 - 15:30	Questões sanitárias que demandam colaboração internacional, estrutura e capacidades disponíveis - Percepção do Uruguai	Gustavo Castro	MGAP/Uruguai
15:30 - 16:00	Questões sanitárias que demandam colaboração internacional, estrutura e capacidades disponíveis - Percepção da Argentina.	Bruno Carpinetti	Universida Nacional Arturo Jaureche / Argentina
16:00- 16:30	Perguntas e debate		
16:30 - 17:00	Coffee break		
17:00	Encaminhamentos futuros e encerramento do evento		





Ecology and Conservation



Equipe Javali no Pampa, Sindicato e Associação Rural de Livramento, Prefeitura Municipal de Santana do livramento e Intendência Municipal de Rivera. Foi abordado durante as palestras diferentes impactos causados por essa espécie, impactos de carácter ambiental, e de saúde tanto em animais domésticos como em humanos, e suas implicações, identificando vários pontos comuns nos diferentes países.

A troca de informação e de experiências ocorrida durante esses dias permitiu o melhor entendimento do problema bem como a construção de novas perspectivas de trabalho trazendo para o contexto novas instituições que passam a integrar com as forças que já estavam atuantes. Podemos afirmar que o evento de forma geral foi brindado com muita informação, alcançando o objetivo proposto trazendo aos legisladores e envolvido no assunto erudição e congregação de esforços pertinentes na busca de conhecimentos que possibilitem uma melhor solução a este desafio.

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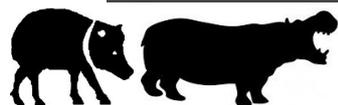
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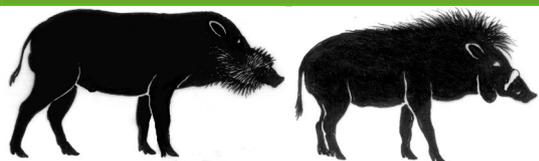
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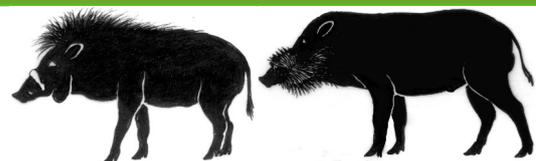


Fig. 3: Feral hog. Photo: T. X. dos Reis





Ecology and Conservation



Notes on the Physical and Reproductive exams of Chacoan Peccaries (*Catagonus wagneri*) at the Chaco Center for Conservation and Research (CCCI)

Juan M. Campos Krauer^{1,2} and Jeff Holland³

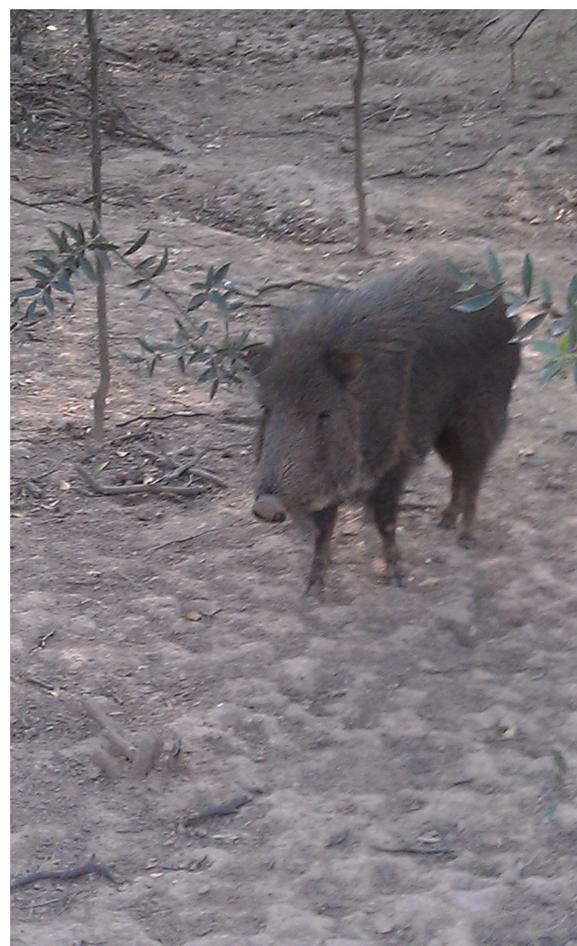
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²Centro Chaqueño para la Conservación e Investigación, Fortín Toledo, Boquerón, Paraguay

³Center for the Conservation of Tropical Ungulates, Punta Gorda, Florida 33982, USA

The Chacoan peccary or tagua (*Catagonus wagneri*) is listed by the IUCN as Endangered with an estimated population of less than 3,000. The species is endemic to the Gran Chaco of South America found only in the countries of Argentina, Bolivia and Paraguay. Since its rediscovery in Paraguay in 1972 the species has drastically declined in numbers throughout its range due to hunting and primarily to habitat loss. The development of the Chaco, particularly in Paraguay, for cattle and soybean production at a rate of 1,000 hectares per day has had an immediate effect on the future stability of the Chacoan peccary population in Paraguay. In Argentina, the population is on the verge of extinction if not already so and the numbers in Bolivia are unknown at this time.

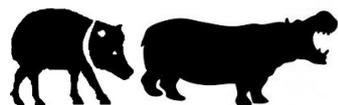
In 1987 a captive population of Chacoan Peccaries was established at CCCI in Fortin Toledo, Paraguay. This captive population is the foundation of the captive breeding program for the species in Paraguay, AZA and EAZA. At this time, the population at CCCI is the only captive population of the species within its natural habitat. Currently the population at CCCI consists of 102 animals. Despite the fact that the species has been in captivity for over three decades very little research on the physical and reproductive components for the species has been carried out. With such a large population available at CCCI it was decided to begin looking at the overall physical health and reproductive assessment of this population.

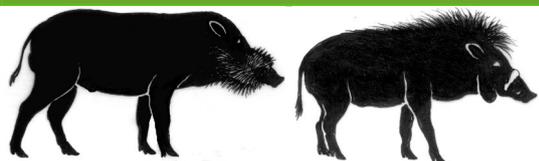


Chacoan peccary (*Catagonus wagneri*).

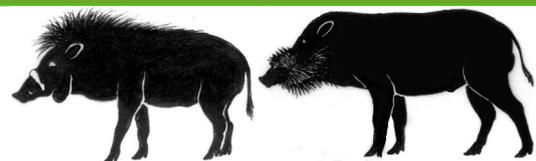
Photo: J. Holland

From 3-15 July 2017 a team of US zoological experts, veterinarians and University researchers along with the Center's staff conducted physical exams on 58 tagua over the course of 11 days. The purpose of these exams was to assess the overall health of the tagua population at the center, collect semen samples and analyze parameters of male tagua and examine the genetic diversity of the centers tagua population. Each animal was immobilized via pneumatic dart gun (DANiNJECT, Borkop, Denmark) with a new combination of drugs for the population in Paraguay





Ecology and Conservation



consisting of an intramuscular tiletamine/zolazepam (Zoletil® 50, Virbac, Forth Worth, TX, USA), azaperone (ZooPharm, Windsor, CO, USA), and medetomidine (ZooPharm). Once fully anesthetized (~20 minutes), animals were brought by truck from their pens to a working area at which point supplemental intranasal oxygen was initiated (1-2 L/min). A complete physical exam was conducted on all animals. The physical exam included the following: blood draws for genetic testing as well as overall blood chemistry analysis and disease screening, body weight, measurements (snout to tail), sex and age estimates based on teeth wearing.

For the reproductive physiology study eleven male tagua were examined with ten of the eleven males providing semen samples for the study. This initial study will form the basis for future possible artificial insemination attempts and the possibility of storing semen for the future. Comparisons of the AZA and EAZA population will need to be done in the next year and future examinations of male tagua from the wild will provide a better picture of tagua overall. The genetic study will provide valuable information on the diversity of the population here at the center and will be able to show the relatedness of the AZA and EAZA population to the animals at the center, thus allowing better genetic management for the entire captive populations. Additional exams and studies will be conducted in 2018, which will provide valuable information for the overall husbandry and management of the captive population. We would like to thank the following participants who provided their time and expertise to this effort.

- Khalil Ivan Benitez (General manager) - CCCI
- Victor Robles (Veterinarian Technician) - CCCI
- Javier Ovelar (Animal Handler) - CCCI
- Dr. Gary West (Veterinarian) - Phoenix Zoo
- Dr. Annie Newell-Fugate (Veterinarian) - Texas A&M University
- Camille Goblet (Graduate Student) - Texas A&M University
- Martin Ramirez (Curator of Mammals) - Woodland Park Zoo
- Michele Hatwood (Curator of Mammals) - Audubon Zoo



Examination of a Chacoan peccary.
Photo: J. M. Campus Krauer

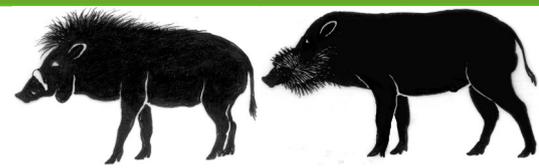


Members of the Proyecto Tagua. Photo: J. M. Campos Krauer





Behaviour



Collared peccaries (*Pecari tajacu*) respond to the death of a member of the herd

Dante de Kort¹ and Mariana Altrichter^{2,3}

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³IUCN/SSC Peccary Specialist Group

Editor's note

This is a short note about a novel observation on the behaviour of collared peccaries. A detailed analysis of the observations can be found in the journal *Ethology*, 2017.

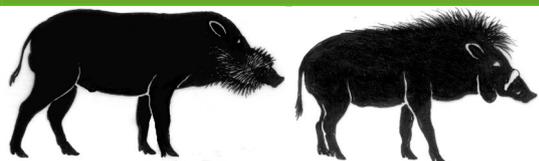
This note presents a novel observation of collared peccaries reacting to the death of one of the herd members in very particular ways, only found so far in few other highly social species. In January 2017, a family in Prescott, Arizona, recorded through photographs and videos the behavior of a group of collared peccaries, or javelinas, after one of the herd members died. This group of javelinas spent time in the unfenced property of the family, along a creek. In this note we report the story.



Fig. 1: Pictures of javelinas nuzzling and pushing the dead individual.

Collared peccaries or javelinas (*Pecari tajacu*) are gregarious animals that maintain very close social relationships, living in cohesive groups of less than 10 to up to 30 (Sowls 1997). However, very little has been published about the behavior of peccaries towards the death of individuals. An anonymous reference in a newsletter (DesertUSA) states “Members eat, sleep, and forage





Behaviour

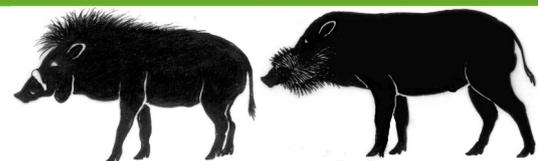


Fig. 2: Javelinas sleeping next to the dead individual.

members of their species and respond to death in particular ways, showing mourning and grieving behavior (Goodall, 1986; Dudzinski et al., 2003; Douglas-Hamilton et al., 2006; King 2013). However, these are difficult events to observe and study in the wild.

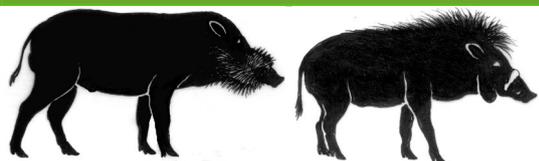
In Prescott, Arizona, javelinas spend time in the suburban areas, and are habituated to human presence, which makes it easier to observe them. In this case, a herd was observed behind the first author's house, who noticed that one of the javelinas was behaving in a way that revealed to be either very old or sick. A few days later, on January 8th, the same group was observed sleeping together near the creek. Two javelinas were snuggling next to a dead individual (presumably the one that was observed sick a few days earlier), and three more were lying farther up the hill from the creek-side group. One day after the cadaver was detected, local people moved it 150 feet up the hill. The remaining peccaries of the herd kept on coming to visit the dead body rather than the physical site. On January 10th, a motion-sensitive wildlife camera with a 30 second time out was set next to the dead javelina. A total of 93 videos were recorded. A throughout analysis of the videos is published elsewhere (De Kort et al. in press).

We found that the herd visited and spent time with the dead body for 10 days after the peccary died. The frequency of the visits declined until the cadaver was consumed by coyotes. Most of the videos showed two individuals visiting the dead animal (44 %). The visiting javelinas reactions included pushing at the dead individual, scent it repeatedly, staring at it, biting it, sleeping next to it, and trying to pick it up by putting their snout under the corpse and pushing it up (Figs. 1 and 2). These behaviors were observed and recorded many times, mostly during the night (64%). The two javelinas that visited the most often and slept next to the dead one were smaller and seemed younger, which could indicate that they were the offspring of the dead one. Upon close examination of the cadaver it was confirmed it was a female.

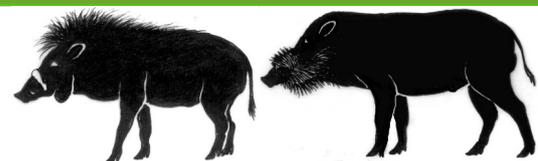
On January 28th, a pack of coyotes approached the site trying to get to the dead individual on the hillside. The group of javelinas kept chasing away the coyotes. The coyotes tried to attack from different angles and sides of the hill, but the javelinas kept them away. Then, sometime that night, the coyotes were able to reach the dead javelina and the camera recorded them eating it (Fig. 3). The camera did not record any further visits from the herd after that day.

Because it is rare for humans to observe a natural death in the wild, there is scarce information on the reaction of animals when a death in the group occurs. Available evidence shows that some species respond to the death of individuals (Goldman 2012). For example, researchers have found that elephants show a special interest in dead bodies of their own kind. Observations have been made of elephants visiting the carcass of a group member over the course of several days.





Behaviour



The elephants sniffed and poked the body, touching it with their feet and trunks (Douglas-Hamilton 2006). Anthropologist King (2013) presents a series of stories of animals grieving the loss of animal companions, showing evidence of attachment that leads to grief.

For peccaries, only casual observations exist, and these point to similar responses; researchers capturing white-lipped peccaries for radio-telemetry studies in Brazil, Mexico and Costa Rica have observed that

when an individual has been captured in a trap the rest of the group comes around, lie down adjacent to the trap and remain in close proximity for hours (Alexine Keroughlian, Rafael Reyna-Hurtado, Marcos Alberto Briceño Méndez and M. Altrichter respectively, pers com). Similarly, the group remains near an animal that has been shot by hunters, thus making the whole group vulnerable to hunting. Observations have also been made of peccaries pushing or biting individuals that are lying down due to illness or injuries (Rafael Reyna, pers. com).

These observations demonstrate that the behavior of peccaries may have more layers of complexity than what is known until now, and they may have behavioral reactions towards dying and deceased individuals similar to those observed in a few other social species.

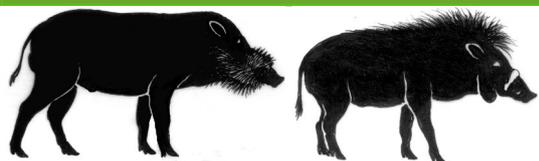
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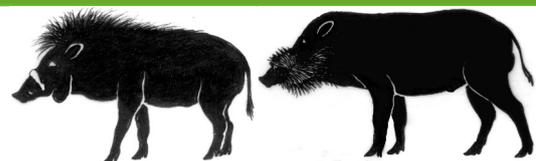


Fig. 3: Coyotes eating the dead javelina.





Taxonomy



Taxonomic observations on Eurasian wild boar in Tajikistan

Mario Melletti¹

¹AfBIG (African Buffalo Initiative Group) IUCN/SSC/ASG

The taxonomy of wild boar (*Sus scrofa* group), in particular in Asia, is very complex due to many regional forms, species and subspecies that have been described by Groves (2007) and Groves and Grubb (1993). These authors have described up to 16 populations/subspecies on the basis of cranial characteristics. Recently in two major works, Groves and Grubb (2011) and Melletti and Meijaard (2017) have proposed to elevate 11 subspecies of wild boar here listed (*S. s. scrofa*, *S. s. nigripes*, *S. s. ussuricus*, *S. s. moupinensis*, *S. s. chirodontus*, *S. s. leucomystax*, *S. s. riukiuanus*, *S. s. taevanus*, *S. s. davidi*, *S. s. cristatus* and *S. s. vittatus*) to the status of species. However this new proposed classification needs to be widely supported by further genetic and morphometric studies to better elucidate the complexity of wild boar taxonomy across its huge range.

This brief introduction is necessary in an attempt to better clarify recent observations on wild boar during a hunting trip of a colleague of mine in an area of southern Tajikistan (Zigar) bordering with North Afghanistan (see Figure 1). During this trip a group of hunters killed some wild boar that showed morphological characteristics

similar to the new proposed wild boar species *Sus nigripes* described in Chapters 1 and 21 in Melletti and Meijaard 2017; see also Figure 2-4). As stated by Gongora, Groves and Meijaard (2017) in Chapter 1, *S. nigripes* was originally described from Kyrgyzstan to Transbaikal including north western China and shows a creamy gold or light brown colour with black legs as shown in the pictures. Groves (1981) in fact describes it as “striking for its contrasting colouration. In all races the



Fig. 1. Map showing the location in Tajikistan (Zigar) where Eurasian wild boar have been killed.

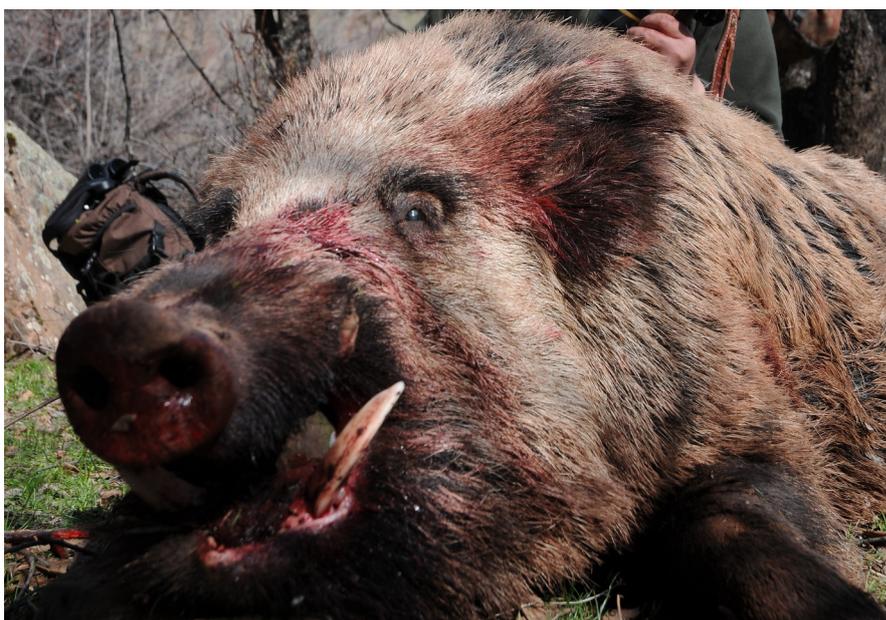
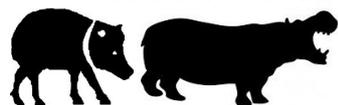
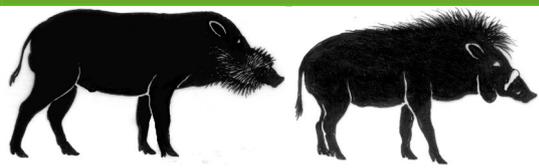


Fig. 2: Particular of the head of an adult male Eurasian wild boar from Tajikistan.

Photo: M. Rizzardo





Taxonomy



Fig. 3: Adult male from Tajikistan with white face and very light brown colour typical of *Sus nigripes*. Photo: M. Rizzardo

legs are dark and the face has white bands or is diffusely white.” Furthermore it seems that the head of *S. nigripes* is somewhat shorter and broader than in *Sus s. attila* (see Figure 2 and 3), which occurs further west and north. Unfortunately it was not possible to take any body measures (except the weight 220 kg and the length of tusks 25 cm for the adult male shown in Figure 2) and so these assumptions are only based on the attached images. If these boars belong to *S. nigripes*, its large range can be further extended in the south of Tajikistan and until Nord Afghanistan and possibly to south-eastern of Uzbekistan and Turkmenistan where a possible area of overlap with *Sus s. attila* might occur.

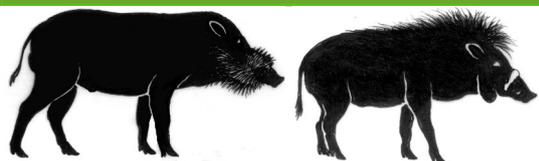
The morphological description here reported differs at least in the coat colour from the description of *S. s. attila* subspecies that seems to be distributed until North-West Iran and possibly further in north-east of this country as suggested by Meijaard and Moqanaki (2011). Furthermore the findings of a recent paper based on (mt) DNA samples from North-West Iran suggest that this region is the contact zone among the Asian and European clades where a mix of Middle Eastern and European and East Asian haplotypes occurs (Khalilzadeh et al. 2016).

Finally, this short description based on these pictures is mainly an attempt to stimulate some debate since we have just a few observations of Eurasian wild boar from these remote areas and we need further investigations based on the analysis of body measures and DNA to better clarify the complex taxonomy of Eurasian wild boar in Asia.

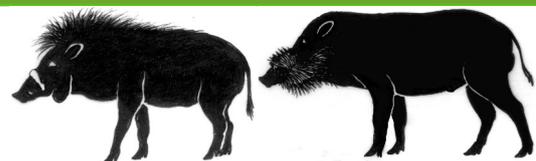
Acknowledgments

I am grateful to Erik Meijaard and Thiemo Braasch for the useful advices, to Moris Rizzardo for providing the pictures and to the local guide Ayub Mulloyorov for his help during the stay.





Taxonomy



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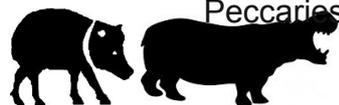
Meijaard, E. & Moqanaki, Ehsan M. 2011. *Sus scrofa* subspecies of Iran. Suiform Soundings Vol. 11, pp. 6-14.

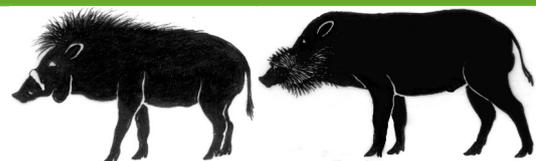
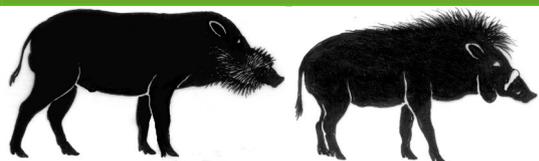
Melletti, M. & Meijaard E. 2017. Ecology, Conservation and Management of Wild Pigs and Peccaries. Cambridge: Cambridge University Press. Pp. 470.



Fig. 4: Adult female with black legs and light colour similar to the description given for *Sus nigripes* by Meijaard, E. & Moqanaki 2011 and Gongora, Groves and Meijaard 2017.

Photo: M. Rizzardo





Veterinary, Genetic and Physiological Studies

A Serologic Survey of Pathogens in Wild Boar (*Sus scrofa*) in Sweden.

Malmsten A, Magnusson U, Ruiz-Fons F, González-Barrio D, Dalin AM.

J Wildl Dis. 2018 Jan 29. doi: 10.7589/2017-05-120

The wild boar (*Sus scrofa*) population has increased markedly during the last three decades in Sweden and in other parts of Europe. This population growth may lead to increased contact between the wild boar and the domestic pig (*Sus scrofa scrofa*), increasing the risk of transmission of pathogens. The objective of our study was to estimate the seroprevalence of selective pathogens, known to be shared between wild boars and domestic pigs in Europe, in three wild boar populations in Sweden. In total, 286 hunter-harvested female wild boars were included in this study. The sera were analyzed for antibodies against nine pathogens using different commercial or in-house enzyme-linked immunosorbent assays. Antibodies were detected against porcine parvovirus (78.0%), porcine circovirus type 2 (99.0%), swine influenza virus (3.8%), *Erysipelothrix rhusiopathiae* (17.5%), *Mycoplasma hyopneumoniae* (24.8%), and *Toxoplasma gondii* (28.6%). No antibodies were detected against porcine respiratory and reproductive syndrome virus, *Brucella suis*, or *Mycobacterium bovis*. Our results highlight the potential importance of the wild boar as a reservoir for pathogens potentially transmissible to domestic pigs and which also may affect human health.

Faecal *Escherichia coli* as biological indicator of spatial interaction between domestic pigs and wild boar (*Sus scrofa*) in Corsica.

Barth SA, Blome S, Cornelis D, Pietschmann J, Laval M, Maestrini O, Geue L, Charrier F, Etter E, Menge C, Beer M, Jori F.

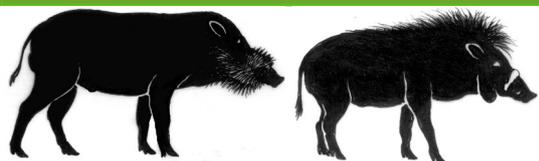
Transbound Emerg Dis. 2018 Jan 10. doi: 10.1111/tbed.12799

On the Mediterranean island of Corsica, cohabitation between sympatric domestic pigs and Eurasian wild boar (*Sus scrofa*) is common and widespread and can facilitate the maintenance and dissemination of several pathogens detrimental for the pig industry or human health. In this study, we monitored a population of free-ranging domestic pigs reared in extensive conditions within a 800-ha property located in Central Corsica which was frequently visited by a sympatric population of wild boar between 2013 and 2015. We used GPS collars to assess evidence of a spatially shared environment. Subsequently, we analysed by PFGE of XbaI-restricted DNA if those populations shared faecal *Escherichia coli* clones that would indicate contact and compared these results with those collected in a distant (separated by at least 50 km) population of wild boar used as control. Results showed that one of eight wild boars sampled in the study area shed *E. coli* XbaI clones identical to clones isolated from domestic pig sounders from the farm, while wild boar populations sampled in distant parts of the study area shared no identical clone with the domestic pigs monitored. Interestingly, within the sampled pigs, two identical clones were found in 2013 and in 2015, indicating a long-time persisting colonization type. Although the method of isolation of *E. coli* and PFGE typing of the isolates requires intensive laboratory work, it is applicable under field conditions to monitor potential infectious contacts. It also provides evidence of exchange of microorganisms between sympatric domestic pigs and wild boar populations.

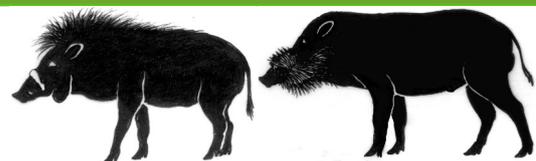
Detection and persistence of environmental DNA from an invasive, terrestrial mammal.

Williams KE, Huyvaert KP, Vercauteren KC, Davis AJ, Piaggio AJ.





New literature on Suiformes



Ecol Evol. 2017 Dec 3;8(1):688-695. doi: 10.1002/ece3.3698 Invasive *Sus scrofa*, a species commonly referred to as wild pig or feral swine, is a destructive invasive species with a rapidly expanding distribution across the United States. We used artificial wallows and small waterers to determine the minimum amount of time needed for pig eDNA to accumulate in the water source to a detectable level. We removed water from the artificial wallows and tested eDNA detection over the course of 2 weeks to understand eDNA persistence. We show that our method is sensitive enough to detect very low quantities of eDNA shed by a terrestrial mammal that has limited interaction with water. Our experiments suggest that the number of individuals shedding into a water system can affect persistence of eDNA. Use of an eDNA detection technique can benefit management efforts by providing a sensitive method for finding even small numbers of individuals that may be elusive using other methods.

Urolithiasis in a group of Visayan Warty Pigs (*Sus cebifrons negrinus*).

Chatterton J, Unwin S, Lopez J, Chantrey J.

J Zoo Wildl Med. 2017 Sep;48(3):842-850. doi: 10.1638/2016-0281.1.

Four cases of obstructive urolithiasis occurred in male Visayan warty pigs (*Sus cebifrons negrinus*) during a 12-mo period. One animal died, two were euthanized, and one was treated successfully with a tube cystotomy procedure and a subsequent urinary acidification diet. Uroliths from two cases of urethral obstruction were analyzed and confirmed as calcium carbonate. A fifth nonobstructive case was suspected in an adult female in which calcium carbonate crystalluria was diagnosed, and that case was resolved with medical management. Possible causes of these uroliths included reduced water intake, increased calcium in the diet through use of lucerne hay, and concurrent urinary tract infections. Changes to the diet and access to water were correlated with cessation of further cases, and no recurrence has been seen to date. To the authors' knowledge, this is the first report of calcium carbonate urolithiasis and the first use of a tube cystotomy in a nondomestic pig species.

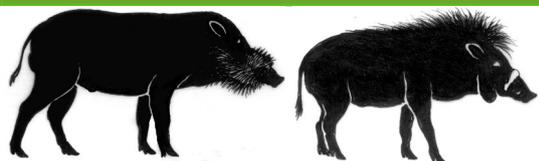
A Review of Zoonotic Infection Risks Associated with the Wild Meat Trade in Malaysia.

Cantlay, J. C., D. J. Ingram, et al. (2017).

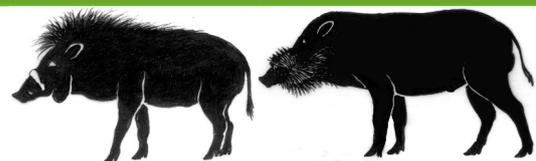
Ecohealth 14(2): 361-388.

The overhunting of wildlife for food and commercial gain presents a major threat to biodiversity in tropical forests and poses health risks to humans from contact with wild animals. Using a recent survey of wildlife offered at wild meat markets in Malaysia as a basis, we review the literature to determine the potential zoonotic infection risks from hunting, butchering and consuming the species offered. We also determine which taxa potentially host the highest number of pathogens and discuss the significant disease risks from traded wildlife, considering how cultural practices influence zoonotic transmission. We identify 51 zoonotic pathogens (16 viruses, 19 bacteria and 16 parasites) potentially hosted by wildlife and describe the human health risks. The Suidae and the Cervidae families potentially host the highest number of pathogens. We conclude that there are substantial gaps in our knowledge of zoonotic pathogens and recommend performing microbial food safety risk assessments to assess the hazards of wild meat consumption. Overall, there may be considerable zoonotic risks to people involved in the hunting, butchering or consumption of wild meat in Southeast Asia, and these should be considered in public health strategies.





New literature on Suiformes



Recent knowledge on hepatitis E virus in Suidae reservoirs and transmission routes to human.

Pavio, N., V. Doceul, et al. (2017).

Veterinary Research 48: 78-78.

Hepatitis E virus (HEV) causes self-limiting acute hepatitis in humans that can eventually result in acute liver failures or progress to chronic infections. While in tropical and sub-tropical areas, HEV infections are associated with important waterborne epidemics, in Northern countries, HEV infections are autochthonous with a zoonotic origin. In the past decade, it has become clear that certain HEV genotypes are zoonotic and that swine, and more generally Suidae, are the main reservoir. Zoonotic transmissions of the virus may occur via direct contact with infected pigs, wild boars or consumption of contaminated meat. This review describes the current knowledge on domestic and wild Suidae as reservoirs of HEV and the evidence of the different routes of HEV transmission between these animals and humans.

Reconstitution of UCP1 using CRISPR/Cas9 in the white adipose tissue of pigs decreases fat deposition and improves thermogenic capacity.

Zheng, Q. T., J. Lin, et al. (2017).

Proceedings of the National Academy of Sciences of the United States of America 114(45): E9474-E9482.

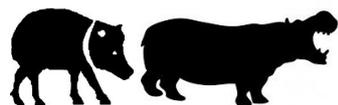
Uncoupling protein 1 (UCP1) is localized on the inner mitochondrial membrane and generates heat by uncoupling ATP synthesis from proton transit across the inner membrane. UCP1 is a key element of nonshivering thermogenesis and is most likely important in the regulation of body adiposity. Pigs (Artiodactyl family Suidae) lack a functional UCP1 gene, resulting in poor thermoregulation and susceptibility to cold, which is an economic and pig welfare issue owing to neonatal mortality. Pigs also have a tendency toward fat accumulation, which may be linked to their lack of UCP1, and thus influences the efficiency of pig production. Here, we report application of a CRISPR/Cas9-mediated, homologous recombination (HR)-independent approach to efficiently insert mouse adiponectin-UCP1 into the porcine endogenous UCP1 locus. The resultant UCP1 knock-in (KI) pigs showed an improved ability to maintain body temperature during acute cold exposure, but they did not have alterations in physical activity levels or total daily energy expenditure (DEE). Furthermore, ectopic UCP1 expression in white adipose tissue (WAT) dramatically decreased fat deposition by 4.89% ($P < 0.01$), consequently increasing carcass lean percentage (CLP; $P < 0.05$). Mechanism studies indicated that the loss of fat upon UCP1 activation in WAT was linked to elevated lipolysis. UCP1 KI pigs are a potentially valuable resource for agricultural production through their combination of cold adaptation, which improves pig welfare and reduces economic losses, with reduced fat deposition and increased lean meat production.

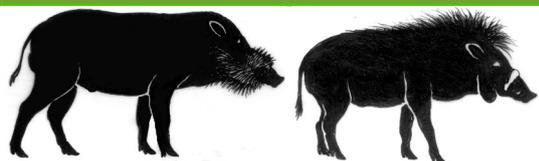
Magnetic alignment in warthogs *Phacochoerus africanus* and wild boars *Sus scrofa*.

Cervený, J., H. Burda, et al. (2017).

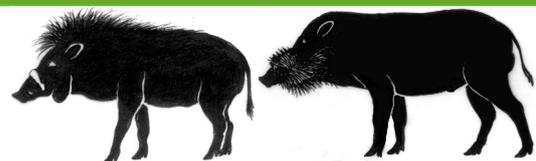
Mammal Review 47(1): 1-5.

Magnetic alignment (MA) results from the preference of animals to align themselves along the field lines of the geomagnetic field, a behavioural expression of a magnetic sense. MA is well documented for ruminants and might demonstrate a general magnetic sensory ability among artiodactyls. We measured body-axis alignment in 1614 foraging or resting wild boars *Sus scrofa*,





New literature on Suiformes



1849 wild boar beds, and 1347 warthogs *Phacochoerus africanus*, and found a highly significant north-south preference. The magnetic field was the only common denominator of all observations. Thus, we provide the first data suggesting a magnetic sense in the Suidae.

Regional level risk factors associated with the occurrence of African swine fever in West and East Africa.

Zheng Y. X. Huang, Frank van Langevelde, Karanina J. Honer, Marc Naguib and Willem F. de Boer

Parasites & Vectors 2017 10:16, <https://doi.org/10.1186/s13071-016-1953-z>

Background

African swine fever (ASF) causes severe socio-economic impacts due to high mortality and trade restrictions. Many risk factors of ASF have been identified at farm level. However, understanding the risk factors, especially wild suid hosts, determining ASF transmission at regional level remains limited.

Methods

Based on ASF outbreak data in domestic pigs during 2006–2014, we here tested, separately for West and East Africa, which risk factors were linked to ASF presence at a regional level, using generalized linear mixed models.

Results

Our results show that ASF infections in the preceding year was an important predictor for ASF presence in both West and East Africa. Both pig density and human density were positively associated with ASF presence in West Africa. In East Africa, ASF outbreaks in domestic pigs were also correlated with higher percentages of areas occupied by giant forest hogs and by high-tick-risk areas.

Conclusions

Our results suggest that regional ASF risk in East Africa and in West Africa were associated with different sets of risk factors. Regional ASF risk in West Africa mainly followed the domestic cycle, whereas the sylvatic cycle may influence regional ASF risk in East Africa. With these findings, we contribute to the better understanding of the risk factors of ASF occurrence at regional scales that may aid the implementation of effective control measures.

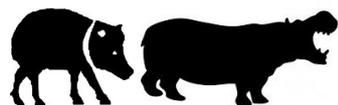
African swine fever in Uganda - epidemiology and socio-economic impact in the smallholder setting

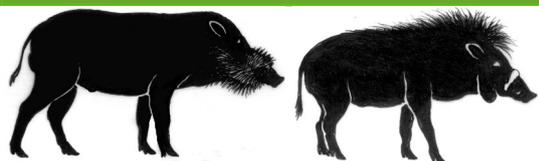
Chenais, Erika (2017).

Acta Universitatis agriculturae Sueciae, 1652-6880 ; 2017:26

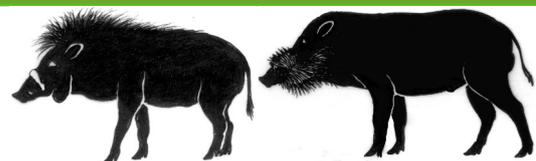
In the last decade millions of people have been able to leave poverty, increasing the regional demand for meat and livestock products. In combination with reforms in market and agricultural policy, this has led to an increase in pig production in sub-Saharan Africa, most notably in Uganda. The growing pig sector could be an important contributor to poverty reduction among smallholder pig keepers. However, the growing pig population has been followed by an increase in African swine fever (ASF) incidence.

ASF is a contagious, typically very lethal, haemorrhagic, viral disease of domestic pigs. The overall goal of this doctoral project was to develop the understanding of ASF epidemiology in the smallholder setting in Uganda. Four studies were conducted in two districts in northern Uganda among smallholder farmers, other pig production value-chain actors, and a medium-sized farm.





New literature on Suiformes



The studies included group- and individual interviews as well as biological and environmental sampling and testing for the virus. Data were analysed using semi-qualitative and quantitative methods. The thesis concluded that ASF was endemic in the study area, and that outbreaks could be detected using retrospective and real-time farmer reports. ASF outbreaks were associated with activities of humans, such as trade in pigs and pig products and free-range management systems. ASF outbreaks had long-term negative social and economic impact for pig production value-chain actors on all investigated levels in the value chain. For smallholder farmers, the impact was aggravated with increasing herd size. Trade and consumption of sick and dead pigs were commonly used as coping strategies. Farm-level biosecurity was insufficient for ASF protection and awareness of control methods did not guarantee their implementation. The continuous ASF transmission in the study area was not driven by lack of knowledge, but rather by cultural circumstances, taboos and poverty. Therefore, in order for control methods to be successfully and sustainably implemented, they need to be developed in participation with the communities, adapted to the local context, socially acceptable, flexible, and cost-effective.

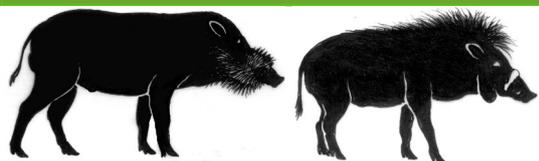
Influence of Cryopreservation Solution on the In Vitro Culture of Skin Tissues Derived from Collared Peccary (*Pecari tajacu* Linnaeus, 1758)

Borges AA, Lira GPO, Nascimento LE, Queiroz Neta LB, Santos MVO, Oliveira MF, Silva AR, Pereira AF.

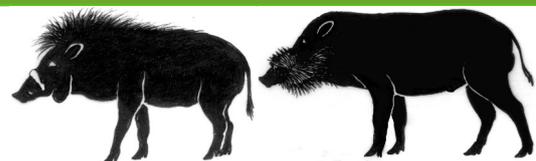
Biopreserv Biobank. 2017 Dec .

Skin vitrification is a promising and alternative tool for the conservation of biodiversity, especially for wild mammals, such as collared peccaries. Several factors can affect the success of this procedure, such as the cryoprotectant solution used. Therefore, this study was carried out to compare the efficiency of various vitrification solutions for recovery of viable cells after in vitro culture of cryopreserved skin tissues derived from the collared peccary, aiming to study the application in biobanking, where cellular use is not immediately required. Then, Dulbecco's modified Eagle's medium (DMEM) composed of 2.2 g/L sodium bicarbonate and 10% fetal bovine serum (FBS) was supplemented with 3.0 M ethylene glycol (EG) or 3.0 M dimethyl sulfoxide (DMSO) or 1.5 M EG plus 1.5 M DMSO with or without sucrose (SUC; 0.25 M) to produce six solutions for solid-surface vitrification. After warming, skin tissues were cultured in vitro and recovered cells were analyzed for morphology, adhesion, subconfluence, and proliferative activity for developing the growth curve and determining the population doubling time (PDT), and viability by Trypan Blue. The vitrification did not alter the ability of the tissues to adhere to the culture dish, as well as the day of all explants with cell growth, subconfluence samples, subconfluence total time, and PDT ($p > 0.05$). Moreover, independent of the cryoprotectant solution used, the vitrification altered the day of all attached explants ($p < 0.05$). Nevertheless, for viability after the first passage, only the EG-SUC (86.9%) and DMSO-SUC (91.4%) groups maintained viable cell recovery similar to the nonvitrified group (96.3%, $p > 0.05$). Additionally, for viability after the third passage, only the EG-SUC group maintained the cell quality (88.3%), when compared with the nonvitrified (97.8%, $p > 0.05$). In conclusion, DMEM with 10% FBS, 3.0 M EG, and 0.25 M sucrose was the most efficient solution for vitrifying collared peccary skin tissues, leading to the in vitro culture of viable cells.





New literature on Suiformes



Genetic diversity of *Hepatozoon* spp. in *Hydrochoerus hydrochaeris* and *Pecari tajacu* from eastern Amazon

Laise de Azevedo Gomesa, Leopoldo Augusto Moraesa, Délia Cristina Figueira Aguiara, Hilma Lúcia Tavares Diasa, Ana Silvia Sardinha Ribeirob, Henrique Píram do Couto Rochab, Márcio Roberto Teixeira Nunes, Evonnildo Costa Gonçalvesa.

Ticks and tick-borne diseases.

This study aimed to identify and characterize genetically species of the genus *Hepatozoon* detected in *Hydrochoerus hydrochaeris* (capybaras) and *Pecari tajacu* (collared peccaries) from two localities from the Eastern Amazon. Blood samples from 196 free-living *H. hydrochaeris* from Marajó Island and 109 *P. tajacu* kept in captivity in Belém, Pará, were collected and analyzed for the presence of *Hepatozoon* spp. Partial sequences of the 18S rRNA gene were obtained and analyzed in comparison to others available in the NCBI database. Our results demonstrated a high prevalence of *Hepatozoon canis* in both mammals and the existence of four haplotypes of *Hepatozoon* spp., three of *Hepatozoon canis* and one of *Hepatozoon cuestasensis*, found only in *H. hydrochaeris*. In addition, these data increase the genetic diversity of *H. canis* from the Eastern Amazon, as well as reporting, for the first time, the infection of mammals by *H. cuestasensis* and *P. tajacu* by *H. canis*.

Protein requirements of collared peccary (*Pecari tajacu*)

Rogério M. Borges, Alcester Mendes, Selene S. C. Nogueira, Jérôme Bindelle, Sérgio L. G. Nogueira-Filho

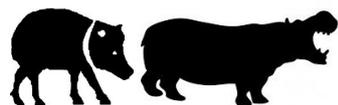
Tropical Animal Health and Production. October 2017, Volume 49, Issue 7, pp 1353–1359

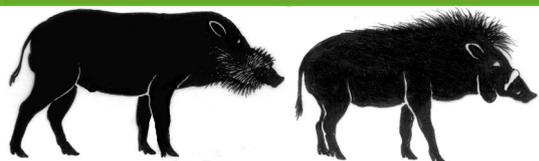
A nitrogen (N) balance digestion trial was conducted to determine the protein requirement of collared peccaries (*Pecari tajacu*). In a 4 × 4 Latin square design, four captive adult male peccaries were fed four isoenergy diets containing four different levels of N (11.7, 16.3, 22.8, and 26.7 g N/kg of dry matter—DM). After 15 days of adaptation, a total collection of feces and urine was carried out for five consecutive days. Regression analyses between N intake and N in feces and urine allowed to calculate the metabolic fecal nitrogen (MFN = 2.3 g N/kg of dry matter intake—DMI) and daily endogenous urinary N (EUN = 185 mg N/kg^{0.75}). Likewise, by regression analyses between consumption of nitrogen and the nitrogen balance (NB = N ingested – N excreted, mg N/kg^{0.75}), a daily requirement of 514 mg N/kg^{0.75} was calculated. Therefore, if food intake is unrestricted, collared peccaries require a minimum in their diet of about 5.4% crude protein on DM basis. These values are almost as low as those found for browsing and frugivorous wild ruminants, which reinforce the proposition that peccaries' digestive physiology is nearer to that of domestic and wild ruminants than domestic pigs. This relatively low protein requirement of collared peccary and its great ability to digest protein reveal the relevance of the forestomach for the species on nitrogen/protein metabolism and allow the use of diets with lower crude protein levels than the commercial ones used for the domestic pig, which reduces feed costs.

Conservation of somatic tissue derived from collared peccaries (*Pecari tajacu* Linnaeus, 1758) using direct or solid-surface vitrification techniques

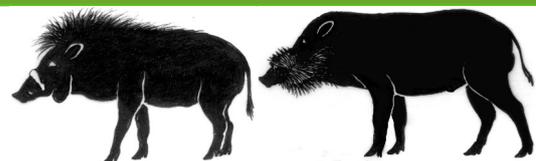
Alana Azevedo Borges, Gabriela Liberalino Lima, Luiza Bento de Queiroz Neta, Maria Valéria de Oliveira Santos, Moacir Franco de Oliveira, Alexandre Rodrigues Silva, Alessandra Fernandes Pereira.

Cytotechnology .August 2017, Volume 69, Issue 4, pp 643–654





New literature on Suiformes



Cryopreservation of somatic tissue can be applied in biodiversity conservation, especially for wild species as collared peccary. We aimed to evaluate the effect of vitrification techniques of ear tissue of collared peccary [direct vitrification in cryovials (DVC) or solid-surface vitrification (SSV)] on the layers of epidermis and dermis by conventional histology and cell ability during the in vitro culture. Thus, both the vitrification methods were able to maintain normal patterns of the epidermis as the cornea and granular layers, furthermore the intercellular space and dermal–epidermal junction of the spinous layer when compared to fresh control. Nevertheless, DVC and SSV percentage of normality decreased in the morphological integrity of cytoplasm (37.5 and 25.0%) of spinous layer, respectively, as compared to the fresh fragments (100%, $p < 0.05$). Moreover, other differences between the fresh control (100%) and DVC tissues were verified in the intra-epidermal cleavage of the spinous (37.5%) and basal (37.5%) layers. In general, DVC and SSV techniques were efficient for the recovery of the somatic cells according to most of the evaluated parameters for the in vitro culture ($p > 0.05$). In addition, only at time of 72 h (D3), in the growth curve, DVC fragments showed a reduced cell concentration than fresh control. In conclusion, SSV was found to be a more efficient method for vitrifying collared peccary skin tissue when compared to DVC. These results are relevant for the tissue cryopreservation from collared peccary and could also be useful for mammals with phylogenetic relationships.

Histomorphological characterization of collared peccary (*Pecari tajacu* Linnaeus, 1758) ear integumentary system

A.A. Borges, F.V.F. Bezerra, F.N Costa, L.B. Queiroz Neta, M.V.O. Santos, M.F. Oliveira, A.R. Silva, A.F. Pereira.

Arq. Bras. Med. Vet. Zootec. vol.69 no.4 Belo Horizonte July/Aug. 2017

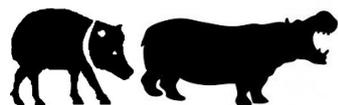
The cryopreservation of somatic tissue derived from skin of collared peccaries is an alternative for biodiversity conservation through association with nuclear transfer. In this context, tissue manipulation of skin is a critical step for the success of this biotechnology. Therefore, the aim was to characterize the peripheral ear integumentary system derived from collared peccaries, directing to improve tissue conservation. Thus, ear fragments of eight animals were evaluated for tissue layers, components, proliferative activity and metabolic viability, using hematoxylin-eosin and Gomori Trichrome, AgNORs quantification and transmission electronic microscopy. Hence, sizes of 104.2 μm and 222.6 μm were observed in the epidermis and dermis, with a volumetric ratio of 36.6% and 58.7%, respectively. Moreover, basal layer (22.5 μm), intermediate (53.5 μm) and cornea (28.2 μm), with mean values of 65.3 epidermal cells, 43.4 melanocytes and 14.8 perinuclear halos were evidenced in the epidermal. Already the dermis has 127 fibroblasts with 2.5 AgNORs/nucleolus. Additionally, the metabolic activity was 0.243. In conclusion, the peripheral ear integumentary system derived from collared peccaries possessed some important variations compared to other mammals, as the number of layers and thickness of the epidermis, number of epidermal cells, melanocytes and proliferative parameters.

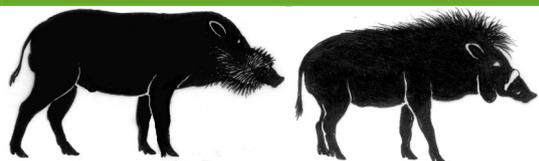
Semen Parameters from a Captive Population of the Endangered Chacoan Peccary (*Catagonus wagneri*) in Paraguay

C. C. Goblet A, A. E. Newell-Fugate A, G. West B and J. M. Campos-Krauer C D

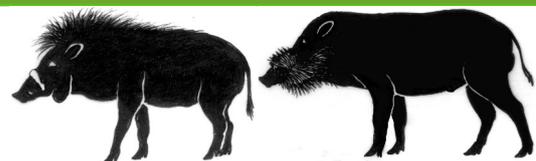
Reproduction, Fertility and Development 30(1) 186-187

Priority conservation actions for the endangered Chacoan peccary (*Catagonus wagneri*) include improvement of captive breeding initiatives. Eleven captive male peccaries housed in mixed-sex





New literature on Suiformes



groups of 17 to 35 animals at the Centro Chaqueño para la Conservación e Investigación in Paraguay were immobilised with intramuscular tiletamine/zolazepam (30 mg; Zoletil® 50, Virbac, Forth Worth, TX, USA), azaperone (10 mg; 50 mg mL⁻¹; ZooPharm, Windsor, CO, USA), and medetomidine (1 mg; 10 mg mL⁻¹; ZooPharm). Animals were administered supplemental intranasal oxygen (1-2 L min⁻¹) and reversed with atipamazole (5 mg; 25 mg mL⁻¹; ZooPharm). Testis length, width, and firmness (1-3 scale; 1 = hard, 2 = normal, 3 = flaccid) were recorded. The preputial sheath was clipped, cleaned, and flushed with sterile saline using a Foley catheter. A lubricated 13-mm-diameter electroejaculator probe (Beltron Instruments, Longmont, CO, USA) was inserted into the rectum to a depth of 5 cm. The electroejaculation protocol consisted of 4 cycles of 10 stimuli each (1-4 V/cycle). Collection tubes were changed frequently during electroejaculation to avoid urine or gel fraction contamination of the sperm-rich fraction. Collected semen was evaluated for volume, color/appearance, and pH. Percent motility was determined as the average motility of spermatozoa from 10 fields (40×). Progressive motility of spermatozoa was scored on a scale of 0-5 (0 = dead sperm; 5 = rapid forward progression). Semen samples were assessed for total spermatozoa. Percent of live spermatozoa and spermatozoa morphology were evaluated with Eosin-Negrosin smears. The mean ± standard error of the mean of each parameter is presented. A Pearson correlation coefficient between age and semen parameters was calculated. Males assessed in this study were 10.5 ± 1.2 years old. The mean testis volume was 1005.7 ± 50.9 cm³ and mean testis firmness was 2.1 ± 0.1. The mean ejaculate volume was 2.9 ± 0.7 mL and pH was 7.7 ± 0.3. Few males had motile spermatozoa (n = 5/9), which yielded a mean percent motility of 18.3 ± 8.5 (range: 0-50%) and a mean progressive motility of 0.6 ± 0.3 (range: 0-2). The mean percentage of live spermatozoa was 25.1 ± 5.6 (range: 4-44%). Male Chacoan peccaries in this population had a low percentage of normal spermatozoa (12.4 ± 2.5%; range: 2.8-24.0%). The mean total count of spermatozoa per ejaculate was 1.58 ± 1.01 million (range: 0.09-8.28 million). Spermatozoa defects were predominantly primary (67.1%), with the most common defects being tapered head (15.4 ± 6.2%), diadem/crater (14.8 ± 2.6%), and excess residual cytoplasm (8.5 ± 2.7%). There was no correlation between age and semen parameters (percent live: r = -0.19; motility percentage: r = 0.01; percent normal spermatozoa: r = 0.38; total count: r = 0.29; P > 0.05). This is the first report of semen parameters in the Chacoan peccary. It is unknown whether the poor semen quality is inherent to the species or this population. Reproductive assessment of males from other captive populations and of wild male Chacoan peccaries is warranted.

The retina of the collared peccary (*Pecari tajacu*): structure and function.

Ezra-Elia R, Ross M, Avni-Magen N, Berkowitz A, Ofri R.

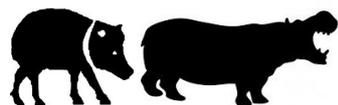
Vet Ophthalmol. 2018 Jan 16. doi: 10.1111/vop.12548.

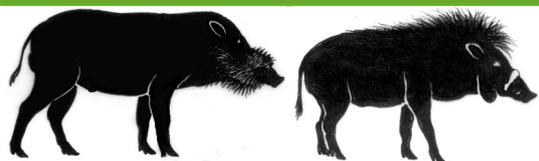
OBJECTIVE:

To study retinal morphology and function in the collared peccary, an ungulate species distantly related to the domestic pig.

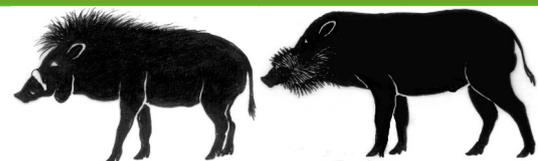
ANIMAL STUDIES:

Twenty captive peccaries anesthetized for routine health examinations. Procedures No abnormalities were noted on a complete ophthalmic examination. Fundi were examined ophthalmoscopically and photographed. The eyes of an individual that died of unrelated, nonocular reasons were studied histologically and by immunohistochemistry. Scotopic, mixed rod-cone, and photopic electroretinography (ERG) responses were recorded using the





New literature on Suiformes



'QuickRetCheck' (n = 6) and 'Dog diagnostic' (n = 5) protocols of the Handheld Multispecies ERG (HM_sERG).

RESULTS:

The fundus of the peccary is atapetal, with varying amounts of pigmentation seen ophthalmoscopically, and histologically in the retinal pigment epithelium (RPE) and choroid. The retina is holangiomatic with dichotomously branching vessels. These cross, and apparently loop on, the optic disk surface, but no venous circle was seen. Immunohistochemistry suggests a high concentration of cone photoreceptors with red/green cones being more abundant than blue cones. Rod ERG responses were very low with no evident dark adaptation. Mixed rod-cone and cone ERG response amplitudes were low compared to those of domestic pigs, but quite similar to those of minipigs.

CONCLUSIONS:

To the best of our knowledge, this study describes the collared peccary's retinal features for the first time. A comparison of our findings with data from other ungulate species shows some similarities between the peccary and pig retinas. Further studies are warranted to determine whether the peccary can be used alongside the pig as an animal model in retinal studies.

Salt bath as a treatment for idiopathic dermatitis in captive Nile Hippopotamus (*Hippopotamus amphibius*).

Helmick KE.

J Zoo Wildl Med. 2017 Sep;48(3):915-917. doi: 10.1638/2017-0075.1.

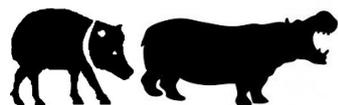
Ulcerative skin lesions were observed in two captive adult female hippos (*Hippopotamus amphibius*) from a zoological collection. Lesions appeared as cracking, peeling, or vesicles of the skin affecting the lateral and ventral aspects of the neck, limbs, thorax, and abdomen, dorsum, toes, and perineal region. Some lesions drained blood, serum, or purulent material. Histologic evaluation of sloughed skin consisted of deep dermal collagen with bacterial cellulitis and vasculitis and superficial fungal colonization. No viral pathogens were isolated and no fungal or bacterial pathogen predominated. Minimal response to systemic antibiotics and topical treatment was observed. Commercial cattle food-grade salt was added to the exhibit pool at 2-3 g/L with complete healing of all skin lesions within a 4-mo treatment period. No complications were observed. Patient compliance with salt bath therapy was higher and results more effective compared to topical and oral treatments.

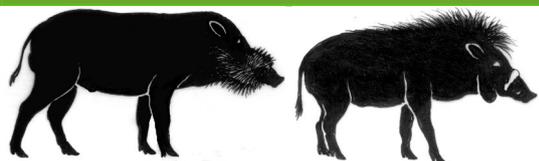
***Echinococcus felidis* in hippopotamus, South Africa.**

Halajian A, Luus-Powell WJ, Roux F, Nakao M, Sasaki M, Lavikainen A.

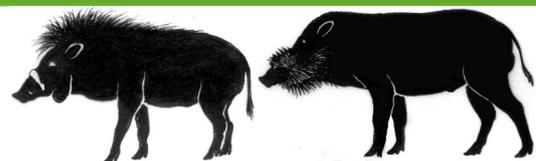
Vet Parasitol. 2017 Aug 30;243:24-28. doi: 10.1016/j.vetpar.2017.06.001

Hydatid cysts of *Echinococcus felidis* are described from the hippopotamus (*Hippopotamus amphibius*) from Mpumalanga Province, South Africa. Among six hippopotami investigated, hepatic hydatids were found in three. The identification was based on mitochondrial and nuclear DNA sequences. In addition, the rostellar hook morphology was analysed. This is the first morphological description of the metacestode of *E. felidis*, and the first molecularly confirmed report of the intermediate host of *E. felidis* in South Africa. The definitive host of *E. felidis* in South Africa is the lion (*Panthera leo*).





New literature on Suiformes



Characterizing the reproductive biology of the female pygmy hippopotamus (*Choeropsis liberiensis*) through non-invasive endocrine monitoring.

Flacke GL, Schwarzenberger F, Penfold LM, Walker SL, Martin GB, Millar RP, Paris MCJ.

Theriogenology. 2017 Oct 15;102:126-138. doi: 10.1016/j.theriogenology.2017.07.017.

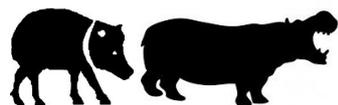
The pygmy hippopotamus (*Choeropsis liberiensis*) is endangered in the wild and very little is known about its reproductive biology. In zoological facilities, this species experiences a number of reproductive issues that complicate breeding management, including a high rate of stillbirths and failure of many pairs to reproduce. We conducted a comprehensive study to evaluate reproductive cycles and pregnancy in this species using enzyme immunoassays (EIAs) for fecal hormone metabolite analysis. Fresh fecal samples were collected twice weekly for a one to three year period from 36 female pygmy hippos housed at 24 zoological institutions. Samples were analyzed in three separate laboratories. Three progesterone metabolite EIAs (Pg-diol: 5 β -pregnane-3 α ,20 α -diol 3HS:BSA; PdG: pregnanediol-3-glucuronide R13904; mono-P4: Quidel clone 425) and three estrogen metabolite EIAs (E2a: estradiol-17 β -OH 17-HS:BSA; E2b: estradiol 17 β R0008; E2c: estradiol 17 β R4972) accurately reflected reproductive events. Average estrous cycle length was 31.8 \pm 7.4 days based on estrogen metabolite peaks and 30.9 \pm 7.3 days based on nadir to nadir progesterone metabolite concentrations. Cyclical patterns in both estrogen and progesterone metabolites were detected throughout the year, indicating a lack of seasonality. Estrogen metabolite peaks were also observed during pregnancy and lactation, suggesting that follicular development occurs during both reproductive states. Pregnancy was most reliably demonstrated by elevation in progesterone metabolites (Pg-diol or PdG) in the second half of gestation. Average gestation length based on breeding to calving date was 203 \pm 4 days for 15 pregnancies. This comprehensive overview of the reproductive biology of the female pygmy hippo provides valuable data for guiding long-term breeding management for this endangered species and serves as a baseline for future studies addressing the potential influence of social structure, diet, body condition, and other husbandry factors on estrous cycling and reproduction.

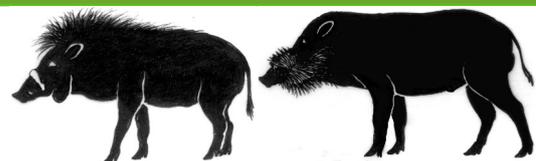
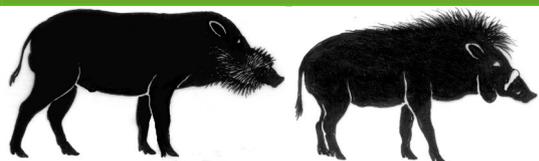
Results of the Megavertebrate Analgesia Survey: Giraffe and Hippopotamus.

Boothe M, Kottwitz J, Harmon R, Citino SB, Zuba JR, Boothe DM.

J Zoo Wildl Med. 2016 Dec;47(4):1049-1056. doi: 10.1638/2015-0268.1.

Results of an online survey posted on the American Association of Zoo Veterinarians listserv examined the patterns of analgesic medication and pain management modalities used for captive giraffe and hippopotami. Compiled data included signalment, drugs administered, dosing regimens, subjective efficacy scores, ease of administration, and adverse events. Nineteen institutions exhibiting hippopotami (*Hippopotamus amphibius*) and pygmy hippopotami (*Choeropsis liberiensis*) and 45 exhibiting giraffe (*Giraffa camelopardalis* spp.) responded. Phenylbutazone was the most-commonly administered nonsteroidal anti-inflammatory drug (NSAID), followed by flunixin meglumine, but doses varied widely. Eight institutions reported adverse events from NSAID administration. Tramadol was the most-commonly administered opioid followed by butorphanol. Only one adverse event was reported for opioids. Twenty-three of 45 institutions exhibiting giraffe utilized alternative analgesia methods including gabapentin, glucosamine-chondroitin, local anesthetics, and low level laser therapy. Six of 19 institutions exhibiting hippopotami administered omega 3-6 fatty acids, gabapentin, glucosamine-chondroitin, and α -2 adrenergics to provide analgesia. While all reporting zoological institutions administered





similar drugs, there was substantial variation and diversity in both dosing regimens and frequencies, indicating the need for both preclinical and clinical studies supporting dosing regimens.

Taxonomic, Biogeographic and Evolutionary Studies

Contacts in the last 90,000 years over the Strait of Gibraltar evidenced by genetic analysis of wild boar (*Sus scrofa*).

Soria-Boix C, Donat-Torres MP, Urios V.

PLoS One. 2017 Jul 25;12(7):e0181929. doi: 10.1371/journal.pone.0181929

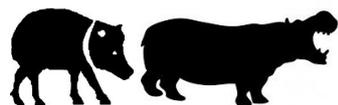
Contacts across the Strait of Gibraltar in the Pleistocene have been studied in different research papers, which have demonstrated that this apparent barrier has been permeable to human and fauna movements in both directions. Our study, based on the genetic analysis of wild boar (*Sus scrofa*), suggests that there has been contact between Africa and Europe through the Strait of Gibraltar in the Late Pleistocene (at least in the last 90,000 years), as shown by the partial analysis of mitochondrial DNA. Cytochrome b and the control region from North African wild boar indicate a close relationship with European wild boar, and even some specimens belong to a common haplotype in Europe. The analyses suggest the transformation of the wild boar phylogeography in North Africa by the emergence of a natural communication route in times when sea levels fell due to climatic changes, and possibly through human action, since contacts coincide with both the Last Glacial period and the increasing human dispersion via the strait.

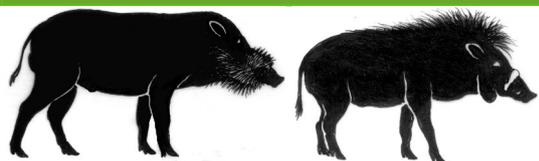
Relative abundances and palaeoecology of four suid genera in the Turkana Basin, Kenya, during the late Miocene to Pleistocene.

Rannikko, J., I. Zliobaite, et al. (2017).

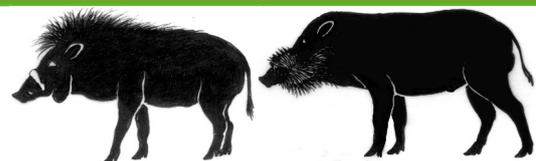
Palaeogeography Palaeoclimatology Palaeoecology 487: 187-193.

Most suids (Mammalia: Suidae, pigs) worldwide are omnivores living in closed environments, but the African warthog (*Phacochoerus*) has special adaptations for grazing in open environments. Similar specializations have been recorded from Plio-Pleistocene African suids. Four genera, *Nyanzachoerus*, *Notochoerus*, *Kolpochoerus*, and *Metridiochoerus*, have been discovered in late Miocene to middle Pleistocene locations around the Turkana Basin. We analyse the relative abundances of these four suid genera compared to other mammals, from approximately 8-0.7 Ma. The dataset includes most of the mammal specimens collected from locations around the Kenyan side of the Turkana Basin. Species of genus *Nyanzachoerus* were dominant before 4 Ma, but their relative abundance decreases through time thereafter. At the same time, *Notochoerus* increases in relative abundance, followed by *Kolpochoerus*, and finally *Metridiochoerus*. Their peak relative abundances do not overlap: *Notochoerus* peaks at 3.44-2.53 Ma, *Kolpochoerus* at 2.53-1.87 Ma, and *Metridiochoerus* at 1.38-0.7 Ma. We interpret the palaeoecology of these suids based on their relative abundances over time and on published isotope and pollen data. We find that *Nyanzachoerus* was replaced by its abrasive-diet-specialized successor *Notochoerus*, possibly in response to a rapid decrease in forest cover. *Notochoerus* adapted at first to the expanding wood- and grasslands, and then to more arid shrublands. After a period of severe aridity around 2.7-2.5 Ma, more variable environments allowed *Kolpochoerus* and *Metridiochoerus* to disperse, while *Notochoerus* disappeared, perhaps having lost its competitive





New literature on Suiformes



edge. Further changes in the environment encouraged the expansion of grasslands over shrublands, favouring *Metridiochoerus*. *Kolpochoerus* persisted in the more closed environments near water sources.

Phylogenetic Systematics of Peccaries (Tayassuidae: Artiodactyla) and a Classification of South American Tayassuids.

Dutra, R. P., D. D. Casali, et al. (2017).

Journal of Mammalian Evolution 24(3): 345-358.

Tayassuidae is a family of pig-like Artiodactyla restricted to the New World. Despite its rich fossil history, they have received less attention from a taxonomic and phylogenetic perspective when compared to the Old World pigs, Suidae. In this study, we performed a computer assisted phylogenetic analysis using morphological and molecular data including fossil and extant Tayassuidae, using parsimony and Bayesian approaches. We recovered the monophyly of the family Tayassuidae, confirming previous proposals, as well as the monophyly of the subfamilies Hesperhyinae and Tayassuinae, and the genus *Platygonus*, which we placed in a new taxon of tribe level. The three living peccaries and a number of fossil species belong to a new, tribe level, monophyletic group. The genus *Catagonus* comes out as paraphyletic, leading us to propose to restrict the generic name to the type species, *C. metropolitanus*, and a new taxonomic arrangement for the remaining species previously included in it, revalidating the genera *Brasiliochoerus* and *Parachoerus*, and describing a new genus, *Protherohyus*, gen. nov.

Ecological, Behavioural and Conservation Studies

Population dynamics and space use of wild boar in a tropical forest, Southwest China.

Guo, W; Cao, GH; Quan, RC.

GLOBAL ECOLOGY AND CONSERVATION, 11 115-124; 10.1016/j.gecco.2017.04.005 JUL 2017

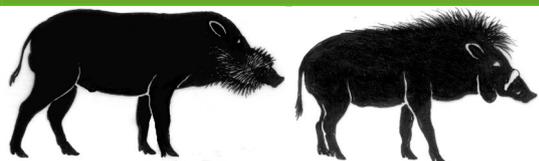
Wild boar (*Sus scrofa*) is the most common native wildlife species causing crop damage in some regions of China. However, in Tropical East Asia, there is limited knowledge on wild boar ecology for application in management and policy decisions. To address this void, we examined wild boar sex-age class structure, group size and space use variation in the Naban River Watershed National Nature Reserve in Xishuangbanna Dai Autonomous Prefecture, Yunnan province, Southwestern China, using 4 years of camera trap data. We found that the adult sex ratio was slightly skewed towards females, and that adults and subadults were the dominate age classes. The annual relative abundance for each age class exhibited a bimodal distribution pattern: the abundance of subadults and adults peaked in May and October, while the abundance of piglets peaked in June and October. Mean group sizes (1.6 +/- 1.1) were smaller than the typical mean group of 4 individuals observed in Europe. The space use patterns differed by age class, with piglets preferring forest interior regions while adult males were active near the villages. As such, controlling the adult male population is the most direct way to address crop raiding concerns. On the other hand, protecting piglets would have beneficial effects as potential prey for rare carnivore species of conservation concern that are limited to reserve inner zones.

Urban wild boars prefer fragmented areas with food resources near natural corridors.

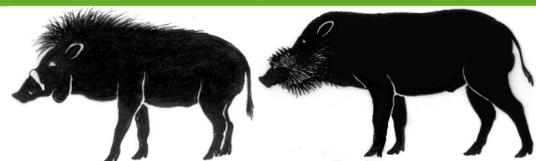
Castillo-Contreras R, Carvalho J, Serrano E, Mentaberre G, Fernández-Aguilar X, Colom A,

González-Crespo C, Lavín S, López-Olvera JR.





New literature on Suiformes



Sci Total Environ. 2018 Feb 15;615:282-288. doi: 10.1016/j.scitotenv.2017.09.277.

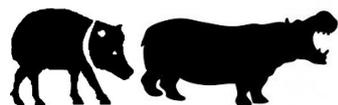
Wild boar populations are expanding throughout the world and intruding into periurban and urban areas. In the last years, wild boar has colonized several European cities, including our study area, the city of Barcelona. It is required to identify the main factors driving wild boar into urban areas prior to establish management measures. We built Boosted Regression Trees (BRT) using 3148 wild boar presences registered in the urban area of Barcelona from 2010 to 2014 to identify the variables correlated with these presences. The variables analysed included proxies for distance to source population, urban food resources, climate and urban habitat structure. Wild boars enter the urban area from close natural habitat using corridors such as streams, preferably in fragmented urban environment, looking for food such as urban green areas or dry pet food from cat colonies. Wild boar presence is higher in spring possibly due to the births of piglets and the dispersion of yearlings during that season, and also when natural resources in the Mediterranean habitat fail to satisfy the nutritional requirements of the wild boar population during the summer season. Management measures derived from this study are currently being applied in the city of Barcelona, including vegetation clearings in the wild boar entrance areas and an awareness campaign aimed at reducing the anthropogenic food availability for wild boars. The methodology used can be applied to other cities with wild boar or even other wildlife species issues. The comparison between the factors attracting wild boars into different urban areas would be helpful to understand the global phenomenon.

Vocal correlates of emotional reactivity within and across contexts in domestic pigs (*Sus scrofa*).

Leliveld LMC, Döpjan S, Tuchscherer A, Puppe B.

Physiol Behav. 2017 Nov 1;181:117-126. doi: 10.1016/j.physbeh.2017.09.010.

Vocalizations have long been recognized to encode information about an individual's emotional state and, as such, have contributed to the study of emotions in animals. However, the potential of vocalizations to also encode information about an individual's emotional reactivity has received much less attention. In this study, we aimed to test whether the vocalizations of domestic pigs contain correlates of emotional reactivity that are consistent between different contexts. We recorded vocalizations of 120 young female pigs in an experimental arena in two consecutive recording contexts, social isolation and an encounter with a familiar human. Simultaneously, we measured their heart rate and behaviour to determine their emotional reactivity in the same context (within-context). In addition, we aimed to determine the subjects' emotional reactivity in other contexts (across-context) by measuring their behaviour in four common tests of emotional reactivity, the human approach test, the open door test, the open field test and the novel object test. Using a cluster analysis, we identified four different call types. Significant inter-context correlations were found for all call types, suggesting that pig vocalizations are consistent within an individual across contexts. The call rate and the proportions of the individual call types were found to correlate significantly with indices of emotional reactivity both within and across contexts. Thereby, we found more significant correlations to indices of emotional reactivity within context (behavioural and physiological response during recording) compared to across context (behavioural response in the four emotional reactivity tests). The consistency of the vocal correlates to emotional reactivity between the different contexts depended on the call type. While we found moderate evidence that the high grunt is indicative of more active, more explorative and less fearful individuals both within as well as across contexts, the other call types provided less





New literature on Suiformes



consistent results. Thus, it seems that some call types are better suited to provide information on a caller's emotional reactivity than others, and further research is needed to clarify the underlying influential factors.

From minutes to days-The ability of sows (*Sus scrofa*) to estimate time intervals.

Fuhrer N, Gygax L.

Behav Processes. 2017 Sep;142:146-155. doi: 10.1016/j.beproc.2017.07.006.

Time estimation helps allocating time to different tasks and to plan behavioural sequences. It may also be relevant to animal welfare if it enables animals assessing the duration of a negative situation. Here, we investigated the ability of dry sows to estimate short and long time periods. We used a variant of the peak-interval procedure and the choice between 2 resources of different quality and replenishment rates to assess time periods in the order of minutes and days, respectively. In the minute-experiment, the sows were trained to expect an interruption while feeding at the end of an interval. Heart rate and heart rate variability slightly and continuously increased and decreased, respectively, towards the end of that interval. In the day-experiment, lasting about 60 days, the sows were increasingly more likely to open the door to a high food reward on the correct day when this food reward was presented every fifth day. We conclude that the sows learnt to estimate time intervals of 5 days after lengthy training but did not accurately learn intervals in the range of minutes. Therefore, they might re-visit replenishing resources after several days, but may not base short-term decisions solely on the passing of time.

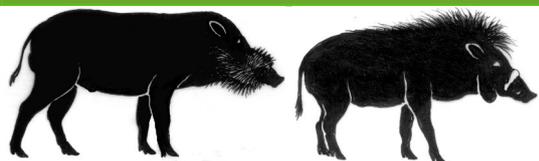
When pork is not on the menu: Assessing trophic competition between large carnivores and poachers.

Ghoddousi, A., M. Soofi, et al. (2017).

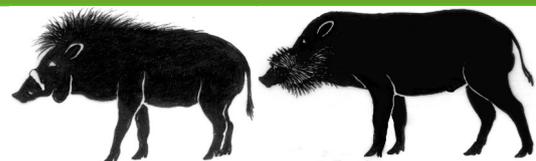
Biological Conservation 209: 223-229.

Overexploitation of wildlife for meat is a widespread phenomenon, which drives populations of many species toward extinction and may in turn affect large carnivores. Therefore, human hunters may compete with large carnivores over food resources and threaten their survival. In this study, we assessed the trophic competition of endangered Persian leopard with local poachers in Golestan National Park, Iran, where poaching has depleted populations of three ungulate species by 66-89% in the past decades. We compared leopard diet (77 scats) with prey offtake by poachers (75 poacher seizure records). In addition, we estimated prey abundance by line transect sampling (186 km), camera trapping (2777 camera days), double-observer point-counts (64 scans) and dung counts (38 km). Using interview surveys with local poachers, we also quantified their stated hunting preference. We documented a narrow hunting specialization of leopard (niche breadth 0.24) and poachers (niche breadth 0.19), and exclusivity (niche overlap 0.31) of their dietary/hunting niches, which suggest no exploitative competition between these two apex predators. This pattern likely results from the major role of wild boar in leopard diet. Due to religious beliefs, poachers avoid hunting this species and its population has increased in contrast to other ungulates. Considering the general avoidance of Suidae species across leopard range, depletion of alternative prey species may have resulted in a prey-switching strategy by leopard. The influence of religious beliefs and taboos on hunting preference and, consequently, on prey populations and predators' trophic niches shows the importance of incorporation of cultural beliefs in conservation practices. (C) 2017 Elsevier Ltd. All rights reserved.





New literature on Suiformes



The IUCN Wild Pig Challenge 2015.

Linkie, M., J. Ng, et al. (2017).

Oryx 51(3): 477-481

Asian mammal species are facing unprecedented pressures from hunting and habitat conversion. Efforts to mitigate these threats often focus on charismatic large-bodied species, while many other species or even guilds receive less attention, particularly Asian wild pigs. To address this we developed a rapid questionnaire survey and administered it to relevant experts to identify the presence, population trends and conservation needs of Asia's 11 threatened wild pig species. The results highlighted geographical differences within species (e.g. the near collapse of bearded pig populations in Peninsular Malaysia yet their widespread presence on Borneo), and knowledge gaps for many endemic species of the Philippines, notably the Critically Endangered Visayan warty pig *Sus cebifrons*. To support field-based conservation projects, we identified 66 medium-to-large zoos in Asia, Europe and the USA that house Asian wild pigs and have applicable conservation funding schemes. Our rapid survey method, which yielded 170 wild pig records from across Asia, proved effective in filling many of the existing knowledge gaps, and may be widely applicable in assessing the status and needs of other non-flagship threatened species.

The conservation value of unlogged and logged forests for native mammals on the East Coast of Peninsular Malaysia.

Magintan, D., S. M. Nor, et al. (2017).

Journal for Nature Conservation 40: 113-119.

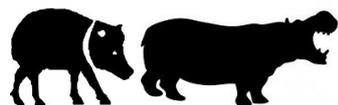
Tropical forests across the world provide important habitats for a diverse number of conservation priority species, yet are under threat from a range of anthropogenic impacts including logging. This study aims to quantify mammalian biodiversity in unlogged and logged forests in the adjoining Tembat and Petuang Forest Reserves, Terengganu, on the East Coast of Peninsular Malaysia. Data was collected over a series of surveys using direct and indirect observation methods from 2008 to 2014. A total of 30 medium and large sized mammals species were identified, with 27 of those species found in unlogged forests and 22 species in logged forests. Carnivores encompassed 11 species from 67 observations representing 15% of the total number of observations. The family Felidae had the highest number of species (six species), followed by Hylobatidae, Cercopithecidae and Suidae with three species each. A total of 17 species contributed to more than 90% of the mammal community in the unlogged and logged forests, while six species were uncommon and only observed once during the entire survey. Species abundance in the unlogged forest was significantly greater than the logged forests, but the difference was not significant for species richness. This study provides critical baseline information on the impact of unlogged and logged forests and the identification of threatened species warrant the establishment of conservation measures such as anti-poaching patrol and ranger stations in the study area.

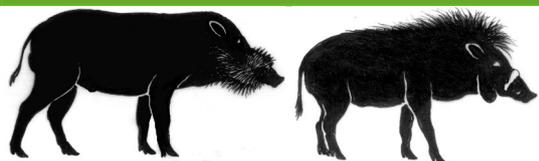
Wild boar impact on forest regeneration in the northern Apennines (Italy).

PaoloBongi, MarcelloTomaselli, Alessandro Petraglia, Davide Tintori, Michele Carbognani

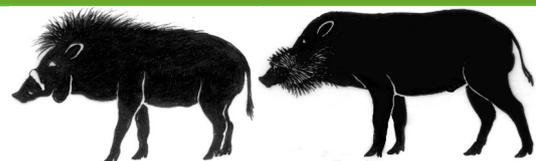
Forest Ecology and Management, Volume 391, 1 May 2017, Pages 230-238

The foraging activities of wild boar (*Sus scrofa* L.) have been suggested to impact biodiversity and ecological processes in a wide array of ecosystems. Data indicate that wild boar affects forest vegetation by feeding on above- and belowground plant parts, as well as by soil





New literature on Suiformes



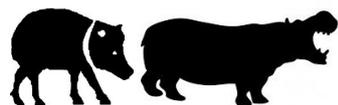
disturbance causing plant mortality and influencing seedling recruitment. In this paper, we investigated wild boar impacts on forest regeneration within three different types of mixed deciduous woodlands, respectively dominated by chestnut (*Castanea sativa*), Turkey oak (*Quercus cerris*) and beech (*Fagus sylvatica*) occurring in the northern Apennines (Italy), a mountain area where wild boar numbers have increased rapidly in recent decades. The goal of our study was to present a robust procedure targeted towards estimating wild boar impact on fruits predation and seedling survival of tree species. We evaluated the impact comparing wild boar excluding plots with completely access free ones. Differently from the majority of other experiments, we used replicated exclosure plots (by means of an electro-welded iron grid) excluding wild boars without excluding all other large ungulates such as deer and native small vertebrates. This method, tested with camera trapping surveys, was effective in reducing time spent by wild boar on experimental plots in comparison with other animals. Nevertheless, the number of fruit was similar in the exclosure plots and completely access free plots. Our study demonstrated, however, that wild boar feeds preferentially with the bigger fruits that are visually more attractive and have higher energetic potentialities too. The proportion of seedlings survived at the end of the period studied was significantly higher in wild boar excluding plots compared to those completely access free. Moreover, the dominant species were not equally influenced by the exclosure method, with chestnut and beech more markedly affected with respect to Turkey oak. Finally, the seedling survival of subordinate tree species, compared to the one of dominant plants, was reduced by the activity of wild boars in all the woodlands studied. This impact could lead to reduced tree species richness of the woodlands under study with negative effects on the biodiversity of plants and animals within these ecosystems.

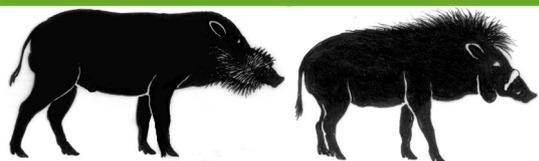
Assessment and Synthetization of Extension Needs Encompassing the Economic and Ecological Impacts of Wild Pigs Among Young Pine Plantations

Fern, Micah

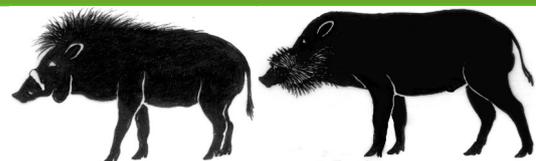
PhD Dissertation, Department Forestry and Wildlife Science, Auburn University Alabama

The southeastern United States has recently seen its first increases in Longleaf pine (*Pinus palustris* Mill.) acreage after more than four centuries of decline thanks to ongoing restoration efforts. Connecting existing longleaf landscapes across this species' native range depends largely on the successful establishment of plantations on non-industrial private lands. As in Alabama, the majority of forest lands in southeastern states are owned by non-industrial private landowners. Seedling depredation by wild hogs (*Sus scrofa*) poses a threat to longleaf restoration efforts especially in young forest plantations. Improving the knowledge base about wild hogs among young forest plantations will help guide better management decisions for non-industrial private landowners and resource professionals. This dissertation addresses extensions needs for information regarding wild hogs and explores the relationship between wild hogs and young forest plantations from two perspectives. First, an extension publication was created to synthesize and organize resource material pertaining to wild hogs in order to supplement the nine year gap since the last published bibliography. Second, a mail survey was conducted among non-industrial private landowners in Alabama to gain an understanding about wild hog damage and control in forest plantations. Findings were used to further explore the economics of wild hog damage and control for a stand level model utilizing longleaf. Third, a field study was performed to determine wild hog's preference among seedling species and to observe ecological factors influencing seedling depredation.





New literature on Suiformes



Assessing landowners' attitudes toward wild hogs and support for control options

Carlotta A. Caplenor, Neelam C. Poudyal, Lisa I. Muller, Chuck Yoest

Journal of Environmental Management Volume 201, 1 October 2017, Pages 45-51

Wild hogs (*Sus scrofa*) are an invasive species with destructive habits, particularly rooting and wallowing, which can directly impact agricultural crops, pasture land, and water quality. Considering wild hogs are widely dispersed across the landscape, they are extremely difficult to control. Disagreements can arise among different stakeholders over whether and how their populations should be managed. The purpose of this article was to examine Tennessee, United States landowners' attitudes toward wild hogs, to compare acceptability of control methods, and to evaluate factors significantly influencing public support for regulations to control wild hogs. Logistic regression was employed to analyze data collected from a statewide survey of rural landowners in the fall of 2015. Landowners had overwhelmingly negative attitudes towards wild hogs, and were concerned about their impact on the natural environment and rural economy. Although landowners showed support for controlling wild hogs, levels of acceptability for management options varied. Respondents favored active management and supported education and incentive-based control programs to control wild hogs. Cognitive concepts such as social and personal norms and awareness of consequences, as well as demographic characteristics, significantly predicted landowners' support for state regulations to control wild hogs in Tennessee. Findings increase our understanding of the human dimensions of wild hog management and that of other similarly invasive animals, and may guide resource managers in designing effective and socially acceptable management strategies to control wild hog populations in Tennessee and elsewhere.

Short-term Home Range and Habitat Selection by Feral Hogs in Northern Texas.

Gregory A. Franckowiak and Richard M. Poché

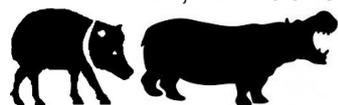
The American Midland Naturalist 179(1):28-37. 2018

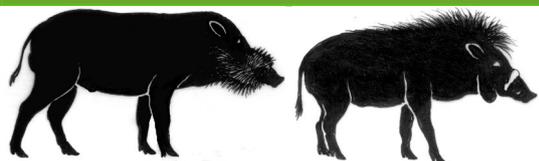
Texas is estimated to harbor more than 2 million feral hogs, *Sus scrofa*. The increasing abundance of feral hogs throughout the United States is a testament to their ability to adapt to nearly any environment. We GPS-collared and tracked 16 feral hogs in the spring of 2015 and 2016 in the Texas Panhandle, United States. We determined home range and core area size using kernel density (KDE) and minimum convex polygon (MCP) estimators and selection of habitats by feral hogs in two field sites. Mean (\pm se) KDE home range and core area sizes were 9.73 ± 1.74 km² and 1.31 ± 0.23 km², respectively. Mean (\pm se) MCP home range and core area sizes were 15.13 ± 3.49 km² and 3.14 ± 0.69 km², respectively. Home range sizes were slightly larger but comparable to other home range sizes in Texas, and with home range and core area sizes larger for males than female. Feral hogs did not exhibit second-and-third order habitat selection at random ($P < 0.005$) in both field sites. Hogs selected for woodland and floodplain habitats over human developed areas. Feral hogs spent more time in agricultural habitats during crepuscular and nighttime periods and more time in natural habitats throughout the day. These results suggest management techniques in northern Texas need to be executed for the removal or deterrence of feral hogs in areas of cultivated crops, ideally before the planting period through the harvesting season.

Sympatry among three Suid species (Family Suidae) on the North coast of Kenya.

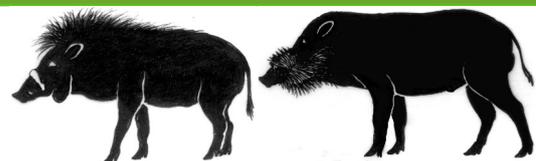
Amin, R. Wachter T. & Butynski TM.

Journal of East African Natural History 106(2): 67–78 (2017)





New literature on Suiformes



Three species of suids occur on the broad coastal plain of Kenya east and north of the Tana River; desert warthog *Phacochoerus aethiopicus*, common warthog *Phacochoerus africanus*, and bushpig *Potamochoerus larvatus*. Systematic camera-trap surveys, comprising 9229 camera-trap days on grids at six study sites, were used to determine the distribution and relative abundance of these three suids in the Boni-Dodori Forest Complex (ca. 4000 km²) and in Arabuko-Sokoke Forest Reserve (416 km²) on Kenya's north and central coasts, respectively. In the Boni-Dodori Forest Complex, desert warthog was captured at one camera site, common warthog at four camera sites, and bushpig at 33 camera sites. In Arabuko-Sokoke Forest Reserve, only bushpig was captured (seven camera sites). Sympatry of desert warthog and common warthog seems limited in the Boni-Dodori Forest Complex. Here, desert warthog appears to be narrowly sympatric with bushpig whereas common warthog is broadly sympatric with bushpig. Sympatry of the three suids in this region was not previously reported. This sympatry is absent in Arabuko-Sokoke Forest Reserve.

Population Status, Feeding Ecology and Habitat Association of the Common Warthog (*Phacochoerus africanus*) in Bale Mountains National Park, Ethiopia.

Gebremeskel Teklehaimanot, Mundanthra Balakrishnan

Int. Journ. Ecol. And Environm. Sciences Vol 43, No 3 (2017)

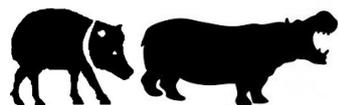
Population status, structure, sounder size, feeding ecology and habitat association of the common warthog (*Phacochoerus africanus* Gmelin, 1788) were studied in Bale Mountains National Park, Ethiopia using both total and sample count methods. A total of 195 individuals were counted in the six study sites by total count method, of which 118 (60.5%) were from Dinsho headquarters area with a population density of 43.7 individuals per km². Adults constituted 27.7%, sub-adults 16.4% and young 55.9% of the population in Dinsho, with a male to female ratio of adults and sub-adults together 1:1.7. The mean sounder size was 6.5 individuals. Sample count method revealed the presence of 561 individuals in Gaysay/Adelay area, where the population density was 18.1 individuals per km². Adults constituted 30.5%, sub-adults 15.9% and young 53.6% of the population in Gaysay/Adelay, with a male to female ratio of adults and sub-adults together 1:1.65. They were mainly grazers and associated with open grassland habitats regardless of seasonal variations. There was more vegetation coverage (64.5%) during the wet season than during the dry season (29.3%). The quality of a given habitat and availability of essential resources have major influence on the distribution and abundance of the common warthogs in the present study area.

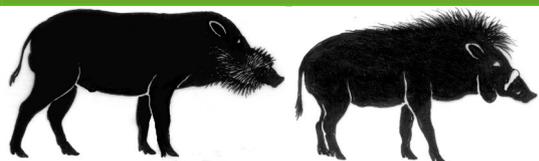
Niche centrality and human influence predict rangewide variation in population abundance of a widespread mammal: The collared peccary (*Pecari tajacu*).

P. G. Martínez-Gutiérrez, E. Martínez-Meyer, F. Palomares, N. Fernández

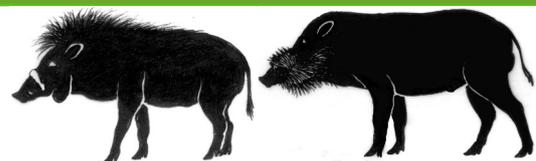
Diversity and Distribution. 01/2018, Volumen 24, Número 1. Pages: 103–115.

Aim: (1) To evaluate whether geographic variation in population abundance of a wide-spread mammal (*Pecari tajacu*) is related to its location with respect to the centroid of its ecological niche or to the centroid of its geographic range. (2) To assess whether the abundance–niche centrality relationship defines the maximum expected abundance at any location, rather than the realized abundance. (3) To test whether including human impacts improves the abundance–niche centrality relationship, and therefore the prediction of geographic variation in population abundance.





New literature on Suiformes



Location: The Americas.

Methods: We modelled the ecological niche of the species using occurrence and environmental data and created spatial models of distance to the niche centroid (DNC) and to the geographic centroid (DGC). We tested the relationships between population abundance and DNC and between abundance and DGC. We evaluated whether the rate of change in the abundance–DNC relationship was steeper near the upper boundary of quantile regressions. We tested whether the human influence index (HII) contributed to improve niche-based predictions of population abundance. Finally, we generated broad-scale predictions of collared peccary population abundances.

Results: We found a negative relationship between abundance and DNC and a non-significant relationship between abundance and DGC. The abundance–DNC relationship was wedge-shaped, steeper in the upper quantile boundary than in the median. HII also had a negative effect on abundance. The model including DNC and HII was best supported for predicting the median abundance, while DNC alone was the best to predict the upper boundary of population abundances.

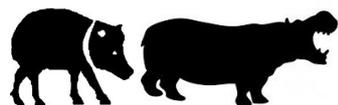
Main conclusions: Population abundances are associated with the structure of the ecological niche, especially the maximum abundance expected in an area. Thus, the DNC approach can be useful in obtaining a spatial approximation of potential abundance patterns at biogeographic extents. To achieve a better prediction of realized abundances, it is critical to consider the human influence.

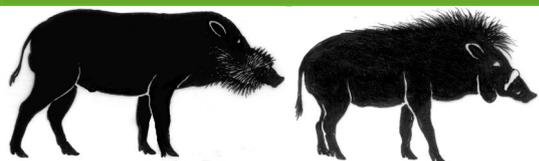
Ocorrência de queixada (*Tayassu pecari*), caititu (*Pecari tajacu*) e javaporco (*Sus scrofa*) (Mammalia, Cetartiodactyla) em João Pinheiro, Cerrado de Minas Gerais, Brasil, com observações sobre história natural, conservação e distribuição regional

Adriano Lima Silveira* & Sandro Aparecido Pacheco

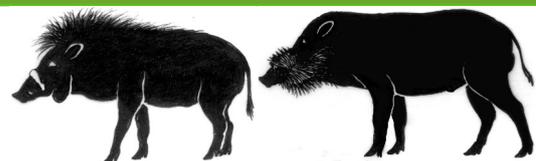
Revista Brasileira de Zoociências 19(1): 91-136. 2018

Occurrence of the White-lipped Peccary (*Tayassu pecari*), Collared Peccary (*Pecari tajacu*), and Wild Boar (*Sus scrofa*) (Mammalia, Cetartiodactyla) in João Pinheiro, Cerrado of Minas Gerais, Brazil, with observations on natural history, conservation and regional distribution. Field sampling with active searches and camera-trap produced new records for three species of wild pigs in an area of Cerrado in the municipality of João Pinheiro, northwest Minas Gerais State. Field study was carried out in floodplain, meadow, dry forest and plateau landscapes composed of remnants of a diversity of phytophysionomies and agricultural areas. Groups of *Tayassu pecari* (White-lipped Peccary), Endangered in Minas Gerais, were recorded at 14 localities in a great interfluvial plain with extensive conserved remnants, suggesting the occurrence of a metapopulation. Groups of *Pecari tajacu* (Collared Peccary), Vulnerable in Minas Gerais, were recorded at 20 localities, indicating a wide geographic distribution in the region among remnants in different states of conservation. Established groups of *Sus scrofa* hybrids (Wild Boar), an invasive species, were recorded at a single locality. We present observations on the natural history of the three species, emphasizing the consumption of several Cerrado fruits and seasonal movements due to fruiting for *T. pecari*, and the formation of significant groups and possible piscivorous behavior for *P. tajacu*. The records for *T. pecari* represent the first recent confirmed occurrences for the species in areas outside of conservation units in Minas Gerais. Local threats to *T. pecari* and *P. tajacu* are discussed, highlighting habitat destruction and fragmentation in the context of the history of land occupation in the municipality, different hunting practices and potential interference by *S. scrofa*.





New literature on Suiformes



Based on these records, the relevant threats identified and the known susceptibility of *T. pecari* to local extinctions, we considered that the population of this species in the municipality of João Pinheiro is in danger to extinction unless large natural remnants are effectively protected in conservation units.

Collared peccary (*Pecari tajacu*) behavioral reactions toward a dead member of the herd

Dante de Kort, Mariana Altrichter, Sara Cortez, Micaela Camino

Ethology. 2018; 124:131–134.

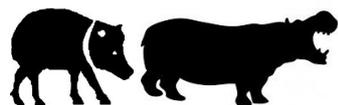
Humans, elephants, chimpanzees, and cetaceans show concern with the death of other members of their species and respond to death in particular ways. Science considers that these species are exceptions and that other mammal species show little or no reaction to the dead bodies of individuals of their species. Collared peccaries (*Pecari tajacu*; Tayassuidae) are social animals that live in groups of 5–50 individuals maintaining close and complex social relationships. The collared peccary occupies many different environments and it is widely distributed from the south of North America to the north of Argentina. Their behavior is well studied, but we know little about their behavior toward the dead. We directly observed and filmed with a camera trap the reactions of a five-member herd of collared peccaries to the death of a herd member. We worked on a suburban forested area in the mountains of central Arizona. We found that the herd visited and spent time with the dead body for 10 days after the peccary died. The frequency of the visits declined until the cadaver was consumed by coyotes. Most of the videos showed two individuals visited the dead animal (44%), solitary records were also frequent (39%) and only 4% of the videos recorded three peccaries. Visits were more frequent during the night (64%). Peccaries do react to the death of a herd member by behaving in particular ways. Reactions include pushing at the dead individual, staring at it, biting it, and trying to pick it up by putting their snout under the corpse and pushing it up, and defending it from coyotes, among others. These levels of behavioral complexity for peccaries are beyond those known so far. The behaviors of this herd of peccaries resemble those of humans, cetaceans, chimpanzees, and elephants and show that these groups are not the only ones that react to death.

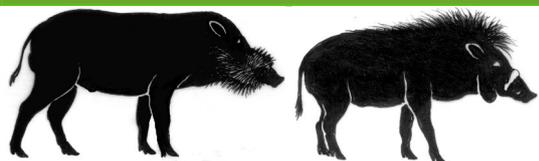
Availability of two species of fruits and their influence on the social structure of *Tayassu pecari* and *Dicotyles tajacu*.

Marcos Briceño-Méndez, Eduardo J. Naranjo, Mariana Altrichter, Salvador Mandujano.

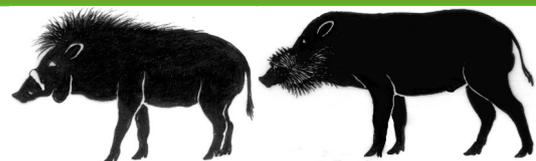
Therya vol.8 no.3 La Paz sep. 2017

The white-lipped peccary (*Tayassu pecari*) and the collared peccary (*Dicotyles tajacu*) are social ungulates that contribute to tropical forest maintenance, molding the composition of tree species through herbivory and seed dispersal and predation. The fruits of zapote (*Manilkara zapota*) and ramón (*Brosimum alicastrum*) trees are important items in the diet of both peccary species. The objective of this study was to assess the relationship between the abundance of fruits of *Manilkara zapota* and *Brosimum alicastrum* and its relationship with the number of newborns in groups of both peccary species during the rainy and dry season in a tropical forest in the Yucatan Peninsula, Mexico. Peccary groups were monitored with ten camera trap stations and through direct observations during the dry season of 2014 (February-May) and the rainy season of 2015 (June - September). To estimate fruit availability, five transects (2 km long) were set at random in forested areas. Several 2-m² tree plots were established in each transect to obtain a fruit abundance index. Peccary group size and number of newborns in each season were correlated





New literature on Suiformes



with fruit abundance. In both species, group size was significantly larger in the dry vs. rainy season ($P < 0.001$). Offspring were proportionally more abundant during the dry season ($P < 0.001$). Fruits of *M. zapota* were more abundant in the dry season and reached the peak availability in May ($P < 0.001$). Fruits of *B. alicastrum* were more abundant in the rainy season, reaching the peak availability in September ($P < 0.001$). For both peccary species, the highest numbers of newborns in individual groups may be attributable, although not specifically, to the abundance of *M. zapota* fruits during the dry season. In this sense, the groups of both peccary species may depend on the seasonal availability of food of key species, such as the fruits of *M. zapota* during the dry season. Based on these results, preserving areas in good conservation status is deemed important, as well as reducing tree clearing of species such as zapote and ramon at the study site.

Anti-Predator Strategies of, and Possible Thanatosis in, Juvenile Collared Peccaries (*Pecari tajacu*)

Erick J. Lundgren and Karla T. Moeller

The Southwestern Naturalist / Sep 2017 / pg(s) 235-237

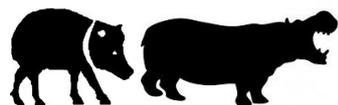
Little is known about the antipredator strategies of juvenile collared peccaries (*Pecari tajacu*). This note reports camera trap footage of an interaction between a young collared peccary and two potential predators, a gray fox (*Urocyon cinereoargenteus*) and a bobcat (*Lynx rufus*), as well as a personal observation of two young peccaries in what appeared to be physiological thanatosis (a state of tonic immobility). Juvenile mammals are particularly vulnerable to predation, and survivorship in this age class is a critical driver of population dynamics. Documenting the antipredator behaviors used by collared peccaries contributes to our understanding of the distribution of such behaviors among ungulate taxa, which is important in understanding the evolution of responses to predation.

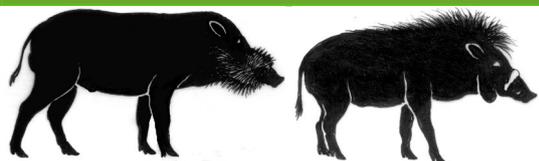
The defensive behavioral patterns of captive white-lipped and collared peccary (Mammalia, Tayassuidae): an approach for conservation of the species

Selene S. C. Nogueira, Aline M Reis, Stefane G. Marsaro, José M. B. Duarte, Viviana Moreto, Stella G. C. Lima, Thaise S. O. Costa, Sérgio L G Nogueira-Filho.

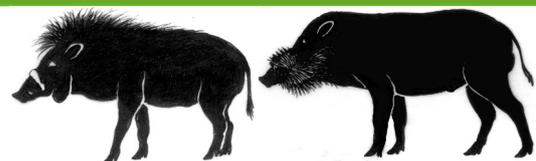
Acta ethologica. June 2017, Volume 20, Issue 2, pp 127–136

Defensive behavioral patterns in response to human-induced rapid environmental change can affect animals' fitness and may play a role in species conservation status. To test this hypothesis, we compared the risk assessment and defensive behavioral responses of captive white-lipped peccary (WLP; *Tayassu pecari*) and collared peccary (CP; *Pecari tajacu*), which retain different conservation status; WLP are considered vulnerable and CP of least concern. We used an adapted paradigm of the mouse defense test battery (MDTB) comprising four consecutive tests. Two of these tests simulated a novel environment, while the other two stimulated the expression of defensive behavioral patterns. Besides differences in risk assessment and defensive threat/attack behavioral patterns between species, we compared flight initiation distance, flight speed, and plasma glucocorticoid concentrations. When facing a novel environment and risk challenges from humans' predator-like cues, the white-lipped peccary showed more exploratory and defensive threat/attack behavioral patterns, shorter flight initiation distances, and lower flight speeds, whereas the collared peccaries showed more cautious and retreat patterns, longer flight initiation distances, and higher flight speeds. There were also correlations between physiological





New literature on Suiformes



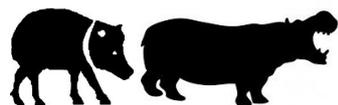
and behavioral parameters. We confirmed our hypothesis that the collared peccary's cautiousness may help to prevent a decrease in its population, while the white-lipped peccary's exploratory and confrontational behavioral patterns in overhunted areas, together with other simultaneous factors as forest fragmentation, might contribute to placing this species in the vulnerable category.

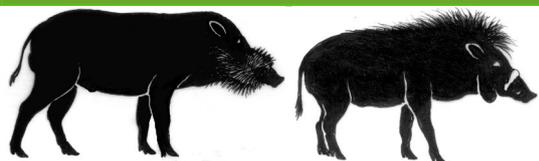
Achieving optimal welfare for the Nile hippopotamus (*Hippopotamus amphibius*) in North American zoos and aquariums.

Tennant KS, Segura VD, Morris MC, Snyder KD, Bocian D, Maloney D, Maple TL.

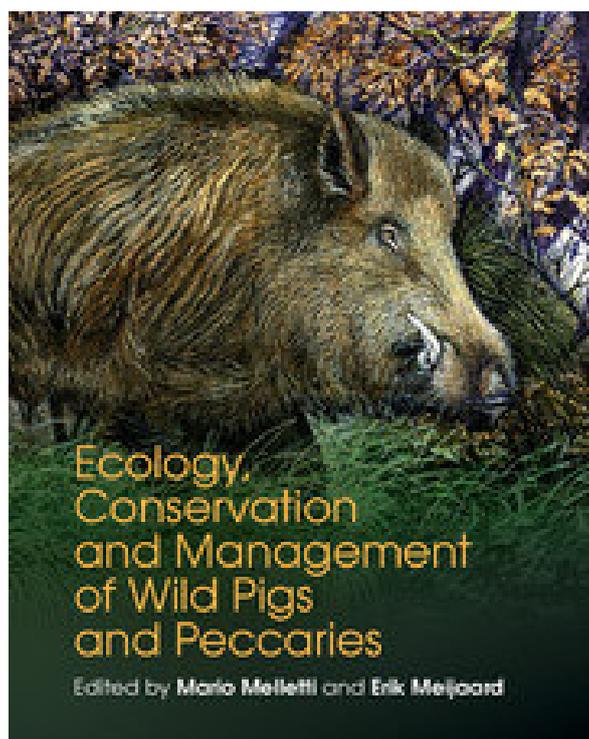
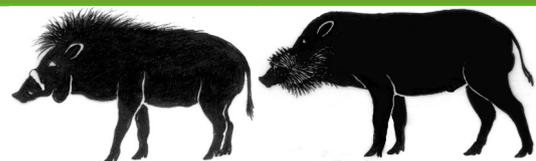
Behav Processes. 2017 Jul 29. pii: S0376-6357(17)30334-0. doi: 10.1016/j.beproc.2017.07.009.

Compared to other megafauna managed in zoos and aquariums, the current state of welfare for the Nile hippopotamus (*Hippopotamus amphibius*) is poorly understood. Complex behavior and physiological characteristics make hippos a difficult species to manage. Thus, hippos in managed care are currently at risk for a decreased state of welfare. In an effort to assess and improve conditions for this species, a survey was administered to North American institutions housing Nile hippos. This assessment utilized a multiple-choice format and consisted of questions relating to group structure, behavior, and exhibit design, allowing for the creation of cross-institutional, welfare-based analysis. Responses were gathered from 85.29% of the institutions to which the survey was distributed. Despite recommendations for maintaining groups of at least five individuals (Forthman, 1998), only 34.25% of hippos in North America were housed in groups of three or more. The survey also highlighted that 39.29% of institutions secure their hippos in holding areas overnight, despite their highly active nocturnal propensities. A better understanding of hippo behavior and environmental preferences can be used to inform wellness-oriented management practices to achieve a state of "optimal welfare".





New books about Suiformes

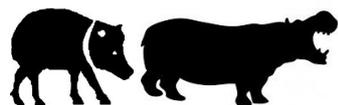


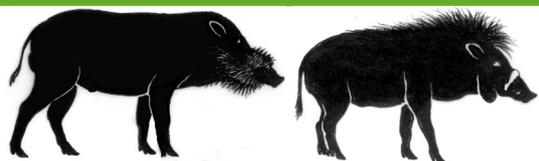
Wild pigs and peccaries play an important role in many ecosystems as keystone species and many of them are easy to watch such as the Common warthogs in Africa, Eurasian wild boars in Europe or White-lipped peccaries in Central and South America. Nevertheless, there are still gaps in the knowledge about wild pigs and peccaries regarding their taxonomy (e.g. the Eurasian wild boar species group, collared peccaries) while any knowledge about the general biology of the Mindoro warty pig is limited. There are only few books, which deal exclusively with wild pigs and peccaries and interested people have to consult general books about taxonomy (e. g. “Ungulate Taxonomy” by Groves and Grubb or “Handbook of the Mammals of the World Volume 2: Hoofed Mammals”) to get information about these animals. Therefore, the book “Ecology, Conservation and Management of Wild Pigs and Peccaries” edited by Mario Melletti

and Erik Meijaard deserves attention as one hundred experts from 25 countries have worked on this book to present and review the latest information about the evolution, taxonomy, ecology, behavior, conservation and management of wild pigs and peccaries.

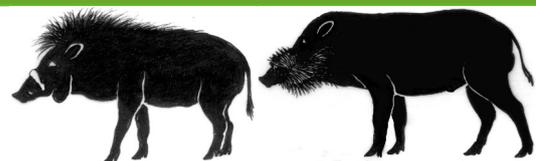
After a general introduction by the editors the book is separated into three parts. The first part comprising five chapters deals with evolution, taxonomy and domestication, the second and biggest part has 20 chapters, in which each chapter is about one of the at least 21 pig and peccary species. Finally, the third part deals with conservation and management including thirteen chapters.

The first chapter in the first part of the book describes the latest scientific state of knowledge about the evolutionary relationships and taxonomy of the two families Suidae (suids, hogs or pigs) and Tayassuidae (tayassuids, javelinas or peccaries). Unfortunately, Colin Groves, the most important mammal taxonomist passed away recently (see also the obituary on him, page four to seven in this issue of Suiform Soundings). The authors use the Phylogenetic Species Concept, which includes both anatomical and genetic analysis, to decipher the phylogenetic relationships between extant Suidae and between extant Tayassuidae. This seems to be a difficult subject for people not used to scientific terminology but the authors write in a style that is both easy to understand and in a summary style, e.g. explaining the Phylogenetic Species Concept and species delimitation criteria. Furthermore, they explain the differences between the different pig and peccary genera and discuss new proposed species in the Eurasian wild boar (*Sus scrofa*), three subspecies of the Giant forest hog (*Hylochoerus meinertzhageni*) proposed as species and three species which form the Collared peccary group (*Peccary* sp.). Other chapters of this part of the book deal with postcranial skeletal morphology in living and extant fossil African Suidae, diet and ecology of extant and fossil wild pigs, a history of pig domestication and pig-human relations. These chapters are written in a rather scientific way and might be difficult to understand for readers without scientific background.





New books about Suiformes



All twenty species accounts in the second part of the book comprise a sketch of each species, descriptions of the taxonomy, subspecies and distribution, main characteristics, habitat, movements and home range, activity patterns, feeding ecology, reproduction and growth, behavior, parasites and diseases, status in the wild (including threats to the survival and conservation measures) and status in captivity, followed by detailed lists references. Furthermore, there are distribution maps for each species and also for each species at least one photo in black and white (except for Mollucan babirusa and Philippine warty pig). The knowledge about the Javan warty pig and the Bawean warty pig is integrated in one chapter. To write about each species account would go far beyond the scope of this review. Each species account is the most up-to-date compilation of the knowledge about it. Take a look on page 166 to see the only known published photo of a wild Mindoro warty pig. The Eurasian wild boar is split in eleven species: European wild boar (*Sus scrofa*), Central Asian wild boar (*Sus nigripes*), Far Eastern wild boar (*Sus ussuricus*), Chinese wild boar (*Sus moupinensis*), *Sus chirodontus* in the swamps south-west of Shanghai in China, Japanese wild boar (*Sus leucomystax*), Riukiu wild boar (*Sus riukiuanus*), Formosa wild boar (*Sus taevanus*), David's wild boar (*Sus davidi*) in eastern Iran, Pakistan and western India, Indian wild boar (*Sus cristatus*) and Banded boar (*Sus vittatus*) from peninsular Thailand and Tenasserim to Sumatra and Java.

In the third part of the book the authors discuss the conservation and management of wild pigs and peccaries, first their general threats (population declines, hunting and trapping, habitat loss), then habitat management for the critically endangered Pygmy hog, the history, problems and management of wild pigs in North America and South America, feral pigs in Australia and New Zealand, wild boar management in Europe, disease transmissions and ecological impacts of wild boars on ecosystems. Most of these chapters present novel case studies and scientific reviews. They give a good overview about human-pig conflicts around the world. Kristin Leus has contributed a chapter about ex-situ conservation of wild pigs and peccaries, also describing the ex-situ conservation programmes for Chacoan peccaries, Visayan warty pigs, Pygmy hogs, Javan warty pigs, Sulawesi babirusa, Common warthog and Red river hog.

Additionally to all the black and white photos there are 32 special pages showing colored photos of some of the black and white photos and the distribution maps for all species.

Overall, this book is the best and most up-to date compilation of the ecology, conservation and management of wild pigs and peccaries. It will be THE reference for the species. Therefore, the book will hopefully get a broad distribution in the conservation community and should get a place in (scientific) libraries. Also people generally interested in the biology of wild pigs and peccaries will find a cornucopia of new and interesting information about these species.

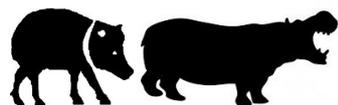
Reviewed by Thiemo Braasch

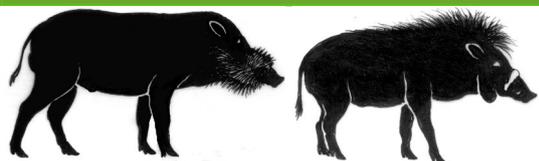
Ecology, Conservation and Management of Wild Pigs and Peccaries

By Mario Melletti and Erik Meijaard (eds.)

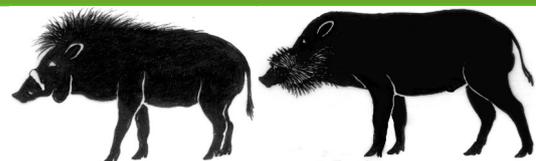
466 pages

2017 Cambridge University Press

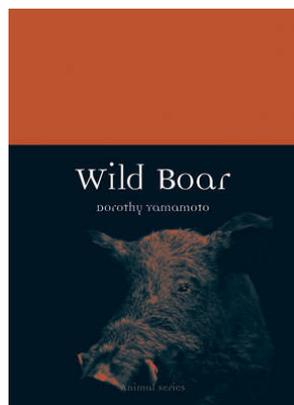




New books about Suiformes

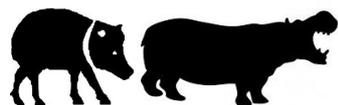


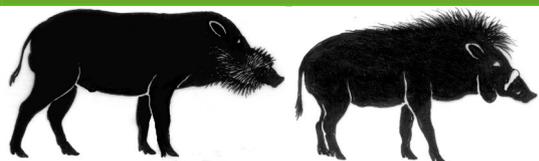
Reaktion Books has published many different books about the cultural history of animals, ranging from flies to gorillas. There is already one book in this Animal series dealing with pigs, mostly domestic pigs (Brett Mizelle: "Pigs", for a review of this book see also Suiform Soundings 14(1): 76-77). Recently, two new books have been published, one about wild boars, the second about the cultural history of the hippopotamus.



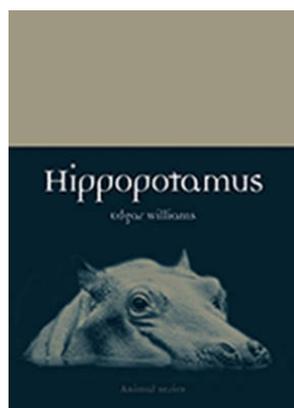
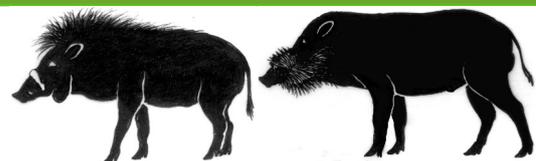
Dorothy Yamamoto's book about the cultural history of the wild boar and its relations to humans published in September 2017 covers a broad range of topics: First she writes about the definition of wild boars and the problems of genetic hybridization with domestic pigs. In the next chapter, "The Natural Boar", the wild boar's ecology and biology is described. Charles Darwin's book "The Variation of Animals and Plants under Domestication" is cited as he mentioned the broad range of traits among the many different feral pig forms around the world. The Chapter "The Legendary Boar" tells about wild boars in legends all around the world, e.g. in Japan, in India and ancient Greek or in Nordic myths. A focus lies on legends from the British Isles. Boars used as symbols show the cultural importance of this species in Northern Europe. They are symbols for courage, fierceness and aggressiveness. Hunting wild boars was a favourite activity for kings and other noblemen for many decades. Therefore, there are lots of tales of boar hunting in many different methods including hunts with dogs. Yamamoto also writes about modern boar hunts and a boar called Hogzilla, because it was such a big individual. Wild boars are part of the very early human art such as in the Altamira cave in Spain. Scenes of wild boar hunts are shown on many ancient Greek, Hellenistic and Roman artefacts like coins, vases and mosaics. There are famous paintings like Paul Ruben's "The Calydonian Boar Hunt" or the Florentine boar statue called "Il porcellino". The role of wild boars in films like Disney's "Beauty and the Beast" is also analysed. The chapter "Useful Boars" deals with different ways how to prepare wild pork meat and furthermore the Gauls Asterix and Obelix created by René Goscinny and Albert Uderzo and the Gaulish appetite for roasted wild boars as shown in the feast at the end of every story. Finally, modern attitudes towards wild boars and human-boar conflicts are mentioned like the increase of the wild boar population around Fukushima after the nuclear disaster 2011. Crop damages by boars and boars entering towns in Japan or Germany (with an estimated population of 10,000 wild boars in Berlin) show new conflicts but also the adaptability of this species to a changing world. To say it in a nutshell, the book comprises all the important different aspects of wild boars' relations to humans. Many photos of paintings, sculptures and other art and the vivid style of writing make this an entertaining book for everybody who is interested in the special relations of wild boars with humans. It is a good complement to Brett Mizelle's book about pigs.

The second book "Hippopotamus" written by Edgar Williams was published in January this year. Hippos have a totally different relation to humans compared to boars. Although it was part of the ancient Egyptian as a deity, mentioned by Greek scholars and was killed in Roman gladiatorial games the hippo has made only little impact on classical art or music. Known by early Portuguese explorers, this species became popular in the western world when the first living hippo arrived in London 1850. Pygmy Hippos were identified as a real species by a few bones and skull fragments in the year 1849. The first Pygmy Hippos that lived for a while in captivity were taken to





New books about Suiformes



Europe and later to USA in the year 1912. The beginning chapter is about “A Tale of Two Hippos”, the evolutionary history of hippos and ancient hippos as well as their taxonomic relations to whales as their closest living relatives. The biology of the two hippos is presented in the second chapter. Due to the secret life of Pygmy Hippos, the biology of the Common Hippo is much better known. The chapter “Water Horse” deals with hippos in ancient Egyptian religion art and depictions of hippos in ancient Greek and Rome, citing Herodotus’ description in “Histories”. The author analyses the origin of the species name and writes also about confusions with sea cows and tapirs. Examples of ancient art made of hippo ivory are shown. During the colonization of the African continent

the first Common Hippo arrived alive in London as mentioned above. Edgar Williams writes about this arrival and of following hippos and the huge public interest in these animals. There were ideas to breed hippos on farms and use their meat (“lake cow bacon”) and also to use hippos to fight against invasive hyacinths in Southern USA. These ideas were skipped with the Great Depression in the late 1920s. The most famous hippo of the 20th century became Huberta, a hippo, who made a long wandering along the coast of Eastern South Africa.

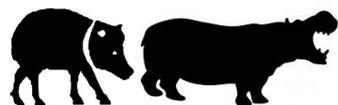
There are only few records of tales and paintings in Europe after the ancient time and these are mentioned in the chapter “The Good, the Bad and the Ugly”. and also modern depictions like T. S. Eliot’s poem “The Hippopotamus” or Gloria the Hippo of the three “Madagascar” movies by Dreamworks. Stamps and coins from African countries showing hippos are presented. In the last chapter Williams writes about animal trappers like Carl Hagenbeck and the methods they used to catch Common Hippos and Pygmy Hippos. As Pygmy Hippos are smaller and easier to keep, there are now more of them kept in zoos than the bigger Common Hippopotamus. William also tells about the around sixty free-ranging Common Hippos in the Colombian province Antioquia. They escaped drug baron Pablo Escobar’s private zoo after his death 1992. Williams’ book presents many new and interesting facts about hippos and shows interesting photos of hippo paintings and art. There are only few monographs of hippos. As this book has a focus on hippo-human relations it closes a gap in the literature about hippos and offers new insights in the way we look on big African mammals and wildlife in general.

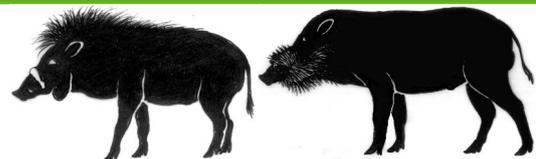
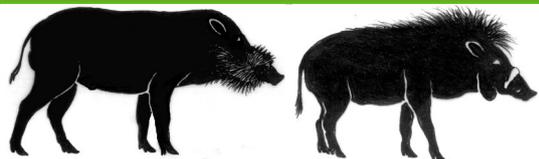
The two books of the Animal series by Reaktion Books reviewed here show again the many different attitudes of humans towards two species and how humans include wild animals in their different civilisations ranging from ancient empires to Hollywood movies. Reading the books help us to rethink how we treat pigs, hippos and animals in general and how we can live along with these marvellous creatures.

Reviewed by Thiemo Braasch

Wild Boar
By Dorothy Yamamoto
200 pages
Reaktion Books 2017

Hippopotamus
By Edgar Williams
200 pages
Reaktion Books 2018





Highest EVER levels of radiation are found in Sweden's wild boar - 25 times the safe limit for meat consumption

<http://www.dailymail.co.uk/news/article-5303341/Swedish-wild-boar-25-times-safe-level-radiation.html#ixzz55gzUNmaH>

Wild boar shot in Sweden had a radiation level of 39,706 becquerel per kilo

The level which is deemed safe for consumption is 1,500 becquerel per kilo

The radiation found in wild boars in Sweden is from Chernobyl in 1986

By Sara Malm For Mailonline

PUBLISHED: 16:50 GMT, 23 January 2018 | UPDATED: 16:57 GMT, 23 January 2018

A wild boar with radiation levels 25 times the safe consumption limit has been shot in Sweden - the highest ever recorded in the Scandinavian country. The 45kg animal was shot during a hunt in Tierp, Uppland, in south-central Sweden, and was found to have a radiation level of 39,706 becquerel per kilo (bq per kg). This exceeds by far the safe consumption limit of 1,500 bq per kg set by Swedish authorities. Roland Palm who shot the wild boar told a local hunting magazine that he thought the test had been misread.

'I thought I was going to die, that must be almost luminescent!', Mr Palm told Jaktjournalen. The radiation found in the meat of wild boars in Sweden today comes from the fallout of the 1986 nuclear disaster in Chernobyl, the remains of which can still be found in the ground. One of the reasons why levels this high have not been seen in Swedish wild boars in the past, is that the animals have not previously been found in the areas worst affected by the fallout. As wild boars commonly dig for foods like truffles and other fungi, they are more likely to ingest items affected by the 1986 fallout than many other animals. The Swedish Radiation Authority are currently offering free tests to establish how Swedish wild boars are affected by the fallout from Chernobyl. The hunting team which slayed the record boar had killed two other boars which had measured 170bq per kg and 4,000bq per kg, showing huge variations even in local areas. Experts put this variation down to diet, saying that it is likely that the record wild boar had 'managed to stumble upon a big find of truffles' with high radiation levels.

'World's ugliest pig' spotted in Indonesia: Rare breed identified by its giant warts is caught on camera

<http://www.dailymail.co.uk/news/article-5238885/Worlds-ugliest-pig-spotted-Indonesia.html#ixzz55gv70ntx>

Rare images show the endangered Javan warty pigs in their habitat in Indonesia

The pictures offer a window into a little-known species close to extinction

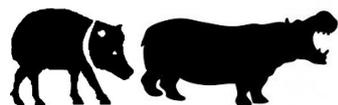
Males distinguished by three large warts on their faces which grow as they age

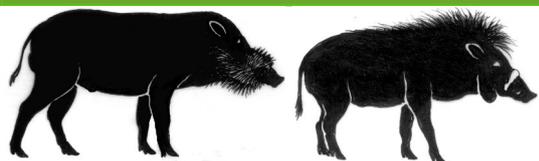
Researchers laid camera traps across Java island to capture the elusive creature

By Rod Ardehali and Afp

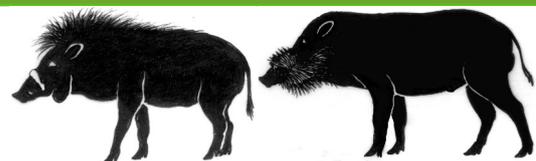
PUBLISHED: 12:57 GMT, 5 January 2018 | UPDATED: 17:04 GMT, 5 January 2018

Rare images of the 'world's ugliest pig' have been captured in Indonesia, offering a window into a little-known species believed to be on the brink of extinction. The number of endangered Javan warty pigs has plunged since the early 1980s due to hunting and forest habitat loss, according to





Articles in the news



the UK-based Chester Zoo. Males are distinguished by large warts on their faces which grow as they age, meaning the oldest pigs have the most prominent warts. British and Indonesian researchers laid camera traps in the forests of the Southeast Asian nation's Java island in the hopes of capturing images of the elusive creature. Their goal was to get a clearer sense of population levels and find ways to boost conservation of a 'highly threatened species'. 'It was even feared that many, if not all, populations had become extinct until their existence was confirmed by the

zoo's cameras,' the zoo said as it released the images. The research 'could eventually be used to establish new protection laws for the species as, currently, they are not protected by Indonesian law', it added. The pigs - which are only found on Java - are similar in size to European wild boars but are more slender and have longer heads, the zoo said. 'Males have three pairs of enormous warts on their faces,' said Johanna Rode-Margono, Chester Zoo's Southeast Asia field programme coordinator. 'It is these characteristics that have led to them being affectionately labelled as 'the world's ugliest pig' but, certainly to us and our researchers, they are rather beautiful and impressive.'

Hordes of Wild Pigs Make Palm Oil Even More Destructive

<https://news.nationalgeographic.com/2017/12/palm-oil-wild-pig-boom-rainforest-environment/>
A new study says palm oil plantations damage the forest even beyond what they actually cut down—by fueling a boom in wild pigs.

By Hillary Rosner

PUBLISHED December 21, 2017

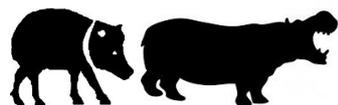
Deep in a rainforest on the Malaysian mainland, there was a longstanding mystery to solve. Since the late 1980s, scientists working in the Pasoh Research Forest, a 1,500-acre chunk of virgin forest connected to a vast protected reserve, have noticed that the understory was disappearing. Over time, the researchers found they could walk with increasing ease through the jungle, without having to bushwhack through a tangle of seedlings and saplings. The trend was worrisome, since those young trees represent the future forest canopy.

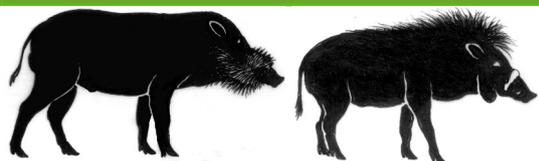
There was an obvious culprit: wild boars. They snap off saplings to use for nests, they trample seedlings, and they churn up the soil. But why was the forest teeming with pigs? Could a decline in predators like tigers be responsible?

Matthew Luskin was skeptical. He had spent months traipsing through the forests of nearby Sumatra to study tigers for his PhD. He knew that if a lack of predators was the problem, there should also be an excess of other prey species, like deer and tapir. There wasn't.

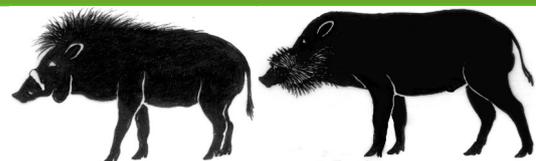
In a study published this week in *Nature Communication*, Luskin and his colleagues suggest another explanation: palm oil.

A ubiquitous ingredient in all sorts of supermarket products, from cookies to cosmetics, palm oil is a booming business—and an environmental disaster. Land clearing to make way for palm





Articles in the news



plantations has been the direct cause of a massive loss of forest across Indonesia and Malaysia. What Luskin's team has found is that those plantations can also damage even the seemingly healthy forest around them. The reason out-of-control boars are destroying the understory in the Pasoh Forest, the researchers say, isn't a dearth of tigers. It's a plethora of nearby palms.

A Natural Experiment

Normally in southeast Asia's forests, trees produce fruit only every few years, and animal populations rise and fall with that food supply. In most years, there's very little fruit to eat, which keeps animal densities low.

The Pasoh Forest, however, is surrounded on three sides by oil palm plantations. Oil palm trees are the most productive fruit trees in the world—that's why they're so commercially important—and they fruit continuously for roughly 25 years. Luskin suspected that the wild pigs of Pasoh were commuting to the plantations to consume fallen fruit, then returning to the forest to wreak ecological havoc.

The crop cycle for oil palm—combined with copious data on tree growth, boar nests, and oil palm production collected by scientists working at Pasoh—provided a perfect natural experiment to test the hypothesis. After 25 years, oil palm trees begin to decline, so growers must rip up their plantations and start again. In the early 2000s, the growers around Pasoh cleared all their trees and replaced them.

All of a sudden there was no oil palm fruit—and though conditions hadn't changed in Pasoh itself, the boar population crashed. In a 125-acre area of the forest, the number of boar nests plummeted, from more than 300 before the palms were cleared to just one nest a few years later. When the new oil palms started fruiting, the boars came back with the same speed: within a few years there were hundreds of nests again.

Wild boar are highly destructive in large numbers in part because they rip out thousands of trees and churn up the soil, but also because they eat anything on the forest floor—a seed, an egg, a lizard. They can also reproduce faster than any large animal in the world, with females giving birth to two litters of 9 to 12 piglets each per year. Previous research showed that during peak population years, boars can damage more than half of all the saplings in an area.

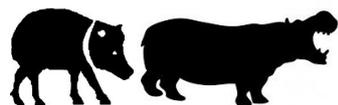
But Luskin, a research fellow at Nanyang Technological University in Singapore and the Smithsonian Tropical Research Institute (and also a National Geographic Society grantee), believes macaques may ultimately prove just as problematic. The monkeys' numbers are also skyrocketing near oil palm plantations, and like the pigs they will eat anything available, from fruit to chicks to frogs. "No one has studied those effects yet," Luskin says.

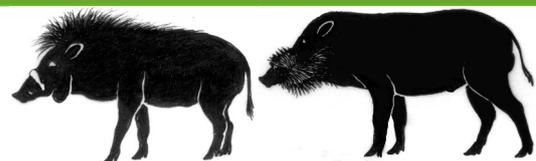
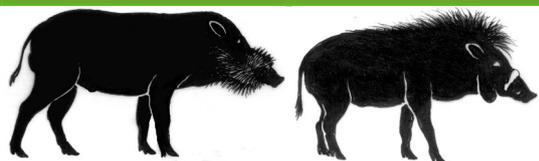
Bigger Patches Are Better

Ecologists have a name for this kind of phenomenon, he and his colleagues write: When animals that are benefitting from agriculture "extend the ecological impacts of cultivation into food webs far away, in seemingly unaltered areas," it's called a "subsidy cascade."

What surprised the scientists, though, was how far this particular subsidy cascaded. All the study sites at Pasoh were deep inside the forest, at least .8 mile from the forest edge and the oil palms. Oil palm plantations sometimes set aside patches of forest in order to be certified as "sustainable" by the Roundtable on Sustainable Palm Oil. These areas of "high-conservation value" forest are often small patches in a sea of palm. Luskin, who visited dozens of such forest patches in Sumatra, refers to them as "pig and macaque zoos." He thinks they may be inadequate.

"A solution has been to keep these patches of forest as oases for nature," he says. "But that strategy might not work over the long term because of these invisible processes that are happening and are slowly eroding the forest."





To keep forest ecosystems from being unraveled by plagues of palm-fed pigs and monkeys, he goes on, we may need to set aside swaths that are “much larger than we thought before. This paper indicates that we really need to up the size of our forest reserves if we want to have them long-term.”

Protecting pigs from PRRS during reproduction

<https://www.sciencedaily.com/releases/2017/11/171129131343.htm>

Date: November 29, 2017

Source: Kansas State University

In the words of Kansas State University researcher Raymond "Bob" Rowland, his latest work is helping to eradicate a devastating swine disease.

The disease is caused by the porcine reproductive and respiratory syndrome, or PRRS, virus. The virus costs the U.S. pork industry more than \$600 million in losses every year.

In his latest study, Rowland, professor of diagnostic medicine and pathobiology in the College of Veterinary Medicine, has created a way to protect offspring from the PRRS virus during pregnancy. He has found that mothers without the CD163 protein are resistant to the PRRS virus and give birth to healthy, normal piglets. The work appears in Nature's Scientific Reports.

"We have created a protective shell against the PRRS virus during the reproductive phase of production," Rowland said. "The offspring does not become infected during pregnancy and is born a healthy piglet. During this critical phase of production, we have essentially ended a disease."

The PRRS virus causes disease in two forms: a respiratory form that weakens young pigs' ability to breathe and a more severe reproductive form that causes mass deaths in pigs during late pregnancy.

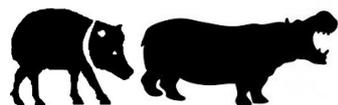
"The reproductive form not only has a tremendous economic impact, but also a psychological impact on people who work with pigs," said Rowland, who has spent more than 20 years studying the PRRS virus. "When we look at ways to control this disease, it really begins with reproduction. We want to keep this disease out of the reproductive process and we have found a way to do that."

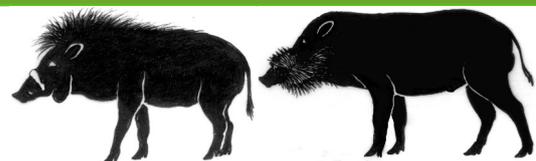
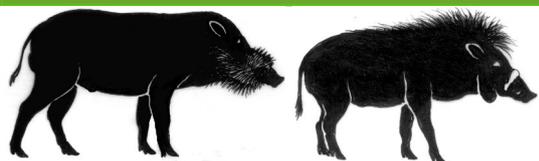
To address the devastating reproductive form of the virus, Rowland collaborated with Randall Prather, a professor at the University of Missouri, and a team to develop PRRS-resistant pigs. Using CRISPR/Cas9 technology, the researchers found that pigs without the CD163 protein showed no signs or evidence of being infected with the PRRS virus. CD163 is the receptor for the virus.

The research can save swine producers millions of dollars because pigs are protected from the PRRS virus during the critical reproductive process, Rowland said. But because offspring are born normal, they may still be susceptible to the disease later in life.

"This is one tool that we can use," Rowland said. "It doesn't mean that we can give up on vaccines or diagnostics, but it does create more opportunities for other tools to become more effective. Because this pig is born healthy, it will respond better to a vaccine or a diagnostic test. We are enhancing other aspects of disease control as well."

Rowland will present the research for the first time at the 2017 North American PRRS Symposium from Dec. 1-3 in Chicago.





Journal Reference:

Randall S. Prather, Kevin D. Wells, Kristin M. Whitworth, Maureen A. Kerrigan, Melissa S. Samuel, Alan Mileham, Luca N. Popescu, Raymond R. R. Rowland. Knockout of maternal CD163 protects fetuses from infection with porcine reproductive and respiratory syndrome virus (PRRSV). *Scientific Reports*, 2017; 7 (1) DOI: 10.1038/s41598-017-13794-2

Family left in shock after pet pig mauls 20-day-old baby to DEATH, after snatching the infant from her mother while she was being breastfed

<http://www.dailymail.co.uk/indiahome/indianews/article-5050451/Pet-pig-mauls-20-day-old-baby-death-Delhi.html#ixzz55gxFJR5R>

Pushpa was being fed at her Bhati Mines home in Delhi when the pig took her

Residents had to pelt the animal with stones to free the infant

Pushpa's family have accused the police of failing to react quickly to the fatal mauling

See more news from India at www.dailymail.co.uk/indiahome

By Mail Today Bureau and Debbie White For Mailonline

PUBLISHED: 22:35 GMT, 4 November 2017 | UPDATED: 22:35 GMT, 4 November 2017

In a shocking incident, a pet pig has mauled a 20-day-old baby girl, Pushpa, to death, while she was being breastfed in south Delhi.

The baby's mother was feeding her at home in Bhati Mines on Friday, when the animal suddenly entered through the main door, which had been left open, and rushed off with her into the street.

According to police, Pushpa's shocked mother screamed and ran after the pig. Local residents, alerted to her cries for help, pelted the animal with stones to make it drop the baby.

But, by then it had eaten the infant's head.

Once the animal had dropped the baby onto the ground, locals immediately picked her up and rushed her to AIIMS trauma centre, where she succumbed to her injuries.

A police official said: 'It has been learnt that it was a pet pig which was roaming free. A case has been registered against unknown people under IPC sections 289 and 304A.'

Rampal, the baby's father, said many people in Bhati Mines kept pigs as pets.

He had been fearing such an attack, explaining: 'On Friday, when Pushpa's mother was breastfeeding her, a pig entered inside and took away my daughter. These pigs create a ruckus in the area and are very violent. Every day, we have to be cautious or else a pig could attack us.'

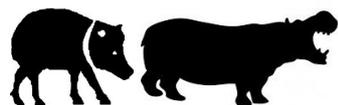
Her grieving family also claimed that a delay in the arrival of police officers, and the rush to get the mauled baby to the AIIMS trauma centre contributed to Pushpa's death.

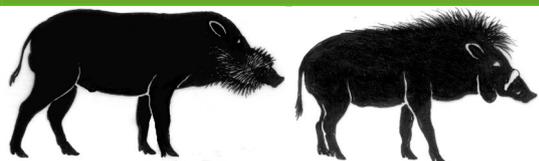
'After the call was made to police, the team reached [the area] very late and then took her to the hospital, which was 30 km away. Traffic snarls delayed the journey,' they claimed.

Chinmoy Biswal, additional Deputy Commissioner of Police (south), said that an investigation was being carried out to identify the pig's owner.

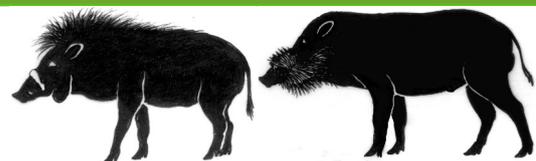
Texas man shoots dead 417-pound wild hog nicknamed 'The Big Daddy' after it menaced his property for FIVE years

<http://www.dailymail.co.uk/news/article-5008033/Texas-landowner-kills-417-pound-wild-hog-FIVE-years.html#ixzz55gxzSPkP>





Articles in the news



Joe Clowers brought down the enormous pig with an AR-15 assault rifle last week Hog - also known as 'The Ghost', 'Bush Beast' and 'Leroy' - surprised him at 1am But after defeating his foe, Clowers plans to mount the animal's skull as a trophy
By Iain Burns For Mailonline

PUBLISHED: 11:26 GMT, 23 October 2017 | UPDATED: 13:46 GMT, 23 October 2017

A Texas landowner has shot and killed a gigantic wild hog he called 'The Big Daddy' after a battle of wits that lasted five years.

Joe Clowers brought down the enormous pig - which he and his daughters also called 'The Bush Beast', 'The Ghost' and 'Leroy' - with an AR-15 assault rifle last weekend.

It weighed 417 lbs, making the elusive beast twice as big as the average hog found on Clowers' Union Grove property.

He told CBSDFW he saw the animal during an evening of hunting. 'At about 1 am this guy walks in and it was that moment of, "I can't believe I'm actually seeing this pig".

'You've always heard you can't kill a large wild hog with an AR-15... and I did.'

He won't be enjoying pork chops, however, because the meat had been left out too long by the time he brought it in. Instead, he will be fulfilling the wish of his daughters - who want to keep the head as a trophy. Clowers said he will mount the hog European-style. The meat will be fed to homeless animals. Over the last five years, food laid out for deer and other game has been routinely snatched from his land by the portly pig. He told the Houston Chronicle the hog had preyed on fawns in the past and explained that he always went to his deer feeders with a weapon in case the giant animal attacked him. 'He was the big daddy,' Clowers said. 'He is finished. He has made his final appearance. It is a relief more than anything else.'

Kune Kune piglets possess social learning skills and have an astonishingly good memory

<https://www.sciencedaily.com/releases/2017/10/171011120347.htm>

Date: October 11, 2017

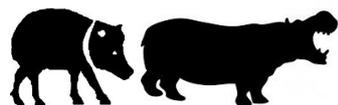
Source: University of Veterinary Medicine, Vienna

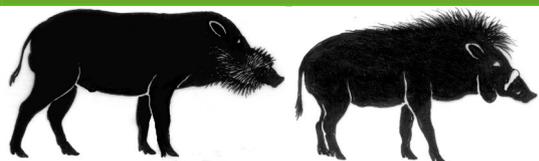
Pigs are not normally thought to be especially intelligent. New research, however, has shown them to be very capable of learning and making decisions. In combination with their pronounced social competence, it can therefore be assumed that the animals may also possess social learning abilities.

The few studies published on this learning aspect, however, have not yielded any clear results so far. Pigs in these tests merely showed that they would search for food in places where other pigs had eaten previously. While this is evidence of socially facilitated attention, it does not demonstrate any highly developed learning abilities. The animals would have had to copy a complex behaviour of another pig or understand the objectives and intentions of a demonstrator, for example with regard to the manipulation of objects.

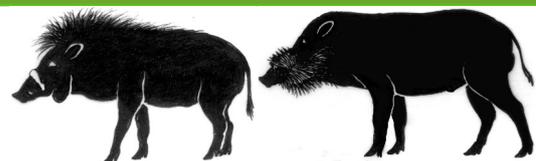
A new study conducted by cognitive researchers from the Messerli Research Institute of Vetmeduni Vienna has now shown that pigs do in fact possess highly developed learning abilities. The researchers demonstrated that free-ranging piglets of the New Zealand breed Kune Kune attentively observed and replicated tasks demonstrated by their mother or an aunt.

Learning from one's elders





Articles in the news



The objective of the study was to demonstrate social learning through the "vertical transmission of information," i.e. the passing on of knowledge to the next generation. "In contrast to most previous studies, in which the animals learned from peers, the present study tested piglets after they observed their mother or their aunt in the process of solving a manipulative task," explains Ludwig Huber, the director of this Messerli Foundation-financed study. "The task involved opening the sliding door of a food box in order to get at a piece of food." The animals could use their snout to move the door to the left or right into one of three positions: left, right or middle.

Eighteen piglets were divided into three groups of six animals each. Two groups were placed in a separate observer compartment from which they could observe their mother or aunt as they used one of two possible opening techniques. The third group had to figure out the task without observation. The behaviour of this control group served as a test for any possible predisposition or bias regarding the movement of the sliding door.

Watch how mum does it -- Piglets remember and copy demonstrated techniques

The findings from the trials showed that the non-observer piglets used all possible techniques, confirming that there was no predisposition or bias. The observer piglets, on the other hand, exhibited true learning through observation, though they rarely copied the push position; for the most part, they copied the push direction or both direction and position together, so demonstrated object movement re-enactment. Interestingly, the piglets produced the best results when they were not tested for the learning effect until the next day. Apparently, they memorized what they observed and could correctly reproduce it when needed. Only rarely, and never before among pigs, has this remarkable behaviour been demonstrated among animals. Pigs, which have been paid little attention in learning research and are not regarded very highly among the general public, thus have a much higher importance for cognition research than had been previously believed.

Piglets also have a good long-term memory

The performance of the non-observer piglets was also remarkable. Animals in this group remembered a particular solution if they found one after a few attempts. A replication of the technique half a year later showed they could immediately recall the same solution. "That indicates a well-functioning long-term memory," says Huber.

The researchers believe that the talent for social learning among Kune Kune pigs is related to the way these pigs are kept. "The pigs live in natural family groups under free-ranging conditions. This appears to trigger an existing aptitude for social intelligence among these animals. It would be worthwhile to consider the positive effects of learning from older animals in commercial pig farming, for example when making improvements to the housing conditions."

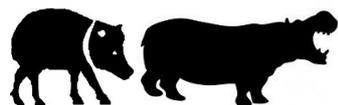
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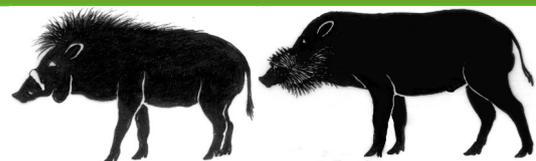
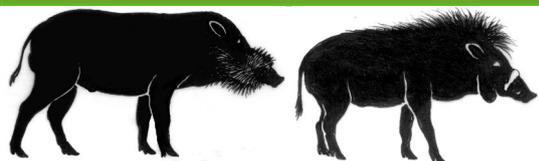
Ariane Veit, Marianne Wondrak, Ludwig Huber. Object movement re-enactment in free-ranging Kune Kune piglets. *Animal Behaviour*, 2017; 132: 49 DOI: 10.1016/j.anbehav.2017.08.004



Kune Kune piglets are able to learn from older pigs around them and copy actions of older pigs just by watching.

Credit: Vetmeduni Vienna





Protected tropical forests are threatened by the bounty of adjacent oil palm plantations

<https://www.sciencedaily.com/releases/2017/12/171221101413.htm>

Date: December 21, 2017

Source: Nanyang Technological University

A new study led by Nanyang Technological University, Singapore (NTU Singapore) has warned of the threat that oil palm production poses to tropical forests.

Over two decades, the international team of scientists found that oil palm production in Malaysia has an impact beyond the direct loss of habitat. It also provides a rich source of food for nearby wildlife such as wild boars, which then multiply in big numbers and damage forest trees and prevent them from regenerating.

Published in *Nature Communications* today, the research paper reports that the wild boar population grew a hundred-fold in forests that were adjacent to oil palm plantations, even when the forest and plantations were over a kilometre apart.

The wild boars reduced the number of small trees and saplings by more than half, compared with experimentally fenced-in areas of the forest that did not have wild boars. This reduction is primarily driven by wild boar mothers harvesting small trees to build nests for their young.

Dr Matthew Luskin, a research fellow at NTU Singapore's Asian School of the Environment, conducted this study in partnership with the Center for Tropical Forest Science -- Forest Global Earth Observatory (CTFS-ForestGEO) at the Smithsonian Tropical Research Institute and researchers at the University of California, Berkeley.

"For 10 years, we saw that plants and small trees on the forest floor were disappearing but we didn't understand why," said Dr Luskin. "Once we started looking outside the forest to the surrounding oil palms, the story became clear.

"When oil palms start fruiting, wild boars quickly aggregate to feed in the plantations. The abundant food allows them to reproduce, causing a massive surge in their population in the nearby forest. The biggest subsequent effect this leads to is when pregnant wild boars build nests, as this clears vegetation from the forest floor."

Dr Stuart Davies, Director of CTFS-ForestGEO programme that facilitated the study, said, "This important new study uses intensive long-term field research to illustrate that the effect of agriculture is not necessarily restricted to the land under production.

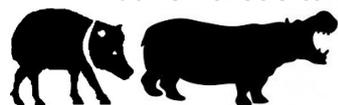
"Further experiments and observations are critical for understanding interactions between production and protection lands, thereby improving the management of the world's hyper diverse ecosystems."

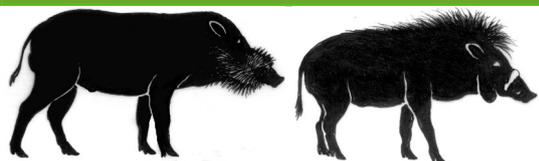
The researchers said that with many oil palm plantations found near Southeast Asia's remaining forested lowlands, it could have a similar knock-on effect on the ecology in those areas, but its long term impact warrants more in-depth studies.

"I've personally seen population eruptions of pigs and macaque monkeys in forests near oil palms across Peninsular Malaysia, Borneo, and Sumatra. This may become a huge conservation issue for the entire region," said Dr Luskin.

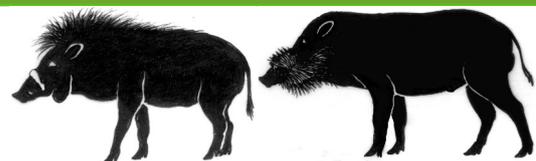
The researchers urged oil palm growers as well as the countries and regulatory bodies that govern them to consider ways to limit negative impacts.

One solution suggested by Dr Luskin could be for forest reserves to be surrounded by larger 'buffer' areas to limit wildlife access to oil palm fruits.





Articles in the news



With many tropical forests lying within a kilometre of a non-forested area, such as a plantation, the scientists said well-protected forest reserves may be insufficient to conserve tropical biodiversity in the face of ongoing agricultural expansion.

Efforts to control the wild boar or feral pig population is also culturally sensitive in some parts of Southeast Asia where pigs are regarded as unclean and consumption of pork is taboo.

The study focused on native wild boars (*Sus scrofa*), which are well-known to farmers as crop-raiding pests. The wild boar population was estimated to grow 100-times larger than natural levels, resulting in dramatic impacts on an intact forest.

Other animals such as macaque monkeys are also known to forage on oil palm and become common in forests found near plantations. These animals eat birds' eggs and a variety of other species and also alter the food webs in forests found near oil palm plantations.

Associate Professor Fidel Costa, Acting Chair of NTU's Asian School of the Environment, said this paper is yet another project that showcases the strengths of the partnership NTU Singapore has with the Smithsonian Institution in the United States.

"Together with the Smithsonian, NTU Singapore hopes to groom the next generation of scientific research expertise, which will help Asian countries effectively conserve their environment and to embark on more sustainable business practices," Prof Costa explained.

"Through impactful studies on the effect of agricultural expansion and wildlife population, we hope to provide insights for countries and policymakers who seek to better protect our environment for future generations."

Journal Reference:

Matthew Scott Luskin, Justin S. Brashares, Kalan Ickes, I-Fang Sun, Christine Fletcher, S. Joseph Wright, Matthew D. Potts. Cross-boundary subsidy cascades from oil palm degrade distant tropical forests. *Nature Communications*, 2017; 8 (1) DOI: 10.1038/s41467-017-01920-7

Using drones to estimate crop damage by wild boar

<https://www.sciencedaily.com/releases/2017/12/171212141841.htm>

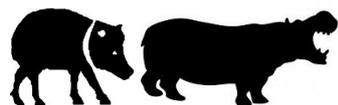
Date: December 12, 2017

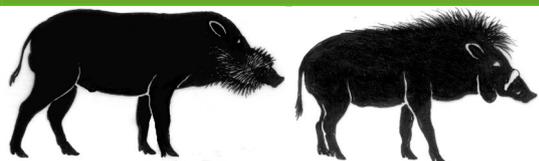
Source: British Ecological Society (BES)

Growing populations of wild boar (*Sus scrofa* L.) are causing more and more damage to agricultural land in Europe, requiring hundreds of thousands of Euros in compensation. A new drone-based method allows estimating crop damage in a fast, standardised and objective manner.

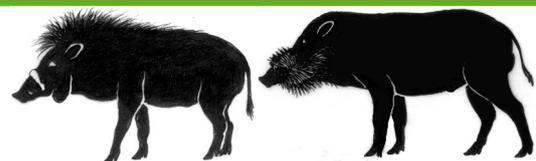
Anneleen Rutten, PhD student at the University of Antwerp and the Research Institute for Nature and Forest (INBO, Brussels) will present the method at the 'Ecology Across Borders' conference in Ghent, Belgium this week. She uses a standard commercial drone to take aerial photographs of agricultural fields, which are analysed with an algorithm to identify the damaged areas.

Rising numbers of wild boar have been linked to higher crop damage, disease transmissions and car accidents in many European countries. In Flanders, wild boars have been absent for almost 50 years and only returned in 2006. Estimates from hunting bags show a growing population which is still expanding its range, from the eastern province of Limburg towards the more central provinces of Antwerp and Vlaams-Brabant.





Articles in the news



Landscape structures in Flanders changed in the years of absence of wild boar, resulting in a dense, mosaic-like pattern of agricultural, natural and urban areas. Thus, there have been many human-wildlife conflicts since.

"I want to get a first insight into the extent of agricultural damage by wild boar because, in contrast to neighbouring regions and countries, this has not been monitored in the past and it is not known how high the financial damages are for this sector," Anneleen Rutten says.

The method was developed to be affordable and easy to apply. "I connect my smartphone to the remote controller of my drone which allows me to see the camera visualisation. Damage is really clear on the camera: in maize fields, boars roll over the maize which results in gaping holes with broken stems in an otherwise green field. In grasslands, rooting causes a clear colour difference because the soil is rooted up," Rutten explains.

For each field, many individual photographs with 75-85% overlap are taken. The high overlap enables combination of individual photographs into a single image, taking account of different perspectives and showing the entire field. The area of the field is then classified into damaged and undamaged parts using Object Based Image Analysis (OBIA). The algorithm reaches 93% of accuracy for maize fields and 94% for grasslands.

Traditionally, crop damage is estimated by trained experts measuring the damaged area in the field. "Flying and taking photographs of damaged fields does not take as long as doing an assessment by ground visits, making it more cost-effective," Rutten adds. Another advantage is that the method is standardised, allowing for direct comparisons between different fields and over time.

Anneleen Rutten will present her work at the conference 'Ecology Across Borders' on Tuesday 12 December 2017.

This year's annual meeting is jointly organised by the British Ecological Society, Gesellschaft für Ökologie (the Ecological Society of Germany, Switzerland and Austria), and Dutch-Flemish Ecological Society (NecoV), in association with the European Ecological Federation, bringing together 1,500 ecologists from around 60 countries to discuss the latest advances in ecological research across the whole discipline.

Protecting a forest in the land of the Indonesian deer-pig

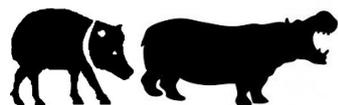
https://news.mongabay.com/2017/08/protecting-a-forest-in-the-land-of-the-indonesian-deer-pig/?n3wsletter&utm_source=Mongabay+Newsletter&utm_campaign=a1d98f1464-newsletter_2017_08_17&utm_medium=email&utm_term=0_940652e1f4-a1d98f1464-67244223
by Christopel Paino on 15 August 2017 | Adapted by Melati Kaye

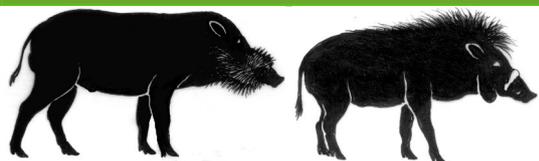
In a village in the northern part of Indonesia's giant Sulawesi island, hunters pursue rare animals that are protected by the law.

A local affiliate of NGO BirdLife International is working with locals to preserve the Popayato-Paguat forest block — and the dozens of endemic species within.

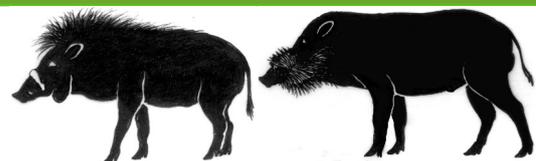
The NGO is facilitating an ecosystem restoration project in the forest block.

LEMBAH PERMAI, Indonesia — Joula Goni stepped out of her house cradling a skull. "A babirusa," she explained, placing the bleached white cranium on a formica table on the patio. Babirusa are one of the island of Sulawesi's unique menagerie of endemic animals. In Indonesian, the name of the animal translates to "deer-pig." Unlike wild boars, the babirusa has a





Articles in the news



dramatic set of tusks. One set curves up from its lower jaw. The second, more pronounced, set emerges from its top jaw and curls over the animal's eyes.

Goni is one of the few indigenous Minahasa people in Lembah Permai village, Gorontalo province, in northern Sulawesi, one of the archipelago country's largest islands. She said her husband happened upon the skull during a hunting expedition. "He only got the skull. Perhaps the animal died from old age or after being gored in a fight." Her quip is justifiably defensive. Lembah Permai is famous among trophy hunters as a place to land rare endemic fauna that are protected under Indonesian law.

"It's true, a lot of hunting happens here," said Sudirman Hasan, the village secretary of this mostly Javanese hamlet that sits at the forest edge. Hasan confessed he is uncomfortable with this notoriety. He hopes the situation will change with the signing of what Burung Indonesia — an affiliate of global NGO BirdLife International — calls a Village Nature Conservation Agreement, or KPAD.

"The KPAD will outline what is allowed and not allowed in the forest," he said.

Home to many migrants

Lembah Permai sits at the end of a rocky six-to-seven-hour drive from Gorontalo city, the provincial capital. It's home mostly to "transmigrants" from the faraway island of Java, where more than half of the Muslim-majority nation's 260 million people live.

Here in Lembah Permai, the air is clear. Plentiful water flows. At one time, a Korean company considered building a microhydro electricity plant on the local Malango creek. They canceled their plans on account of the oil palm plantation on the opposite bank.

"The plantation has had a bad effect on the Malango," said village secretary Hasan. "It sucks up a lot of water. The Koreans decided against investing as a result of the plantation. They just went home."

Only a third of the 419 souls (114 families) that live in Lembah Permai are fulltime residents. The rest are regional migrants. The original village, established by the government's transmigration department, had a designated area of 5,000 hectares, an area just smaller than Manhattan. When it was last surveyed in 2015 though, the village covered a mere 1,323 hectares. Many houses sit abandoned.

Hasan thinks this is on account of the grade. He says the village land is steep and unsuitable for farming.

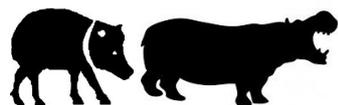
Goni, whose husband found the babirusa skull, said that many Minahasan relatives who came to settle decided instead to move back to their home villages after seeing the conditions in Lembah Permai.

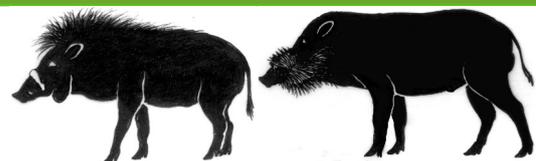
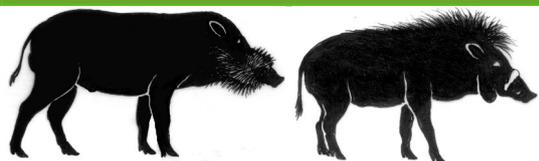
For those migrants that stayed, their greatest hope is that they will be able to build up a cacao agroforestry system similar to the two other villages in the Popayato-Paguat forest area. Makarti Jaya and Puncak Jaya are larger settlements that Burung Indonesia — an affiliate of global NGO BirdLife International — is supporting in the development of village conservation agreements.

Birds aplenty

Burung Indonesia is facilitating an ecosystem restoration program in the Popayato-Paguat forest. According to the 2015 report, Popayato-Paguat's zonation as a "production forest" fragments and therefore threatens endemic biodiversity. According to Global Forest Watch data, deforestation has been increasing in the Pohuwato area, particularly since 2013.

"Popayato-Paguat is a center of connectivity between important forest blocks such as the Nantu, Matinan-Illeile and Panua," the Birdlife Indonesia report says. "It unites the natural forest area."





Ecosystem restoration work here will rebalance the function and type of habitat in this forest block.”

Burung Indonesia’s technical memorandum describes the Popayato-Paguat as a dry deciduous forest spanning 84,789 hectares — bigger than Singapore — which includes 18,230 hectares of production forest and 66,568 hectares of “limited production forest.” The forest area is jurisdictionally split between two districts, Pohuwato and Boalemo.

The report mentions that the Popayato-Paguat forest block has been deemed an Important Bird and Biodiversity Area since 2014. It has an A1 rating, meaning that it is home to endangered species, and an A2 rating, meaning that it is also home to birds with a limited distribution.

There are 67 species of endemic bird and seven rare species present here. Locally present are also Globally Threatened Species including the maleo (*Macrocephalon maleo*), yellow-crested small cockatoo (*Cacatua sulphurea*), blue-faced rail (*Gymnocrex rosenbergii*), Knobbed hornbill (*Rhyticeros cassidix*) and Sulawesi hornbill (*Rhabdotorrhinus exarhatus*).

Also present are two endangered species – pigdeer (*Babyrousa celebensis*) and low altitude anoa (*Bubalus depressicornis*)- and four vulnerable species – the high altitude anoa (*Bubalus quarlessi*), black macaque (*Macaca hecki*), the tarsier known to be the world’s smallest primate variety (*Tarsius tarsier*) and the kuskus bear (*Ailurops ursinus*).

The ecological costs of war: Conflict a consistent killer of African megafauna

<https://www.sciencedaily.com/releases/2018/01/180110131516.htm>

Date: January 10, 2018

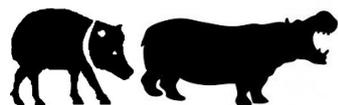
Source: Princeton University

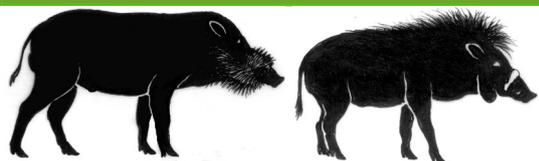
When Joshua Daskin traveled to Mozambique’s Gorongosa National Park in 2012, the park and the iconic large animals that roamed it were returning from the brink of extinction. Gorongosa, among Africa’s most spectacular wildlife preserves until the 1970s, had been devastated by an anti-colonial war of liberation followed by a ghastly 15-year civil war -- a one-two punch that exterminated more than 90 percent of the park’s wildlife.

The park’s violent past intrigued Daskin, then a first-year Princeton graduate student in ecology and evolutionary biology. As he explored the savannas and grasslands of Gorongosa with his advisor, Robert Pringle, an assistant professor of ecology and evolutionary biology, the two researchers discussed whether similar wildlife declines might have occurred across Africa during the many conflicts of the 20th century. If so, they wondered how severe the impacts had been, and if animals generally retain the capacity to rebound like those in Gorongosa had, or if war was a human pressure that most animals just couldn’t withstand.

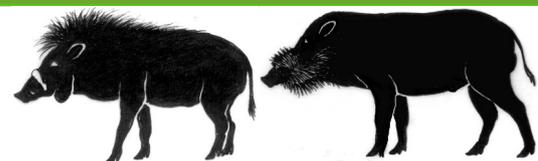
After years of examining conflict in Africa’s protected areas, Daskin and Pringle reported in the journal *Nature* Jan. 10 that war has been a consistent factor in the decades-long decline of large mammals in Africa. Populations that were stable in peaceful areas needed only a slight increase in conflict frequency to begin a downward spiral. But, the researchers report, while wildlife populations declined in conflict areas, they rarely collapsed to the point where recovery was impossible.

The study found that more than 70 percent of Africa’s protected areas were touched by war between 1946 and 2010, an era during which the overthrow of European colonial rule was followed in many countries by violent post-colonial power struggles. Elephants, hippos, giraffes,





Articles in the news



and other large mammals perished as combatants and hungry citizens hunted animals for meat and for marketable commodities such as ivory.

Nonetheless, said Daskin, who completed the study as part of his doctoral dissertation at Princeton, the findings show that even those protected areas most severely affected by conflict remain promising candidates for conservation and rehabilitation efforts. The study was supported by the National Science Foundation and the Princeton Environmental Institute (PEI).

"We hope our data and conclusions will help in the effort to prioritize these areas for attention and funding from their governments and from international NGOs," said Daskin, now a Donnelley Postdoctoral Fellow at Yale University. "We're presenting evidence that although mammal populations decline in war zones, they don't often go extinct. With the right policies and resources, it should often be possible to reverse the declines and restore functional ecosystems, even in historically conflict-prone areas."

The study was needed to establish a general scientific expectation about how conflict typically affects wildlife populations, said Pringle, who is associated faculty in PEI. "It wasn't obvious to us in advance that conflict would have negative effects on wildlife populations," Pringle said. "Different studies of different places at different times have found both positive and negative effects of conflict on biodiversity, but the overall net effect had never been measured." For instance, previous research has shown that animal populations have increased in contested regions such as the Korean Demilitarized Zone (DMZ) and rural Zimbabwe during that country's Bush War of 1964-1979.

Daskin and Pringle, however, found that with few exceptions, frequent conflict resulted in a downward trend among large-animal populations. No other factor they evaluated exhibited the same consistent effect. There was no statistically detectable effect on wildlife trajectories from mining, urban development, corruption, drought, or even the intensity of the conflict as measured by the number of human battle fatalities.

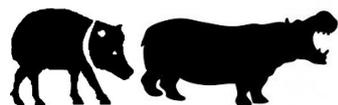
"This enabled us to make some educated guesses about what the underlying mechanisms might be," Daskin said. "Most of the effects of conflict on wildlife populations seem to be due to knock-on socioeconomic effects that degrade the institutional capacity for biodiversity conservation, or the collective societal ability to prioritize and pay for it."

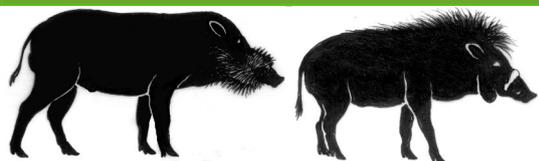
Hugh Possingham, the Chief Scientist at The Nature Conservancy, concurred that social structures ultimately determine the fate of animals and protected areas. Possingham had no role in the research but is familiar with it and has published on related topics.

"The most surprising finding is the strength of the relationship between the presence of conflict and declines in large mammals," Possingham said. "One might have imagined that the magnitude or scale of conflict would be the driver, but the mere presence of conflict seems to be a strong predictor in its own right.

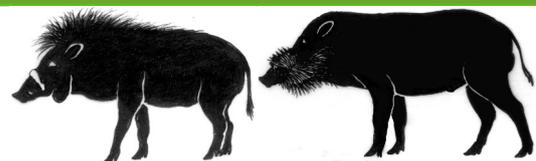
"This is unusual and useful," he continued. "It suggests to me that any sort of conflict needs to be avoided, even if it's at a low level, and such conflicts may be indicative of broader social and institutional problems that are the primary drivers of mammal declines. Bottom line -- to stop threats such as bushmeat hunting, governance really has to be strong."

Daskin and Pringle found that 71 percent of Africa's protected areas experienced one or more conflicts from 1946 to 2010. For a quarter of these areas, wars occurred for an average of nine or more years. Several large nations experienced an average of 20 or more years of conflict per protected area, including Chad, Namibia and Sudan (before it split into Sudan and South Sudan in 2011).





Articles in the news



To conduct the analysis, Daskin drew from nearly 500 sources to find estimates of a specific animal species' abundance from at least two years between 1946 and 2010. He compared those estimates in order to calculate the change in population density during a given time interval. Daskin then used a series of databases to identify how many conflicts overlapped with each of Africa's protected areas during the study interval. In the end, the researchers examined the trends of 253 animal populations representing 36 species, ranging from antelopes to elephants, in 126 protected areas across 19 countries.

"No one else had made the effort to assemble conflict data across this range of parks and make them talk with the wildlife data," Daskin said. "These data were all freely available, but not always highly accessible."

Gorongosa, the park in Mozambique that originally inspired the study, exemplifies the thrust of the findings, Daskin and Pringle said. From 1977 to 1992, government soldiers, anti-government militias, and refugees alternately fought in or fled through the park. For years after the war, displaced and dispossessed residents hunted wildlife. By the early 2000s, the elephant population had crashed by more than 75 percent, while successive aerial counts found that buffalo, hippo, wildebeest, and zebra numbers were hovering in the single or double digits.

Yet, none of these animal populations disappeared completely. Since 2004, wildlife in Gorongosa have rebounded to 80 percent of their total pre-war abundance. Park staff, the Mozambican government and the nonprofit Gorongosa Restoration Project have worked with neighboring communities to nurture the remnant animal populations by suppressing illegal hunting and creating educational and employment opportunities for villagers within the park.

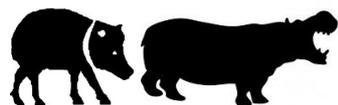
"Our results show that the case of Gorongosa could be general," said Pringle, who serves on the board of the Gorongosa Project. "Gorongosa is as close as you can come to wiping out a whole fauna without extinguishing it, and even there we're seeing that we can rehabilitate wildlife populations and regrow a functional ecosystem. That suggests that the other high-conflict sites in our study can, at least in principle, also be rehabilitated."

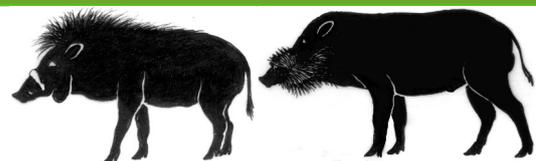
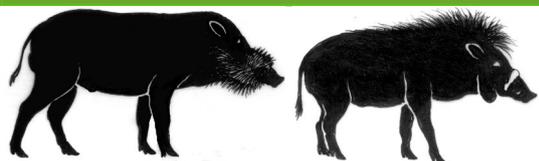
Pringle and Daskin emphasized in their paper that wildlife recovery rests in the hands of local people. "I would love to see conservation and humanitarian organizations collaborate on post-conflict relief work," Pringle said. "Long-term recovery hinges on the health and hopefulness of the people, and healthy environments catalyze human health and hope. It's a positive-feedback loop."

When people have a personal and economic stake in a thriving ecosystem, they embrace protective behaviors such as preventing poaching and monitoring wildlife, Possingham said. "This publication confirms the philosophy behind that approach," he said.

"In any area where large-mammal protection is a concern, one has to get the people-side of the conservation initiative sorted -- establishing alternative livelihoods, law and order, education, anti-corruption, etc. -- at the same time as taking habitat-protection and anti-poaching actions on the ground," he said. "If you don't tackle the ultimate drivers such as a breakdown of civil society, then taking action on the ground and investing in park management might not work."

The paper, "Warfare and wildlife declines in Africa's protected areas," was published online by Nature Jan. 10. This work was supported by the National Science Foundation (grant nos. DEB-1501306, DEB-1355122 and DEB-1457697) and the Princeton Environmental Institute's Grand Challenges program (project title: "Ecosystem Spatial Pattern and Development Opportunities in African Rangelands").





Journal Reference:

Joshua H. Daskin, Robert M. Pringle. Warfare and wildlife declines in Africa's protected areas. *Nature*, 2018; DOI: 10.1038/nature25194

Rampant consumption of hippo teeth

Rampant consumption of hippo teeth combined with incomplete trade records imperil threatened hippo populations in Africa

<https://www.sciencedaily.com/releases/2017/10/171004101435.htm>

Date: October 4, 2017

Source: The University of Hong Kong

Global wildlife trade is pushing many species to the brink of extinction. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established to regulate this trade, but inadequate monitoring may facilitate or lead to unsustainable levels of exploitation. A recent study by the School of Biological Sciences of the University of Hong Kong (HKU) examined the case of hippo teeth and revealed discordance in trade volumes declared between importers and exporters -- a scenario that could threaten the survival of the species.

The findings have been published in the *African Journal of Ecology*.

"If authorities do not more diligently monitor the international trade in threatened species, those species could be exposed to unmanageable exploitation levels, which could lead to extinction," said Alexandra Andersson from the School of Biological Sciences, who led the study.

Since CITES trade records began in 1975, over 770,000 kg of hippo (*Hippopotamus amphibius*) teeth have been traded internationally -- and 90% of this trade has passed through Hong Kong. Of that imported to Hong Kong, over 75% has come from just two countries: Tanzania and Uganda.

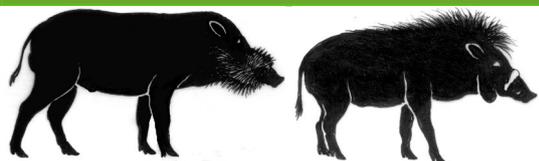
CITES records show significant discrepancies between hippo teeth trade volumes declared by the main exporters, Uganda and Tanzania, and



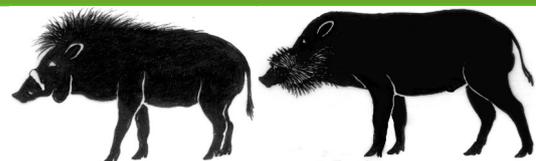
This is an image of hippo teeth products for sale in an ivory shop in Sheung Wan, Hong Kong.

Credit: Alexandra Andersson





Articles in the news



the main importer Hong Kong, which points to potential mismanagement -- since all CITES parties are duty-bound to accurately report trade in threatened species. Since Tanzania joined CITES in 1980, records show that, cumulatively, Hong Kong has received a total of 3,176 kg more hippo teeth than declared exported by Tanzania. Similarly, in the 19 hippo teeth trade transactions between Hong Kong and Uganda since the latter joined CITES in 1991, Hong Kong received less hippo teeth than declared exported by Uganda. Discrepancies in declared trade volumes amount to over 14,000 kg of hippo teeth, representing more than 2,700 individual hippos, or 2% of the global population.

Meanwhile, hippo populations have declined significantly. The International Union for the Conservation of Nature estimates a 7-20% decline in the past decade, and predicts a further 30% decrease in the next 30 years -- a rate at which hippos will disappear within 100 years. In Uganda's Queen Elizabeth National Park the population has plummeted from 21,000 in the 1950s to 2,326 in the most recent count in 2005.

"This gross mismatch in trade records challenges the persistence of hippo populations in Africa," said co-author Dr Luke Gibson, also from HKU. "This is a common problem -- hippos are not the only species to face such mismanagement."

Since 2000, Hong Kong has received over 100,000 more live, wild-caught Southeast Asian box turtles (*Cuora amboinensis*) compared to trade records from exporting nations Indonesia and Malaysia. Since 2006, Hong Kong imported 2,400 fewer live, wild-caught humphead wrasse (*Cheilinus undulatus*) than exported from, mainly, Indonesia and Malaysia -- demonstrating that data mismatch is common across many species.

"It is imperative that authorities in both exporting and importing nations cross check the volumes of threatened species declared on paper to those actually received, work together to understand the cause of any discrepancies, as well as correct any reporting errors or fraudulent declarations" added Andersson. "The fate of hippos -- and a plethora of other species -- could depend on it."

"As a hub of legal commerce in rare animals and parts, authorities in Hong Kong must have a precise knowledge and control of endangered species being imported, sold or exported in its territory," she said.

Journal Reference:

Alexandra Andersson, Luke Gibson. Missing teeth: Discordances in the trade of hippo ivory between Africa and Hong Kong. *African Journal of Ecology*, 2017; DOI: 10.1111/aje.12441

More than 100 hippos are 'killed by Anthrax' in Namibia as shocking images show them bloated and lifeless on their backs

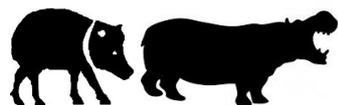
<http://www.dailymail.co.uk/news/article-4963176/More-100-hippos-Namibia-killed-ANTHRAX.html#ixzz55h3ZyF9R>

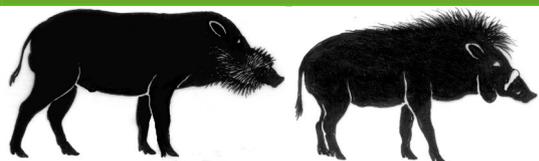
In total 109 hippos have died in Namibian national park since Sunday last week
Park rangers believe the animals may have been killed in an anthrax outbreak
Anthrax is a disease which is caused by bacterial spores that occur naturally

By Chris Pleasance for MailOnline

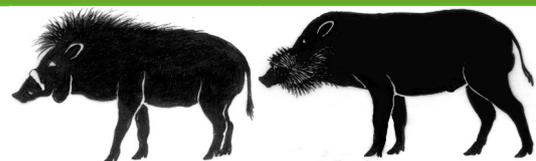
PUBLISHED: 16:52 GMT, 9 October 2017 | UPDATED: 17:55 GMT, 9 October 2017

More than 100 hippos have died in Namibia after they are believed to have contracted anthrax.
Rangers at Bwabwata National Park say 109 of the animals have perished





Articles in the news



since Sunday last week as pictures show dozens of bloated bodies floating in murky water. While the exact cause of the deaths is not clear, workers believe it could be down to an anthrax outbreak, which is caused by bacterial spores that occur naturally. Apollinaris Kannyinga, parks deputy director of the north-east regions, told *The Namibian* that such outbreaks are not uncommon. They usually occur when waters in the Kavango River, where a large number of bodies have been found, are running low, he added. Veterinarians still need to confirm the cause, and say the death toll could be higher because vultures and crocodiles have been eating the remains. Government officials estimated that Namibia's hippo population was around 1,300 before the mass death. The minister added that he would be alarmed if there were any further hippo deaths at the national park which is one of the country's foremost tourist attractions. Several countries have weaponised anthrax and it was used in a string of high-profile poisoning cases in the US in 2001. Five people died and a further 17 were poisoned after spores were mailed to newspaper offices and two Democrat senators.



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The IUCN/SSC Wild Pigs, Peccaries and Hippos Specialist Groups (WPSG, PSG and HSG) are three of several Specialist Groups of the Species Survival Commission (SSC) developed by the IUCN to foster conservation, research and dissemination of information for species of conservation concern.

These groups consist of technical experts focusing on the conservation and management of wild pigs, peccaries and hippos.

The broad aim of these groups is to promote the longterm conservation of wild pigs, peccaries and hippos and, where possible, the recovery of their populations to viable levels.

Pigs, peccaries and hippopotamuses are nonruminant ungulates belonging to the Suborder Suiformes of the Order Artiodactyla (the even-toed ungulates). Within the Suborder Suiformes, pigs belong to the Family Suidae, peccaries to the Family Dicotylidae and hippopotamuses to the Family Hippopotamidae.

