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Review article

Some brief considerations regarding the invasive potential of the wild populations of *Sus scrofa ferus* and *Sus scrofa domesticus* outside their native range

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Abstract. Wild boar (*Sus scrofa ferus*), native to Eurasia and North Africa, has been introduced for hunting purposes in North and South America, in the beginning of 20th century. Domestic pigs (*Sus scrofa domesticus*), which is a descendant of wild boar, has been introduced hundreds of years ago all over the word (except for Antarctica) as a food source, but numerous individual escaped captivity or were intentionally released in the wild, forming feral populations. In Americas there are various hybrids between the two subspecies. These wild pigs are a great threat for the environment, and they also can transmit some diseases to humans and animals. Some preventing and control measures took place around the world, with more or less positive results.
Key Words: feral pigs, wild pigs, invasive species, ecological impact, control, pest.

Introduction. The wild boar (*Sus scrofa ferus*) is native to North Africa, Europe northern to Scandinavian Peninsula, and in Asia where it leaves everywhere to Southern Siberia, Transbaikalia, and the Far East to the North, populating also tropical continental zones as Sulawesi, Java, Sumatra, New Guinea, Malaysia (Leaper et al 1999; Murariu 2004; Bengsen et al 2011; O'Rourke & O'Flynn 2014) (Figure 1). The species has recently recolonized Sweden, Finland, Estonia and United Kingdom (Leaper et al 1999; O'Rourke & O'Flynn 2014). Wild boars are regionally extinct in Denmark, Norway, Egypt, Libia (Oliver & Leus 2008). Outside its native range, the species has been introduced on a private ranch in California, USA in 1925, for sport hunting (Jay & Wiscomb 2008) and in Uruguay at the beginning of the 20th century, also for hunting purposes (www.redorbit.com).

There are many strains of domestic pigs (*Sus scrofa domesticus*) worldwide, but all of them descend from the wild boar. Domestic pigs were introduced in many places for food, being now present worldwide. They have escaped from enclosures or were intentionally released in the wild in many places where they have been introduced. Wild populations of domestic pigs exist now on all continents except Antarctica (Barrios-Garcia & Ballari 2012). These former domestic pigs are named feral pigs, feral swines, wild swines or feral hogs (Saunders & Kay 1996; Jay & Wiscomb 2008; Koichi et al 2012; O'Rourke & O'Flynn 2014).

There are some differences between these two subspecies: the wild boars are generally thinner and their hair is coarser, they have longer legs and larger heads. They also have longer canine teeth or tusks than domestic pigs. The color of young boar is generally reddish brown with black longitudinal stripes; as the young develop, the stripes begin to shade and the red changes to brown and finally to black (Murariu 2004). The two species can interbreed.

In the present paper we discuss about the feral populations of pigs in America and Australia, because more information exist for these two zones. We took into consideration the ways of introduction, the impacts of feral pigs upon the environment, measures of control and future plans.

Figure 1. Native range of the wild boar (*Sus scrofa ferus*)
(Source: http://www.lhnet.org/assets/wild-boar/Range-map-wild-boar.png).

The Wild Pigs in North and South America. Christopher Columbus was the first who introduced domestic pigs into North America in the West Indies (Towne & Wentworth 1950). In Florida they have been introduced in 1593, and shortly after, more introductions followed in Georgia and Carolina (Barrett & Birmingham 2005). The pigs escaped or were intentionally released into the wild, establishing populations in the new areas (www.darkrye.com), becaming feral pigs. Besides the domestic pigs, in California has been introduced the wild boar in 1925, for hunting purposes (Jay & Wiscomb 2008). The hybridization of the wild boar with feral pigs occured rapidly, that is why now in the USA exist a wide range of hybrid strains. This is why the most proper name for these wild animals is wild pigs, which include feral pigs (various domestic pigs strains which escaped captivity) (Figure 2), wild boars (native to Eurasia but introduced to North America) (Figure 3) and their various hybrids (Figures 4 and 5). It is presumed that now exist in the wild around eight million wild pigs spread out over 39 states (Nordrum 2014) (Figure 6) in USA. Starting with 1990s, they are present in Canada also (www.producer.com).

Domestic pigs were brought from Europe to many parts of South America, by Spanish and Portuguese colonists beginning in the 1500s; the common practice of allowing domestic pigs to forage free-range led quickly to feral populations that have since spread throughout most of the continent (www.scirecordbook.org). Eurasian wild boars were also introduced in South America in early 20th century for hunting, in Uruguay; from there they spread and entered Brazil in 1990's (www.redorbit.com). To date, as in the U.S.A., the wild pigs in South America are a mix of feral pigs, feral pig x Eurasian wild boar hybrids, and any pure Eurasian wild boars that may still exist; hybrids can exhibit a variety of characteristics (www.scirecordbook.org). In the present days,

wild pigs can be found in areas all over the South America, except for southern parts of Chile and Argentina where winters are too cold for these animals. Anyway, they are somehow under control (Salvador & Fernandez 2014), which is a different situation when compare to U.S.A.

Figure 2. Feral pigs in Australia (Source: www.abc.net.au).

Figure 3. Wild boars in UK (Source: www.tornadowire.co.uk).

Figure 4. Feral pigs (*S. scrofa domesticus*) x wild boar (*S. scrofa ferus*) hybrids in Texas (Source: www.2mrealty.com/blog/houstons-gone-hog-wild.html).

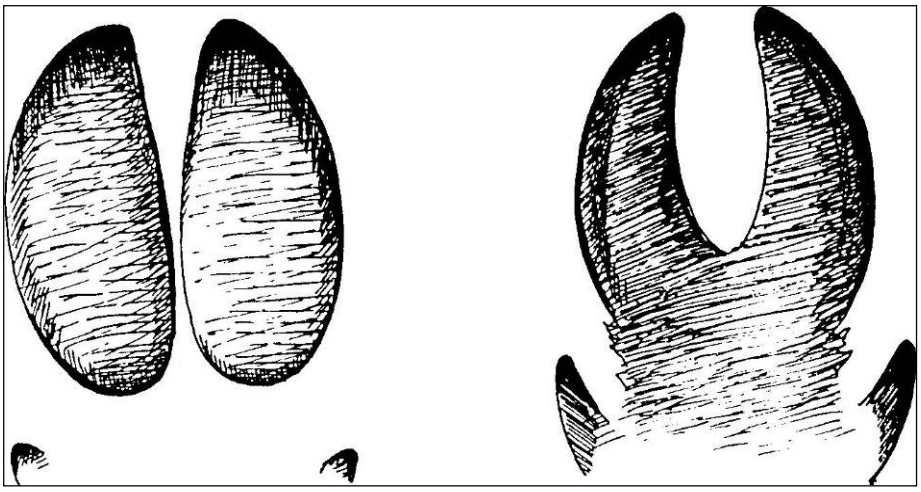

Figure 5. Feral pig (left) and wild boar (right) tracks (Source: http://www.tngunowners.com/forums/topic/11190-tn-wildlife-tracks/).

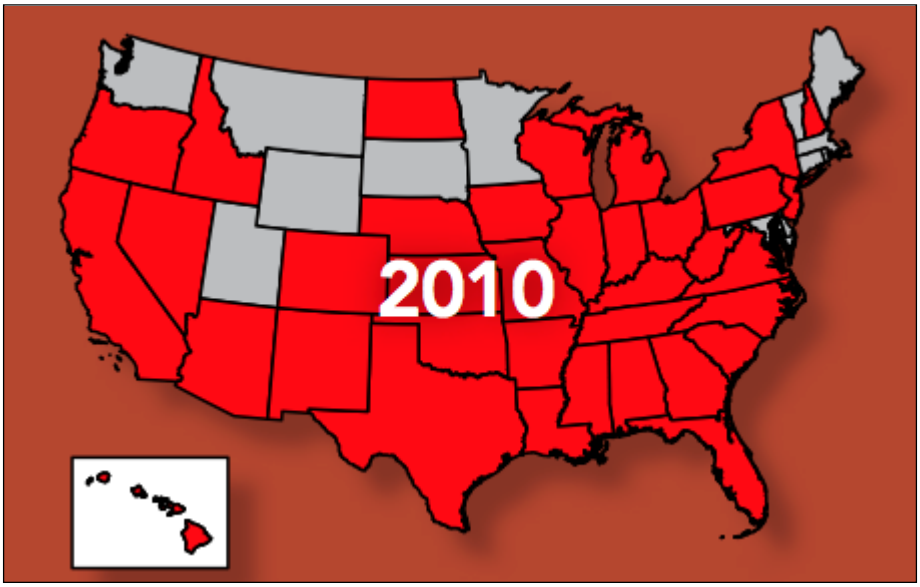

Figure 6. The distribution of wild pigs in USA in 2010 (Source: http://eattheinvaders.org).

The Feral Pigs in Australia and New Zealand. Feral pigs in Australia are a result of releases ans escapes of various breeds of domestic pigs (which have been introduced by the first European explorers) dating back to 1700's (McIlroy 1990). The way of spreading within the country is not well documented, but in the presend days feral pigs are estimated to around 23.5 million individuals, with a range across approximately 38% of mainland Australia (Natural Heritage Trust & Australian Goverment 2005) (Figure 7).

The domestic pigs were introduced as a food source in New Zealand in 1796 by explorers and settlers (www.nzpcn.org.nz); by 1840 feral populations were well established in North and South islands and on numerous offshore islands (www.marlborough.govt.nz).

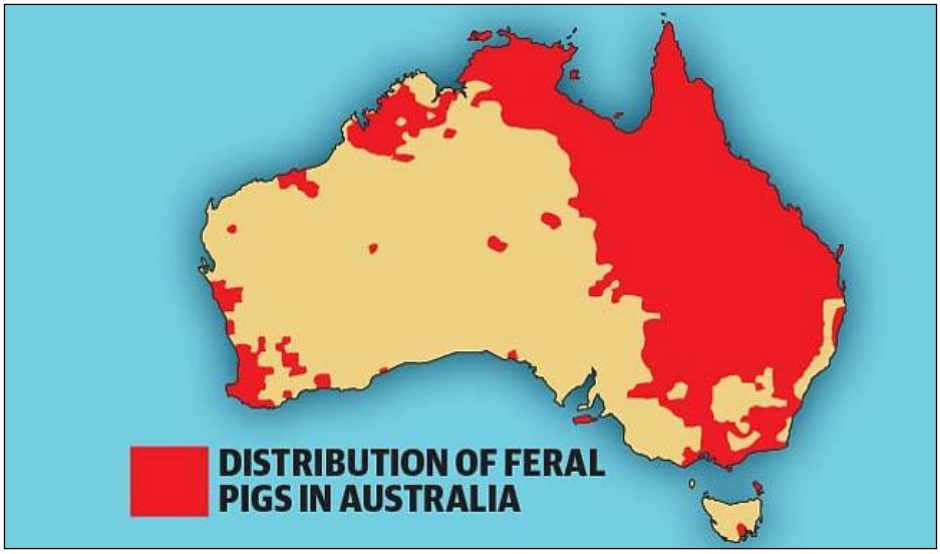

Figure 7. Distribution of feral pigs in Australia (Source: http://www.couriermail.com.au).

Negative Impacts. Wild pigs are a very high risk invader because they can easily establish in a variety of habitats (Coblentz & Bouska 2005) and can cause a variety of damage.

The most common negative aspect is rooting, which results in the destruction of crops, pastures and native plants, consequently causing soil erosion; moreover, the wild pigs eat certain tree sedlings (Barrett & Birmingham 2005) or spread them in new habitats. Ferla pigs consume birds chick and eggs, reptiles and reptile eggs, frogs, numerous invertebrates, underground fungi and so on (Natural Heritage Trust & Australian Goverment 2005). They also cause damages to farm ponds and fences, also eating farmed animals as sheep, goats, turkeys; wild pigs have a high potential for transmission a wide range of diseases both to humans and farmed or native animals (Wood & Barrett 1979; Barrett & Birmingham 2005; Jay & Wiscomb 2008).

Control Methods. Several methods are used in order to prevent the damege and to control wild pigs populations. Fences are used to protect small areas as gardens and yards, but these fences have to be as solid as possible, because if the pigs are persistent, they can easily break down the fences (Barrett & Birmingham 2005). Electric fences can be also useed, but they are difficult to be maintained over large areas (Hone & Atkinson 1983). Cage traps, steel traps and leg snares have also been used, the more effective method being the cage traps (Barrett et al 1988). Sport hunting is used in certain areas to reduce pig densities, but the success depends on local terrain and situation (Barrett & Birmingham 2005). In Australia several chemical substances were put in baits in order to poison the feral pigs (Lapidge & Eason 2010; IMVS 2010); the method proved to be an effective technique (Natural Heritage Trust & Australian Goverment 2005).

Anyway, in most areas it is unlikely that wild pigs can be totally removed or exterminated, because the costs are very high. That is why there is a need for long-term control programs.

Conclusions. Feral populations of pigs (Eurasian wild boars, wild domestic pigs and their hybrids) exist now all over the world, except for Antarctica. They were all introduced by humans as food resource or for hunting purposes. All these types of pigs are now invasive species in the areas where they spread, posing a great threat to the environment and to the public health. Some methods of prevention and control are used in different parts of the world, but it seems there is no method able to totally remove wild pigs from their habitats.

References

Barrett R. H., Birmingham G. H., 2005 Wild pigs. Available at: http://icwdm.org.handboo/mammals/WildPigs.asp. Accessed August 20, 2014.

Barrett R. H., Goatcher B. L., Gogan P. J., Fitzhugh E. L., 1988 Removing feral pigs from Annadel State Park. Transactions of the Western Section of the Wildlife Society 24:47-52.

Barrios-Garcia M. N., Ballari S. A., 2012 Impact of wild boar (*Sus scrofa*) in its introduced and native range: a review. Biological Invasions 14:2283-2300.

Bengsen A. J., Leung L. K. P., Lapidge S. J., Gordon I. J., 2011 Target-specificity of feral pigs baits under different conditions in a tropical rainforest. Wildlife Research 38:370-379.

Coblentz B., Bouska C., 2005 Pest risks assessment for feral pigs in Oregon. Corvallis, Oregon.

Hone J., Atkinson B., 1983 Evaluation of fencing to control feral pig movement. Aust Wildl Res 10:499-505.

Institute of Medical and Veterinary Science (IMVS), 2010 Assessing the humaneness and efficacy of a new ferla pig bait in domestic pigs. Report for the Australian Government Department of the Environment, Water, Heritage and the Arts. Canberra, Australia, 11 pp.

Lapidge S. J., Eason C. T., 2010 Pharmacokinetics and methaemoglobin reductase activity as determinants of species susceptibility and non-target risks from sodium nitrite manufactured feral pig baits. Report of the Australian Government Department of the Environment, Water, Heritage and the Arts. Canberra, Australia, 18 pp.

Leaper R., Massei G., Gorman M. L., Aspinall R., 1999 The feasibility of reintroducing wild boar (*Sus scrofa*) to Scotland. Mammal Review 29:239-259.

Jay M. T., Wiscomb G. W., 2008 Food safety risks and mitigation strategies for feral swine (*Sus scrofa*) near agriculture fields. In: Proc. 23rd Vertebr Pest Conf. Timm R. M., Madon M. B. (eds), University of California, Davis, pp. 21-25.

Koichi K., Cottrell A., Sangha K. K., Gordon I. J., 2012 Are feral pigs (*Sus scrofa*) a pest to rainforest tourism? Journal of Ecotourism 11:132-148.

McIlroy J., 1990 Feral pigs. In: The handbook of New Zealand mammals. King C. M. (ed), Oxford University Press, Auckland, New Zealand, pp. 358-371.

Murariu D., 2004 Romanian Fauna, vol. XVI(4) - Mammalia: Lagomorpha, Cetacea, Artiodactyla, Perissodactyla. Romanian Academy Publishing House, Bucharest, pp. 113-119 [in Romanian].

Natural Heritage Trust & Australian Government, Department of the Environment and Heritage, 2005 Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs. 39 pp. Available at: www.deh.gov.au/biodiversity/threatened/tap/pig. Accesed November 23, 2014.

Nordrum A., 2014 Can wild pigs ravaging the U.S. be stopped? Scientific American, October 21. Available at: http://www.scientificamerican.com/article/can-wild-pigs-ravaging-the-u-s-be-stopped/. Accessed November 20, 2014.

Oliver W., Leus K., 2008 *Sus scrofa*. IUCN Red List of Threatened Species. Version 2013.2. Available at: www.iucnredlist.org. Accessed September 19, 2014.

O'Rourke E., O'Flynn C., 2014 Risk assessment of *Sus scrofa*. Joint project of Inland Fisheries Ireland and the National Biodiversity Data Centre, Ireland, 29 pp.

Salvador C., Fernandez F. A. S., 2014 Using the Eurasian wild boar phenotype as a basis to document a new process of invasion by *Sus scrofa* L. in a neotropical biodiversity hotspot. Wildl Biol Pract 10:22-29.

Saunders G., Kay B., 1996 Movements and home ranges of feral pigs (*Sus scrofa*) in Kosciusko National Park, New South Wales. Wildlife Research 23:711-719.

Towne C. W., Wentworth E. N., 1950 Pigs from Cave to Cornbelt. University of Oklahoma Press, Norman, 305 pp.

Wood C. W., Barrett R., 1979 Status of wild pigs in the United States. Wildlife Society Bulletin 7:237-246.

*** http://www.darkrye.com/content/wild-things-life-and-times-sus-scrofa. Accessed August 20, 2014.
***http://www.redorbit.com/education/reference_library/animal_kingdom/mammalia/1112721400/wild-boar-sus-scrofa/. Accessed September 23, 2014.
*** http://www.scirecordbook.org/feral-boar-south-america/. Accessed June 02, 2014.
*** http://www.tornadowire.co.uk/fencing/animal/wild-boar/. Accessed October 11, 2014.
*** http://www.abc.net.au/news/2013-07-09/pigs-on-macadamia-farm/4806046. Accessed August 21, 2014.
*** http://www.2mrealty.com/blog/houstons-gone-hog-wild.html. Accessed October 16, 2014.
*** http://www.nzpcn.org.nz/threats_details.aspx?ID=32. Accessed 01 December 2014.
*** http://www.marlborough.govt.nz/Environment/Biosecurity/Other-Pests/Feral-Pigs.aspx. Accessed August 20, 2014.
*** http://www.lhnet.org/assets/wild-boar/Range-map-wild-boar.png. Accessed August 20, 2014.
*** http://eattheinvaders.org/wp-content/uploads/2011/12/Screen-Shot-2013-05-02-at-2.27.19-PM.png. Accessed November 22, 2014.
*** http://www.couriermail.com.au/news/queensland/governments-to-take-on-feral-pig-menace-from-the-sky-as-native-species-pushed-to-the-brink/story-fnihsrf2-1226849196431?nk=216645b77a8604810bc29725d3da4da2. Accessed September 02, 2014.
*** http://www.tngunowners.com/forums/topic/11190-tn-wildlife-tracks/. Accessed September 02, 2014.
***http://www.producer.com/2013/04/wild-boar-pose-disease-risk-to-humans-domestic-pigs/. Accessed September 02, 2014.

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