

## *Pigs, Peccaries and Hippos Status Survey and Action Plan (1993)*

### Chapter 5.7

#### **The Sulawesi Warty Pig**

##### **(*Sus celebensis*)**

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#### **Status and Action Plan Summary**

Status category 2 (locally abundant, but with a restricted distribution).

*S. celebensis* is a medium sized pig which is common in north, central and eastern Sulawesi, but it is now scarce in south Sulawesi and may be extinct on nearby Selayar Island, both of which areas have been largely deforested. It also occurs as a native form on the adjacent islands of Buton, Muna, Peleng, Lembeh and on some of the Togian Islands. The species has also been quite widely introduced elsewhere in Indonesia, e.g. to the islands of Halmahera, Flores, Timor, Lendu and Simeulue. The wild pigs on some of these islands are strongly modified and there is now little doubt but that *S. celebensis* has been domesticated, and transported to these areas as a domestic or feral form, probably during the early migrations of settling peoples. It is still maintained as a domestic form on the islands of Roti and Savur, near Timor.

Whilst continued habitat destruction, hunting pressure and genetic contamination through contact with *S. scrofa* domesticates represent potentially serious threats to this species, it cannot be regarded as seriously threatened throughout its range at the present time. For this reason, recommendations for future action are primarily directed towards elucidating outstanding questions about: a) the systematic status and future management needs of populations in certain specified areas within its original range and in locations to which it can only have been introduced by human agency; and b) promoting applied research on various aspects of its biology, its socio-economic significance to village and island societies and its potential importance as a genetic resource for further domestication.

#### **Introduction**

Sulawesi warty pigs are medium sized, short-legged animals weighing between 40-70 kg. Recent forms are larger than the subfossil remains found in caves in southern Sulawesi (Hooijer, 1950) and the Pleistocene specimen reported by Hooijer (1969). Adult boars are larger than sows, averaging 60 cm at the shoulder (National Research Council, 1983). Adult animals are usually dark-haired, although some individuals are reddish-brown or yellowish in color, sometimes with lighter colored hairs on the trunk and abdomen (Groves, 1981, Hardjasmita, 1987). A clear yellow snout band is usually present, along with a distinctive tuft or 'crest' of longer hair on the crown of all but the oldest adults. Adult males have three pairs of facial warts: the preorbital pair is

the largest, the infraorbital somewhat smaller and the mandibular warts emerging from a whorl of hair marking their position to enlarge and eventually dominate (in captive specimens at least).

Recent studies of Bosma *et al.* (1991) indicate that the Sulawesi warty pig, like the other Asian *Sus* spp., has a chromosome number of 38. However, there are significant differences in the banding of its Y chromosome when compared with either *S. scrofa* or *S. verrucosus*. The only anatomical study to date, was of a female reproductive tract, which was found to be indistinguishable from that of *S. scrofa* (Macdonald *et al.*, 1984).

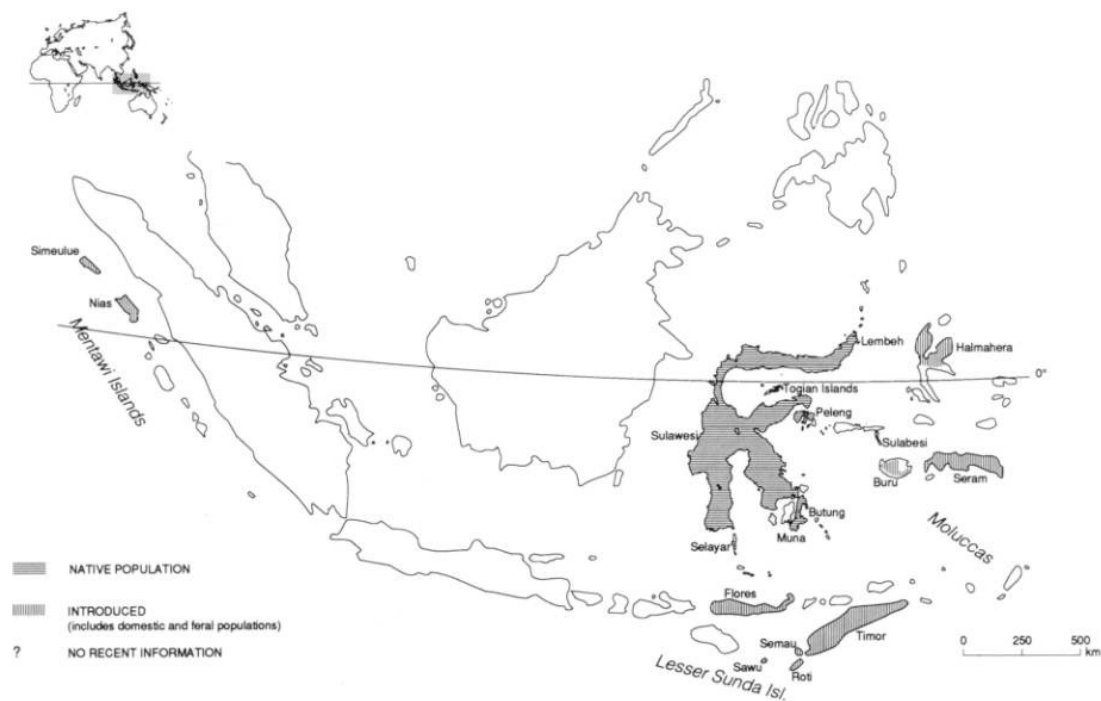


Fig. 15: Approximate distribution of native and introduced (including domestic and feral) populations of the Sulawesi warty pig, *Sus celebensis*.

### Former and Present Distribution

Available evidence suggests that the species formerly occurred throughout Sulawesi, as well as on the neighboring islands of Selayar, Buton, Muna, Peleng, Lembeh and the Togian Islands. MacKinnon (1981) reported that the species remained extremely abundant throughout north, central and south-eastern Sulawesi, despite hunting pressure and agricultural development, but that it was extinct or greatly reduced in numbers in south-west Sulawesi, and on nearby Selayar, following the virtual deforestation of these areas.

Wild pigs referred to as feral *S. celebensis* by Groves (1981), are known from Halmahera, Flores, Timor, Lendu and Simeulue and Nias islands, and domesticated animals of *S. celebensis* derivation are reported from the islands of Roti and Sawu

(Groves, 1983; Bell, 1987). The present working hypothesis is that the species was transported by man to the Mollucas and along the Lesser Sunda chain of islands either as a domesticate or as a barely modified wild form which was released to be hunted whenever required for eating. In the Mollucas, and possibly elsewhere in this region, these introduced *celebensis* are thought to have hybridized with other introduced pigs of *S. scrofa* derivation, and apparent hybrids between these species are now reported to survive on a number of islands in this region, including Salawatti, Great Kei Island, Dobu, Seram, Ambon, Bacan, Ternate, Morotai and New Guinea (Groves 1981, 1983; Oliver and Brisbin, this vol.).

### **Habitat, Ecology and Behavior**

Sulawesi warty pigs are reported to occur in a wide variety of habitats, ranging from rainforest and swamp, to open grasslands and agricultural areas, and at all altitudes up to moss forest (>2,500 m) (MacKinnon, 1981). They usually live in groups, but the social composition of these groups is not known (Macdonald, 1991). They forage during the day, this activity being concentrated in the early morning and evening. Although roots, fallen fruit, leaves and young shoots constitute the bulk of their diet, invertebrates, small vertebrates and carrion are also eaten (National Research Council, 1983).

The pregnant sow reported from south Sulawesi by Sody (1941) was probably mated in February. Birth can occur at any time throughout the year but sows usually have their young in April or May (National Research Council, 1983). Gestation length is not known for certain, and the suggestion that it may lie between 16 and 20 weeks should be treated with the caution implied by Sody (1941). Farrowing sows give birth in nests made of grasses, leaves, branches and twigs, piled over a shallow excavation of approximately 2 m in length. Litter size ranges from 2-8 (National research Council, 1983), but a recent study in North Sulawesi found 6 pregnant sows killed by hunters to be carrying only 1-3 fetuses with a mean of only 2.17 fetuses per pregnancy (Budiarso *et al.*, 1991). The young are striped along the length of their bodies but lose these markings as they get older (Appelman, 1955; National Research Council, 1983; and pers. obs.).

### **Threats to Survival**

*S. celebensis* is evidently highly adaptable, and is thought to remain abundant through much of its former range, despite changing land use and hunting pressure. Apart from man, it has few if any important predators on Sulawesi and its offshore islands.

Whilst it is not, therefore, considered threatened over much of its range at the present time, wide scale deforestation for timber and conversion of land for agriculture, coupled with human population expansion and immigration, have resulted in a marked contraction of its range in some places. In addition, resources are insufficient to enforce controls on hunting, and there are reports that subsistence and/or organized commercial hunting is continuing even within designated reserves and national parks (Smiet, 1982; Blouch, 1990). In north Sulawesi, the Minahasa people consider wild pig meat to be superior to domestic pork, and are willing to pay 20% to 50% more for it. Reports obtained during brief surveys of three village markets in north-east Sulawesi, suggest that butchers in each market handled from 2 to 20 wild pigs per

week, buying them live from commercial hunters and slaughtering them when needed (Blouch, 1990). Budiarmo *et al.* (1991) recorded 2,317 pigs harvested in four regions of North Sulawesi during 12 months in 1990 and 1991. Although they found the fetal sex ratio to be approximately 1:1, the male to female ratio of 1:1.7 in harvested pigs suggests that the females are more susceptible to these commercial hunting operations, which may make heavily exploited populations especially vulnerable to extirpation.

The expansion of human settlements also brings an increased threat of genetic contamination and/or disease to the wild pig populations through the importation of 'improved' (ex-*S. scrofa*) domesticates, and the carriage of these animals from coastal communities to villages in the interior.

### **Conservation Measures Taken**

Sulawesi warty pigs are known or are likely to occur in all of the principal national parks, nature and game reserves on Sulawesi, including Lore Lindu (2,310 sq km), Dumoga-Bone (3,000 sq km), Morowali (2,250 sq km) and many other smaller sites. Within all of these areas the species is technically fully protected by law, though it is certainly still hunted in some of these areas (Setyodirwiryono, 1959).

There are few recent data on the distribution and numbers of *S. celebensis* on Sulawesi and neighboring islands. However, preliminary surveys conducted in 1991 in various locations north and south-west of Kendari and within the Lore-Lindu, Dumoga-Bone and Morowali National Parks, indicate that the species is still plentiful in these areas. However, the socio-economic importance of these animals to local people, as well details of their distribution and relative abundance in each of these areas and elsewhere in Sulawesi will require further study.

### **Captive Breeding**

The species has only very rarely been kept in captivity outside its country of origin; and, as far as is known, pure-bred animals have never been produced in captivity. Unfortunately, only the male of the pair acquired by the Singapore zoo about ten years ago appears to have been pure *S. celebensis*, and although these animals have produced several litters, various domestic traits (including piebald markings and curled tails) are evident in their progeny.

At present there seem to be no other individuals of this species held in zoological collections elsewhere, though wild-caught piglets are kept by villagers in Sulawesi. These animals are usually raised to slaughter weight and eaten or sold in local markets (Blouch, 1990). Longevity is not known in the wild population, but in captivity, animals have lived longer than 9 years.

### **Additional Remarks**

*S. celebensis* is somewhat variable in size and other characters, a circumstance, which led Groves (1981) to treat the species as monotypic, and to reject a number of previously recognized subspecies. However, Groves also drew attention to the existence of three skulls from Latimojong Mountains in South Sulawesi, which may

represent a distinct form. These skulls are of relatively small size for this region, i.e. there being evidence of a north (smallest) to south (largest) cline in body size on Sulawesi (which also extends to the offshore island populations - see also Groves and Grubb, this vol.).

Sulawesi and associated islands comprise the larger (southern) section of the Wallacean sub-region, which also includes the eastern Philippines. Sanborn (1952) included the wild pigs of the eastern Philippines with *S. celebensis*. This treatment was followed by various authors (e.g. Sinha, 1982; and Catibog-Sinha, 1985), but strongly refuted by Groves (1981) and Groves and Grubb (this vol.) who demonstrated that these animals were more closely related to the (Sundaic) *S. barbatus*. This view is followed here, though the close resemblance of at least some of the Philippine pigs (especially those from Luzon; to *S. celebensis* suggests that further investigation of their affinities is warranted.

### **Conservation Measures Proposed: An Action Plan**

*S. celebensis* is of particular interest in that it is the only pig species, apart from *S. scrofa*, which has been domesticated and quite widely transported by human agency outside its original range. The available evidence indicates that it is still maintained as a domesticate in some areas, but its commercial importance and future potential as a genetic resource are virtually unknown. Detailed studies of its ecology, behaviour, physiology and regional genetic variation have yet to be undertaken, and although its apparently large population size suggests it is not seriously threatened at present, the small amount of available data is mostly anecdotal. This lack of substantive data is presumably due to the relative remoteness of Sulawesi and its offshore islands, which have only recently become more accessible. The increasing interest in the renewable resources of this region should include studies of these animals, which have long been of great economic importance to the local people.

### **Objectives**

1. To promote field studies relevant to an enhanced understanding of the biology and future management of this poorly known species.
2. To conduct studies of its socio-economic significance amongst societies of different ethnic origin and its potential as a genetic resource for further domestication and development.
3. To investigate its regional genetic variation with particular reference to the identification (and, if necessary, the protection) of any possibly distinct forms, its affinities to other Asian warty pigs and the origins and relationships of surviving domestic and feral populations.

### **Priority Projects:**

1. Conduct status surveys in selected areas within its original known range.

Although detailed, island-wide surveys would be impractical and possibly unjustified on the basis of the present known status of this species, there is a need

to assess, or reassess, its conservation and taxonomic status in certain locations, such as the Latimojong Mountains and elsewhere in south Sulawesi, and on Selayar and other offshore islands where the species is known to have occurred. In north Sulawesi, the extent of market hunting and its effects on the wild populations needs to be determined with a view to ensuring that the species is managed on a sustained yield basis.

2. Conduct surveys in selected areas where the species is known or believed likely to have been introduced.

Efforts should be made to establish the present status, human utilisation and affinities of the various introduced wild (i.e. unmodified), feral or domestic *S. celebensis* populations in the Mollucas, Lesser Sunda Islands and the west Sumatran islands of Simeulue and Nias (Oliver and Brisbin, this vol.). These studies are of considerable anthropological interest, and can be expected to throw light on the origins and affinities of these animals (and hence also the people who introduced them), as well as the history and process of animal domestication. In addition, some of these pig population are likely to be of some potential genetic importance for the production of improved breeds, and efforts may need to be made to preserve some pure-bred stocks (e.g. from genetic contamination by hybridization with more modern domesticates of *S. scrofa* origin).

3. Promote studies of the biology of this species, with particular reference to its behaviour and ecology.

Very little is known about the natural history of *S. celebensis*, despite its evident importance as a basic economic resource to a number of island and village societies. No detailed studies of its behavioral ecology, diet, reproductive biology, parasites and diseases have ever been published. Such studies should also investigate hunting pressures and practices, and the relative densities of these animals in intact and degraded habitats, with a view to assessing the impact of logging and other sources of disturbance on their populations.

4. Promote the establishment of captive breeding programmes for this species.

Although this species is not considered threatened at the present time, captive breeding should be considered for several reasons: to stimulate local interest in the species and its anthropological significance; to facilitate an understanding of its biology; and to assist the development of management techniques which may be of value to the commercial husbandry of the species.

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## References

- Appelman, F. J. 1955. Über *Sus celebensis* Müller & Schlegel. Zoologischer Garten 21: 152-156.
- Bell, J. 1987. Nutrition and reproduction of Indonesian wild pigs. (Unpubl.) rep., Edinburgh University: 6 pp.
- Blouch, R. A. 1990. Report from the field: Indonesia. Smithsonian Instit. Conserv. and Res. Centre Newsletter 1: 6-8.
- Bosma, A. A., de Haan, N. A., Blouch, R. A. and Macdonald, A. A. 1991. Comparative cytogenetic studies in *Sus verrucosus*, *Sus celebensis* and *Sus scrofa vittatus* (Suidae, Mammalia). Genetica 83: 189-194.
- Budiarso, Wilar, A. F., Tulung, B., Kaligis, D. and Kaligis, W. A. A. 1991. The importance of Sulawesi wild pig (*Sus celebensis*) as a source of meat in North Sulawesi. (Unpubl.) rep, Universitas Sam Ratulangi and World Wide Fund for Nature Indonesia Programme: 19 pp.
- Catibog-Sinha, C. 1985. Depredation of wild pigs (*Sus celebensis* Sanborn) on shifting cultivation. Sylvatrop, Philippine Forest Research J. 10: 283-292.
- Groves, C. 1981. Ancestors for the Pigs: Taxonomy and Phylogeny of the genus *Sus*. Tech. Bull. No. 3, Australian National University Press, Canberra: 96 pp.
- Groves, C. 1983. Pigs east of the Wallace Line. J. Soc. Oceanistes 39: 105-119.
- Hardjasmita, H. S. 1987. Taxonomy and phylogeny of the Suidae (Mammalia) in Indonesia. Scripta Geologica 85: 1-68.
- Hooijer, D. A. 1950. Man and other mammals from Toalian sites in S. W. Celebes. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen (Natuurkunde) 46 (2): 1-162.
- Hooijer, D. A. 1969. Pleistocene vertebrates from Celebes, 8 *Sus celebensis* Muller & Schlegel, 1845. Beaufortia 16: 215-218.
- Macdonald, A. A., Kneepkens A. F. L. M. and Bosma, A. A. 1984. Anatomical studies on the female and male reproductive tracts of wild pigs. In: F. Spitz & D. Pepin (eds.), Proc. Symp. Int. sur le Sanglier, INRA; Paris (Les Colloques de l'INRA No. 22): 93-104.

- Macdonald, A. A. 1991. Monographe des Celebes-schweines (*Sus celebensis*). Bongo, Berlin 18: 39-45.
- MacKinnon, J. 1981. The distribution and status of wild pigs in Indonesia. (Unpubl.) rep. to IUCN/SSC Pigs and Peccaries Specialist Group: 9 pp.
- National Research Council 1983. Little-known Asian Animals with a Promising Economic Future. National Academy Press, Washington: 75-79.
- Oliver, W. L. R. 1984. Introduced and feral pigs. In: Feral Mammals - Problems and Potential. Proc. of the Workshop on Feral Mammals at the IIIrd Int. Theriol. Congr., Helsinki, 1982; I.U.C.N., Gland: 87-126.
- Sanborn, C. C. 1952. Philippine Zoological Expedition 1946-47. Fieldiana: Zoology 33: 89-158.
- Setyodiwiryono, K. 1959. Nature protection in Indonesia. Proc. 9th Pacific Science Congress 7: 18-20.
- Sinha, C. C. S. 1982. The quality and quantity of wild food plants and the depredation of wild pigs in the Philippines. Dissertation Abstracts International (B), 42 (a): 3513.
- Smiet, F. 1982. Threats to the spice islands. Oryx, 16: 323-328.
- Sody, H. J. V. 1941. Tweede bijdrage over de voortplantings tijden der Indische zoogdieren. De Nederlandsch-Indische Jager 11: 198-201 & 256-265.