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Naturally occurring suid hybrid in Java

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Abstract

A free-living hybrid between the Javan warty pig (*Sus v. verrucosus*) and the common wild boar (*S. scrofa vittatus*) was identified by physical characteristics including skull measurements. These species are sympatric on Java, and it is speculated that habitat reduction and the rarity of one parental species are environmental factors which result in localized hybridization.

Introduction

Twenty-five years ago very few genuine cases of hybridization between closely related sympatric species of mammals in the wild had ever been reported (MAYR 1963, p. 115), and at present such reports for species of larger mammals are still rare. Those encountered involve primates most frequently (BERNSTEIN 1966; ALDRICH-BLAKE 1968; STRUHSAKER 1970), but also include a well documented occurrence with canids (NOWAK 1979). Among the ungulates, BARTOS et al. (1981) mention that there is currently hybridization between sika deer (*Cervus nippon*) and red deer (*C. elaphus xanthopygus*) in natural contact in northwestern China. ROBERTS (1977) suggests that there may be natural hybridization between the straight horned markhor (*Capra falconeri jerdoni*) and the Persian pasang (*C. aegagrus*) in Pakistan, and an examination of specimens by one of us (CPG) leads him to concur with this assessment.

This paper describes the first recorded instance of natural hybridization between wild pig species, in this case the Javan warty pig (*Sus v. verrucosus* Müller, 1840) and the common wild boar (*S. scrofa vittatus* Boie, 1828). These species are naturally sympatric in Java, *verrucosus* being endemic at subspecific level to the island and *scrofa* reaching the southern limit of its range there. Possible environmental factors which could cause a breakdown of the isolating mechanisms separating these species are examined, and the effects which hybridization could have on the gene pool of the Javan warty pig are discussed.

Material and methods

During a 1982 survey of the remaining *S. verrucosus* populations in Java (BLOUCH 1988), all recently killed adult wild pigs encountered were examined for indications of hybridization. An animal was classified as a possible hybrid if it showed a mixture of *verrucosus* and *scrofa* characteristics for such parameters as presence or absence of warts in the male, pelage colouration, and shape of the male's lower canine as described by GROVES (1981). Among 31 recently killed specimens examined, one skull was provisionally identified as a hybrid. Its measurements were then compared with those of 19 adult male *S. s. vittatus* from Java and 27 adult male *S. v. verrucosus*. All material, including skulls collected during the survey, is housed in the collection of the Museum Zoologici Bogoriense, Bogor, Indonesia.

Results

The evidence for the hybrid was the head of an adult male killed by a hunter in November 1982 in East Java near the village of Sumber Jambe about 150 km southeast of Surabaya. The common wild boar does not have warts, but in the putative hybrid a full complement of three pairs was present. These were smaller than normal for *verrucosus*, the infraocular being barely distinguishable and the mandibular extending less than 3 cm above the skin.

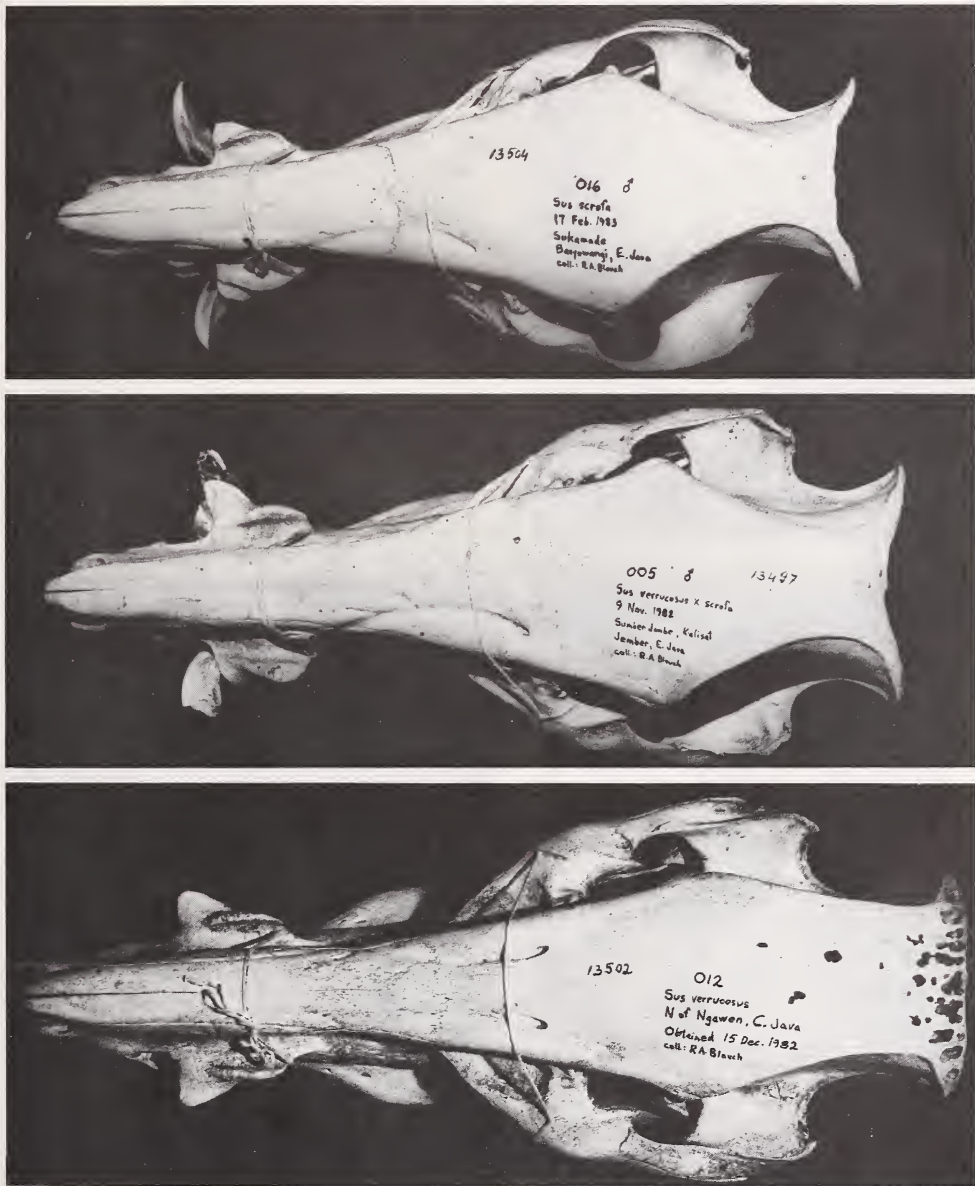


Fig. 1. Skulls of adult male pigs from Java, in lateral view. Above: *Sus scrofa vittatus*, MZB 016; centre: The putative hybrid, MZB 005; below: *Sus verrucosus verrucosus*, MZB 012

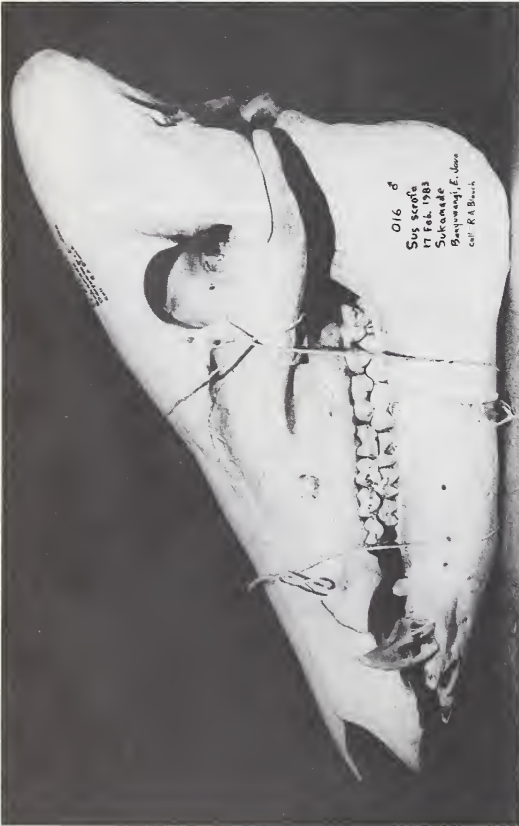
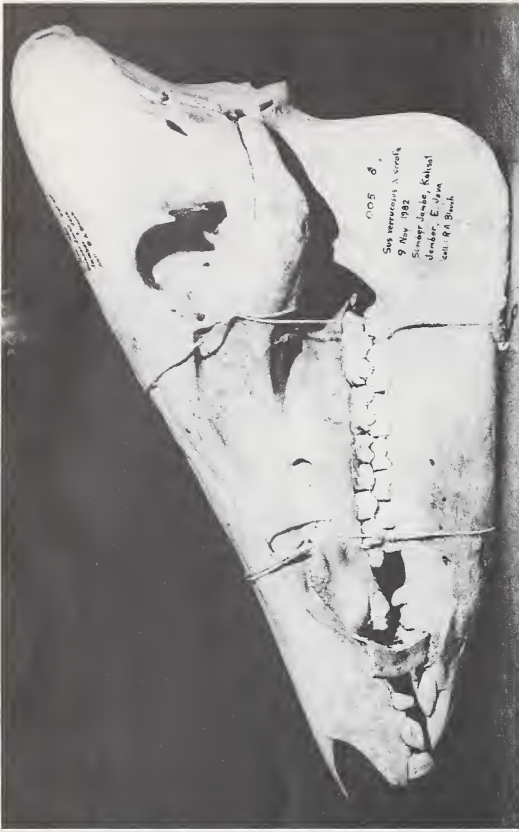


Fig. 2. Skulls of adult male pigs from Java, in dorsal view. Above left: *Sus scrofa vittatus*, MZB 016; right: The putative hybrid, MZB 005; below: *Sus verrucosus verrucosus*, MZB 012

The lower canines were typical of *scrofa*, having the posterior surfaces broader than the inferior surfaces. (Figs. 1, 2).

To test the skull's putative hybrid status further, a Discriminant Analysis was performed using seven measurements which were found by GROVES (1981) to discriminate well between the two pigs sympatric on Java (Table 1). The Direct method (SPSS-X,

Table 1. Skull measurements of *Sus scrofa vittatus*, *Sus verrucosus verrucosus* and the putative hybrid skull (in mm)

Ranges are for fully adult males only

	Hybrid	<i>S. s. vittatus</i>	<i>S. v. verrucosus</i>
1 Greatest Skull Length	380	290-380 (21)	363-445 (27)
2 Condylbasal Length	328	267-335 (21)	321-369 (24)
3 Bizygomatic Width	150	121-155 (22)	154-189 (27)
4 Occipital Breadth	92	55-80 (22)	80-100 (27)
5 Nasal Length	188	134-187 (22)	185-222 (24)
6 Palate Length	230	170-231 (21)	229-270 (27)
7 Diastema Length	8	0-6 (15)	5-12 (14)

Measurement technique:
 1 Tip of premaxillae to tips of occipital crest
 2 Tip of premaxillae to posterior border of occipital condyles
 3 Greatest span across zygomatic arches
 5 Free ends of nasals to most posterior point on naso-frontal suture
 4 Greatest width across occipital crest
 6 Tip of premaxillae to most posterior point on margin of hard palate (lateral to choanal opening)
 7 Length from posterior point on maxillary canine alveolus to most anterior point on anterior premolar alveolus

Discriminant program) was used, rather than Mahalanobis or Rao, as in this method the variables are not selected by rank according to their discriminating power, which tends, in a case such as this, to result in absolute size being the main discriminating factor. To reduce still further the chance of size being the main discriminant, two immature skulls of the larger-sized species, *Sus verrucosus*, were included in the sample for that species; and a few skulls of *Sus scrofa* from Sumatra, including unusually large specimens, were added to the *scrofa* sample which was otherwise composed of Java skulls. In the end, the following sample sizes were used: *Sus scrofa vittatus*, 14; *Sus verrucosus verrucosus*, 16.

The standardized Canonical Discriminant Function Coefficients were strongly positive for Palate Length, Bizygomatic Width, Diastema Length, and Nasal Length (in descending order), strongly negative for Condylbasal Length and fairly strongly negative for Occipital Breadth, and almost zero for Greatest Length. Thus, skulls scoring positively on the Discriminant Function would be those with long palate, diastema and nasals, and broad zygomata, compared to their size and occipital widths; those scoring negatively, the opposite. In the event (Fig. 3) all the *verrucosus* skulls except one scored positively; all the *scrofa* skulls, negatively. The single *verrucosus* skull scoring (just) on the negative side was not an unusually small sized one; a single *scrofa* skull, again not unusual as far as size was concerned, fell almost at zero. The putative hybrid fell exactly on the section point between the two species, with the same score as these two extreme individuals. We consider that this result strongly supports the hybrid status we have proposed for it.

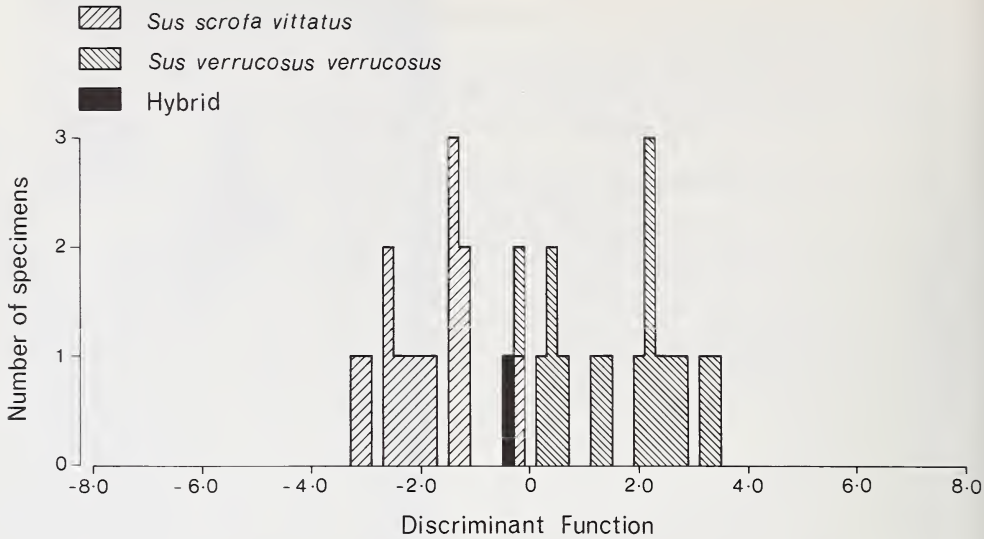


Fig. 3. Plot of Discriminant Function scores, showing intermediate status of the putative hybrid

Discussion

These results indicate that currently in East Java there is evidence of hybridization between free-living individuals of *scrofa* and *verrucosus*. Its frequency cannot be estimated from the single putative hybrid collected, but unconfirmed reports of hybrid wild pigs from two other locations in the province suggest this is more than an isolated instance. In the provinces of Central Java and West Java no evidence of hybridization has yet been found. This situation resembles "localized sympatric hybridization" as defined by WOODRUFF (1973), wherein highly localized hybridization occurs between two widely sympatric populations, often in association with habitat alteration and the breakdown of premating isolating mechanisms.

The habitat preferences of the two species differ, although they are by no means completely segregated in the wild (BLOUCH 1988). The Javan warty pig is found below about 800 m altitude and prefers extensive areas of secondary vegetation and grassland interspersed with clumps of forest; the common wild boar occurs at all altitudes in Java and inhabits dense forests as well as secondary vegetation. It seems that *scrofa* has a wider ecological amplitude than *verrucosus* and is generally better able to coexist with humans.

The putative hybrid from Sumber Jambe originated from about 650 m altitude on the western flank of Mt. Raung (3322 m). Here the distribution of the local *verrucosus* population is confined to a relatively narrow band around the sides of the volcano complex, delineated above by the altitudinal limit of the species and below by agricultural land with a moderate human population. In addition to occurring both above and below the elevations occupied by the Mt. Raung *verrucosus* population, *scrofa* also outnumbers the Javan warty even within their limited range (BLOUCH 1988).

MAYR (1963) mentioned the rarity of one parental species as an important factor contributing to the breakdown of isolating mechanisms. Individuals that occur beyond the solid range of their species often have difficulty in finding a conspecific mate and are apt to respond to individuals belonging to a different species. Such a situation appears to exist on Mt. Raung. Here, as natural vegetation was converted to agriculture on the lower slopes,

the *verrucosus* population was reduced and confined to a shrinking area at the upper edge of its altitudinal range. Under these conditions individual Javan warty pigs, particularly dispersing males, could easily become isolated from their conspecifics and, in the absence of their preferred mates, could breed with the available *scrofa*. Since *verrucosus* is the larger species, *scrofa* males would be unlikely to be able to prevent it.

In captivity, production of fertile offspring has been reported from interbreeding between *S. scrofa* and *S. barbatus*, a species closely related to *verrucosus* (MOHR 1960). Thus there is the possibility that introgressive hybridization between the two Javan wild pigs could occur, resulting in creation of a hybrid swarm. The extreme example of this is seen with the red wolf (*Canis rufus*) and the coyote (*C. latrans*) in North America where interbreeding was an important factor in the eventual disappearance from the wild of the red wolf (NOWAK 1979). Although there is currently no evidence that hybridization is approaching levels which would threaten the *verrucosus* gene complex, a species having such a restricted range is especially vulnerable, and future monitoring of the situation is advisable.

Zusammenfassung

Natürliches Vorkommen von Suiden-Hybriden auf Java

Eine Hybride zwischen *Sus v. verrucosus* und *Sus scrofa vittatus* aus freier Wildbahn auf Java wurde über körperliche Merkmale und Schädelmaße identifiziert. Beide Arten kommen dort sympatrisch vor. Es wird angenommen, daß Habitatverminderung und die Seltenheit einer der Elternarten Umweltfaktoren darstellen, die zu Artbastardierungen führen könnten.

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