

The Sabah Rhino Breeding Programme: reproductive pathology and its clinical implications in wild-caught Sumatran rhinoceroses

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The Sumatran rhinoceros (*Dicerorhinus sumatrensis*) is on the verge of extinction. Intensive hunting and habitat loss contributed to a precipitous decline in its numbers during the first half of the 20th century. In 1984 it was agreed that in addition to the protection of wild individuals, it was time to establish a captive breeding programme. By 2014, 39 of the original 40 wild-caught animals were dead, and a species that was once found throughout Southeast Asia was reduced to less than 100 individuals scattered mainly in three national parks in Sumatra. In the last decade poaching and habitat loss were no longer the main threats to the Sumatran rhinoceros. It is clear that very low densities of a slow-breeding solitary species like the Sumatran rhinoceros drastically decrease the possibility of finding a reproductively active partner in the short frame of sexual receptivity (one day of oestrus in a 21 to 27-day cycle), leading to long non-reproductive periods. As described for other rhinoceros species, the organs of non-breeding females are exposed to sex steroids for prolonged periods of time due to continuous ovarian cycle activity, which results in the development of reproductive pathology, depletion of the follicular stock and premature senescence. Several reports of reproductive pathology in Sumatran rhinoceros suggest that at least 50 % of wild-caught females were affected by this phenomenon known as “asymmetric reproductive aging”, with variable consequences to their fertility. Since 2009 the Leibniz Institute for Zoo and Wildlife Research (IZW) has been collaborating with the Borneo Rhino Alliance (BORA) through the use of advanced imaging and assisted reproduction techniques on the 1.3 Bornean rhinoceroses (*Dicerorhinus sumatrensis harrissoni*) held at the Borneo Rhino Sanctuary, in Sabah. When captured from the wild, both cycling females showed severe reproductive pathology that rendered them incapable of carrying a pregnancy, namely extensive cystic endometrial hyperplasia and a large number of uterine leiomyomas. Four different techniques were used for the removal of endometrial cysts: uterine lavage with cell medium M199 and povidone-iodine solution, endoscopic assisted photoablation and ultrasound-guided aspiration. These procedures proved to be of limited success. Consequently artificial insemination was attempted only once and no fertilisation occurred. As natural conception was excluded, the focus of the programme turned to *in vitro* fertilisation as a last resource for reproduction.