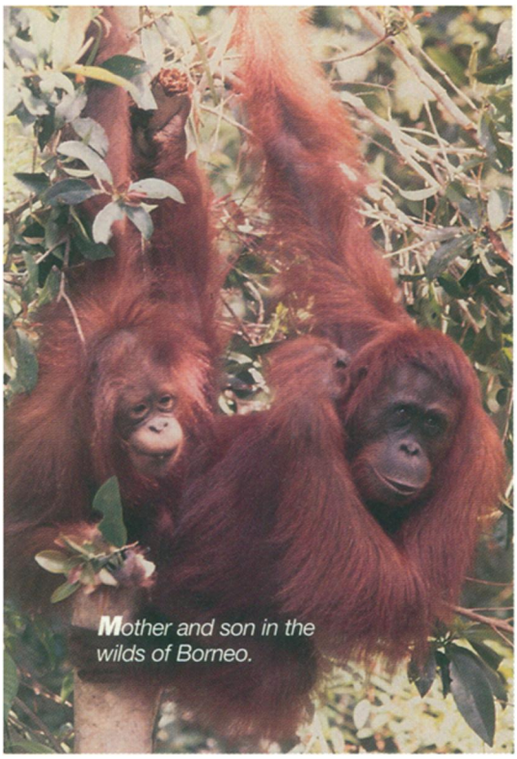

Mother and son in the wilds of Borneo.

Anne Russon/York Univ.

Caste-Off Orangs

Controversy surrounds implications of a hybrid label

By JANET RALOFF

At the tender age of 9 months, Chantek left his mother in Atlanta to live in a trailer next to the music building on the University of Tennessee campus in Chattanooga. There, his surrogate family toilet trained the inquisitive, red-haired youngster and taught him language, how to clean his bedroom, and the deportment necessary to ride in cars, visit parks, and eat burgers at the local fast-food chain. Eventually, this quiet, strapping boy even received an allowance — one he could bank or spend at his discretion on treats.

In many ways, Chantek lived much of his first 9 years like any ordinary child in the United States. But Chantek is an orangutan, and his every action and reaction has been recorded and studied as part of an ongoing examination of how these quiet, slow-moving — some would say highly intellectual — apes think and behave.

Acculturation to human society did not prevent Chantek from slipping back into the traditional world of captive orangutans when he returned home to the Yerkes Primate Research Center in 1986. Indeed, he fathered a child 3 years later.

But this healthy, 18-year-old representative of an endangered species will never sire again — at least if internationally recognized primate conservation policies prevail.

The reason? Chantek's mother hailed from Borneo, his father from Sumatra. That makes Chantek a biological hybrid as well as a cultural one.

The American Association of Zoological Parks and Aquariums (AZA) adopted a policy 10 years ago to stop interbreeding Sumatran and Bornean orangutans — and to prevent any of AZA's hybrid offspring (now numbering 51) from reproducing. The organization's 55 member zoos and primate conservation centers with orangutans all adopted the policy, though some "accidental" births did occur through 1991, observes Lori A. Perkins, a conservation biologist at Zoo Atlanta who coordinates AZA's species survival plan for orangutans.

Four other international umbrella organizations that oversee endangered species management also subscribe to this policy, which now affects the reproduction — and status — of 192 hybrid orangutans worldwide.

Biologists avoid crossbreeding captives because zoo animals are intended to represent their wild brethren. Hybrids "don't have any biological meaning," observes Zoo Atlanta director Terry Maple, himself an orangutan researcher. "[They're] a man-made creation."

In fact, he says, "nobody wants them — isn't that a pretty darn good reason not to produce any more?"

Sensitive to their plight, Maple hopes to make his institution a stimulating refuge for hybrids, including Yerkes' Chantek, who could arrive within a year.

A few scientists, however, are challenging AZA's policy and interpretations of the science underpinning it. Some aired their views in Atlanta last month at the American Association for the Advancement of Science (AAAS) annual meeting.

At issue, they argue, is not only the fate of these unwanted hybrids in decades to come — Chantek, for instance, could live another 40 years — but also whether a moratorium on their breeding might jeopardize efforts to preserve the genetic health of future populations of purebred captive orangutans.

Others worry that AZA's moratorium doesn't go far enough. Even zoos that adhere to AZA's policy, they point out, might unwittingly be propagating hybrids by mating unrecognized subspecies.

Orangutans (*Pongo pygmaeus*) once ranged throughout Southeast Asia and well into China. Today, some 15,000 or so live in the imperiled rain forests of Sumatra and Borneo — and nowhere else outside captivity.

Throughout most of the 300-plus years that Westerners have captured and studied these primates, all orangutans were treated as one species. Though Borneo's males tended to develop broader cheek pads and, often, darker hair than Sumatra's, such physical differences weren't unimpeachable indicators of origin. So zoo managers sometimes accidentally interbred animals from the two islands.

Then geneticists got involved.

Perkins pegs 1976 as the watershed. That's when Brazilian researcher Hector N. Seuanez of the Federal University of Rio de Janeiro and his coworkers published data demonstrating a clear difference between Sumatran and Bornean orangutans — an inversion, or consistent rearrangement of genetic material, in a region of chromosome 2. Perkins says Seuanez interpreted the inversion as suggesting that orangutans on the two islands represent distinct subspecies "that had evolved over at least 1,000 generations of separation."

Soon, a debate erupted among orangutan conservators. One side advocated calling a halt to interbreeding. The other

Miles

A biological and cultural crossbreed, Chantek possesses a vocabulary of more than 150 terms in sign language. He also can tie knots and link as many as 22 discrete, tool-using operations into an integrated task. Many of his behavioral traits — including self-awareness and deception — resemble those typical of 2- to 3-year-old humans, observes University of Tennessee primatologist H. Lyn Miles, who directs Project Chantek.


Zoo Atlanta/Joe Sebo


Russon

Physical differences between a Sumatran (left) and Bornean (right) tend to show up in the shape of adult males' cheek pads, facial hair, and coloring.

side decried this suggestion as racist, arguing instead that the animals constitute a single breed, recalls geneticist Oliver A. Ryder of the Zoological Society of San Diego.

Hoping to resolve the dispute with data, a committee overseeing AZA's species survival plan for orangutans asked Ryder to look at the chromosomes of all these animals in AZA member institutions.

The survey, completed in 1985, showed that orangutans born in the wild carry the same inversion on both copies of chromosome 2 — an SS pair in Sumatrans, a BB pair in Borneans. Hybrids with wild-born parents carry one of each, or SB.

While these inversion patterns provided a marker for wild-born orangutans' island of origin, they couldn't establish how genetically divergent the two groups are. Are the differences equivalent to races in humans? Do they signal subspecies as dissimilar — and therefore as unnatural for mating — as Sumatran and Siberian tigers? Or do they represent distinct species, such as the chimpanzee and bonobo (pygmy chimpanzee)?

In 1990, researchers at the National Cancer Institute in Frederick, Md., helped pinpoint the answer, Perkins says. A study led by Stephen J. O'Brien and Dianne N. Janczewski compared several hundred proteins — reflecting several hundred genes — from Sumatran and Bornean orangutans.

It showed that genetic differences between the two kinds of orangutans were 5 to 10 times greater than the differences between the tiger subspecies.

Ryder followed up on these data 2 years ago with a report on his chromosome 2 typing for 144 captive orangutans — including 58 born in the wild. He also analyzed variations in the mitochondrial DNA of 14 of the orangutans, including six each from Borneo and Sumatra.

Mitochondrial DNA is located outside a cell's nucleus and is inherited only from the mother. In addition, it mutates more frequently than nuclear DNA. For this reason, anthropologists use mutation patterns in mitochondrial DNA to construct evolutionary trees of relationships within and between species.

Together, the two forms of genetic information established that the chromosome 2 inversion distinguishes two taxonomically distinct lines, Ryder says. And the roughly 3 percent variation between Sumatran and Bornean DNA sequences suggests that gene flow between the two islands ended approximately 1.5 million years ago, Ryder and Leona G. Chemnick conclude in the September-October 1993 JOURNAL OF HEREDITY.

Last year, O'Brien and NCI colleague Lu Zhi reported similar findings from their newest orangutan studies — also involving mitochondrial DNA. Their data suggested that "the extent of difference between Bornean and Sumatran populations was consistent with species-level divergence."

Case closed? Not necessarily, according to data unveiled at the AAAS meeting by C. Cam Muir of Simon Fraser University in Vancouver, British Columbia. Muir finds no compelling difference between the mitochondrial DNA of wild Bornean and captive Sumatran orangutans.

When he plotted the animals' genetic trees, Muir found that, rather than occupying different branches, the orangutans shared various limbs, depending on which sequence of genetic material he analyzed.

In contrast to earlier studies, Muir told SCIENCE NEWS, his relies on differences obtained by actually sequencing genes, as opposed to differences inferred from variations in the proteins that genes code for and other indirect data. So presumably, he says, his data may prove a bit better at distinguishing changes.

Overall, he believes, "use of the term 'hybrid' is improper because these are not two species."

That interpretation could change, he concedes, once he has expanded his analysis to include more genes — including some from the nucleus — and several hundred more wild orangutans.

But even if Sumatran and Bornean orangutans constitute separate species or subspecies, Muir fears that a ban on crossing them in captivity may dangerously restrict the gene pool, potentially making the animals less fit and more prone to extinction.

For populations numbering in the thousands, he says, "there is an advantage to keeping distinct populations separate, because in mixing them you could lose some critical genetic diversity." However, "the opposite is true once you get below a threshold number and don't have a full representation of genetic types." Muir worries that maintaining captive Sumatrans and Borneans separately risks falling below that threshold.

Anthropologist Colin P. Groves of Australian National University in Canberra worries about a related problem. In analyzing orangutan skulls, he has found bigger differences between those from Borneo's three geographically isolated groups than between any of those populations and the orangutans in Sumatra.

Groves not only agrees that Borneans and Sumatrans are distinct subspecies and should not be interbred, he also says that "eventually, we'll be proposing that these [Bornean populations] be formally recognized as subspecies."

The Bornean skull differences he has observed are not visible in living animals. So unless someone finds a genetic marker, he argues, the ongoing repatriation to the wild of recently captured orangutans (usually from the illegal pet trade) should be halted or altered. Otherwise, well-intentioned game managers may hybridize animals in the wild.

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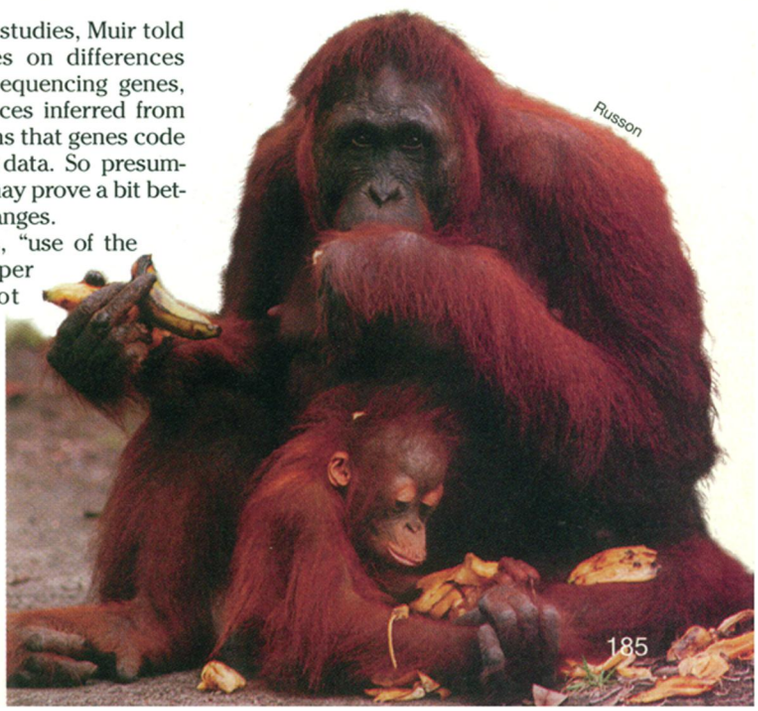
Russon

Unyuk and her year-old son, Udik, take a lunch break at home in central Indonesian Borneo.

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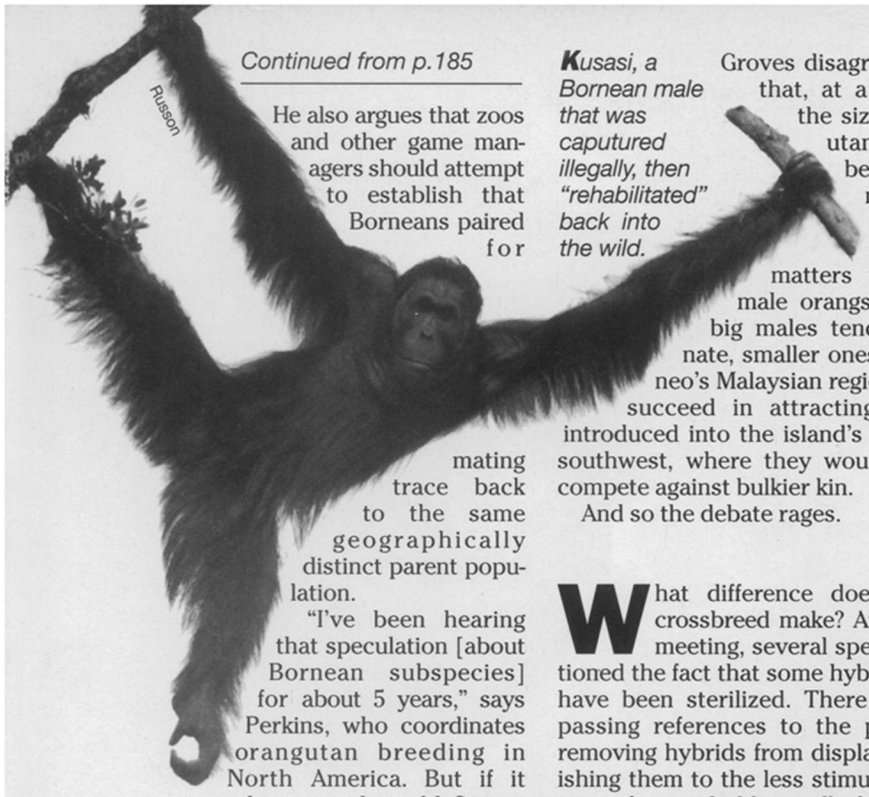

Kusasi, a Bornean male that was caputured illegally, then "rehabilitated" back into the wild.

He also argues that zoos and other game managers should attempt to establish that Borneans paired for mating trace back to the same geographically distinct parent population.

"I've been hearing that speculation [about Bornean subspecies] for about 5 years," says Perkins, who coordinates orangutan breeding in North America. But if it turns out to be true, she told SCIENCE NEWS, "I don't know what I would do with the information."

Only 82 Bornean orangutans are managed under the AZA program, Perkins notes. Even if roughly equal numbers came from each of the three populations, "I don't know that it would be smart to subspeciate them," she says. The number in each group might become too small to ensure a healthy degree of genetic diversity.

Moreover, "I'd have no basis on which to separate them," she points out, because records of where orangutans were captured are spotty at best. "So our only options now are to just breed them as Borneans or to not breed any Borneans — which would send the [captive] population into a crash from which it probably would not recover."

But veterinarian William B. Karesh of the Wildlife Conservation Society, which operates the Bronx Zoo in New York, suspects that Perkins has no reason to worry. He says unpublished genetic data from a study of 50 wild-born orangutans in Asia on which he and O'Brien's team are collaborating suggest that Borneo's various populations may have been geographically isolated for a long time — at least 250,000 years. And while they do appear to be dividing into subspecies, Karesh says, "they don't yet qualify, really, as subspecies."

In practical terms, he says, when reintroducing a Bornean captive to the wild, "if you knew where the animal came from, it would be nice to return it to that gene pool. But if you don't, we're not really disturbing nature that much." For zoo animals, which will never return to the wild, the issue becomes even less important, he suspects.

Groves disagrees, noting that, at a minimum, the size of orangutans varies between Borneo's populations — and "size matters with adult male orangs." Because big males tend to dominate, smaller ones from Borneo's Malaysian region may not succeed in attracting mates if introduced into the island's Indonesian southwest, where they would have to compete against bulkier kin.

And so the debate rages.

What difference does being a crossbreed make? At the AAAS meeting, several speakers mentioned the fact that some hybrid animals have been sterilized. There were also passing references to the practice of removing hybrids from display and banishing them to the less stimulating environs of a zoo holding cell after the AZA policy went into effect.

Such charges spark Perkins' ire. "We do not stick hybrids in the back of zoos," she maintains. "They stay in the social groups they've been in and engage in a complete range of behaviors — even copulation." You could call every AZA institution in the orangutan program "and they would tell you they don't keep [hybrids] any differently." And, she adds emphatically, "as long as I'm the [species survival plan] coordinator, they will not."

Perkins concedes that some males have received a vasectomy, which may not prove reversible. But most institutions now rely on timed-release hormone implants to prevent sexually active hybrid females from conceiving. Remove that implant, she notes, "and the females are fertile again."

Even if one subscribes to not mongrelizing purebred populations, hybrids needn't remain childless. Groves suggests sending fertile hybrids to major, responsible zoos that could not otherwise afford orangutans, such as several in India.

Ethel Tobach of the American Museum of Natural History has another idea. Many uninhabited Southeast Asian islands are ecologically similar to Borneo and Sumatra. "It would be great to put hybrids on such an island and study them there."

Groves agrees that "if you reintroduce them way outside their known modern range — such as in the Malay Peninsula — you can do what you like because there would be no population to disrupt."

But Maple argues that "the only reason we've been interbreeding [orangutans] is out of ignorance. If nature isn't making Sumatran-Bornean crosses," heargues, "why should we?" □