

= Japanese serow =

The Japanese serow (*Capricornis crispus*) is a Japanese goat @-@ antelope , an even @-@ toed ungulate mammal . It is found in dense woodland in Japan , primarily in northern and central Honshu . The animal is seen as a national symbol of Japan and is subject to protection in conservation areas .

Adult Japanese serow stand about 81 centimetres (32 in) tall and weigh 30 ? 45 kilograms (66 ? 99 lb) . They are black to whitish , and colouring lightens in summer . The fur is very bushy , especially the tail . Both sexes have short , backwards @-@ curving horns and are difficult to distinguish by sight . Japanese serow are found in dense mountain forests where they eat leaves , shoots , and acorns . They are diurnal and feed in early mornings and late afternoons . Serows are solitary , or gather in couples or small family groups . The animal marks its territory with sweet @-@ and @-@ sour @-@ smelling preorbital gland secretions , and males and females have separate territories that may overlap .

In the mid @-@ 20th century the Japanese serow was hunted to near @-@ extinction . In 1955 the Japanese government passed a law designating it a " Special National Monument " to protect it from poachers . Populations have since grown so greatly that IUCN Red List of Threatened Animals ranks it " least concern " . Complaints from foresters and farmers led in 1979 to the 1955 law 's repeal . Since then the serow has had protected status in 13 designated protected areas over 23 prefectures , and has been subject to culling as a pest outside conservation areas . Conservationists have labelled it a " living national treasure of the forest " . Athletes with superior agility and speed draw comparisons with the serow , and the Yamaha Motor Company has marketed the XT 225 enduro motorcycle as the Yamaha Serow .

= = Taxonomy = =

Coenraad Jacob Temminck first described the Japanese serow in 1836 , and named it *Antelope crispa* . John Edward Gray gave it its current name in 1846 . Pierre Marie Heude proposed many new genera and species in a system published in 1898 ; *Capricornis* became *Capricornulus* , which included *crispus* , *pryerianus* , and *saxicola* . The system did not find acceptance .

There is no fossil record of the Japanese serow ; its evolutionary history and the closeness of its relation to the Taiwan serow (*Capricornis swinhoei*) are speculative Its taxonomic position has led to its being called a " living fossil " . Karyotype studies indicate it was the earliest species to split from the common *Capricornis* ancestor . The closest relative to the Japanese Serow is the Taiwan serow (*Capricornis swinhoei*) . Genetically , there is little difference between Japanese and Taiwan serows ; their karyotype is essentially the same : $2n = 50$, $FN = 60$. The Taiwan serow is smaller and shorter @-@ haired , with browner fur and a white patch under the chin and throat .

Phylogenetically *Capricornis* is closer to goats and sheep than cattle . The nomenclature and status of *Capricornis* taxa are not completely resolved . Some researchers have considered *Capricornis* a junior synonym of *Naemorhedus* , a classification that includes gorals ; molecular analysis has not supported this classification . *Capricornis* has a lower canine , which *Naemorhedus* species usually do not .

In Japan , the serow is widely thought of as a kind of deer , though deer and serows are not even of the same infraclass . In the past , the Japanese word *kamoshika* was written using the Chinese character for *shika* , meaning " deer " . Today , when written using Chinese characters , the characters for " antelope " and " sheep " are used . Sometimes the serow is mistaken for a wild boar .

= = Appearance and anatomy = =

The Japanese serow is a small bovid whose displayed morphology is primitive in relation to other bovids . It has a stocky body whose size varies little between sexes or geographic location ; it stands about 70 ? 85 centimetres (28 ? 33 in) tall (70 ? 75 centimetres (28 ? 30 in) at the shoulder) and

weighs 30 ? 45 kilograms (66 ? 99 lb) . The hoof is cloven . Compared to mainland serow , the ears are shorter and the coat is typically longer and woollier ? about 10 centimetres (3 @. @ 9 in) on the body . It has a bushy tail of 6 ? 6 @. @ 5 centimetres (2 @. @ 4 ? 2 @. @ 6 in) and no mane .

Its fur is whitish around the neck and on the body may be black , black with dorsal white spot , dark brown , or whitish ; the coat lightens in summer . There are three well @-@ developed skin glands : large preorbital glands in both sexes , which increase in size as the animal ages ; poorly developed interdigital glands in all four legs , and preputial glands . The adult 's 32 permanent teeth form by 30 months , and have a dental formula of 0 @. @ 0 @. @ 3 @. @ 33 @. @ 1 @. @ 3 @. @ 3 . The inner sides of the teeth become blackened with a hard @-@ to @-@ remove substance , likely tree resin . The tongue has a V @-@ shaped apex .

Differentiation between the sexes is not well developed ; body size , growth , survival , and feeding habits show negligible difference . Both sexes have short , backwards @-@ curving horns measuring 12 ? 16 centimetres (4 @. @ 7 ? 6 @. @ 3 in) ; the sheaths have a series of transverse rings . Horns begin to develop at about four months and continue to grow throughout the lifespan .

Environment affects the size of the first growth ring . Size , curvature , and thickness and number of transverse rings are indicative of age . Up to two years , there are thicker transverse rings , of greater length and flexion than in adults . Into adulthood , thinner horn rings force the thick transverse rings upward . Growth increment slows earlier in maturation in females than in males . Researchers use genitalia and sexual behaviour to distinguish the sexes . Females have two pairs of mammae .

Hearing is sensitive and eyesight is strong ? the serow is able to detect and react to movement from a distance , and it can see well in low lighting . Sense of smell is also strong , and the serow can be observed raising its head and sniffing the air around it .

= = Distribution , ecology , and behaviour = =

Capricornis crispus is the only wild bovine ruminant in Japan , and is endemic to three of the four main islands of Japan : primarily northern and central Honshu , and small areas in Shikoku and Kyushu . It can tolerate colder , snowier climates than mainland serows . The animal is found solitary , in pairs , or in small family groups in open grassland and forests at an elevation of about 1 @, @ 000 metres (3 @, @ 300 ft) , and uses caves to rest in . It prefers temperate deciduous forest , but also lives in broad @-@ leaved or subalpine coniferous forest made up of Japanese beech , Japanese oak , alpine meadow , and coniferous plantations . Population density is low , at an average of 2 @. @ 6 per square kilometre (6 @. @ 7 / sq mi) , and no greater than 20 per square kilometre (52 / sq mi) .

C. crispus is philopatric and territorial , and marks trees with sweet @-@ sour @-@ smelling preorbital gland secretions to indicate its territory . Males and females establish separate , overlapping ranges , typically 10 ? 15 hectares (25 ? 37 acres) , the male 's typically larger than the female 's . Aggression is rare , but the serow may react with hostility to territorial breaches . The animal has few predators , as Japanese wolves have become extinct ; bears may prey on the serow . It flees with a whistling snort when it detects danger . It is an agile , sure @-@ footed mountain dweller that is able to sprint up mountains and to jump from cliff to cliff to safety , an agility hunters have likened to the ninja .

The diurnal Japanese serow is a browser that feeds in early morning and late afternoon , primarily on fleshy or coniferous leaves , plant shoots , and acorns . It feeds on alder , sedge , Japanese witch @-@ hazel (*Hamamelis Japonica*) , and Japanese cedar . It adjusts its diet to what food is locally available , and as a ruminant , the serow has a four @-@ chambered stomach . Studies indicate that even severe winters have negligible impact on the serow 's food intake , suggesting that , given its solitary social structure , it selects its territory to ensure sufficient food supply . Defecation occurs in set locations .

Life expectancies may be up to 20 ? 25 years . Parapoxvirus is common , though rarely fatal ; Infection causes papular and nodular lesions . There have been epidemics of contagious pustular

dermatitis . Bacteria such as *E. coli* and Lyme borreliosis are common , and *Toxoplasma gondii* has been reported . *C. crispus* is susceptible to numerous parasites , such as the nematode *Trichuris discolor* and the lungworm *Protostrongylus shiozawai* .

== = Reproduction == =

Capricornis crispus is socially monogamous . Females reach sexual maturity at 30 months . First breeding takes place at age 2 @. @ 5 ? 3 years ; breeding occurs once a year , between September and January . In a courtship ritual resembling that of goats or gazelles , the male Japanese serow licks the female 's mouth , strikes her on the hind legs with his forelegs , and rubs her genitalia with his horns . Both sexes display Flehmen responses .

Birth takes place between June and August after a gestation period of about 210 ? 220 days . It takes about half an hour , as the female walks about . The single fawn is 30 centimetres (1 ft) tall and reaches adult height in a year . The fawn stays with its mother for a year or two . It then moves gradually from its mother 's range until it establishes its own . Young that do not disperse on their own may be chased away by the mother .

'' *C. crispus* '' in its natural habitat

== Relationship with humans ==

The earliest record of human contact with the serow is of a small number of prehistoric J?mon period bones unearthed by archaeologists , primarily in mountainous regions . It is speculated the serow was hunted for its hide and for food . What is believed to be the earliest written record appears in the *Nihon Shoki* (720) : the Emperor Tenmu (r . 672 ? 686) sent the hides of a yamashishi to senior statesmen ; this yamashishi likely refers to the serow , and recurs elsewhere in the *Nihon Shoki* .

The 8th @-@ century Man 'y?sh? contains a waka poem by Kakinomoto no Hitomaro that mentions a group of shishi ; a number of writers have concluded this animal is the serow , but others have pointed out the serow is normally solitary . Heian period (794 ? 1185) documents record gifts of serow horns brought to the capital . Japan 's earliest extant medical work , the *Daid?ruijuh?* (808) , appears to record the use of serow horn and flesh for medicinal purposes .

For centuries following the Heian period mention of the serow becomes scarce . There is some belief that it was still hunted for medicinal use . The Edo period (1603 ? 1868) saw records increase . The *Wakan Sansai Zue* encyclopaedia of 1712 contains an illustrated entry on the serow . Laws prohibiting hunting came into effect , but exception were made where animals damaged crops . Following the Meiji Restoration in 1868 , realistic depictions appeared of the serow , beginning with one in Keisuke Ito 's *Fauna Japonica* (1870) .

== = Hunting and conservation == =

The serow has long been hunted in Japan , especially in northern Japan where , along with bear @-@ hunting , serow @-@ hunting was strongly associated with matagi culture . Throughout Japan 's mountainous regions the serow has been a valued catch , its various body parts used without waste . Prized in particular its meat ? until the mid @-@ 20th century serow meat was so widely eaten in these regions the animal itself was known as " meat " . Its waterproof hides were used for rafters ' backflaps , its horns were ground as a preventative against diseases such as beriberi , and a cure for stomachaches was made from the serow 's small intestines and gall bladder .

An animal that once inhabited deep forests far from populated areas , the Japanese serow has increasingly penetrated the outskirts of villages . In western Honsh? , it had become extinct by the 20th century . Elsewhere it had been hunted to such a severe degree that the Japanese government declared it a " Non @-@ Game Species " in a 1925 hunting law . In 1934 the Law for Protection of Cultural Properties designated it a " Natural Monument Species " .

Poaching continued , so in 1955 the government declared the Japanese serow a " Special Natural

Monument " , at which point overhunting had brought its numbers to 2000 ? 3000 . Populations grew as the police put an end to poaching , and post @-@ War monoculture conifer plantations created favourable environments for the animal . By the 1980s , population estimates had grown to up to 100 @,@ 000 and serow range had reached 40 @,@ 000 square kilometres (15 @,@ 000 sq mi) . Between 1978 and 2003 , its distribution increased 170 % , and population had stabilized .

Conflicts with agriculture and forestry led to a 1978 repeal of the full protection the animal received under the 1955 designation . Thenceforth 13 designated protection areas were established over 23 prefectures . They cover about 20 % of the serow range , have a total area of 11 @,@ 800 square kilometres (4 @,@ 600 sq mi) , and range in size from 143 square kilometres (55 sq mi) to 2 @,@ 180 square kilometres (840 sq mi) . Culling removed 20 @,@ 000 outside of conservation areas between 1978 and 2005 .

The IUCN Red List of Threatened Animals ranked the Japanese serow as " Least Concern " in 2008 , as it has wide distribution in Japan , and a large , stable or increasing population . The Law for Protection of Cultural Properties and Wildlife Protection and Hunting Law provide for the legal management of the Japanese serow . In 1979 the Agency for Cultural Affairs , Environmental Agency , and Forestry Agency reached an agreement on serow management measures , such as the establishment of protection areas and culling as pest control . The measures met with resistance from conservationists , naturalist organizations , and some biologists , as the animal had previously been fully protected . A 1999 amendment to the Wildlife Protection and Hunting Law allowed prefectures to manage wildlife populations ; by 2007 seven plans had been established for serow management outside of conservation areas .

Foresters have raised concerns that the rising serow populations have interfered with post @-@ War mountainside reforestation efforts , as the animal feeds on the saplings of Japanese cypress , Japanese cedar , and Japanese red pine , species with commercial significance . Serow have caused damage to farm crops in mountain villages , and the villagers have objected to conservationists ' efforts . Damage by serows to forests has been characterized in parts of Japan in criminal or martial terms : the media have referred to the problems as ningen to shika no sens? (" the war between humans and deer ") and kamoshika sens? , (" serow war ") .

Frustration with government and conservationists led 400 foresters to launch a lawsuit in the 1980s over serow damage to timber plantations . Foresters in Gifu Prefecture have justified the shooting of serows in the legs , as such shooting would not be fatal . Estimating accurate population numbers has been difficult . Foresters see the serow as a harmful animal , and resent government interference in controlling serow @-@ hunting . They have accused the government and wildlife experts of undercounting serows , while conservationists have counteraccused that foresters may inflate population numbers and levels of forestry damage to promote their own interests .

Conservationists such as Shin Got? believe that the increased visibility is due not to an absolute increase in populations , but to deforestation which has driven the animal further from its traditional home . Serows close to populated areas may feed on farms and cypress , including saplings . Clearcutting practices may also contribute to the problem , as clearcut forests create areas of rapid herbaceous growth ideal for herbivores , who see population increases . The situation is temporary , though , and after regrowth of trees leads to the forest canopy closing over after 15 ? 20 years , the herbivore populations are displaced as the herbaceous growth ceases to flourish .

In the 1990s , as the number of young plantations decreased , so did forestry damage from serows . Concern instead turned to damage caused by sika deer , wild boars , and Japanese macaques . In Kyushu in particular , increased grazing and browsing competition from sika deer may be slowing growth of serow populations .

== Conservation areas ==

== Cultural significance ==

Labelled a " living national treasure of the forest " , the Japanese serow has achieved emblematic

status in Japan with national associations . It is seen as a relic species harking back to the formation of the Japanese archipelago as distinct from mainland Asia . In a symbolic gesture in 1973 , the Chinese government gifted Japan a giant panda , to which the Japanese government returned two Japanese serow . Municipalities and other regions of Japan have adopted the serow as a local symbol .

In Japan , the Japanese serow is most commonly known as kamoshika or kamoshishi . It has historically been given a variety of names , often based on its appearance , some of which translate as " mountain sheep " , " wool deer " , " nine tail cow " , and " cow demon " . Regional names abound , some of which translate as " dancing beast " , " foolish beast " , or " idiot " . Japanese people often characterize the serow as " weird " or " abnormal " , and it is seen as a " phantom animal " as it tends to live alone in the depths of distant forests , and appears to observe forest workers from areas high in the mountains .

The serow has a reputation in Japan for its speed and agility . Superior athletes are compared to the serow , as it is known not only for its agility , but also its sprinting ability . The Yamaha Motor Company has marketed the XT 225 sport motorcycle as the Yamaha Serow , and the title character of the Miyazaki @-@ directed animated film Princess Mononoke (1997) uses a serow @-@ like creature as a mount . In Japanese , the word ochiru means both " to fail an exam " and " to fall " ; as the serow is known for its sure @-@ footedness on mountain cliffs , students can buy omamori charms marked with a serow hoofprint in the hope it will help them pass exams .

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