GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Ovis aries***

Ovis aries **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Artiodactyla	Bovidae

Common name sheep (English), mouflon (English)

Synonym
Ovis aries musimon , Pallas, 1762
Ovis aries ophion , Blyth, 1841
Ovis musimon , Pallas, 1762
Ovis musimon musimon , Pallas, 1762
Ovis musimon ophion , Blyth, 1841
Ovis ophion , Blyth, 1841
Ovis orientalis , Gmelin, 1774

Similar species

Summary Ovis aries (sheep) are an ungulate mammal believed to have originated in Europe. While humans have domesticated the majority of sheep, feral populations exist. These populations are causing impacts on the native diversity of plant species, especially on islands. The impact their grazing has on vegetation is known to cause declines in rare and endangered bird species and other native ungulate species.

view this species on IUCN Red List

Species Description
There exist over 200 distinct breeds of sheep *Ovis aries*. The breeds differ in their physical characteristics. Female sheep tend to be smaller than males by a quarter to one third of male size- head and body lenght 1,200-1,800mm and shoulder height 650-1,270mm. *O. aries* have a vertical cleft and narrow snout completely covered with short hair except on the margins of the nostrils and lips. Wild *O. aries* have tails between 70-150mm but in domestic *O. aries* tails may be larger and used as a fat reserve, although these long tails are removed on most commercial farms. The skulls of domesticated *O. aries* differ from those of wild sheep in that the eye socket and brain case are reduced. The genus *Ovis* is characterized by the presence of glands situated in a shallow depression in the lacrimal bone, the groin area, and between the two main toes of the foot. These glands secrete a clear semi-fluid substance that gives domestic *O. aries* their characteristic smell. Selection for economically important traits has produced domestic *O. aries* with or without wool, horns and external ears. Colouration ranges from milky white to dark brown and black (Reavill, 2000).

Uses
Reavill (2000) observes that, \"Sheep (*Ovis aries*) is one of the most economically significant species on the planet. Since their domestication between 9000 and 11000 years ago they have been a source of meat, milk, wool and hides in nearly every country. In some cultures *O. aries* are considered highly useful as a sacrificial animal. The versatility of the species contributes to its economic significance as large herds of animals can be maintained in many environments at relatively low costs. Besides their usefulness in an agricultural sense, *O. aries* have become important as a tool for scientific research. Because of their large size and low maintenance costs they make an ideal model for a great deal of scientific research.\"

Habitat Description
Sheep (*Ovis aries*) are extremely versatile and exist in a wide variety of habitats worldwide ranging from temperate mountain forests to desert conditions (Grzimek 1990, MacDonald 1984 in Reavill, 2000).

Reproduction
Sheep (*Ovis aries*) breeds on a seasonal basis, determined by day length, with females (ewes) first becoming fertile in the early fall and remaining fertile through midwinter. Estrus cycles range between 14 and 20 days with 17 as the average. Females are in heat on average for 30 hours. Males (rams) are fertile year round and most domestic sheep breeders use 1 ram to 25 to 35 ewes. Gestation averages 148 days with most lambs born in mid spring. One or two lambs, which are able to stand and suckle within a few minutes of birth, are born to each ewe. Both male and female lambs reach sexual maturity within one year. (Ensminger 1965 in Reavill 2000).
Réale *et al.* (2000) states that, \"Although humans have modified the rutting and lambing seasons of *O. aries*, some feral populations show highly synchronized estrus and lambing periods that relate to latitude (Jewell 1989). These herds were assumed to have recovered that synchrony because of the high adaptive value of spring lambing.\"

Nutrition
Sheep (*Ovis aries*) are extremely hardy animals and can survive on a diet consisting of only cellulose, starch or sugars as an energy source and a nitrogen source which need not be protein. In general, *O. aries* feed mainly on grasses while in pastures and can be fed a wide variety of hays and oats. Considerable research has been done on sheep nutritional requirements, and feed substitution tables are present in Ensminger's 1965 \"The Stockman's Handbook\". Grazing *O. aries* ingest a large amount of food in a short time, then retire to rest and rechew the ingested matter. *O. aries* spend their day alternating between these periods of grazing and ruminating. *O. aries* has a large and complex stomach which is able to digest highly fibrous foods that can not be digested by many other animals. Its modest nutritional requirements contribute to its economic significance.(Hecker 1983, Ensminger 1965 in Reavill 2000).

General Impacts
Establishment of feral herbivores like sheep (*Ovis aries*) have had significant ecological impacts on island ecosystems. Island ecosystems are particularly vulnerable to herbivores as insular plants in these ecosystems evolved largely in the absence of large herbivores, therefore lacking in defences against them. Increased bare ground followed by increased erosion are some of the other impacts (Van Vuren and Coblentz, 1987). Van Vuren and Coblentz (1987) in their study on the ecological effects of feral sheep on Santa Cruz Island, California observe that feral sheep are forage generalists when compared to domestic sheep on mainland. Feral sheep diet include annual grasses, forbs and also a substantial quantity of shrubs. The authors summarise the ecological impacts of feral sheep: consumption of endemic species by feral sheep could potentially cause decline in their population levels; loss of vegetation due to trampling while grazing; compaction of the soil and therefore changes in the soil structure; soil erosion due to removal of vegetration and denudation of the soil; removal of hebaceous vegetation caused changes in the grassland community, reduction of litter and a decline in the recruitment of seedlings. Alteration in the plant community led to decrease in species diversity.
Grazing and browzing of herbaceous vegetation, and stripping of bark by feral sheep and other introduced mammals (cattle (*Bos taurus*), Mouflon sheep (*Ovis musimon*), and feral goats (*Capra hircus*)) have led to exposure of soil to erosion and degradation of forests on Mauna Kea (Scowcraft and Sakai 1983). Welsh (2002) adds that, \"*O. aries* are extensive and destructive herbivores. They have been found to decrease populations of the *mamane* (*Sophora chrysophylla*), an endemic leguminous tree, by stripping the bark off thus facilitating damage from insects and and other disease causing organisms\". Results of a study (Scowcroft and Giffen 1983) which evaluated the regeneration of vegetation and forests inside and outside sheep exclosures located in heavily browsed portions of the *mamane* forest of Mauna Kea, indicated feral sheep browsing suppresses regeneration of *mamane* and three other endemic species, Hawai'ian bent, *heu-pueo*, and *aheahea*.
Liu and Jiang (2004) report that, \"The most important food competitor of the critically endangered Przewalski's gazelle (see *Procapra przewalskii* in IUCN Red List of Threatened Species) is the domestic Tibetan sheep (*O. aries*) in the steppe and deserts around Qinghai Lake on the Qinghai-Tibet Plateau.\"
Kirby *et al.* (2004) state that, \"The sheep tick *Ixodes ricinus* (L.) is an ectoparasite of major economic and pathogenic importance in Scotland. Its distribution in the Scottish uplands is assumed to be governed by the abundance and distribution of its definitive hosts (deer and *O. aries*) and climatic variables such as temperature and rainfall.

Management Info
Preventative measures: Risk Assessment models for assessing the risk that exotic vertebrates could establish in Australia have been further explored by the Western Australia Department of Agriculture & Food (DAFWA) to confirm that they reasonably predict public safety, establishment and pest risks across a full range of exotic species and risk levels.
The Risk assessment for the Domestic Sheep (*Ovis aries*), has been assigned a VPC Threat Category of **EXTREME**.
Mammals and birds were assessed for the pest risk they pose if introduced to Australia, by calculating Vertebrate Pests Committee (VPC) Threat Categories. These categories incorporate risk of establishing populations in the wild, risk of causing public harm, and risk of becoming a pest (eg causing agricultural damage, competing with native fauna, *etc*). The 7-factor Australian Bird and Mammal Model was used for these assessments.
Physical: Management strategies for sheep (*O. aries*) include hunting and the use of fencing to keep animals out (Welsh, 2002). Due to the behavioural similarities between sheep and goats (see *Capra hircus*), management strategies and hunting techniques for goats work equally well for sheep, although some minor variations may be required for each technique (this is also the case with goats, depending on vegetation, terrain, naivety). Please see Campbell & Donlan, 2005; Parkes *et al.* 1996 and Daly & Goriup, 1987 for more details on management strategies and hunting techniques for goats. Trapping of sheep at waterpoints or other limited resources (e.g. salt licks in some areas) can be highly effective. Please see O'Dempsey, 1993 for methods.
The use of Judas sheep as a hunting method could be applied quite easily; sheep are highly social animals and will search for conspecifics when isolated. Techniques like sterilisation, termination of pregnancy and inducing a prolonged estrus in goats for increasing their efficacy as Judas goats could be adapted for sheep.
Epididymectomy can be conducted efficiently in rams with the procedures indicted for male goats. Tubal occlusion could similarly be applied in ewes as described for does. Pregnancy termination in the ewe isn't as straight-forward as it is in goats. In the first 55 days of pregnancy, abortion can be induced with prostaglandins (6 mg PGF2alpha / 58kg body weight), after 55 days pregnancy termination with prostglandins is unlikely (Stellflug *et al.* 1997). Incorporating cesarean section with sterilisation procedures may be the most effective means of ensuring pregnancy is terminated prior to deployment of Judas sheep. The procedure for cesarean section on sheep is outlined by Mobini *et al.* 2002.
(Karl Campbell., pers.comm., September 2005).

Principal source: Van Vuren, D. and B.E. Coblentz. 1987. Some ecological effects of feral sheep on Santa Cruz Island.

Compiler: IUCN SSC Invasive Species Specialist Group
Updates with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

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ALIEN RANGE

[1] AFRICA
[1] AUSTRALIA
[1] FALKLAND ISLANDS (MALVINAS)
[1] FRENCH SOUTHERN TERRITORIES
[1] NEW ZEALAND
[1] PORTUGAL
[1] SAINT LUCIA
[2] SPAIN
[1] ASIA
[1] CHINA
[1] FRENCH POLYNESIA
[1] MEXICO
[1] NORTH AMERICA
[2] SAINT HELENA
[1] SOUTH AMERICA
[1] UNITED KINGDOM

[2] UNITED STATES

[1] VIRGIN ISLANDS, BRITISH

Red List assessed species 103: EX = 3; EW = 2; CR = 22; EN = 35; VU = 16; LR/nt = 1; NT = 20; DD = 2; LC = 2;

Androcymbium psammophilum **VU**
Antechinomys laniger **LC**
Aratinga brevipes **EN**
Argyroxiphium kauense **CR**
Atelognathus praebasalticus **EN**
Begonia samhaensis **EN**
Brassica oleracea **DD**
Brassica villosa **NT**
Calyptorhynchus latirostris **EN**
Certhilauda burra **VU**
Cicer canariense **EN**
Ctenomys sociabilis **CR**
Darevskia unisexualis **NT**
Echium handiense **CR**
Frankenia portulacifolia **VU**
Fritillaria epirotica **EN**
Helix valentini **EN**
Hymenolaimus malacorhynchos **EN**
Juniperus standleyi **EN**
Ledebouria insularis **EN**
Leontodon siculus **NT**
Leporillus conditor **VU**
Macaca sylvanus **EN**
Masticophis anthonyi **CR**
Microtus guatemalensis **NT**
Minuartia dirphya **CR**
Myadestes obscurus **VU**
Oldenlandia adscensionis **EX**
Oreomystis mana **EN**
Pardalotus quadragintus **EN**
Pelargonium insularis **CR**
Plebejus trappi **NT**
Podiceps gallardoi **EN**
Pomarea mendozae **EN**
Potentilla emilii-popi **DD**
Procellaria westlandica **VU**
Pteris adscensionis **CR**
Pterodroma sandwichensis **VU**
Puffinus opisthomelas **NT**
Rupicapra rupicapra **LC**
Salvia herbanica **CR**
Silene nocteolens **CR**
Solenanthus albanicus **EN**
Sorbus arranensis **VU**
Sterna albostriata **EN**
Todiramphus godeffroyi **CR**
Troglodytes sissonii **NT**
Tympanuchus cupido **VU**
Vermivora crissalis **NT**
Vipera darevskii **CR**

Anogramma ascensionis **CR**
Aphelocoma insularis **NT**
Ardeotis australis **NT**
Argyroxiphium sandwicense **VU**
Atelognathus reverberii **EN**
Bencomia exstipulata **VU**
Brassica rupestris **NT**
Cabalus modestus **EX**
Centaurea princeps **EN**
Chaeropus ecaudatus **EX**
Corvus hawaiiensis **EW**
Darevskia clarkorum **EN**
Diomedea epomophora **VU**
Ferula sadleriana **EN**
Fritillaria conica **EN**
Haematopus chathamensis **EN**
Horstrissea dolinicola **CR**
Iguana delicatissima **EN**
Lasiorhinus krefftii **CR**
Leipoa ocellata **VU**
Leporillus apicalis **CR**
Loxioides bailleui **CR**
Marattia purpurascens **NT**
Microcavia shiptoni **NT**
Mimus graysoni **CR**
Montivipera bornmuelleri **EN**
Neraudia ovata **CR**
Onychogalea fraenata **EN**
Origanum cordifolium **VU**
Parvilacerta fraasii **EN**
Perameles gunnii **NT**
Pluvianellus socialis **NT**
Polytelis alexandrae **NT**
Portulaca samhaensis **EN**
Procapra przewalskii **EN**
Pseudomys australis **VU**
Pterodroma madeira **EN**
Puffinus auricularis **CR**
Ribes sardoum **CR**
Ruprechtia apetala **LR/nt**
Sceloporus exsul **CR**
Sminthopsis douglasi **NT**
Somuncuria somuncurensis **CR**
Stemmacantha cynaroides **EN**
Thinornis rubricollis **NT**
Torreornis inexpectata **EN**
Turnix castanotus **NT**
Urosaurus auriculatus **EN**
Vini ultramarina **EN**
Vipera eriwanensis **VU**

Vipera lotievi **NT**
Zenaida graysoni **EW**
Zavattariornis stresemanni **EN**

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IUCN/SSC Invasive Species Specialist Group (ISSG)., 2010. A Compilation of Information Sources for Conservation Managers.
Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.
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Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php/Portada), under the section Novedades for information on updates.
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Spanish:
La lista de especies del Sistema de informaci&#65533;n sobre especies invasoras de m&#65533;xico cuenta actualmente con informaci&#65533;n aceca de nombre cient&#65533;fico, familia, grupo y nombre com&#65533;n, as&#65533; como h&#65533;bitat, estado de la invasi&#65533;n en M&#65533;xico, rutas de introducci&#65533;n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p&#65533;gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci&#65533;n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci&#65533;n novedades, para conocer los cambios.
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