Activity

Part 1

Read the species information sheets. Answer the questions below:

- What threats does each species face?
- What characteristics would make them vulnerable to land use change/other threats? Range size, specialist diets, conflict with people etc
- Are these species likely to be a refugee? (i.e. has it been pushed out of preferred habitats? Identify wording in the species profile that suggest it has been moved, pushed, or now occurs in poor habitats) Why?

Sheets with relevant parts highlighted are available, as is an answer sheet with short explanations of why each highlighted part is important.

Part 2

Using the 'Study design' document, outline your proposal for a research programme to better understand the biology and conservation of the banteng.

$10,000 competition to better understand Banteng ecology

Design a research project to study habitat preferences in Banteng

- How would you survey the population?
- How could you measure health and reproduction?
- How could you use historical information to study habitat preferences?

Aims

What are the gaps in our knowledge?

What do we need to find out?

Methods

What are the difficulties in studying them?

Budget

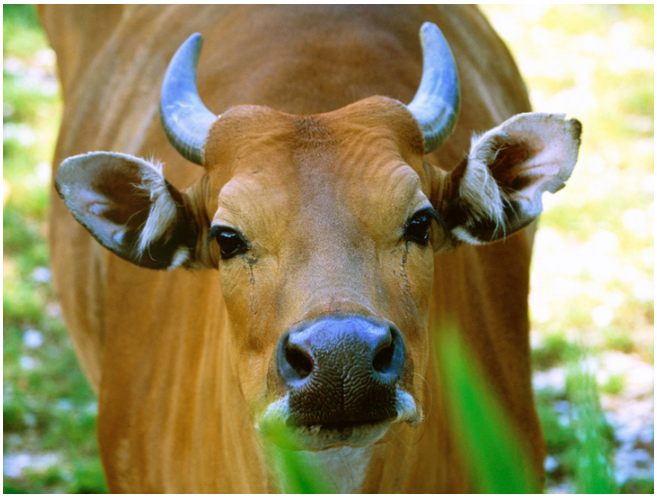
Timeline

Desired outcomes

What other species could this be applied to?

Banteng

Bos javanicus



Population

The world population of Banteng is likely to be approximately 8,000 individuals of which approximately 4,600 occur in a single subpopulation in eastern Cambodia (Gray et al. 2012. 2016). Outside eastern Cambodia only 6-8 subpopulations of more than 50 animals, are known, with 4–5 on Java, 1–2 in Thailand (S. Hedges pers. comm. 2000, Pudyatmoko 2004), and possibly one in Sabah (P. Gardner pers. comm. 2013). A once fairly widely distributed species, it is now largely reduced to small isolated populations, most of which are still in decline.

Habitat and Ecology

Wharton (1968) summarized information about Banteng habitat from throughout its range and he concluded that on the Asian mainland it avoids evergreen forest and even extensive tracts of closed canopy semi-evergreen forest, and is usually within more open dry deciduous forests; but within the more humid areas of Java and Borneo it occupies secondary forest formations resulting from logging and fires, and enters tracts of sub-humid forest on occasion. However, on mainland South-east Asia, human use of these preferred areas has increased and may have forced residual groups of surviving Banteng to retreat to relatively closed formations where consequently they now overlap more with Gaur Bos gaurus; although good evidence for such an assertion is lacking. On the eastern plains of Cambodia where the species remains numerous, but human use is relatively high, there is no evidence for any change in ecology. In Myanmar, Banteng is reported to prefer flat or undulating terrain with light deciduous (particularly dipterocarp indaing forest) or mixed deciduous and evergreen forest, with grassy glades which burn annually, and patches of bamboo; but it has purportedly retreated to denser hill forest in the face of advancing cultivation. (Peacock 1933, Wharton 1968, Tun Yin 1967, Prater 1971). Similarly in Thailand, Cambodia, Viet Nam, and Lao PDR, Banteng occurs (or occurred) in open mainly deciduous forest with glades, parklands, and dense forest patches; and ‘it is claimed by some that they prefer rocky, slightly hilly country, but they are certainly at home wherever the Kouprey [Bos sauveli] is found. Their range in Cambodia [and elsewhere in South-east Asia] suggests that Banting [sic] are more adaptable than Kouprey and perhaps less exacting in their habitat requirements’ (Wharton 1957, 1968). Recently the attachment to open, more deciduous

forest types was reported in Xe Pian National Protected Area, Lao PDR (Steinmetz 2004).

Banteng reportedly drinks large quantities of water and prefers feeding grounds near a permanent water supply (Hoogerwerf 1970). When conditions are favourable it drinks daily, preferring standing water; but during droughts animals can survive several days without drinking (National Research Council 1983). Mineral licks are also an important feature of Banteng habitat; in coastal regions which lack mineral licks animals seem to meet their mineral requirements by occasionally drinking seawater (Halder 1976, Payne et al. 1985, Alikodra 1987, S. Hedges pers. obs.).

Although probably a grazer by preference Banteng should perhaps be considered an intermediate feeder since it can and does consume a lot of browse and fruits depending on season and local food availability. It eats grasses, sedges, herbs, bamboo, as well as the leaves, fruits, flowers, bark, and young branches of woody shrubs and trees including palms.

Threats

The major threats to Banteng throughout its range are hunting and increasing loss of habitat (Duckworth and Hedges 1998, Pudyatmoko 2004, Steinmetz 2004, S. Hedges unpub. data 1991–2002, T. Gray pers. comm. 2013). In mainland South-east Asia hunting is the main direct threat and the species has been lost from much of its former range, even where suitable habitat remains (Duckworth and Hedges 1998, Duckworth et al. 1999, Tordoff et al. 2005, R. J. Timmins pers. comm. 2013). Hunting is exacerbated especially in mainland South-east Asia by human repopulation of lowland forest areas and associated habitat fragmentation, that is, the very areas where most Bantengs occur (Duckworth and Hedges 1998, Timmins and Ou 2001, R.J. Timmins pers. comm. 2008). Although huge tracts of suitable habitat were lost in the twentieth century, and continue to be converted, this has probably occurred largely after Banteng was hunted out (R.J. Timmins pers. comm. 2008). Thus, the hunting is the proximate cause of decline, but habitat loss is continually reducing the maximum population possible if hunting issues were to be controlled, and is increasing the ease with which remaining animals can be hunted. The recent granting of large-scale economic land concessions for industrial agriculture (particularly rubber plantations) is a significant threat to remaining lowland deciduous forest (and hence Banteng habitat) in northern and eastern Cambodia.

Charlesworth Paphiopedilum

Paphiopedilum charlesworthii

Habitat and Ecology

Paphiopedilum charlesworthii is a small rosulate terrestrial or lithophytic plant. It grows in evergreen broad-leaved forests, sheltered places in the cracks and soil-deposited crevices of limestone and rocks.

Paphiopedilum charlesworthii prefers moist well-drained soils, steep stony places on humus-rich substrates and cliffs on limestone rocks. The species prefers shaded habitats and is sometimes found in exposed places. The species flowers in September and October. It lasts very long when shaded.

Threats

Paphiopedilum charlesworthii is sensitive to the environment and is typically associated with a specific set of habitat conditions, such as rocky high altitude, specific levels of nutrient availability, steep places and shaded habitats.

Paphiopedilum charlesworthii is under numerous threats including habitat fragmentation and deterioration of the surrounding environments due to deforestation, random cutting, soil erosion, exploitation for horticultural purposes, ruthless collection for regional and international trade, trampling, recreation and ecological disturbance.

Paphiopedilum charlesworthii is threatened more generally by climate change, drought, degradation of the habitat due mainly to tourism, leisure activities, urbanisation, infrastructure development, management activities, recreation activities by direct effects (e.g., destruction of plants) and indirect effects (e.g., alteration of habitat). In addition the intrinsic factors of the population are considered a threat to the species, including the distribution limited to few sites and the low number of mature individuals.

Gharial

Gavialis gangeticus

Habitat and Ecology

The gharial is a river dwelling crocodilian that congregate for mating and nesting during the dry season in these highly seasonal, monsoonal rivers. When concentrated in these areas, gharial are highly vulnerable to impacts from fishing and malicious killing. The eggs are also vulnerable because in some areas they are sought for food/medicineOnce monsoon waters start to rise, the guarding adults make long distance seasonal movements, and the crèches break up with hatchlings dispersing widely into aquatic shoreline habitats. Adult gharial are seasonal migrants in large, open river drainages, with movements of 50-200+ km recorded in Chambal. Upon release, non-resident, captive-reared individuals appear highly mobile, and some have moved in excess of 1,000 km.

A number of gharial subpopulations now exist in lentic, rather than lotic, environments, principally in reservoirs behind dams and/or barrages, formed in flooded water courses that were formerly river channels. These include the Katerniaghat subpopulation and the Corbett subpopulation. The Chitwan subpopulation is possibly impacted by the Tribeni Dam on the Gandak (=Narayani) River, but the distances between gharial concentrations and the dams in all three locations vary.

Threats

Dams and Barrages: Major water control structures, including dams, barrages (=low, gated diversion dams) and related constructions, have been detrimental to gharial distribution and abundance on all of the river drainages in which the species occurred. These structures resulted in serious habitat fragmentation and degradation. In the future, many dams and barrages are planned for major rivers and tributaries in areas where Gharials reside, or are suspected to

remain, such as the upper reaches of the Brahmaputra. In this area recent studies predict major detrimental effects of hydropower and storage projects on the rich and diverse fishes inhabiting the Lohit river basin, a major Brahmaputra tributary (Kansal and Arora 2012).

Water Extraction /Irrigation: Lift stations on the Chambal threaten gharial survival because during the dry season, water flow and consequently river connectivity is greatly reduced. Such activities are illegal, but persist despite restrictive legislation and regulations (Hussain et al. 2011; Nair 2017).

River Interlinking: The proposed Ganges-Brahmaputra inter-link canal and dam project, envisioned under the Indian National Waterways Act 2016, is intended to convert 111 reaches of 106 rivers to inland waterways for transport of cargo, coal, industrial raw materials, and for tourism, without government seeking environmental approvals for bulk of the waterways (Hindustan Times 2018). The cumulative effects of these projects will severely affect the remaining extant populations of gharial which persist in the few remaining remnants of natural riverine habitat, presently under governmental and legal sanctions as protected areas.

Mortality in Fishing Nets/Gear: As legal and illegal net fishing, especially with monofilament gill nets, has intensified in large rivers, gharial losses to entrapment are increasing. Data on mortality rates due to net fishing are scarce, but observations on the Chambal and Yamuna over the past decade indicate the gharials most vulnerable are young animals, primarily juveniles and sub adults, despite some large mature adults occasionally getting caught.

Largetooth Sawfish

Ciconia stormi

Habitat and Ecology

Largetooth Sawfish are generally restricted to shallow (<10 m) coastal, estuarine, and fresh waters, although they have been found at depths of up to 26 m in Lake Nicaragua. Largetooth Sawfish move across salinity gradients freely and in northern Australia, parturition probably occurs in brackish or saltwater and juveniles spend ~4–5 years in the freshwater reaches of rivers and floodplain waterholes before migrating to estuarine and marine waters (Thorburn et al. 2007, Peverell 2008, Whitty et al. 2008, Whitty et al. 2009, P. Kyne unpublished data). In Lake Nicaragua, individuals spent much, if not all, of their lives in freshwater with reproduction of the population occurring primarily in the lake (Thorson 1982).

The life history of Largetooth Sawfish, like many elasmobranchs, is characterised by slow growth, late maturity, and low fecundity, which generally contributes to a low intrinsic rate of increase. The maximum reported size of Largetooth Sawfish is 656 cm TL, although it has been estimated up to 700 cm TL (Compagno and Last 1999). Very large individuals are now rarely seen anywhere in the Indo-West Pacific.

Using life history information from populations in Central America, Simpfendorfer (2000) estimated an intrinsic rate of increase of 0.05 to 0.07 per year and population doubling times of 10.3–13.6 years. These rates were estimated under ideal conditions (i.e. no fisheries, no population fragmentation, no habitat modification and no inbreeding depression). Moreno Iturria (2012) estimated an intrinsic rate of population increase of 0.12 yr-1, a population doubling time of 5.8 yrs and a generation time of 14.6 yrs for Indo-West Pacific Largetooth Sawfish, and an intrinsic rate of population

increase of 0.03 yr-1, a population doubling time of 23.3 yrs and a generation time of 17.2 yrs for Western Atlantic Largetooth Sawfish.

Threats

The principal threats to this species are from fishing; it was formerly targeted, but is now mostly taken incidentally in broad-spectrum fisheries (CITES 2007). The long toothed rostrums of sawfishes make them extraordinarily vulnerable to entanglement in any sort of net gear, gillnetting and trawling in particular. The exploitation of elasmobranchs is high in many parts of the Largetooth Sawfish's range, particularly in coastal areas and freshwater systems. Unregulated and unmanaged fisheries, and habitat loss and degradation all threaten sawfishes across large parts of its range.

For at least part of its life cycle, the Largetooth Sawfish relies on a variety of specific habitat types including freshwater systems, estuaries and mangroves; these are all affected by human development (CITES 2007). Agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff as a result of continued coastal and catchment development has caused substantial loss or modification of these habitats (CITES 2007). Mining activities, in northern Australia, New Guinea (e.g., the Fly River) and elsewhere, pose a risk to Largetooth Sawfish through freshwater habitat alteration or potential pollution events. Alterations to river courses are a realised threat to Largetooth Sawfish which migrate upstream in early life stages. These range from smaller barrages and road crossing in northern Australia to large-scale river alterations in Southeast Asia.

Northern River Terrapin

Batagur baska

Habitat and Ecology

Batagur baska is a highly aquatic turtle species, associated with estuarine river sections, with nesting taking place on large on sand banks. It feeds primarily on riverside plants and fruits, however, it also consumes molluscs and has been observed to accept a variety of animal matter in captivity (Moll 1980). Females mature at 45 cm carapace length and may reach 60 cm; males mature at around 40 cm carapace length and can reach up to 49 cm (Moll 1985). Breeding maturity may occur at an age of nine years in captivity, but requires up to 25 years in rivers with modest productivity (Moll 1980). Females only produce a single clutch per year of about 18-33 eggs (P. Praschag pers. comm. 2018).

Threats

Batagur baska has been exploited long-term for local subsistence and ritualistic consumption as well as some regional trade, including supply to the Calcutta markets in the 19th and 20th centuries. Harvest of its eggs has been extensive as the eggs are highly prized for consumption and can be collected at known sites at predictable times.

The species' use of estuarine and mangrove habitats and sandy nesting beaches means it has been significantly impacted by habitat loss, as estuaries are prime locations for human settlement and industrial development, mangrove areas are cleared for fuelwood and for shrimp and other aquaculture development, and sandy banks and beaches are exploited for sand as building material and tourist developments.

The extent of threat posed by entanglement in fishing nets, the effects of altered water flow from hydrological mega-projects (dams, reservoirs, river

diversion) on nesting sites and habitat in general, or habitat pollution, have not been documented as specific threats, but have likely impacted the species.

Tiger

Panthera tigris

Habitat and Ecology

Tigers are found mainly in the forests of tropical Asia, although they historically occurred more widely in drier and colder climes. One subspecies, the Amur Tiger P. t. altaica, persists in the Russian Far East. Photos of Tigers up to 4,500 m have been obtained in Bhutan (Wang 2008).

Availability of a sufficient prey base of large ungulates is the Tiger's major habitat requirement: "wild pigs and deer of various species are the two prey types that make up the bulk of the Tiger's diet, and in general Tigers require a good population of these species in order to survive and reproduce" (Hayward et al. 2012, Sunquist and Sunquist 2002).

Tigers are generally solitary, with adults maintaining exclusive territories, or home ranges. Adult female home ranges seldom overlap, whereas male ranges typically overlap from 1–3 females, a common felid pattern of social organization.

Threats

Poaching for illegal trade in high-value Tiger products including skins, bones, meat and tonics is a primary threat to Tigers, which has led to their recent disappearance from broad areas of otherwise suitable habitat, and continues at unsustainable rates. That there are roughly one million square kilometres of unoccupied Tiger habitat is a clear indication that poaching is the greatest threat to Tigers range-wide.

Asia is a densely populated and rapidly developing region, bringing huge pressures to bear on the large wild areas required for viable Tiger populations.

Conversion of forest land to agriculture and silviculture, commercial logging, and human settlement are the main drivers of Tiger habitat loss. With their substantial dietary requirements, Tigers require a healthy large ungulate prey base, but these species are also under heavy human subsistence hunting pressure and competition from domestic livestock.

Tiger attacks on livestock and people can lead to intolerance of Tigers by neighbouring communities and presents an ongoing challenge to managers to build local support for Tiger conservation and can lead to high rates of retaliatory killing of Tigers. In some areas there have been many human deaths - for example, about 40 people were killed by Tigers in the Sundarbans mangrove forest of Bangladesh and India 2000-2010 (Barlow et al. 2013).

Yunnan Spiny Frog

Nanorana yunnanensis

Habitat and Ecology

It has been recorded from rocky streams in high mountains in closed-canopy forest and grassland, and has also been found in ditches. The eggs are laid under stones in streams.

Threats

Over-collecting for human consumption is the major threat to this species. It is also threatened by habitat destruction and degradation (caused by agricultural expansion), and water pollution.

Study design!

What are the main threats?

What are the gaps in our knowledge?

What do you think we need to find out?

Aims

Methods

Budget

Desired outcomes

What other species could this be applied to?