thermostat controlled fans through cooling pads result in cooled air of about 27-28°C flowing across the birds in comparison with the peak outside air temperatures of 31-34°C. However, the economic viability and practicality of such a system is still questionable. Furthermore, birds reared in such an environment exposed to a warm outside one of 31-34°C may be stressful and fatal to birds crowded into transporting crates over an extended period, in transit to the processing plant.

Conclusions and implications

Cattle and poultry kept in hot environments experience a heat load that results in a reduced productive and reproductive performance. This performance may be greatly enhanced if the animal's environmental temperature is reduced and its feeding management modified to improve both the animal's comfort and nutrition.

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Wetland plants and habitats of Namibia

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The proportion of wetland plants in the Namibian flora is analysed, including the numbers of endemics and aliens. Wetland habitats are identified and the numbers of plant species found in each one listed. The characteristic plants of different habitats are discussed.

Wetland plants

Wetland plants are not easily defined, especially those of ephemeral wetlands. The transition between wetland and terrestrial habitats is not always clear and other factors such as soil condition and hydrology must also be considered. Generally plants that grow in or on the water, often with specially adapted submerged or floating leaves and flowers, are considered true aquatics or hydrophytes. Growth forms include rooted plants with floating leaves or flowers or both, free-floating plants, plants that are submerged and plants that are emergent, arising from the water. Some plants can be combinations of

ancy. The ephemeral rivers of the Namib and Kalahari deserts drain the central highlands forming important linear oases. Coastal lagoons and pools, often associated with river mouths, provide brackish water habitats. In the south of Namibia, temporary pans and vleis form after local rainfall events. Artificial waters include 20 state dams and numerous farm dams scattered throughout the country. Information on the status and conservation of wetlands has been brought together by Simmons, Brown & Griffin (1991). Map 1 shows the major wetlands of Namibia.

Table 2 shows numbers of plant species found in different wetland habitats. A species can occur in several habitats. Perennial rivers provide the widest range of associated habitats that combine to give the greatest number of wetland plant species. This is supported by the plant list for the Okavango River with about 291 wetland species (Bethune 1991) and the Chobe and eastern Caprivi wetlands with 361 species (Smith 2000). Specialised aquatic plants occur in the main river channel, such as the distinctive *Hydrostachys polymorpha* found attached to stones in the Kunene River. River edges and backwaters support a wide range of aquatics including species of *Nymphaea, Ottelia, Nymphoides, Trapa, Ceratophyllum, Myriophyllum, Potamogeton, Lagarosiphon, Utricularia*, and *Vallisneria*. The river floodplains support tall grasses including species of *Phragmites, Miscanthus, Vetiveria, Hyparrhenia, Imperata* and *Panicum*.

The vlei habitat is next in terms of species richness. It is dominated by marginal grasses and sedges (nearly half the species) and semi-aquatics such as species of *Burnatia, Bergia, Ammannia*, and *Nesaea*. True aquatics include species of *Marsilea* ferns, *Aponogeton, Lagarosiphon, Nymphaea, Nymphoides, Lemna* and *Utricularia*. Surveys of the vleis near Tsumkwe have recorded 73 species of wetland plants so far, although this includes pans and waterholes (Hines 1992, Clarke 1999b).

Table 2: *Wetland habitats and number of plant species*

Habitat	Ferns	Grasses	Sedges	Other Monocots	Dicots	Total
River channels	0	0	0	3	1	4
Waterfall/rapids	0	0	0	0	5	5
River edge	9	10	4	12	31	65
Backwater	8	3	6	11	33	59
Floodplain	1	8	8	4	25	46
River Marsh	3	9	6	4	24	45
River Bank	4	13	18	7	45	86
Ephemeral River	2	8	22	2	38	72
Ephemeral River Pool	0	1	6	7	6	20
Oshana	2	16	31	8	19	76
Dam	0	1	9	9	29	48
Pan	11	22	25	17	26	101
Coastal Lagoon	0	4	3	7	6	20
Rock Pool	0	0	0	2	3	5
Vlei	13	28	41	18	49	149
Spring	3	3	22	4	11	43
Spring Marsh	0	1	0	3	20	24
Spring Pool	3	2	3	4	8	20
Depression	6	5	8	1	24	44

Although the study areas were not identical, it is interesting to note that Hines recorded 44 species and Clarke recorded 57, but of these only 28 species were found in both surveys. This emphasises the need for repeated surveys to record species that appear and disappear at different times during the rainy season and the need to include the variation between locations and years.

The most striking vegetation of the ephemeral rivers is the riparian forest made up of large trees such as *Faidherbia albida, Combretum imberbe, Euclea pseudebenus, Hyphaene petersiana, Ficus* spp. and *Tamarix usneoides*. Smaller wetland plants occur where bedrock forces groundwater to the surface to form pools and wet depressions. *Phragmites* reeds, sedges such as *Cyperus laevigatus, C. longus* and *C. marginatus* and the hard rush *Juncus rigidus* are the most common. Small herbs in wet areas include species of *Bergia, Rotala, Nesaea, Lobelia, Craterostigma* and *Veronica*, while aquatics such as *Aponogeton desertorum, Lagarosiphon cordofanus* and *Limosella* species occur in the pools.

Ephemeral habitats include the *oshanas* of the Cuvelai drainage, where 155 plant species were recorded (Clarke, 1998) but only about 70 species belonged to the aquatic or semi-aquatic plant categories. Of these about half (38 species) were also recorded in the vleis and pans around Tsumkwe. Clarke (1999a) briefly compares *oshanas* with other Namibian wetlands. Sedges and grasses dominate

the water margins while most species of aquatic herbs have emergent or floating leaves because suspended silt makes the water very turbid. There are 30 wetland species recorded for Etosha Pan and 10 for the salt marsh communities of Sandwich Harbour.

A study of a man-made dam, Olushandja on the western edge of the Cuvelai drainage, recorded 45 wetland plant species (Burke 1995). Dams in central and southern Namibia are likely to be less diverse than similar water bodies in the more tropical north. Large dams are often poorly vegetated because of steep sides, deep water and irregular changes in water level. Shallow edges support a richer marginal flora of semi-aquatic plants.

To try and ensure sustainable use of our in wetlands, changes need to be monitored and plants can provide an indication of the health of the system.

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Namibia's Livestock Resources

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Genetic diversity within the livestock sector plays an important role in food security, especially in the communal areas of Namibia. Namibia is fortunately blessed with a wide range of both indigenous and adapted introduced species/breeds.

Introduction

Cattle and sheep have been indigenous to Namibia from time immemorial, (Rawlinson, 1994). At the time of the German occupation in 1884, the principal population groups were already established in Namibia. Reports on the livestock of Namibia dates back as far as the reports of Jacobus Coetzee, who visited the Territory, as Namibia was then known, during 1760, while on a hunting trip.

Namibia is a semi-arid to arid country, and is primarily an extensive livestock production country. Production systems range from small-scale subsistence farmers, with small numbers of livestock, to large -scale communal farmers, with larger herds, with-out title-deed, and commercial farmers on title-deed farms. Due to the variability of the rainfall and regular occurrence of droughts, livestock numbers vary from year to year. Table 1. is a summary of livestock numbers per species in the different regions for the year 1999.