

MONGOLIAN PEOPLE'S REPUBLIC

INTRODUCTION

by Jon Davies

Area: 1,565,000 sq.km.

Population: 1.6 million (1979).

The Mongolian People's Republic is a landlocked country situated in north-central Asia between the USSR and People's Republic of China. It extends for some 2,400 km from east to west, and 1,260 km from north to south. Topographically, Mongolia is a plateau averaging 1,580 metres above sea level, upon which three major mountain systems are superimposed. The Altai Massif occupies the western borders, gradually fading as it runs southeastwards into a series of isolated fault blocks called the Gobi-Altai. The Khangai Mountains occupy the centre of the country, whilst the Khentai Mountains run from the capital, Ulan Bator, to the Russian border.

The climate is extreme continental modified by altitude, with an average annual temperature range of -25°C to $+20^{\circ}\text{C}$, although the absolute annual temperature range may be as much as 80°C (from -50°C to $+30^{\circ}\text{C}$). Precipitation is low, ranging from 100 to 400 mm per annum, with most of the rain falling during the period July to September. The rainfall decreases steadily from north to south. In the Ulan Bator area, at 1,159 meters above sea level, the average annual rainfall is 183 mm and the mean monthly temperatures range from a low of -27.2°C in December to a high of $+17.2$ in July.

The country can be divided into four main phytogeographic zones. From north to south, these are as follows: (a) montane forest (taiga) covering 7% of the country; (b) steppe covering 51%; (c) arid steppe/semi-desert covering 27%; and (d) desert covering 15%.

In relation to the size of the country, the human population is very low, and as about one third of the population lives in Ulan Bator, the population density over most of the country is considerably less than one person per square kilometer. Thus, although the population is increasing rapidly (about 3% per annum), there is still very little disturbance in terms of human population pressure on natural ecosystems compared to many other Asian countries. Much the most important form of land use is the raising of domestic livestock including cattle, horses, sheep, goats and camels, although settled agriculture, especially the cultivation of dwarf varieties of wheat, is gaining importance. Industrial development and related activities such as coal-mining, mineral extraction and generation of power, are confined mainly to the region around Ulan Bator and northwards to the Russian border.

Summary of Wetland Situation

Despite its low rainfall, Mongolia is rich in water resources, mainly because of the high mountain ranges which attract ample precipitation. There are approximately 1.5 million ha of standing water bodies and 50,000 km of rivers. Wetland habitats are extremely diverse,

ranging from cold, deep ultra-oligotrophic lakes to temporary saline lakes. There are many major rivers possessing extensive flood plains. Only the southern desert rim and the southeast of the country lack any permanent water.

For the purposes of wetland classification, Mongolia can be conveniently divided into three different drainage basins: the Central Asian Internal Drainage Basin; the Arctic Ocean Drainage Basin; and the Pacific Ocean Drainage Basin.

1. Central Asian Internal Drainage Basin

There are four groupings of lakes in the internal drainage basin. These are mainly fed by rivers rising in the Khangai and, to a lesser extent, the Altai Mountains. Many are saline.

- a) Altai Mountain Lakes. These are all freshwater, mostly high altitude (above 2,000m) and oligotrophic. Their outlet streams connect with other lakes lower in the basin. The major lakes are Achit, Tolbo, Hoton, Horgon and Dayan. In addition, there are many smaller high altitude lakes, presumably cirque and moraine dammed lakes, in this area.
- b) The Valley of the Great Lakes. A series of large lakes occupies a broad, semi-arid depression between the Altai and the western end of the Khangai Mountains. The lakes are fed by large rivers, rising in the Altai and Khangai and forming broad deltas at their mouths. Some are freshwater with outlets into other lakes, whilst others are saline with no outlet. The main lakes are Hyargas, Ayrag, Har-Uus, Har and Dorgon. The saline Uvs Nuur and Orog Nuur are included here although they are partly isolated from the other lakes to the south by a ridge extending west from the Khangai.
- c) Lakes of the Gobi Valley. A chain of large and small saline lakes lies at the foot of the Gobi-Altai in the broad inter-montane depression between the Khangai and Gobi-Altai ranges. They are shallow, with a saucer-shaped depth profile, and vary considerably in size both seasonally and from year to year. Some may dry out completely in certain years. They all receive their inflow from rivers which rise in the Khangai Mountains, and no permanent inflow comes from the Gobi-Altai. The principal lakes are the Boon Tsagaan, Adgiyn Tsagaan, Tatsain Tsagaan, Orog and Ulaan Nuurs.
- d) Lakes of the Khangayn Plateau. This is a system of lakes in the extreme west of the Khangai with no outflow, or flowing only intermittently to the Valley of the Great Lakes to the west. They are mostly saline, oligotrophic lakes at an altitude of between 1,500 and 2,000m. The largest are Sangiyn Dalay, Telmen and Hunguyn Har Nuurs.

All the above lakes have numerous characteristics in common, not least their fauna. This is not surprising since the evidence suggests that they were once part of a vast body of water which covered the area in more humid times, probably in the Cretaceous. As aridity increased, the water body broke up into an inter-connected system with a general flow to the southeast. These inter-connected lakes then broke up further into isolated water bodies, which are now relict lakes.

Individual lakes can vary greatly in size, being largest in spring due to the inflow of melt water from the Altai and Khangai mountains. They generally shrink during the summer, leaving behind isolated saline pools and salt pans. The inflows of the rivers form braided channels with extensive freshwater marshes. Thus a wide range of wetland habitats can occur in and around the lakes, including fresh or saline open water areas, saline marshes, salt pans, freshwater marshes, rivers and streams.

The lakes are dependent on precipitation in the Altai and Khangai mountains for their existence, as there is insufficient rainfall in the semi-desert surrounding the lakes to sustain them. Groundwater inflow may be important where summer rains percolate through the alluvial fans surrounding the mountains, and reappear as springs at the edge of the plains.

In addition to these more or less permanent water bodies, the mountain and basin topography of the area has created many inter-montane depressions which may contain temporary salt lakes at certain times of the year.

Many large rivers flow through the semi-arid zone feeding these lakes, the largest being the Khovd Gol, rising in the Altai, and the Dzavkhan Gol, rising in the Khangai. The whole semi-desert area also abounds in numerous relict features such as ancient lake banks and dry river courses persisting from more humid times, and thus has interest from the point of view of geomorphology and palaeolimnology.

The fish fauna of the lakes is particularly interesting. It is considered a relict and impoverished fauna left over from the vast lake that once covered the entire area. The cyprinid genus *Oreoleuciscus* is endemic to these lakes and their rivers; it is found nowhere else except in the upper reaches of the Ob River, to which it migrated from the basin. Three forms are recognized: *O. pewzowi*, *O. potanini* and *O. humilis* (a dwarf form). It is not clear at present whether these are true species or members of a single polytypic species. It is possible that this genus is currently undergoing speciation, taking advantage of the vacant ecological niches created by the impoverished fish fauna. A species of *Thymallus* (*Salmonidae*), the West Mongolian Grayling *T. brevirostris*, is also endemic to these lakes. These fish, together with a *bach Noemacheilus strauchi*, are the only fishes occurring in these lakes and rivers.

2. Arctic Ocean Drainage Basin

Due to the greater precipitation in the northern part of the country, there is a better developed hydrographic network here than elsewhere in the country, with many large lakes and major rivers. Water collects off the northern slopes of the Khangai Mountains and the western slopes of the Khentai range, almost all of it finding its way into Lake Baikal in the USSR via the Selenge River, the most important river in Mongolia. The only exception is the Shishid River in the extreme west of this drainage basin, which drains into the Yenisei. The lakes range from mesotrophic through to ultra-oligotrophic, and have a fish fauna dominated either by cyprinids typical of northern Eurasia or by coregonids and salmonids. The origins of the lakes are diverse. Some have been formed as a result of volcanic activity, while others have arisen from the dislocation of rivers, glacial activity or tectonic movements, as in the case of Khovsgol which has much in common with Lake Baikal.

The best known lakes in this region are Khovsgol, Ogi and Terhiyn Tsagaan. In addition, there are two areas with a large number of lakes, the Prikhovsgol region and the Darhatsk Basin in the catchment of the Shishid River. The latter area may contain as many as 300 lakes. The main rivers are the Selenge, Orkhon, Tuul (which flows through Ulan Bator) and Egiyn (which drains Khovsgol). The Bulgan River, in the extreme southwest of the country, is also considered to be part of the Arctic Ocean drainage system, despite the fact that it now flows into Lake Ulungur in the People's Republic of China. This is because the river was previously connected to the Arctic Ocean, and has an aquatic fauna similar to that of the Arctic Ocean Drainage Basin.

3. Pacific Ocean Drainage Basin

This region is characterized by major rivers and associated marshes. The Kerulen, rising in the Khentai, the Onon and the Uldze all flow east and drain into the Amur River, whilst the Khalkin River drains northwards into Buyr Nuur, a large oligotrophic lake on the Chinese border. The only other large lake in this region is Hoh Nuur. Both lakes have a fish fauna characteristic of the Chinese lowlands.

The wetland resources of Mongolia have been subjected to only very low levels of exploitation, and so remain relatively undisturbed. This is due not only to the low population density, especially around lakes in the semi-arid region, but also to the fact that traditionally fish and waterfowl have not been a source of food for the Mongols. This is probably because there is already an abundant supply of protein in the form of stock such as sheep.

The fish fauna of Mongolian lakes is particularly interesting, since it covers three distinct geographical divisions: the unique Mongolian Central Asian fauna, the Chinese lowland fauna and the north Eurasian fauna. Within this latter division, there are two distinct types, the salmonids and coregonids typical of ultra- oligotrophic waters, and the cyprinids typical of more eutrophic waters.

The lakes and their associated marshes and rivers provide important breeding areas for a wide variety of waterfowl, and are important staging areas for large numbers of wildfowl and shorebirds migrating between breeding grounds in Siberia and wintering areas in southern Asia. However, due to the severity of the winter, Mongolia is not important for wintering waterfowl, although small numbers of ducks may overwinter on some unfrozen rivers. One of the most important regions for waterfowl is the Valley of the Great Lakes, particularly Uvs Nuur and Hyargas Nuur with their extensive marshes.

Nowak (1970) has reviewed the status of the Anatidae and shorebirds in Mongolia. He lists fifty breeding species including two swans (*Cygnus olor* and *C. cygnus*), three or four geese, 17 ducks, *Fulica atra* and 26 shorebirds. The commonest breeding Anatidae are *C. cygnus* (especially around Hyargas and Uvs Nuur), *Anser cygnoides*, *A. anser*, *A. indicus*, *Tadorna ferruginea*, *T. tadorna*, *Anas strepera*, *A. crecca*, *A. platyrhynchos*, *A. querquedula* and *A. clypeata*. Other breeding species include the Dalmatian Pelican *Pelecanus crispus*, the cranes *Grus vipio* and *Anthropoides virgo* (the latter in very large numbers), and the very rare Relict Gull *Larus relictus*, which is known to breed in small numbers around the Gobi Valley Lakes. Nowak (1970) lists an additional species of swan, two geese, eight ducks and 24 shorebirds as passage migrants.

Major Pressures and Threats

Mongolia is **a rapidly developing country and although** the population is low now, it is increasing rapidly. With this increase, there is no doubt that industrial development, mineral exploitation and intensive forms of agriculture will increase. Domestic pollution may become a threat in certain heavily populated areas, e.g. in the Tuul River around Ulan Bator. The most susceptible wetlands to this form of pollution are the oligotrophic lakes. Eutrophication caused by the inflow of nutrients from domestic waste, and indeed from intensive agriculture, would eliminate the coregonid and salmonid fish fauna and replace it with one dominated by cyprinids.

Some development of the fishery resources may occur. Dulma (1979) reports that some lakes, such as Khovsgol and Ogii Nuur, are already exploited for their fish, and mentions the possibility of using the shallow Gobi lakes for the culture of Chinese Carp during the summer months.

The hunting pressure on waterfowl is considered to be insignificant at the present time. In fact, there has been a history of protection for wildfowl dating back to the 13th century, when laws were enacted forbidding the hunting of game from April to October, i.e. during the breeding season. Since most waterfowl are absent from Mongolia outside this period,

there was scarcely any hunting at all. The Buddhist influence starting in the 16th century reinforced this protection, not only for waterfowl but also for fishes and mammals. Following the revolution in 1921, the Buddhist influence declined and wildlife was increasingly hunted, but the pressure still remains extremely low.

Wetland Research

Much of the early research on Mongolian wetlands was carried out by expeditions. Most of these have been combined Mongolian/Russian expeditions, but there was a series of expeditions from the American Museum of Natural History in the late 1920s. Although the American work was mainly concerned with geology, it gives an interesting insight into the geological history of some wetlands, particularly the Gobi Valley Lakes. Research on the history of the lakes was continued by Mongolian and Russian workers through the 1950s and 1960s, with particular reference to the distribution of the lake fauna throughout geologic time. Khovsgol Nuur has been extensively researched, not only by Mongolian scientists from the Academy of Sciences in Ulan Bator and from the State University of Ulan Bator, but also by Russian scientists from the Lake Baikal Limnological Laboratory, who are interested in Khovsgol because of its similarities with Lake Baikal.

Basic limnological data such as physico-chemical parameters, phytoplankton and zooplankton composition and standing crop, benthic fauna, aquatic macrophytes and ichthyofauna, have been collected from most of the large lakes and serve as very useful baseline data. Much of this work has been summarized by Dulma (1979). The major rivers have been less extensively studied, although the ichthyofauna is well known. Apparently there has been little work on marsh ecosystems.

A few papers have been published on the endemic fishes of Mongolia, particularly the Altai Osman *Oreoleuciscus* spp and the West Mongolian Grayling *Thymallus brevirostris*. The waterbirds of Mongolia have been studied by Mongolian scientists at the Academy of Sciences, often in collaboration with East European biologists. In recent years, several British ornithologists have visited wetlands in Mongolia, either with bird-watching tours or through the British Council cultural exchange programme.

Wetland Area Legislation

Little information is available. It is known that a game law was passed in 1972 and a water law passed in 1974, but the regulations contained therein are not known. Standing Commissions on general pollution control have been in existence since 1972, representing all areas of the country. Apparently, legislation to protect wetlands *per se* is lacking, probably because there are no major threats at present. However, numerous game animals, especially *wildfowl*, are protected by hunting regulations. The open season for hunting is from 15 August to 15 May and thus operates when most of the wildfowl are absent from the country.

Twenty-one animals are listed as being protected from hunting of any kind, including some associated with wetlands. These include five species of waterfowl, *Pelecanus crispus*, *Cygnus columbi anus bewickii*, *C. cygnus*, *Egretta alba*, *Platalea leucorodia*, the Common Otter *Lutra lutra* and the Beaver *Castor fiber*. It is understood that between thirteen and twenty nature reserves have been established, but information is available on only three, the Great Gobi National Park and the Dzungarian National Park in the

extreme southwest of the country, and the Bogd Uul Reserve immediately to the south of Ulan Bator. Hunting, logging, the picking of wild flowers and fishing are prohibited in these reserves.

Wetland Area Administration

There is no body specifically concerned with wetlands. The Committee for Science and Technology of the Council of Ministers is the body most directly concerned; this is the coordinating body for pollution control and conservation, and also issues legislation on hunting. The Hunting Section of the Main Forest Administration enforces this legislation, whilst the Hunting Society of Mongolia issues licences.

The Mongolian Association for Nature Conservation was established in 1975, but it is unclear what role this association plays.

Organizations involved with Wetlands

a) Governmental Organizations

- Committee for Science and Technology of the Council of Ministers
Issues legislation on pollution control, conservation and hunting.
- Institute for General and Experimental Biology, Academy of Sciences of the Mongolian People's Republic
Conducts most of the research on wetlands, their waterfowl and general limnology.
- Hunting Society of Mongolia
Issues hunting licences.
- Mongolian Association for Nature Conservation

b) Universities

- Ulan Bator State University
Conducts research on the major lakes.

WETLANDS

Site descriptions compiled by Jon Davies of the Asian Wetland Bureau.

Wetland name: Hoton Nuur

Country: Mongolia

Coordinates: 48°40'N, 88°20'E;

Location: within the subalpine zone of the Altai Mountain region of the Central Asian Internal Drainage Basin, near the Chinese border, 125 km WSW of Olgiy, Bayan-Olgiy Province.

Area: 5,010 ha.

Altitude: 2,232m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: One of a series of three lakes (the Kobdossk Lakes), the others being Orgon Nuur and Dayan Nuur, situated in an elongated basin 50-60 km in length at the foot of the Tavan Bogd Uul mountain which rises to over 4,250m. The basin was tectonically formed and the lakes are fed by glaciers. The average depth of Hoton Nuur is 26.6m, and the maximum recorded, 58m. Marked stratification develops in summer, with a maximum water temperature recorded in July of 14°C. The lake is covered in 70-120 cm of ice in winter. The lake is considered to be ultra- oligotrophic.

Climatic conditions: Extreme continental climate. The lake lies within the sub-alpine zone of the Altai Mountains.

Principal vegetation: There are reed-beds of *Carex spp* and *Scirpus spp* around the lake, and up to 20% of the lake area is covered by macrophytes. The lake is surrounded by mixed coniferous and deciduous forest and in some places by shrubs.

Land tenure: State owned.

Conservation measures taken: None.

Land use: No information is available, but due to the inaccessibility of the site, there is probably very little human activity in the area.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The benthic fauna is diverse, but density is low. The zooplankton is dominated by rotifers and copepods, with the copepods *Eudiaptomus graciloides* and *Cyclops vicinus* being especially common. The fish fauna includes species of *Oreoleuciscus* and *Thymallus brevirostris*; these are found only in the Mongolian part of the Central Asian Internal Drainage Basin.

Special floral values: No information.

Research and facilities: Very little research has been carried out, and there are no facilities in the area.

References: Dulma (1979).

Criteria for inclusion: 1b, 2d.

Source: Jon Davies.

Wetland name: Horgon Nuur

Country: Mongolia

Coordinates: 48°33'N, 88°35'E;

Location: in an elongated basin in the Altai Mountain region of the Central Asian Internal Drainage Basin, near the Chinese border, 110 km WSW of Olgii, Bayan-Olgii Province.

Area: 6,600 ha.

Altitude: c.2,100m.

Biogeographical Province: 2.35.12.

Description of site: A large freshwater lake, similar in all respects to Hoton Nuur (site 1) to which it is connected. It is situated at a somewhat lower elevation, and its outflow eventually connects with the Khovd Gol. Like Hoton Nuur, it is an ultra-oligotrophic lake.

Climatic conditions: Extreme continental climate. The lake lies within the sub-alpine zone of the Altai Mountains.

Principal vegetation: There are reed-beds of *Carex* spp and *Scirpus* spp around the lake, and up to 20% of the lake area is covered by macrophytes. The lake is surrounded by mixed forest.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Probably very little due to the inaccessibility of the area.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The fish fauna includes *Oreoleuciscus pewzowi*, *O. potanini* and *Thymallus brevirostris*, all three of which are confined to the Mongolian part of the Central Asian Internal Drainage Basin.

Special floral values: No information.

Research and facilities: Very little research has been carried out, and there are no facilities in the area.

References: Dulma (1979).

Criteria for inclusion: lb, 2d.

Source: Jon Davies.

Wetland name: Dayan Nuur

Country: Mongolia

Coordinates: 48°20'N, 88°52'E;

Location: in a basin in the Altai Mountain region of the Central Asian Internal Drainage Basin, near the Chinese border, 105 km southwest of Olgii, Bayan-Olgii Province.

Area: 6,200 ha.

Altitude: c.2,250m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: An oligotrophic, freshwater lake with some areas of surrounding marsh, particularly to the northwest. Apparently the lake has no outlet. In other respects, it is similar to Hoton Nuur (site 1) and Horgon Nuur (site 2), which are located in the same basin.

Climatic conditions: Extreme continental climate. The lake lies within the sub-alpine zone of the Altai Mountains.

Principal vegetation: There are reed-beds of *Carex* spp and *Scirpus* spp around the lake, and up to 20% of the lake area is covered by macrophytes. The lake is surrounded by mixed forest.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Probably very little due to the very low human population density in the region.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The fish fauna includes species of *Oreoleuciscus* and *Thymallus brevirostris*, endemic to the Mongolian part of the Central Asian Internal Drainage Basin.

Special floral values: No information.

Research and facilities: Very little research has been carried out, and there are no facilities in the area.

References: Dulma (1979).

Criteria for inclusion: lb. 2d.

Source: Jon Davies.

Wetland name: Tolbo Nuur

Country: Mongolia

Coordinates: 48°34'N, 90°05'E;

Location: in the Altai Mountain region of the Central Asian Internal Drainage Basin, 45 km south of Olgii, Bayan-Olgii Province.

Area: 8,400 ha.

Altitude: 1,900m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: An elongated, freshwater lake of tectonic origin, 21.5 km long and up to 7 km wide, with a maximum depth of 12m. Two streams flow into it from the south, whilst the outflow forms the Turgen Go!, a tributary of the Khovd River. No stratification develops during the summer. The lake has ice cover up to 150 cm thick from the end of October until the beginning of June. The water temperature reaches about 15CC in July.

Climatic conditions: Extreme continental climate modified by altitude.

Principal vegetation: About 20% of the lake area supports aquatic macrophytes, the southern part of the lake and western bay being almost overgrown with vegetation.

Land tenure: State owned.

Conservation measures taken: None.

Land use: A little grazing by domestic livestock around the lake.

Disturbances and threats: None known

Economic and social values: No information.

Fauna: The summer zooplankton is relatively sparse. The fish fauna includes *Oreoleuciscuspewzowi*, *O. potanini* and *Thymallus brevirostris*, all three of which are endemic to the Mongolian part of the Central Asian Internal Drainage Basin.

Special floral values: No information.

Research and facilities: Some basic limnological studies have been carried out at the lake.

References: Dulma (1979).

Criteria for inclusion: 1b, 2d.

Source: Jon Davies.

Wetland name: Achit Nuur

Country: Mongolia

Coordinates: 49°30'N, 90°35'E;

Location: in the Altai Mountain region of the Central Asian Internal Drainage Basin, 120 km southwest of Ulaangom, Bayan-Olgii Province.

Area: 29,700 ha.

Altitude: 1,435m.

Biogeographical Province: 2.35.12. **Wetland type:** 14.

Description of site: A large freshwater lake in a basin close to the Russian border, about 60-65 km southwest of Orog Nuur. It receives inflow from the Hatugiyn, Buh Moron and Ulyastayn rivers in the northwest; the outflow in the southeast forms the Usan Holoy River, a tributary of the Khovd River which eventually flows into Har-Us Nuur. The average depth is 2m, and the maximum depth, 5m. About 50% of the lake area supports aquatic vegetation, particularly in the southwestern and southeastern parts. There is an extensive marshy area around the lake, especially in the northwest. The lake reaches its maximum temperature of 15-23°C in June and July, and is frozen from October to May or June.

Climatic conditions: Extreme continental climate modified by altitude.

Principal vegetation: No information.

Land tenure: State owned.

Conservation measures taken: None.

Land use: The marshy areas are used for livestock grazing. **Disturbances and threats:** None known.

Economic and social values: An important source of fresh water for livestock in a semi-arid region.

Fauna: The benthic fauna is diverse. Rotifers and copepods are the dominant members of the zooplankton. The fish fauna includes species of *Oreoleuciscus* and *Thymallus brevirostris*, endemic to the Mongolian part of the Central Asian Internal Drainage Basin.

Special floral values: No information.

References: Dulma (1979).

Criteria for inclusion: lb, 2d.

Source: Jon Davies.

Wetland name: Orog Nuur

Country: Mongolia

Coordinates: 50°09'N, 91°00'E;

Location: in a basin in the Altai Mountains close to the Russian border, 70 km WNW of Ulaangom, Bayan-Olgii Province.

Area: 23,760 ha.

Altitude: 1,425m.

Biogeographical Province: 2.35.12. **Wetland type:** 16.

Description of site: A roughly circular lake with a maximum depth of 42m and a mean depth of 15m. It has no outlet, but receives water from streams entering in the northwest, where there are extensive marshy areas. There is a fairly large island in the middle of the lake. The lake is thermally stratified in summer, with a surface water temperature of 12-18°C in July. The water is slightly saline; the total mineral content varies from 2.9 to 5.1 p.p.t., with sulphate and sodium ions being the most important. About 20% of the lake is occupied by aquatic macrophytes.

Climatic conditions: Extreme continental climate modified by altitude.

Principal vegetation: The marshy areas are dominated by *Phragmites* reeds, with *Carex* spp and *Equisetum* sp also being important.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Very little other than some grazing by domestic livestock in the surrounding marshes.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The relatively poor benthic fauna in the littoral zone consists of molluscs and gammarids. Rotifers and copepods dominate in the zooplankton. The fish fauna is dominated by species of *Oreoleuciscus* (*O. pewzowi* and *O. potanini*) endemic to western Mongolia. The extensive marshy areas may be important for migratory waterfowl during the summer months.

Special floral values: No information.

Research and facilities: A little basic limnological research has been carried out at the lake.

References: Dulma (1979).

Criteria for inclusion: 1b, 2d.

Source: Jon Davies.

Wetland name: Uvs Nuur (Ubsa Nuur)

Country: Mongolia

Coordinates: 49°59'-50°41'N, 92°13'-93°25'E;

Location: on the Russian border, 30 km northeast of Ulaangom, Uvs Province.

Area: 335,000 ha.

Altitude: 759m.

Biogeographical Province: 2.35.12.

Wetland type: 16.

Description of site: The largest lake in Mongolia in terms of surface area, with a length of 84 km, a width of 79 km and an average depth of 6m. The lake is separated from the Valley of the Great Lakes by the Khan-Khukhii ridge. It has no outlet and has a very large catchment area, receiving water from the east in the Baruntura, Nariyn and Tes rivers. The latter river forms a vast area of marsh to the northeast of the lake, straddling the Russian border. In the west, the Harhiri and Sangil rivers flow into the lake from the Altai Mountains. There is also an extensive area of marsh to the west of the lake. The lake is situated in a basin with large areas of sand dunes at the northernmost limit of the semi-arid zone. The water is markedly saline (18.8 p.p.t.), with sulphate and sodium ions being the most important constituents. In summer, the water temperature exhibits a gradient from 25°C at the surface to 19°C at the bottom. There is ice cover from October to May.

Climatic conditions: Extreme continental climate.

Principal vegetation: No information.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Probably none other than livestock grazing. **Disturbances and threats:** None known.

Economic and social values: No information.

Fauna: The lake is known to be a very important breeding and staging area for a wide variety of migratory waterfowl, but no details are available. The fish fauna is dominated by *Oreoleuciscus pewzowi* and *O. potanini*, endemic to western Mongolia.

Special floral values: No information.

Research and facilities: Some basic limnological research has been carried out. **References:** Dulma (1979).

Criteria for inclusion: lb, 2d, 3b.

Source: Jon Davies.

Wetland name: Hyargas Nuur (Khirgiz Nuur)

Country: Mongolia

Coordinates: 48°58'-49°20'N, 92°48'-93°48'E;

Location: in the Valley of Great Lakes in western Mongolia, 100 km southeast of Ulaangom, Khovd Province.

Area: 140,700 ha.

Altitude: 1,029m.

Biogeographical Province: 2.35.12.

Wetland type: 16.

Description of site: One of the biggest salt lakes in Mongolia, in the lowest depression in the Valley of Great Lakes between the Altai and Khangai mountain ranges. The lake is 75 km long and up to 31 km wide, and has a maximum depth of 80m. It is connected to a nearby freshwater lake, Ayrag Nuur. The lake has ice cover from October or November to May or June. The surface water temperature reaches 23-25°C in summer.

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is about 300 mm.

Principal vegetation: The dominant phytoplankters are *Ceratium hirundinella* and *Pediastrum* sp. The lake is surrounded by a landscape of xerophytic and halophytic shrubs, and there are probably extensive areas of salt marsh.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Some livestock grazing. A scourge of biting gnats has been reported as making the area virtually uninhabitable in spring.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: Copepods predominate in the zooplankton in summer; rotifers predominate when there is ice cover. The fish fauna includes *Oreoleuciscus pewzowi*, *O. potanini* and *Thyrnallus brevirostris*, species endemic to western Mongolia.

The lake is thought to be one of the most important staging areas for migratory waterfowl in Mongolia, but no details are available.

Special floral values: No information.

Research and facilities: Some basic limnological research has been carried out at the lake.

References: Dulma (1979); Nowak (1970).

Criteria for inclusion: lb, 2d, 3b.

Source: Jon Davies.

Wetland name: Ayrag Nuur

Country: Mongolia

Coordinates: 48°53'N, 93°25'E;

Location: immediately to the south of Hyargas Nuur, in the Valley of Great Lakes, 150 km southeast of Ulaangom, Khovd Province.

Area: 14,330 ha.

Altitude: 1,030m.

Biogeographical Province: 2.35.12. **Wetland type:** 14.

Description of site: A large freshwater lake in a semi-arid region. The lake is about 16 km long and 13 km wide, and has a maximum depth of 10m. It is connected to Hyargas Nuur, to the north, by a deep channel. There is ice cover to a thickness of 110-160 cm from October or November to May or June. The surface water temperature can rise to 25°C in summer. The Dzavkhan River flows into the lake at its southwest corner, and forms an extensive marshy area to the south and west of the lake, with many braided river channels.

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is in the region of 300 mm.

Principal vegetation: Large areas of marshes with much emergent macrophyte growth. Blooms of the blue-green alga *Aphanizomenon flosaquae* have been reported.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Some livestock grazing.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The zooplankton is dominated by rotifers and copepods. The fish fauna includes *Oreoleuciscus pewzowi*, *O. potanini* and *Thymallus brevirostris*, species endemic to western Mongolia.

Special floral values: No information.

Research and facilities: A little basic limnological research has been carried out at the lake.

References: Dulma (1979).

Criteria for inclusion: lb, 2d.

Source: Jon Davies.

Wetland name: Har-Us Nuur

Country: Mongolia

Coordinates: 47°45'-48°23'N, 95°57'-92°49'E;

Location: in the Valley of Great Lakes close to the Altai Mountains, 180 km south of Ulaangom and 25 km east of Khovd, Khovd Province.

Area: c.150,000 ha.

Altitude: 1,160m.

Biogeographical Province: 2.35.12. **Wetland type:** 14.

Description of site: A very large freshwater lake with a maximum depth of 4.5m. Its main inflow, the Khovd River, forms a vast delta at the west end of the lake, and much of the lake is occupied by macrophytes. The lake is connected to Har Nuur to the east by the Conoharayh Gol.

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is in the region of 300 mm.

Principal vegetation: Up to 80% of the lake is covered with macrophytes; the dominant forms are floating-leafed aquatics such as *Potamogeton* and *Nymphaea*.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Fishing, harvesting of muskrats and livestock grazing.

Disturbances and threats: The Muskrat *Ondatra zibethicus* was introduced into the lake in 1967, and has become very abundant. Some 5,000 individuals were harvested annually in the 1970s (Dulma, 1979).

Economic and social values: The lake supports a locally important fishery.

Fauna: The fish fauna includes *Oreoleuciscus pewzowi*, *O. potanini*, *O. humilis*, *Thymallus brevirostris* and a bich *Noemacheilus strauchi*, all of which are endemic to western Mongolia. The lake is considered to be one of the most important breeding and staging areas for migratory waterfowl, particularly ducks, geese and shorebirds, in Mongolia, but little information is available. The Demoiselle Crane *Anthropoides virgo* breeds in the area, and the Common Crane *Grus grus* is known to occur in small numbers on migration.

Special floral values: No information.

Research and facilities: A little basic limnological research has been carried out at the lake. References: Bold (1981); Dulma (1979); Nowak (1970).

Criteria for inclusion: lb, 2d, 3b.

Source: Jon Davies.

Wetland name: Har Nuur

Country: Mongolia

Coordinates: 47°58'-48°13'N, 93°00'-93°25'E;

Location: to the east of Har-Uus Nuur in the Valley of Great Lakes, 220 km SSE of Ulaangom and 110 km east of Khovd, Khovd Province.

Area: 50,000 ha.

Altitude: 1,106m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: A large freshwater lake with a maximum depth of 7m. It is connected to Har-Uus Nuur in the west, and its outflow goes into Dorgon Nuur, immediately to the southeast. The lake also has a connection to the Dzavkhan River. The faunal and floral characteristics are very similar to those of Har-Uus Nuur (site10).

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is in the region of 300 mm.

Principal vegetation: A substantial area of the lake is occupied by macrophytes, mainly *Potamogeton sp* and *Nymphaea sp*.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing.

Disturbances and threats: The lake may be used for the introduction of fur-bearing mammals.

Economic and social values: The lake has some potential for fisheries exploitation.

Fauna: The fish fauna includes *Oreoleuciscus pewzowi*, *O. potanini*, *O. humilis*, *Thymallus brevirostris* and a bich *Noemacheilus strauchi*, all of which are endemic to western Mongolia. The area is thought to be important for migratory waterfowl, but no information is available.

Special floral values: No information.

Research and facilities: A little basic limnological research has been carried out at the lake. References: Dulma (1979).

Criteria for inclusion: lb, 2d.

Source: Jon Davies.

Wetland name: Dorgon Nuur (Doroo Nuur)

Country: Mongolia

Coordinates: 47°42'N, 93°25'E;

Location: immediately to the southeast of Har Nuur in the Valley of Great Lakes, 260 km SSE of Ulaangom, Khovd Province.

Area: 30,000 ha.

Altitude: 1, 106m.

Biogeographical Province: 2.35.12.

Wetland type: 16.

Description of site: A large saline lake with a maximum depth of 27m. It is connected to Har Nuur to the northwest by the Homin Holoy River.

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is in the region of 300 mm.

Principal vegetation: No information.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing.

Disturbances and threats: None known.

Economic and social values: The lake has some potential for fisheries exploitation.

Fauna: The fish fauna includes *Oreoleuciscus pewzowi*, *O. potanini*, *O. humilis*, *Thymallus brevirostris* and a bich *Noemacheilus strauchi*, all of which are endemic to western Mongolia. The lake is thought to be important for migratory waterfowl, but no information is available.

Special floral values: No information.

Research and facilities: Very little research has been carried out at the lake.

References: Dulma (1979).

Criteria for inclusion: lb. 2d.

Source: Jon Davies.

Wetland name: Hunguyn Har Nuur

Country: Mongolia

Coordinates: 48°22'N, 96°10'E;

Location: at the western edge of the Khangayn Plateau overlooking the Valley of Great Lakes, 90 km southwest of Telmen Nuur.

Area: 6,400 ha.

Altitude: c.2,200m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: A meso-oligotrophic, freshwater lake about 14 km long and 7.5 km wide, with a maximum depth of 50m and an average depth of 22m. The lake is somewhat less oligotrophic than Telmen Nuur and Sangiyn Dalay Nuur. The main inflow is the Muhar Hunguyn Gol entering from the east; there is no outlet. The lake is covered with 110-150 cm of ice from the end of November to the beginning of May. The surface water temperature can rise to as high as 25°C in summer.

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is in the region of 300 mm.

Principal vegetation: The aquatic flora consists mainly of communities of *Potamogeton*, *Myriophyllum*, *Polygonum amphibium*, *Ceratophyllum* and *Hippuris*, with *Chara* being somewhat scarcer. Beds of *Potamogeton* and *Potygonum* cover as much as of the lake. There is a massive bloom of phytoplankton in summer, especially the diatom *Cyclotella comta*, the chrysophyte *Dinobryon sociale* and the blue-green alga *Microcystis aeruginosa*.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: Rotifers and copepods are dominant in the zooplankton, the biomass of which can reach 2.1 gm per cubic metre during July and August. There is also a rich benthic fauna. The fish fauna consists of species of *Oreoleuciscus* endemic to western Mongolia. No information is available on the waterfowl.

Special floral values: No information.

Research and facilities: A little limnological research has been carried out at the lake.

References: Dulma (1979).

Criteria for inclusion: lb, 2d.

Source: Jon Davies.

Wetland name: Telmen Nuur

Country: Mongolia

Coordinates: 48°50'N, 97°20'E;

Location: in the Khangayn Plateau region of the Central Asian Internal Drainage Basin, 215 km WSW of Moron, Dzavkhan Province.

Area: 19,400 ha.

Altitude: 1,789m.

Biogeographical Province: 2.35.12.

Wetland type: 16.

Description of site: A large, oligotrophic, saline lake with two or three islands, situated in a wide steppic valley between mountain chains on the Khangayn Plateau. The north shore is gravelly, giving way to grassland; the east and west ends are shallow with muddy areas. The lake is fed by the Holoyin Gol entering from the west, and has no outlet. It has a maximum depth of 27m and an average depth of 13m. The surface water temperature reaches a maximum of 17°C in summer.

Climatic conditions: Extreme continental climate modified by altitude.

Principal vegetation: There are almost no aquatic macrophytes in the lake, other than some patches of *Hippurus* and *Chara* near the southern shore.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing .

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The zooplankton is dominated by copepods and rotifers. The lake supports a typical west Mongolian fish fauna with species of *Oreoleuciscus*. The lake is an important breeding and staging area for migratory waterfowl. Birds recorded during a brief survey in June 1977 included nine pairs of *Gavia arctica*, three pairs of *Cygnus cygnus*, 80 *Anser indicus* (including 5 nests and 12 broods) and:

60 *Tadorna ferruginea*

25 *T. tadorna*

100 *Anas penelope*

50 *A. crecca*

1 pair of *A. poecilorhyncha*

70 *A. acuta*

70 *Aythya ferina*

140 *Mergus merganser*

along with smaller numbers of *Phalacrocorax carbo*, *Ardea cinerea*, *Platalea leucorodia*, *Anas falcata*, *A. strepera*, *A. querquedula*, *A. clypeata*, *Bucephala clangula* and *Mergus albellus* (Kitson, 1978).

Special floral values: No information

Research and facilities: A little basic limnological research has been carried out, and Kitson (1978) has made some ornithological observations at the lake.

References: Dulma (1979); Kitson (1978).

Criteria for inclusion: lb, 2d, 3b.

Source: Jon Davies.

Wetland name: Sangiyn Dalay Nuur

Country: Mongolia

Coordinates: 49°15'N, 99°00'E;

Location: in the Hangayn Plateau region of the Central Asian Internal Drainage Basin, 90 km southwest of Moron, Khovsgol Province.

Area: 16,530 ha.

Altitude: 1,889m.

Biogeographical Province: 2.35.12. **Wetland type:** 16.

Description of site: A large, oligotrophic and slightly saline lake with an irregular shape and several large bays. An island in the western part of the lake rises 100-150m above the lake surface. Most of the shore is gently sloping and consists of gravel, but in several places, rocky mountains drop steeply into the lake. The maximum depth is 30m. Several streams enter the lake on its northern side; there is no outlet. The lake is stratified, with a surface water temperature of 20°C in August and a deoxygenated lower water column. A salinity of 2.9 p.p.t. has been recorded.

Climatic conditions: Extreme continental climate modified by altitude.

Principal vegetation: Macrophyte vegetation develops only in the southern bays and is very sparse in the open lake. The lake is surrounded by grassy hills and mountains with some larch forest.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing in surrounding areas. **Disturbances and threats:** None known.

Economic and social values: No information.

Fauna: The lake contains the endemic west Mongolian fish fauna dominated by species of *Oreoleuciscus*. It is an important breeding and staging area for a wide variety of migratory waterfowl. Birds found breeding during avifaunal surveys in June 1977, June 1979 and June 1980 included *Gavia arctica* (two pairs), *Podiceps cristatus* (up to 50 birds), *Cygnus cygnus* (three pairs), *Anser indicus* (several breeding pairs and up to 170 birds), *Tadorna ferruginea*, *Fulica atra*, *Recurvirostra avosetta*, *Vanellus vanellus*, *Limosa limosa*, *Tringa totanus*, *T. stagnatilis* (several pairs), *Gallinago gallinago*, *Chlidonias leucoptera* (several hundred birds) and *Sterna hirundo*. At least two pairs of Asian Dowitchers *Limnodromus semipalmatus* were observed in the area in 1979, and were probably breeding. Other waterfowl recorded during the three June surveys included:

up to 60 *Phalacrocorax carbo*

5 *Ciconia nigra*

155 *Anser fabalis*

250 *Aythya ferina*

90 *A. fuligula*

9 *Melanitta fusca*

70 *Mergus merganser*

120 *Anthropoides virgo*

40-50 *Chlidonias hybrida*

along with small numbers of *Podiceps nigricollis*, *P. auritus*, *Ardea cinerea*, *Anser anser*, *Tadorna tadorna*, *Anas penelope*, *A. falcata*, *A. strepera*, *A. crecca*, *A. platyrhynchos*, *A. poecilorhyncha*, *A. acuta*, *A. querquedula*, *A. clypeata*, *Netta ru/i*, *Bucephala clangula*, *Mergus albellus*, *Porzana pusilla* and several species of shorebirds still on passage.

Special floral values: No information.

Research and facilities: Basic limnological studies have been carried out at the lake. Avifaunal surveys were made by Kitson in June 1977 (Kitson, 1978) and by expeditions from the German Democratic Republic in June 1979 and June 1980 (Mauersberger *et al.*, 1982).

References: Dulma (1979); Kitson (1978); Mauersberger *et al.* (1982).

Criteria for inclusion: lb, 2d, 3b.

Source: Jon Davies.

Wetland name: Lakes of the Darhatsk Basin

Country: Mongolia

Coordinates: 50°45'-51°35'N, 99°10'-99°45'E;

Location: in the headwaters of the Shishid River, about 50 km west of Khovsgol Nur, Khovsgol Province.

Area: Entire basin of approximately 270,000 ha with about 300 lakes, the largest of which Dood Tsagaan Nuur (8,000 ha).

Altitude: 1,560m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: A complex of at least 300 small lakes in a basin 100 km from north to south and up to 40 km from east to west, at the headwaters of the Shishid River, a tributary of the upper Yenisei River in the Arctic Ocean Drainage Basin. The largest of the lakes is Dood Tsagaan Nuur (8,000 ha); none of the other lakes exceeds about 2,000 ha, and few exceed 500 ha. The lakes were formed by the thawing and sinking of upper soil layers; most are fresh and vary in depth from 5m to 8m (maximum 17m). They are all oligotrophic to mesotrophic. Surface water temperatures reach their maxima of 19-28°C in July.

Climatic conditions: Extreme continental climate. The annual precipitation is in the region of 400 mm.

Principal vegetation: The amount of vegetation cover at the lakes varies from 10% or less in Lakes Hushirt, Dood Tsagaan and Tseutson, to 90% in Lakes Targan, Togrog, Sayrt and Duren. The dominant aquatic plants are *Nuphar sp.*, *Potamogeton natans*, *Myriophyllum spicatum*, *Sparganium erectum* and *Equisetum sp.* Dulma (1979) found that the vegetation of the 30 lakes he investigated fell into one of six types:

a) *Nuphar* type

b) *Potamogeton-Nuphar* type

c) *Myriophyllum-Potamogeton* type

d) *Sparganium-Equisetum* type

e) *Scirpus-Potamogeton* type

f) a mixed type.

Numerous diatoms, blue-green algae and dinoflagellates develop in the phytoplankton.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing. The small town of Rinchinlumbe lies near the southeastern edge of the basin.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: The benthic fauna is very diverse. The fish fauna is dominated by coregonids and salmonids, the principal species being *Hucho taimen*, *Brachymystax lenok*, *Coregonus lavaretus*

pidschian, *Thymallus arcticus*, *Rutilus rutilus lacustris* and *Lota Iota*. The populations of *C. lavaretus pidschian* are particularly interesting in that they include two forms, a lake-river form which entered the basin through the Yenisei region, and a pure lake form which has evolved from the former in the lakes of the Shishid area. The lakes are also inhabited by a dwarf *Coregonus*. The basin is probably a very important breeding area for migratory waterfowl, but no information is available.

Special floral values: No information.

Research and facilities: Some research has been carried out at 30 lakes, mostly on the limnology and fish populations (Dulma, 1979).

References: Dulma (1979); Dulma & Nancalma (1977). **Criteria for inclusion:** lb, 2d.

Source: Jon Davies.

Wetland name: Khovsgol Nuur

Country: Mongolia

Coordinates: 50°30'-51°37'N, 100°09'-100°48'E;

Location: in the extreme northwest of Mongolia, close to the Russian border in the Arctic Ocean Drainage Basin, 100 km north of Moron, Khovsgol Province.

Area: 276,000 ha.

Altitude: 1,645m.

Biogeographical Province: 2.35.12.

Wetland type: 14.

Description of site: A very large freshwater lake with a maximum depth of 262m; the deepest lake in Mongolia. The lake was formed in a tectonic depression at about the same time as Lake Baikal, with which it shares many similarities. It is elongated in a north-south direction for 134 km, the greatest width being 37 km. The lake has steeply shelving sides and a very narrow littoral zone; 69% of the lake is deeper than 100m. About 100 streams and rivers enter the lake, but there is only one outlet at the southern end, the Egiyn Gol, which drains into Lake Baikal via the Selenge River system. The lake is considered to be ultra-oligotrophic. It freezes over in the first half of January and remains with ice cover for four or five months. The average daily water temperature in the open water is 8.7°C in July, 9.8°C in August, 6.1°C in September and 5.4°C in October. Seasonal temperature variations have been noted to a depth of over 50m.

Climatic conditions: Extreme continental climate modified by altitude. The annual precipitation is about 400 mm at the lake and somewhat higher in the high mountains surrounding the lake (peaks to 3,500m).

Principal vegetation: The dominant aquatic macrophytes are *Potamogeton perfoliatus*, *P. vaginatus*, *Polygonum amphibium*, *Myriophyllum spicatum* and *Hippurus vulgaris*. In several places, the littoral region supports growths of *Ulothrix sp.*

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock raising in surrounding areas.

Disturbances and threats: The Baikal Omul *Coregonus autumnalis migratorius* has been successfully introduced into the lake. This is likely to have a detrimental effect on the indigenous fish fauna, and may encourage over-fishing.

Economic and social values: The lake has potential for fisheries exploitation. Of the nine indigenous species of fishes, seven are of economic importance.

Fauna: The lake supports a very interesting fish fauna, composed mainly of the families Salmonidae and Thymallidae. There are nine indigenous species of fishes: *Thymallus arcticus*, *Phoxinus phoxinus* and *Perca fluviatilis* (of European-Siberian origin); *Lota lota* (a Siberian species); *Rutilus rutilus lacustris* (also known from Lake Baikal); *Brachymystax lenok*, *Hucho taimen* and *Noemacheilus barbatulus toni* (of Siberian-Amur origin); and *Thymallus nigrescens* (apparently endemic to Khovsgol Nuur). *Coregonus autumnalis migratorius* has recently been introduced. The benthic fauna consists of gammarids, chironomids, ostracods and oligochaetes. Some components of the Lake Baikal "endemic" fauna are also found in Khovsgol Nuur, for example the molluscs *Kobeltocochlea michnoi* and *Choanomphalus mongolicus*. No information is available on the waterfowl.

Special floral values: No information.

Research and facilities: A considerable amount of limnological research has been carried out by Mongolian scientists in collaboration with the Lake Baikal Limnological Laboratory.

References: Dulma (1979); Dulma & Nancalma (1977).

Criteria for inclusion: 1b, 2d.

Source: Jon Davies.

Wetland name: Bulgan River

Country: Mongolia

Coordinates: 47°03'N, 90°52'E

Location: The Bulgan River from its source in the southern Altai at 47°03'N, 90°52'E, south to 46°05'N, 91°33'E, then west through the Dzungarian Basin to the Chinese border at 46°08'N, 91°00'E, Khovd Province, southwestern Mongolia.

Area: Approximately 250 km of river in Mongolian territory.

Altitude: 1,400-3,000m.

Biogeographical Province: 2.35.12./2.30.1

Wetland type: 11 & 12.

Description of site: A large river rising in the southern Altai Mountains and draining south then west into the Dzungarian Basin and eventually into Ulungar Lake in the People's Republic of China. Faunistically, the river belongs to the Arctic Ocean Drainage Basin, having been separated from the main basin by the uplift of the Altai Mountains. There is a large expanse of marsh at 46°05'N, 91°28'E, around the town of Bulgan, where the river turns westwards as it leaves the Altai Mountains.

Climatic conditions: Extreme continental climate. The average annual rainfall along the lower reaches of the river is about 100-150 mm. The region receives most rainfall during summer, the rain often being accompanied by very violent west and northwest winds.

Principal vegetation: No information.

Land tenure: State owned.

Conservation measures taken: Part of the river may be included in the Dzungarian National Park.

Land use: Mainly livestock raising, with some hunting and fishing.

Disturbances and threats: None known.

Economic and social values: The river is a very important source of fresh water for the local communities and their livestock in this very arid region. Hunting and fishing may also be important in the local economy. The river is of considerable scientific interest as an example of a specific faunal region which has been isolated in the middle of another distinct and totally different faunal region. In terms of their fauna, all the other water bodies in this region belong to the Central Asian Internal Drainage Basin.

Fauna: The river supports relatively large populations of six species of fishes: *Leuciscus leuciscus baicalensis*, *Carassius auratus gibelio*, *Perca fluviatilis*, *Gobio gobio*, *Tinca tinca* and *Noemacheilus barbatulus toni*. The region may be important for fur-bearing mammals and waterfowl, but no information is available.

Special floral values: No information.

Research and facilities: The river was investigated in 1973-75 by combined Mongolian and East German expeditions. These were concerned primarily with the macrofauna of the region.

References: Dulma (1979).

Criteria for inclusion: la, 2b.

Source: Jon Davies

Wetland name: Terhiyn Tsagaan Nuur

Country: Mongolia

Coordinates: 48°10'N, 99°43'E;

Location: in the valley of the Suman River, a tributary of the Selenge River in the central Khangai Mountains, 165 km SSW of Moron, Arkhangai Province.

Area: 6,110 ha.

Altitude: 2,060m.

Biogeographical Province: 2.30.11.

Wetland type: 14.

Description of site: An oligotrophic, freshwater lake of volcanic origin, which has been built up behind a lava flow blocking the Suman valley to the east. Most of the shoreline is gravel, but in the west, there are extensive marshes with many pools. The maximum depth of the lake is 19.5m. The shallow zone, up to 2m deep, comprises 40% of the lake area. In summer, the surface water temperature reaches a maximum of 15°C.

Climatic conditions: Extreme continental climate.

Principal vegetation: About 20% of the lake supports aquatic macrophytes. The aquatic vegetation is not as well developed as that of Ogi Nuur (site 20), but much the same species are present along with some *Butomus umbellatus*. Blue-green algae dominate the phytoplankton in summer. The lake is surrounded by grassy hills and mountains with some larch forest.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Fishing and livestock grazing.

Disturbances and threats: None known.

Economic and social values: The lake supports a small fishery with an annual yield of 50-100 metric tonnes (Dulma, 1979).

Fauna: The benthos is comparatively poor. The zooplankton is dominated by copepods and cladocerans. The fish fauna is dominated by typically north Eurasian species of cyprinids, pike and perch, and is similar to that of Ogi Nuur (site 20). The marshes at the west end of the lake are an important breeding and staging area for migratory waterfowl. Birds recorded during a brief survey in June 1977 included two pairs of *Gavia arctica*, four pairs of *Cygnus cygnus*, 2,100 *Anser indicus* (apparently a moulting flock), 30 *Tadorna ferruginea* (breeding), 10 *Mergus serrator* (possibly breeding) and 15 *M. merganser*, along with small numbers of *Phalacrocorax carbo*, *Ardea cinerea*, *Platalea leucorodia* and eight other species of ducks (Kitson, 1978).

Special floral values: No information.

Research and facilities: Basic limnological research has been carried out at the lake, and some observations have been made on the waterfowl.

References: Dulma (1979); Dulma & Nancalma (1977); Kitson (1978).

Criteria for inclusion: lb. 3b.

Source: Jon Davies.

Wetland name: Ogii Nuur (Ugiy Nuur)

Country: Mongolia

Coordinates: 47°46'N, 102°46'E;

Location: in the valley of the Orkhon River, to the north of the main Khangai ridge in the Arctic Ocean Drainage Basin, 165 km north of Arvayheer.

Area: 2,510 ha.

Altitude: c. 1,280m.

Biogeographical Province: 2.30.11.

Wetland type: 14.

Description of site: A shallow, mesotrophic, freshwater lake with an extensive alluvial area of grassland, river channels, pools and marshes at the western end. Three rivers, including the Orkhon, flow through this marshy area into the lake. The maximum depth of the lake is 16m, but about 40% of the lake is less than 3m deep, and 50% supports macrophytic growth. The surface water temperature in summer reaches 18°C; the conductivity is approximately 280 microSeimens/cm.

Climatic conditions: Extreme continental climate.

Principal vegetation: Most of the shores are erosion shores of gravel, but there are zones of macrophytes one to five metres from the shore composed mainly of *Potamogeton spp*, *Myriophyllum spicatum* and *Ceratophyllum demersum*. The dominant emergent in the marshes at the western end of the lake is *Schoenoplectus (Scirpus) sp*, and there is very little *Phragmites*. Other aquatic plants include *Polygonum amphibium*, *Potamogeton perfoliatus*, *P. praeionungus*, *P. vaginatus*, *Hippuris vulgaris* and *Batrachium eradicatum*. The phytoplankton is composed chiefly of diatoms. The lake is surrounded by grassy steppe.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Intensive fishing and some livestock grazing. **Disturbances and threats:** None known.

Economic and social values: The lake supports a significant fishery, with an annual yield of 50-80 metric tonnes.

Fauna: The benthic fauna is diverse. The zooplankton is dominated by copepods and cladocerans. The fish fauna is dominated by a typically north Eurasian assemblage comprised of cyprinids, pike and perch. The main species are *Esox lucius*, *Perca fluviatilis*, *Rutilus rutilus lacustris*, *Leuciscus leuciscus baicalensis*, *L. idus*, *Phoxinus phoxinus*, *Carassius auratus gibelio*, *Noemacheilus barbatulus toni*, *Cobitus taenia*, *Parasilurus asotus* and *Lota lota*, together with some *Hucho taimen*, *Brachymystax lenok* and *Thymallus arcticus*. The carp *Cyprinus carpio haematopterus* has recently invaded the lake from the Orkhon River.

The lake is a very important breeding and staging area for a wide variety of waterfowl, particularly Anatidae. Birds recorded during a brief survey in June and July 1977 included two breeding pairs of *Cygnus cygnus* along with 25 non-breeders, 1,000 *Anser cygnoides* (including several breeding pairs), one pair of *Gavia arctica* and:

20 *A. anser*

40 *A. indicus* (breeding)

50 *Podiceps cristatus* (breeding)

10 *P. nigricollis*

54 *Tadorna ferruginea*

12 *T. tadorna*
60 *Anas penelope*
45 *A. strepera*
50 *A. crecca*
60 *A. platyrhynchos* (breeding)
20 *A. quequedula*
100 *A. clypeata*
60 *Aythya ferina*
130 *Bucephala clangula*

and small numbers of *Phalacrocorax carbo*, *Ardea cinerea*, *Platalea leucorodia*, *Anas falcata*, *A. acuta*, *Netta ru/ma*, *A. fuligula* and *Mergus albellus* (Kitson, 1978).

Special floral values: No information.

Research and facilities: Basic limnological data have been gathered, and preliminary surveys of the avifauna have been made.

Referencec: Dulma (1979); Dulma & Nancalma (1977); Kitson (1978).

Criteria for inclusion: 1b, 3b.

Source: Jon Davies.

Wetland name: Selenge River

Country: Mongolia

Coordinates: 49°15'N, 100°43'E to 50°22'N, 106°04'E;

Location:the Selenge River from its source in the "Valley of Many Rivers", 55 km southeast of Moron, to the Russian border at Naushki.

Area: c.450 km of river in Mongolian territory. The catchment area of the Selenge in Mongolia is 28,000 sq.km.

Altitude: From 3,000m down to 625m at the Russian border.

Biogeographical Province: 2.30.11.

Wetland type: 11, 12, 13 & 14.

Description of site: The Selenge River from its source at the confluence of the Chulut, Ideryn and Delger Moron rivers in the "Valley of Many Rivers", downstream to the Russian border at Naushki. The river and its tributaries collect water from the northern slopes of the Khangai Mountains, the western Khentai Mountains and Khovsgol Nuur; the Selenge eventually flows into Lake Baikal in the USSR. The Selenge river system includes the Khovsgol, Ogi and Terhiyn Tsagaan lakes; its tributaries include the Orkhon and Tamarin which rise in the Khangai Mountains, and the Tuul River which rises in the western Khentai Mountains and flows through Ulan Bator. The rivers form extensive marshes in some areas. Water temperatures can rise to 17-18°C in August. The rivers in this region have a fairly low conductivity; the Tuul River at Lun (47°54'N, 105°00'E) has a conductivity of 100 microSeimens/cm in summer, while the Orkhon River at Kharakhorim (47°11'N, 102°45'E) has a conductivity of 108 microSeimens/cm.

Climatic conditions: Extreme continental climate.

Principal vegetation: Riverine marshes with *Phragmites* reed-beds, birch and willow scrub; mixed birch and coniferous forest and open grassland in surrounding areas.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Fishing and livestock grazing.

Disturbances and threats: None known.

Economic and social values: Hunting, particularly of fur-bearing mammals, and fishing are important in the local economy.

Fauna: The fish fauna includes *Coregonus lavaretus pidschian*, *Hucho taimen*, *Brachymystax lenok*, *Cyprinus carpio haematopterus*, *Thymallus arcticus*, *Carassus auratus gibelio*, *Lota lota*, *Perca fluviatilis*, *Esox lucius*, *Rutilus rutilus lacustris*, *Leuciscus idus* and *L. leuciscus baicaiensis*. The Whitefish *C. lavaretus pidschian* in the Selenge may be a different form from those found in the Darkhatsk Basin Lakes (Dulma, 1979). The extensive riverine marshes are known to be of considerable importance for migratory waterfowl, but little information is available. The Demoiselle Crane *Anthropoides virgo* nests in marshy meadows along the rivers, and occurs in large numbers on migration, along with small numbers of *Grus grus*. Waterfowl observed along the lower Orkhon valley in late May 1987 included *Ciconia nigra*, *Tadorna ferruginea*, *Anas strepera*, *A. crecca*, *A. platyrhynchos*, *A. acuta*, *A. querquedula*, *A. clypeata*, *Mergus merganser*, *Anthropoides virgo*, *Vanelius vanellus*, *Tringa stagnatilis*, *Actitis hypoleucos* and *Sterna hirundo*.

Special floral values: No information.

Research and facilities: A little limnological research has been carried out, and the ichthyofauna has been investigated.

References: Bankovics (1987); Dulma (1979).

Criteria for inclusion: lb. 2d, 3b.

Source: Jon Davies and Derek A. Scott.

Wetland name: Kerulen (Herlen) River

Country: Mongolia

Coordinates: 48°30'N, 108°50'E to 48°10'N, 115°30'E;

Location: the Kerulen River from its source in the eastern Khentai Mountains to the Chinese border.

Area: Approximately 700 km of river in Mongolian territory.

Altitude: From the headwaters at 1,675m down to the Chinese border at 640m.

Biogeographical Province: 2.30.11.

Wetland type: 11, 12, 13, 15 & 18.

Description of site: The Kerulen River from its source at 1,675m in the eastern Khentai Mountains, southwards then eastwards in a huge bend about 150 km southeast of Ulan Bator, to the Chinese border. The river eventually drains into Hulun Nur, which has a connection with the Amur River, and is thus part of the Pacific Ocean Drainage Basin. The Kerulen is a very large river with a very extensive floodplain, the river splitting into numerous channels in many places on the plains. The floodplain is regularly inundated in spring and summer, leaving behind extensive marshy areas with numerous small ponds which provide ideal habitat for waterfowl.

Climatic conditions: Extreme continental climate. The annual precipitation is about 400 mm in the Khentai Mountains and 200 mm at lower altitudes near the Chinese border. Most of the precipitation falls as rain during the summer months.

Principal vegetation: The banks of the river are often lined with willows, while the floodplain contains many areas of emergent marsh vegetation, flooded grassland and permanent pools with submerged and floating aquatic vegetation.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Mainly livestock grazing. Hay-making is important on the floodplain.

Disturbances and threats: None known.

Economic and social values: The wet meadows of the floodplain provide valuable grazing land for domestic livestock and a source of hay for winter fodder.

Fauna: The very diverse fish fauna includes some species, which are also found in the Arctic Ocean Drainage Basin, such as *Hucho taimen*, *Brachymystax lenok*, *Cyprinus carpio*, *Carrasius auratus* and *Parasilurus asotus*, but most species are characteristic of the Chinese lowland fauna. These include *Rhodeus sericus*, *Misgurnus anguillicaudatus*, *Saurogobio amurensis*, *Hemibarbus maculatus*, *H. labeo*, *Erythroculter erythropterus*, *E. mongolicus* and *Culter alburnus*. In addition, the river has two endemic genera of fish each with one species, *Mesocottus haetus* and *Pseudaspius leptcephalus*, and four other endemic species, *Esox reicherti*, *Acipenser schrenki*, *Coregonus chadary* and *Hemiculter leuciscus warpachowskii*.

The extensive floodplain marshes are known to be of considerable importance for breeding and passage waterfowl, including the White-naped Crane *Grus vipio*, but almost no information is available.

Special floral values: No information.

Research and facilities: Some research has been conducted on the fish fauna, but very little work has been carried out on the other fauna and flora.

References: Bold (1981); Dulma (1979).

Criteria for inclusion: lb. 2a, 2d, 3b.

Source: Jon Davies.

Wetland name: Onon River

Country: Mongolia

Coordinates: 48°20'N, 110°20'E to 49°30'N, 112°30'E;

Location: the Onon River from its upper reaches in the eastern Khentai Mountains to the Russian border.

Area: c.250 km of river in Mongolian territory.

Altitude: 1,200m in the upper reaches down to 900m at the Russian border.

Biogeographical Province: 2.30.11.

Wetland type: 11, 12, 13, 15 & 18.

Description of site: A large river rising in the Hentiyn Nuruu Mountains in the eastern Khentai range and flowing for about 250 km in Mongolian territory before entering the USSR. There are extensive marshes near the headwaters at 48°20'N, 110°20'E, and also in floodplain areas along the lower reaches of the river.

Climatic conditions: Extreme continental climate. The annual precipitation is about 400 mm in the Khentai Mountains and 200 mm at lower altitudes near the Russian border. Most of the precipitation falls as rain during the summer months.

Principal vegetation: The banks of the river are often lined with willows, while the floodplain contains many areas of emergent marsh vegetation, flooded grassland and permanent pools with submerged and floating aquatic vegetation.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Livestock grazing.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: Apparently similar to the Kerulen River (site 22). The diverse fish fauna includes some species characteristic of the Arctic Ocean Drainage Basin, such as *Hucho taimen*, *Brachymystax lenok*, *Cyprinus carpio*, *Carrasius auratus* and *Parasilurus asotus*, and some species characteristic of the Chinese lowland fauna, such as *Hemibarbus labeo* and *Culter alburnus*. In addition, the river has three endemic species, *Pseudaspius leptcephalus*, *Esox reicherti* and *Coregonus chadary*. *Thymallus arcticus grubei* also occurs. The extensive

floodplain marshes are thought to be of considerable importance for breeding and passage waterfowl, but no information is available.

Special floral values: No information.

Research and facilities: Little if any research has been carried out in the area.

References: Dulma (1979).

Criteria for inclusion: lb. 2d.

Source: Jon Davies.

Wetland name: Uldze River

Country: Mongolia

Coordinates: 48°30'N, 111°30'E to 49°54'N, 115°43'E;

Location: the Uldze River from its upper reaches in the eastern Khentai Mountains to the Russian border.

Area: c.400 km of river in Mongolian territory.

Altitude: 1,500m in the upper reaches down to 590m at the Russian border.

Biogeographical Province: 2.30.11.

Wetland type: 11, 12, 13, 14 & 15.

Description of site: A large river rising near the source of the Onon River (site 22) in the eastern Khentai range, and flowing for about 400 km in Mongolian territory before entering the USSR. The river eventually flows into Lake Barun Torey. There are numerous river channels and marshy areas in the catchment area, with many lakes in the broader valleys, particularly between 49° and 50°N, and 114° and 116°E. The largest of these lakes is Hoh Nuur (49°30'N, 115°35'E), with an area of 9,500 ha and a maximum depth of 14m.

Climatic conditions: Extreme continental climate. The annual precipitation is about 400 mm in the Khentai Mountains and 200 mm at lower altitudes near the Russian border. Most of the precipitation falls as rain during the summer months.

Principal vegetation: The banks of the rivers are lined with willows, and there are many areas of emergent marsh vegetation and permanent lakes with submerged and floating aquatic vegetation.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Grazing by domestic livestock. **Disturbances and threats:** None known.

Economic and social values: No information.

Fauna: Apparently similar to the Kerulen and Onon rivers (sites 22 & 23). The fish fauna includes species characteristic of the Arctic Ocean Drainage Basin, as well as species characteristic of the Chinese lowland fauna. The extensive lakes and marshes in the catchment area are thought to be of considerable importance for breeding and passage waterfowl, but no information is available.

Special floral values: No information.

Research and facilities: Little if any research has been carried out in the area.

Wetland name: Buyr Nuur

Country: Mongolia

Coordinates: 47°39'-47°58'N, 117°30'-117°53'E;

Location: on the Chinese border, 50 km NNE of Tamsagbulag, in extreme eastern Mongolia.

Area: 61,500 ha.

Altitude: 590m.

Biogeographical Province: 2.30.11.

Wetland type: 14.

Description of site: A large, oligotrophic, freshwater lake with extensive marshes, in flat steppic country. The lake is fed by the Khalkhin River, which enters from the southeast. It has a maximum depth of 10m, and ice cover during the winter months.

Climatic conditions: Extreme continental climate.

Principal vegetation: Extensive *Phragmites* reed-beds; also floating and submerged macrophytes such as *Potamogeton* spp. The phytoplankton includes blue-green algae.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Fishing and grazing by domestic livestock. **Disturbances and threats:** None known.

Economic and social values: The lake supports an important fishery.

Fauna: The fish fauna includes *Hucho taimen*, *Brachymystax lenok*, *Esox reicherti*, *Ctenopharyngodon idella*, *Pseudaspius leptcephalus*, *Hemibarbus labeo*, *H. maculatus*, *Erythroculter erythropterus*, *E. mongolicus*, *Culter alburnus*, *Cyprinus carpio*, *Carassius auratus gibelio*, *Hypophthalmichthys molitrix* and *Parasilurus asotus*, several of which are endemic to this region of Mongolia. The zooplankton is dominated by copepods and cladocerans. The Red-crowned Crane *Grus japonensis* has been recorded as an irregular migrant. Kitson (1980) suggests that Buyr Nuur might be a breeding station for the rare Relict Gull *Larus*

relictus. An adult of this species was collected at Bayan Nuur, a small lake just to the south, in May 1966. No other information is available on the waterfowl.

Special floral values: No information.

Research and facilities: Basic research has been carried out on the limnology and fish fauna of the lake.

References: Bold (1981); Dulma (1979); Kitson (1980).

Criteria for inclusion: 1b, 2a, 2d, 3b.

Source: Jon Davies.

Wetland name: Boon Tsagaan Nuur

Country: Mongolia

Coordinates: 45°35'N, 99°10'E;

Location: in the Gobi Valley, 135 km SSW of Bayan-Khongor and 285 km WSW of Arvayheer, Bayan-Khongor Province.

Area: Maximum 28,000 ha.

Altitude: 1,131m.

Biogeographical Province: 2.22.8.

Wetland type: 16.

Description of site: A large saline lake with a saucer-shaped depth profile and a maximum depth of 10m; the most westerly of the Gobi Valley Lakes, lying in the broad inter-montane depression between the Khangai and Gobi-Altai mountains, at the foot of the Khara-Argalintu ridge of the Gobi-Altai. During glacial times, the lake was a much larger body of water incorporating the neighboring Adgiyn Tsagaan Nuur (site 27). The shores are mainly sandy and exposed, and the surrounding area is semi-desert. The main inflow comes from the Khangai mountains via the Baydrag River, which enters the lake at the northeast corner. The lake varies considerably in size, reaching its maximum area in spring due to the inflow of melt water from the Khangai Mountains. As it shrinks, it leaves behind areas of freshwater pools, marshes, salt marshes and salt pans. Due to its exposed situation, the lake is very well mixed,

any stratification being only temporary. The conductivity is 4,000-6,000 microSeimens/cm. The surface water temperature reaches about 20°C in August. The lake freezes in December, and probably thaws in April; the ice cover may be up to 80 cm thick

Climatic conditions: Extreme continental climate. The average annual rainfall around the lake is about 100-150 mm, whilst in the mountains to the south, it is 150-200 mm. The area receives most rainfall in summer, the rain often being accompanied by very violent west and northwest winds. The general climate for the whole of the Gobi Valley of Lakes can be illustrated by the parameters recorded at Dalandzadagad, a town at 43°35'N, 104°28'E (altitude 1,486m). Here, the average annual rainfall is 125 mm, the average January temperature -16.6°C, and the average July temperature 21.2°C. The average annual temperature is 3.6°C. Evaporation rates are very high, in the order of 1,500 mm per year.

Principal vegetation: There are patches of flooded grass and freshwater marsh around the mouth of the Baydrag River, at the northeast corner of the lake. As the lake shrinks in summer, it leaves areas of salt marsh, especially to the east of the lake. Species of *Potamogeton* are present in the lake, although not near the shore due to the exposed conditions. The surrounding area is dominated by xerophytic and halophytic vegetation, with Saxaul *Haloxylon ammodendron* being common.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Fishing; grazing by horses, goats, sheep and cattle in the freshwater marshes, and grazing by camels in the more arid areas.

Disturbances and threats: Dulma (1979) mentions the possibility of using the Gobi Valley Lakes for the culture of Chinese carp during the summer, although this may not be feasible for some time, owing to the remoteness of the lakes.

Economic and social values: The freshwater marshes provide important grazing land for domestic livestock in an otherwise arid region.

Fauna: The zooplankton is rich in rotifers; a massive development of the zooplankton takes place in July and August, and an average biomass of 2.1 gm per cubic metre has been recorded (Dulma, 1979). The fish fauna includes species of *Oreoleuciscus* and *Thymallus brevirostris* endemic to western Mongolia.

The lake is known to be an important staging area for migratory waterfowl, particularly Anatidae and shorebirds, but few details are available. It has been suggested that this might be a breeding area for the rare Relict Gull *Larus relictus*.

Special floral values: No information.

Research and facilities: Basic limnological data have been gathered, and some research has been carried out on the palaeolimnology of the lake and geomorphology of the surrounding area. There is a small chalet with beds near the mouth of the Baydrag River which can be used by visiting scientists if permission is obtained from the guardian in the town of Baatsagaan.

References: Davies (1986); Dulma (1979); Nikolaeva (1967); Zegmid (1955).

Criteria for inclusion: 1b, 2a, 2d, 3b.

Source: Jon Davies.

Wetland name: Adgiyn Tsagaan Nuur

Country: Mongolia

Coordinates: 45°32'N, 100°00'E;

Location: in the Gobi Valley of Lakes, about 60 km east of Boon Tsagaan Nuur and 125 km south of Bayan-Khongor, Bayan-Khongor Province.

Area: Maximum 2,200 ha.

Altitude: 1,100m.

Biogeographical Province: 2.22.8.

Wetland type: 14.

Description of site: Apparently only a seasonal lake, appearing in spring as a result of inflow of melt water from the Khangai Mountains. The size thus varies considerably to a maximum of 2,200 ha, and the depth to a maximum of about two meters. The lake is fed by the Nariyn Gol rising in the Khangai Mountains and also by branches of the Baydrag River. These branches, which flow along the foot of the Gobi-Altai, form extensive marshy areas between Boon Tsagaan Nuur (site 26) and Adgiyn Tsagaan Nuur.

Climatic conditions: Extreme continental climate. The average annual rainfall around the lake is about 100-150 mm, whilst in the mountains to the south, it is 150-200 mm. The area receives most rainfall in summer, the rain often being accompanied by very violent west and northwest winds. Evaporation rates are very high, in the order of 1,500 mm per year.

Principal vegetation: Mainly flooded grassland and halophytes at high water levels. The lake is surrounded by plains of sand and stone chippings.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Grazing by domestic livestock.

Disturbances and threats: Dulma (1979) mentions the possibility of using the Gobi Valley Lakes for the culture of Chinese carp during the summer, although this may not be feasible for some time, owing to the remoteness of the lakes.

Economic and social values: A valuable grazing area for domestic livestock in an arid region.

Fauna: Little information is available. The lake may support a fish population in summer due to migration of *Oreoleuciscus spp* from the rivers. Kitson (1978) observed small numbers of waterfowl in late April 1977, including 400 *Anas acuta*.

Special floral values: No information.

Research and facilities: Very little research has been carried out at the lake, and there are no facilities in the area.

References: Dulma (1979); Kitson (1978). **Criteria for inclusion:** 0.

Source: Jon Davies.

Wetland name: Orog (Orok) Nuur

Country: Mongolia

Coordinates: 45°03'N, 100°45'E;

Location: at the foot of the Ikhe Bogd Uul massif, in the Gobi Valley of Lakes, 125 km south of Jargalan, Bayan-Khongor Province.

Area: Maximum 13,000 ha.

Altitude: 1,235m.

Biogeographical Province: 2.22.8.

Wetland type: 16.

Description of site: A large, slightly saline lake, less saline than the other lakes in the Gobi Valley and with a maximum depth of 4m. The shores of the lake are lined with mud, sand and fine shingle. The inflow is the Tuin Gol rising in the Khangai Mountains, but groundwater from the Gobi-Altai is also probably important. The Tuin Gol bifurcates north of the lake to form a swampy delta, whilst freshwater springs to the north of the lake support extensive reed-beds. The lake reacts markedly to changes in the volume of inflow; in dry years, it is divided into two basins. As with Tatsain Tsagaan Nuur (site 29), the lake seems to be

shrinking, especially in the period 1985-1987. This may be due to lack of rain, but Fisher (pers. comm.) speculates that it may be due to the extraction of water for irrigation purposes. Kozlova (1932-33) described the lake in 1926 as having a circumference of 130 km, a length of 50 km and a maximum width of 10 km.

Climatic conditions: Extreme continental climate. The average annual rainfall around the lake is about 100-150 mm, whilst in the mountains to the south, it is 150-200 mm. The area receives most rainfall in summer, the rain often being accompanied by very violent west and northwest winds. Evaporation rates are very high, in the order of 1,500 mm per year.

Principal vegetation: *Phragmites* reed-beds and scattered swampy vegetation, mainly at the north end of the lake. The surrounding terrain is flat and arid, with xerophytes such as *Caragana* sp and *Saxaul Haloxylon ammondendron*.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Fishing; grazing by domestic livestock in the freshwater marshes around springs. Water is extracted from the lake for irrigation purposes.

Disturbances and threats: Excessive extraction of water for irrigation may be responsible for the reduction in size of the lake in recent years.

Economic and social values: The lake supports a locally important fishery, the marshes provide valuable grazing land for domestic livestock, and the springs provide an important source of drinking water.

Fauna: The zooplankton is rich in rotifers. In July and August, there is a massive development of the zooplankton, with the biomass averaging 1.3 gm per cubic meter.

The rich benthic fauna is dominated by larval stoneflies (Plecoptera), the dragonflies *Aeschna affinis* and *Sympetrum flaveolum*, and *caddis flies* (Trichoptera). The lake supports the endemic west Mongolian fish fauna consisting of *Thymallus brevirostris* and species of *Oreoleuciscus*. Mass mortality of fishes may occur at very low water levels. The populations are probably replenished from the Tuin Gol when it starts flowing into the lake again. Orog Nuur is a very important staging area for migratory waterfowl, particularly Anatidae and

shorebirds, and supports breeding populations of a variety of species including *Pelecanus crispus*, *Phalacrocorax carbo*, *Ardea cinerea*, *Tadorna ferruginea*, *T. tadorna*, *Anas poecilorhyncha*, *Recurvirostra avosetta*, *Charadrius alexandrinus*, *Limosa limosa*, *Tringa totanus*, *Gelochelidon nilotica* and *Sterna hirundo*. Kitson (1980) observed 20 pairs of the rare Relict Gull *Larus relictus*, along with *L. ichthyaetus*, *L. ridibundus* and *L. argentatus*, in late April and early May 1977, and suggested that *relictus* might occasionally breed at the lake. Other observers have failed to find the species during the breeding season, and only two individuals were present in 1987. Other waterfowl observed by Kitson during his survey in 1977 included:

60 *Podiceps cristatus*

700 *Phalacrocorax carbo* (55 nests)

3 *Pelecanus crispus*

85 *Ardea cinerea* (18 nests)

12 *Ciconia nigra*

80 *Platalea leucorodia*

500 *Anas penelope*

100 *A. crecca*

115 *A. platyrhynchos*

1,200 *A. acuta*

73 *Netta rufina*

285 *Aythya ferina*

100 *A. fuligula*

90 *Mergus albellus*

and small numbers of *Cygnus olor*, *C. cygnus*, *Anser cygnoides*, *A. fabalis*, *A. anser* and *A. indicus* (Kitson, 1978). The reed-beds support large populations of *Panurus biarmicus*, *Locustella certhiola*, *Acrocephalus agricola* and *Emberiza pallasi*.

Special floral values: No information.

Research and facilities: Basic limnological data have been gathered, and some ornithological observations have been made by Kitson (1980) and recent bird-watching tours from Europe.

References: Dulma (1979); Kitson (1980); Kozlova (1932-33).

Criteria for inclusion: ib, 2a, 2d, 3b.

Source: Jon Davies and David Fisher.

Wetland name: Tatsain Tsagaan Nuur

Country: Mongolia

Coordinates: 45°08'N, 101°28'E;

Location: in the Gobi Valley of Lakes at the foot of the Baga Bogd Masif of the Gobi-Altai, 160 km southwest of Arvayheer, Oeever-Khangai Province.

Area: Maximum 2,400 ha.

Altitude: 1,220m.

Biogeographical Province: 2.22.8.

Wetland type: 16.

Description of site: A shallow, slightly saline lake with shores of mud, fine shingle and sand, in the same sandy depression as Orog Nuur, about 60 km to the east. The lake is fed by the Tatsain Gol which rises in the Khangai Mountains and enters the lake in a marshy area at the west end. Elsewhere, the shores of the lake are sandy. The lake varies enormously in size; the water level fell each year from 1981 to 1983, and in 1985 and 1987, the lake was completely dry. The Tatsain Gol has now disappeared into the sediments to the north of the lake. The disappearance of the lake may be due to a lack of rainfall over the past few years, and it is not certain whether or not the lake will reform.

Climatic conditions: Extreme continental climate. The average annual rainfall around the lake is about 100-150 mm, whilst in the mountains to the south, it is 150-200 mm. The area receives most rainfall in summer, the rain often being accompanied by very violent west and northwest winds. Evaporation rates are very high, in the order of 1,500 mm per year.

Principal vegetation: Some reed-beds around the lake margins.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Grazing by domestic livestock (camels, horses and sheep).

Disturbances and threats: The lake has dried out completely in recent years, possibly because of a lack of rainfall.

Economic and social values: The marshes provide valuable grazing land in an otherwise arid region.

Fauna: The zooplankton is rich in rotifers; a massive development of the zooplankton takes place in July and August, and an average biomass of 3.1 gm per cubic meter has been recorded (Dulma, 1979). The fish fauna includes *Thymallus brevirostris* and species of *Oreoleuciscus* endemic to western Mongolia. The lake is one of the few known breeding localities of the rare Relict Gull *Larus relictus*. A minimum of eight pairs were nesting in 1981, and fourteen nests were located in 1982. Other species which are known to have bred include *Phalacrocorax carbo*, *Recurvirostra avosetta* and *Charadrius alexandrinus*. The lake is also important as a staging area for migratory ducks, shorebirds and terns. Waterfowl observed during a brief survey in April and May 1977 included six *Pelecanus crispus* (in breeding plumage) and:

140 *Podiceps cristatus*
200 *Phalacrocorax carbo*
30 *Ardea cinerea*
1 *Ciconia nigra*
70 *Platalea leucorodia*
40 *Tadorna ferruginea*
30 *T. tadorna*
100 *Anas penelope*
12 *Netta rufina*
13 pairs of *Melanitta fusca*
38 *Mergus albellus*

and small numbers of 14 other species of Anatidae (Kitson, 1978).

Special floral values: No information.

Research and facilities: Some basic limnological data have been gathered, and several British ornithologists have visited the lake in recent years. There are no facilities in the area.

References: Andrews (1932); Dulma (1979); Fisher (1985); Kitson (1980).

Criteria for inclusion: 1b, 2a, 2d, 3b.

Source: Mark Beaman, Jon Davies and David Fisher.

Wetland name: Ulaan Nuur

Country: Mongolia

Location: 44°32'N, 103°35'E; the easternmost of the lakes in the Gobi Valley, about 120 km northwest of Dalandzadagad, Omnogovi Province.

Area: Maximum 6,500 ha.

Altitude: c. 1,000m.

Biogeographical Province: 2.22.8.

Wetland type: 16.

Description of site: A shallow, slightly saline lake, largely covered with reeds and sedges interspersed with open water. The lake is semi-permanent, and may dry out completely in dry years. It is fed by the Ongiyn Gol which flows in a wide arc from the Khangai Mountains.

Climatic conditions: Extreme continental climate. The average annual rainfall around the lake is about 100-150 mm, whilst in the mountains to the south, it is 150-200 mm. The area receives most rainfall in summer, the rain often being accompanied by very violent west and northwest winds. Evaporation rates are very high, in the order of 1,500 mm per year.

Principal vegetation: Extensive areas of reeds and sedges.

Land tenure: State owned.

Conservation measures taken: None.

Land use: Grazing by domestic livestock (camels, horses and sheep); also reed-cutting on a relatively small scale.

Disturbances and threats: None known.

Economic and social values: The marshes provide important grazing land in an otherwise arid region.

Fauna: The lake supports the endemic west Mongolian fish fauna consisting of species of *Oreoleuciscus* and *Thymallus brevirostris*.

The lake is of considerable importance as a staging area for migratory ducks, shorebirds and terns (e.g. *Chlidonias leucoptera*), but is apparently of little importance for breeding waterfowl, perhaps because of the wide fluctuations in water level.

Special floral values: No information.

Research and facilities: Several British ornithologists have visited the lake in recent years.

Criteria for inclusion: 1b, 2d, 3b.

Source: Mark Beaman and Jon Davies.

Other Wetlands

In addition to the wetlands described above, there are numerous freshwater and saline lakes, marshes and salt pans which may be significant, although little or no information is available. The largest of these are listed below.

Central Asian Drainage Basin

a) Altai Mountains

- Tal Nuur: 48°03'N, 90°11'E; 2,500 ha, 2,700 m.a.s.l.; a freshwater lake.
- Unnamed freshwater lake: 48°14'N, 90°39'E; 1,500 ha, 2,300 m.a.s.l.
- Tsagaan Nuur: 49°30'N, 89°47'E; 800 ha, 2,100 m.a.s.l.; a freshwater lake.
- Unnamed freshwater lake: 48°37'N, 88°56'E; 1,700 ha, 2,400m.a.s.l.
- Numerous freshwater glacial lakes in the southwestern high Altai: 46°45'-47°30'N, 91°00'-92°00'E; area unknown, 2,400-3,400m.a.s.l.
- Unnamed freshwater lake basin in the Altai close to the Chinese border: 48°22'N, 88°53'E; 5,500 ha, 2,400 m.a.s.l.
- Unnamed freshwater lake close to the Chinese border: 48°02'N, 90°11'E; 2,500 ha, 2,600m.a.s.l.

b) Valley of the Great Lakes

- Unnamed saline lake southeast of Lake Uvs Nuur: 50°00'N, 93°57'E; 3,500 ha, 1,100m.a.s.l.
- Har Us Nuur: 49°06'N, 91°55'E; 7,000 ha, 1,500 m.a.s.l.; a saline lake southwest of Hyargas Nuur.
- Har Nuur: 48°27'N, 95°10'E; 6,500 ha, 1,500 m.a.s.l.; a saline lake.
- Unnamed salt pans and marshes southwest of Bar-Us Nuur: 47°15'N, 92°45'E; 40,000 ha, 1,000 m.a.s.l.
- Unnamed saline marshy area with temporary lakes: 46°40'N, 93°15'E; 30,000 ha, 1,700m.a.s.l.
- Unnamed temporary saline lake: 46°27'N, 94°05'E; 2,000 ha, 1,600 m.a.s.l.
- Unnamed temporary saline lake: 46°17'N, 93°55'E; 1,000 ha, 2,300 m.a.s.l.
- Unnamed temporary saline lake: 46°11'N, 93°33'E; 500 ha, 2,300 m.a.s.l.
- Shargain Gobi: a very extensive inter-montane basin with salt pans and marshes; 46°15'N, 95°05'E; 40,000 ha, 1,100 m.a.s.l.
- Beger Valley: temporary saline lakes with salt pans and marshes; 45°47'N, 97°10'E; 30,000 ha, 1,500m.a.s.l.

c) Gobi Valley Lakes

- Holboljin Nuur (Days Nuur) and an unnamed lake nearby: 45°20'N, 100°47'E; 1,000 ha, 1,100 m.a.s.l.; two saline lakes with sandy shores and some grassy areas, particularly to the north of Bolboljin Nuur. Kitson (1978) visited the lakes in May 1977, and found a wide

variety of waterfowl at Holboljin Nuur, including breeding colonies of *Phalacrocorax carbo* (107 nests) and *Ardea cinerea* (23 nests).

- Hooloyn Nuur: 43°38'N, 101°20'E; 7,000 ha, 1,400 m.a.s.l.; a large inter-montane depression with salt pans and marshes, south of the Gobi Valley.

d) Lakes of the Khangayn Plateau

- Har Nuur: 48°21'N, 96°05'E; 8,000 ha, 2,200 m.a.s.l.; a saline lake.

- Oigon Nuur: 49°10'N, 96°35'E; 6,000 ha, 1,700 m.a.s.l.; a saline lake in flat terrain with little aquatic vegetation, but with an extensive area of mud at the southeast corner.

- Holboo Nuur: 49°02'N, 97°08'E; 3,000 ha, 2,000 m.a.s.l.; a saline lake with steep gravel shores and little aquatic vegetation.

- Bust Nuur: 49°08'N, 97°28'E; 2,500 ha, 2,200 m.a.s.l.; a saline lake with gravel or grassy shores and a rocky island.

- Unnamed lake, probably saline: 49°25'N, 98°31'E; 2,500 ha, 2,000 m.a.s.l.

- Jugnayn Nuur: 49°21'N, 97°34'E; 4,000 ha, 2,400 m.a.s.l.; an oligotrophic, freshwater lake

with shores of red gravel, surrounded by larch forest.

- Unnamed saline lake 10 km west of Sangiyin Dalay Nuur: 49°13'N, 98°45'E; 1,500 ha, 1,900 m.a.s.l.

Arctic Ocean Drainage Basin

- Dzuun Nuur: 49°03'N, 99°30'E; 1,200 ha, 2,100 m.a.s.l.; an oligotrophic freshwater lake with shores consisting entirely of red stone chips.

- Unnamed lake: 49°56'N, 99°56'E; 2,000 ha, 1,300 m.a.s.l.; a saline lake with no outlet, 80 km south of Khovsgol.

- A group of high altitude glacial lakes close to the Russian border in the Ulaan Tayga Mountains: 50°35'-50°52'N, 98°15'-98°57'E; approximately 20 lakes with a maximum size of 500 ha, 2,600 m.a.s.l.

- Sharga Nuur: 46°56'N, 101°58'E; 2,000 ha, 1,300 m.a.s.l.; a freshwater lake.

- Unnamed freshwater lake in the Selenge River valley: 49°55'N, 102°45'E; 1,200 ha, 1,100 m.a.s.l.

- Unnamed freshwater lake in the Selenge River valley: 49°38'N, 102°40'E; 1,000 ha, 1,100 m.a.s.l.

- Unnamed freshwater lake in the high Khangai: 47°29'N, 98°29'E; 2,000 ha, 2,400 m.a.s.l.; a ribbon-shaped lake, probably of glacial origin and perhaps belonging to the Central Asian Drainage Area.

- Chinging Nuur: 47°52'N, 104°19'E; 400 ha, 900 m.a.s.l.; a freshwater lake surrounded by *Phragmites* reed-beds and grassy marshes. Kitson (1978) found many waterfowl and large populations of *Acrocephalus spp*, *Motacilla flava* and *Panurus biarmicus* in June 1977.

- Tohom Nuur: 46°54'N, 104°59'E; 600 ha, 1,100 m.a.s.l.; a freshwater lake.

Pacific Ocean Drainage Basin

Yahin Gobi Lake: 48°38'N, 114°26'E; 6,500 ha, 900 m.a.s.l.; probably saline.

Hoh (Hok) Nuur: 49°30'N, 115°35'E; 2,500 ha, 800 m.a.s.l.; a freshwater lake and associated marshes. Three adult Relict Gulls *Larus relictus* were collected at the lake in early July 1977, leading Kitson (1980) to suggest that this might be a breeding station for the species. Dulma (1979) found a mesotrophic fish fauna similar to that of Buyr Nuur.

Shabart Nuur: 49°50'N, 116°27'E; 1,500 ha, 600 m.a.s.l.; close to the Russian and Chinese borders. The lake has no outlet and is probably saline.

Tirmiyn Tsagaan Nuur: 49°34'N, 116°03'E; 800 ha, 600 m.a.s.l.; a small lake and associated marshes with no outlet, probably saline.

An extensive area of freshwater lakes and marshes in the Uldze River valley: 49°00'-50°00'N, 114°00'-115°00'E; approximately 35 lakes with a maximum area of 1,000 ha, 800 m.a.s.l.

Melehiiteyn Nuur: 48°27'N, 115°29'E; 2,500 ha, 900 m.a.s.l.; two freshwater lakes in the Kerulen River valley close to the Chinese border.

An extensive area of freshwater marshes and small lakes on the Chinese border: 47°30'-47°50'N, 115°40'-116°00'E; 35,000 ha, 750 m.a.s.l.; the wetland includes seven lakes with a maximum area of 500 ha.

Unnamed marshy area with small freshwater lakes: 46°41'N, 115°25'E; 8,000 ha, 900 m.a.s.l.; the wetland includes about seven lakes with a maximum area of 500 ha.

Bulang Shabar Nuur: 47°19'N, 117°36'E; 1,500 ha, 850 m.a.s.l.; a freshwater lake 20km northeast of Tamsagbulag.

Unnamed freshwater lake 22km NNW of Tamsagbulag: 47°26'N, 117°16'E; 1,700 ha, 900 m.a.s.l.

An extensive area of freshwater marshes and small lakes: 47°20'N, 118°15'E; 50,000 ha, 850 m.a.s.l.; the wetland includes about 20 lakes with a maximum area of 500 ha.

References: Dulma (1979); Kitson (1978 & 1980).

Source: Jon Davies.

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