*Koedoe* 17: 71 – 83 (1974).

# AN EVALUATION OF THE CONSERVATION STATUS OF AQUATIC BIOTOPES*

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*Abstract* – The aims of Project Aqua in South Africa are stated. A classification and definitions of the different aquatic biotopes encountered is discussed. Recommendations for the conservation of additional sites not in existing conservation areas are made. A first South African Project Aqua site list is proposed.

## *1. Introduction.*

In South Africa, as in probably almost all countries, practically all national parks, forest and nature reserves have been brought into being to preserve terrestrial animals and plants and terrestrial habitat features. Aquatic biotopes, of which there are many kinds, have been largely neglected. Some of them have already been either destroyed or drastically altered, many others are threatened in different ways by contamination, by agricultural or urban development or by technical plans for utilization.

Project Aqua is an international undertaking of the Freshwater Productivity (PF) section of the International Biological Programme. It aims at listing and describing and, where necessary, proposing the conservation of aquatic sites of scientific importance. Project Aqua in the Republic of South Africa is an attempt to evaluate at a national level the conservation status both of representative aquatic biotopes and of the habitats of threatened aquatic species in existing conserved areas and the possible need for additional aquatic sites to be conserved.

The conservation of representative aquatic sites in South Africa is an urgent requirement and the conservation of these sites should not preclude their water resources being utilized in a rational way. Indeed, conservation in some cases will protect these water resources. Recreation is also possible on and around these water bodies. Some of them can also be utilized for fish production. The important thing is that they be preserved.

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The area covered by Project Aqua included the Republic of South Africa as well as Marion and Prince Edward Islands.

Project Aqua in South Africa is a joint undertaking by the national and provincial nature conservation authorities. These include:

the Transvaal Provincial Administration;
the Cape Provincial Administration;
the Provincial Administration of the Orange Free State;
the Natal Parks Board;
the National Parks Board;
the Department of Forestry;
the Department of Water Affairs;
the Department of Bantu Administration and Development; and
the Department of Transport.

It can be expected that the findings will accurately reflect the opinions of limnologists in this country.

Our obligation to the IBP is to provide a list of South African sites for publication in a world list of Project Aqua sites. The IBP intends submitting this list to the United Nations Organization for recognition equivalent to the UN list of 'National parks and equivalent reserves'. Obviously no list can ever reach finality. It is to be hoped that new sites will be added and others perhaps deducted as new knowledge is accumulated. If this happens Project Aqua will then truly have served its purpose.

The conservation of aquatic and non-aquatic biotopes are ultimately indivisible. For this reason, Project Aqua in South Africa is a joint PF–CT undertaking and complements two other South African CT projects (Edwards 1974; von Richter 1974) referred to respectively as CT(1) and CT(2) and therefore these three papers should be interpreted as a unit. Certain existing and prospective Project Aqua sites are situated within areas of interest to one or both the papers referred to above. In fact, confluence of interest has actively been sought since this will obviously enhance the potential value of these conservation areas for future research. Wherever possible, future Project Aqua sites will be selected within areas of CT interest. It is hoped in this way to keep to a minimum the number of sites to be acquired purely for their Project Aqua interest.

## 2. *Aims of Project Aqua in South Africa*

a. Evaluation, from a scientific point of view, of the need in South Africa for conservation of representative aquatic biotopes and habitats of threatened aquatic species.
b. Compilation of a first South African Project Aqua list of sites in existing conservation areas.
c. Where necessary, recommendations for the conservation of additional sites not in existing conservation areas.
d. Publication of the list and of short descriptions of South African Project Aqua sites, for the benefit of the IBP and of present and future researchers.

e. Publication from time to time of supplementary lists and descriptions of new South African Project Aqua sites if and when these become conserved.

These aims strongly reflect our local requirements and may possibly differ from the aims of Project Aqua in other countries. This is only to be expected.

## *3. Definition and classification of aquatic biotopes*

### *3.1 Swamp, marsh, fen and bog vegetation*

These vegetation types are found in a variety of aquatic sites. Where the normal dry season water level is above the soil surface, the vegetation is termed a *swamp*. The commonest is reedswamp, up to about 4 m high and dominated by reeds *(Phragmites)*, other tall grasses *(Leersia hexandra, Echinochloa* spp.), bulrushes *(Typha* spp.), rushes, several sedges *(Cyperus* spp., *Carex* spp., *Scirpus* spp.), and a few dicotyledons *(Sium repandrum, Mentha aquatica, Hebenstreitia* spp.).

In *marsh* vegetation the dry season water level is close to, but not normally much above, the ground level. This vegetation grows to about 1 m high and is floristically rich, containing many grasses *(Leersia, Hemarthria, Diheteropogon, Aristida, Arundinella, Stenotaphrum, Agrostis, Koeleria, Poa,* and others), many sedges *(Kyllinga, Ascolepis, Pycreus, Cyperus, Scirpus, Fuirena, Mariscus)*, and many Liliaceae, Amaryllidaceae, Iridaceae, Orchidaceae, Scrophulariaceae and Compositae.

*Fen* vegetation resembles marsh or reedswamp floristically but is situated on soil which is entirely organic or peaty in origin and which is alkaline. The bodies of water in which fen vegetation is developed are characteristically alkaline and eutrophic.

*Bog* vegetation in South Africa is floristically also somewhat similar to marsh, but is found on acid peat instead of on soil of inorganic origin. Some bogs also contain a variety of *Sphagnum*-like mosses, which contribute greatly to the peat accumulation. The water of bogs is characteristically oligotrophic.

*Hygrophilous grassland* is the name given to a grass-dominated herbaceous layer *(Themeda triandra, Tristachya hispida, Aristida junciformis, Imperata cylindrica, Diheteropogon eucomis)*. Like marsh vegetation, this is normally exposed during the dry season and inundated during the rainy season.

*Salt marsh* vegetation in South Africa is found in some estuaries and also at some inland sites. This is dominated by *Salicornia* and other succulent plants.

### *3.2 Mangrove, swamp and riverine forest*

In Natal, fen succession in estauries is succeeded by climax *mangrove swamp (Rhizophora, Bruguiera* and *Avicennia)*. Marsh succession produces *swamp forest (Ficus, Syzigium, Hibiscus, Raphia* and *Phoenix)* or *riverine forest (Ficus sycomorus, Acacia xanthophloea)*.

### *3.3 Sponges*

River source zones frequently include water-retaining areas with marsh or bog vegetation. These areas will here be termed sponges. Individual sponges differ greatly in vegetation, in soil type, in pH, in the degree to which they accumulate peaty material, and so forth.

### *3.4 Headwater stream zones*

Mountain streams include a variety of biotopes. Because of their isolation and because they offer a wide variety in physical conditions these biotopes are characterized by specialised animals and plants not found elsewhere and frequently by endemic species with very restricted distributions. Besides sponges and seepages the major zones in a 'typical' mountain stream might be:

a. a *cliff-waterfall zone* at its source, in which the stream plunges down a steep escarpment.
b. a *mountain torrent zone*, in which the stream bed is narrow, steeply sloping, stony and frequently unstable with cascades and occasional small waterfalls.
c. an *eroding* or *foothill torrent zone*, in which the stream bed is still steeply sloping but widens, is mostly stony but is relatively stable and which has occasional pools, sandbanks and patches of marginal riverine vegetation.
d. a *depositing* or *foothill sand bed zone*, in which the flow rate is further reduced and in which relatively stable stony runs alternate with considerable areas of sand or mud and marginal riverine vegetation.

Obviously individual streams differ in physiography and hence in the extent to which these zones and the different biotopes they contain are represented. They also differ greatly in water chemistry. Streams draining Table Mountain Sandstone mountains in the southern and southwestern Cape Province, for instance, are highly acid. Frequently, some of the smaller tributaries flow only after rain and the larger tributaries are perennial.

### *3.5 Non-perennial inland streams*

Flow in most inland streams is highly irregular. They may flow strongly in summer and have eroding and depositing zones as described above. In the dry season the stream may be reduced to a trickle or a series of pools.

### *3.6 Major rivers*

Larger rivers in general contain for fewer biotopes than do smaller streams. A 'typical' river might have considerable areas of sand or mud and marginal riverine vegetation with occasional deep pools and short rapids composed mostly of large boulders where the river cuts through

rock formations. In some instances geological features can create short stretches of rapids and even waterfalls leading again into stretches of sand bed.

### *3.7 Springs, 'eyes' and sinkholes*

A spring is any place where subterranean water comes to the surface. These may be associated with all sorts of aquatic sites. Three special forms of springs merit special attention.:

a. *'Eyes'* are springs in dolomitic areas. In these areas much of the rainfall sinks into the ground and wells up where the dolomite comes to the surface. The water is clear and the flow usually strong and permanent.
b. *Sinkholes* are dolomitic springs which have become considerably enlarged due to solution of the dolomite. By their nature they are deep and extend great distances horizontally under the ground. *Closed* sinkholes are essentially underground caverns with small surface openings. *Open* sinkholes are those that have caved in from above forming a small deep lake. The best examples of the latter are Otjikoto and the Guinasee in South West Africa. Sinkholes and eyes have their own fauna, mostly cavernicolous and little studied. An example of this fauna is the blind *Clarias* of the Aigamas Cave in South West Africa.
c. *Hot springs*, in which the mean water temperature is more than 10°C above the mean air temperature.

### 3.8 *Pans*

A depression which at some time at least contains a sheet of water which does not drain away, is in South Africa termed a *pan.* The most characteristic of these are the endorheic pans of the dry interior. They are here distinguished from salt flats, which are part of a dry river system and hence drain away, and from floodplain pans, which are filled mainly by floods. These will be dealt with separately (see 3.11, 3.12).

a. *Salt pans* are dry most of the time but can contain perennial pools filled by springs. Their soils are highly salty and devoid of any angiosperm vegetation.
b. *Brackish pans* (brakpanne) are also dry most of the time. Their soils are alkaline and moderately salty. The angiosperm vegetation is restricted to a few halophytic grasses (like *Sporobolus* spp.).
c. *Vegetationless pans* (kaalpanne) may be temporary or semi-permanent. Like brackish pans they have no emergent vegetation when full and their angiosperm vegetation when exposed is restricted to a few grasses.
d. *Grass pans* may be temporary or semi-permanent. They are covered by a thick mat of hygrophilous grassland.
e. *Sedge pans* are temporary or semi-permanent pans with a thick growth of marsh vegetation, mainly sedges, around the periphery and no emergent vegetation in the middle.
f. *Reed pans* are temporary or semi-permanent pans with a dense stand of

*Phragmites* reedswamp in the middle and the open water never more than a narrow peripheral ring.

### 3.9 *Vleis*

A temporary or permanent body of water containing marsh or swamp vegetation and not qualifying as a pan is in South Africa termed a *vlei*. A vlei is characteristically part of a drainage system; a low-lying area filling with water during the rainy season.

a. *Winter rainfall vleis* include flat areas inundated during the rainy season (for instance on the Cape Flats) and a number of smallish permanent or semi-permanent lakes. The vegetation of the vleis is characteristically marsh and reedswamp.
b. *Summer rainfall vleis* are river valleys which become inundated during the rainy season. Their vegetation is also marsh and reedswamp.

### *3.10 Bogs*

a. A few summer rainfall vleis contain areas in which acid peat is accumulated under oligotrophic conditions.
b. Marion and Prince Edward Islands have extensive areas which are inundated during winter and are termed *mires*. They are oligotrophic and contain peat and are covered with low herbs and often with a layer of cyanophyte algae.
c. Marion and Prince Edward Islands also have a number of bogs which resemble the *raised bogs* of the northern Hemisphere. Their vegetation consists mostly of mosses and liverworts (for instance *Rhacomitrium lanuginosum* and *Blepharidophyllum densifolium*), with typical protozoan fauna and desmid flora, but no *Sphagnum*.

### *3.11 Salt and brackish flats*

Some of the normally dry streams of the arid northwestern Cape Province have large flat stretches sometimes termed "pans", although they are not depressions, and which are occasionally inundated but are most often dry. They are formed of hard, flat, compacted alluvial soil. Some are saline and are here termed *salt flats*. Others appear to have a soil salt content less than 5g/l and are termed *brackish flats*.

### *3.12 Floodplain pans and oxbow lakes*

The Pongolo River in northern Zululand is fairly unique in South Africa in having a number of *floodplain pans*. These are depressions adjacent to the river, separated from the river by a levee and filled when the river overflows its banks.

*Oxbow lakes* are also floodplain phenomena and are formed when a loop of sinuous meandering river becomes cut off from the river. It persists as a small bow-shaped lake which is filled by floods which overflow the river banks.

*3.13 Lakes*

a. *Glacial lakes.* The small glacial lakes of Marion and Prince Edward Islands contain very few higher plants but are often mesotrophic, due to the influence of animals.
b. *Crater lakes.* Small crater lakes are found on Marion and Prince Edward Islands. These are oligotrophic.
c. *Tarns.* Marion and Prince Edward Islands also have a number of tarns in sheltered positions in the lava flows. These are surrounded by swamp vegetation and are mesotrophic to eutrophic.
d. *Vleis* with standing water exceeding 10 000 $m^2$ in surface area. These include several drowned and brackish river valleys, such as Verlorevlei on the western Cape coast. Then there are a few small acid lakes in the southwestern Cape. Near Cape Agulhas is a large shallow semipermanent lake, Soetendalsvlei, and one or two much smaller but similar vleis. Near Bredasdorp is a moderately deep, narrow permanent lake of quite different type, De Hoopvlei. Between Wilderness and Knysna are several small brackish coastal lakes. One of these, Groenvlei, is surrounded by reeds undergoing fen-type succession to meadowland.
e. *Pans* exceeding 10 000 $m^2$ in surface area. These include Barberspan in the western Transvaal and Lake Chrissie in the southeastern Transvaal.
f. *Zululand coastal lakes.* Lake Sibaya and the Kosi system of lakes are large coastal lakes of great scientific interest.
g. *Rockfall lakes.* Lake Fundudzi in Vendaland in the northern Transvaal is a small lake formed by a rockfall across a small stream. It is unique in this country.

*3.14 Estuaries*

South African estuaries may broadly be divided into:
a. *mangrove estuaries of Natal,* with mangrove forest;
b. typical *Cape estuaries* which, if large enough, have typical zones of submerged and emergent vegetation.

Marion and Prince Edward Islands also contain the following waters which are under the influence of the sea:

c. *tidal pools* receiving fresh water and also being in contact with the sea at high tide;
d. *elephant seal wallows* above high tide, characterized by nitrification and high chloride content.

*4. Recommendations of the Project Aqua subcommittee*

*4.1 Refuges for rare and endangered fish species*

Investigation has revealed several endemic fish species and local

populations of rare species to be threatened with extinction. The principal threats to them include pollution and the deterioration or destruction of their natural habitats. Some are also threatened by competing or predatory exotic species. Further work may reveal plant and possibly even invertebrate species to be similarly threatened. For their survival these threatened species need refuges, streams fulfilling their habitat requirements which are protected from physical damage and which contain no exotic or competing indigenous fish. The following three rare species occur in an existing conservation area, the Kruger National Park, and the waters within the Park in which they occur are proposed for inclusion in the primary South African Project Aqua list:

a. *Serranochromis meridianus* in the Sabie River within the Kruger National Park, Project Aqua site (17);
b. *Nothobranchius orthonotus* in pools in the upper Mtomene Stream catchment (Nwanedzi River system) in the Kruger National Park, Project Aqua site (18);
c. *Nothobranchius rachovii* in pans north of the Mtomene Stream (Nwanedzi River system) in the Kruger National Park, Project Aqua site (19).

The following rare species are not found within any existing conservation area and research into means for protecting them is urgently required:

d. six endemic species of the Olifants River system, western Cape Province *(Barbus capensis, Barbus serra, Labeo seeberi, Barbus calidus, Barbus phlegatus* and *Gephyroglanis gilli)*;
e. *Barbus tenuis,* known only from Meiringspoort in the Gouritz River system and the Swartberg Forest Reserve, southern Cape Province;
f. *Barbus trevelyani,* previously known only from the upper Buffalo River but recently found also in the Tyume River, eastern Cape Province;
g. *Kneria auriculata,*. within South Africa known only from certain tributaries of the Crocodile River (Incomati River system), eastern Transvaal;
h. *Barbus treurensis*, known only from tributaries of the Blyde River (Olifants-Limpopo River system), eastern Transvaal;
i. *Haplochromis brevis,* known in South Africa (apart from Mocambique) only from the Lomati River (Incomati River system), eastern Transvaal;
j. *Varicorhinus nelspruitensis* and *Chiloglanis anoterus*, occurring together in tributaries of the Crocodile River (Incomati River system), eastern Transvaal.

In addition, the Storms River, proposed below as an entire catchment, Project Aqua site (5), contains no exotic fish. Steps should be taken to keep exotic fish out of this site.

### *4.2 Whole river catchments*

The entire Storms River catchment and estuary, southern Cape Province is situated entirely within an existing conserved area and is

proposed for inclusion in the Project Aqua list, as site (5).

In addition, the following two whole river catchments are situated almost entirely within existing conserved areas, are considered sufficiently well protected and are also proposed for inclusion in the Project Aqua list:

a. the Touws (or Touw) River (Wilderness) entire catchment and estuary, southern Cape Province, Project Aqua site (3);
b. the Groot River (Nature's Valley) entire catchment and estuary, southern Cape Province, Project Aqua site (4).

*4.3 Headwater streams*

The following headwater catchments are situated entirely within existing conserved areas and are proposed for inclusion in the Project Aqua list:

a. the upper Jonkershoek-Eerste River catchment, southwestern Cape Province, Project Aqua site (1);
b. the Holsloot River catchment (Breë River system) western Cape Province, Project Aqua site (2);
c. the upper Buffalo River catchment, eastern Cape Province, Project Aqua site (6);
d. the Mlanbonjwa River catchment (Tugela River system), Natal, Project Aqua site (15);
e. the Houtbosloop catchment (Crocodile-Incomati River system), eastern Transvaal, Project Aqua site (20);
f. the Debegeni River catchment (Groot Letaba-Olifants-Limpopo River system), eastern Transvaal, Project Aqua site (21).

In addition, the following headwater catchment is situated almost entirely within existing conserved areas, is considered sufficiently well protected and is also proposed for inclusion in the Project Aqua list:

g. the Mooi River catchment (Tugela River system), Natal, Project Aqua site (14).

It is recommended that further representative headwater catchments be sought in the southwestern Cape, the Kraai River catchment (Orange River system), in the upper Umzimvubu River catchment, the north-eastern Cape, and in the eastern Transvaal. With a view to their conservation within a prospective vegetation conservation area, heed should be given to proposals put forward by Edwards (1974).

*4.4 Non-perennial Lowveld stream*

The Tsende River, a tributary of the Groot Letaba River, is entirely situated within the Kruger National Park and is recommended for inclusion in the Project Aqua list as site (22).

*4.5 'Eyes', sinkholes and hot springs*

The Kuruman dolomitic 'eye' and miniature lake within the Kuruman

Municipal Park, northern Cape Province, is entirely situated within an existing conservation area and is proposed for inclusion in the Project Aqua list, as site (7).

It is recommended that suitable representatives of the following be investigated in the Transvaal with a view to their conservation:

a. a dolomitic 'eye';
b. a closed sinkhole;
c. an open sinkhole;
d. a hot spring.

### *4.6 Vleis*

Several of the larger vleis in the Cape Province are proposed for inclusion in the Project Aqua list (see 4.13). It is recommended that suitable vleis in the Orange Free State and Transvaal be sought and investigated in collaboration with project CT(1) with a view to their conservation, hopefully within prospective CT vegetation conservation areas.

### *4.7 Bogs*

The bogs and mires of Marion and Prince Edward Islands are situated entirely within the existing conservation areas proposed for inclusion in the Project Aqua list, sites (24) and (25). It is recommended that peat bogs in the Republic be sought and investigated with a view to their conservation.

### *4.8 Winter rainfall area pans*

The pan within the Die Pan Provincial Nature Reserve in the western Cape Province is considered to be adequately conserved and is proposed for inclusion in the Project Aqua list, as site (8).

### *4.9 Salt and brack pans*

The salt and brack pans situated within the Kalahari Gemsbok National Park, northern Cape Province, are proposed for inclusion in the Project Aqua list, site (9). In addition, it is recommended that representative salt pans in the western Orange Free State and western Transvaal be investigated with a view to their conservation.

### *4.10 Kaalpanne, grass pans, sedge pans and reed pans*

It is recommended that representatives of these pan types be sought and investigated in the Lake Chrissie and Lichtenburg areas (and possibly elsewhere) in the Transvaal in collaboration with project CT(1) with a view to their conservation, hopefully within a prospective CT vegetation conservation area.

*4.11 Floodplain pans*

The Nyamiti Pan in the Ndumu Game Reserve in northern Zululand, Natal, is proposed for inclusion in the Project Aqua list, as site (16).

*4.12 Oxbow lakes*

It is recommended that oxbow lakes be sought and investigated in the Transvaal and Orange Free State with a view to their conservation.

*4.13 Lakes*

The following lakes are situated almost entirely in existing conserved areas, are considered to be adequately protected and are proposed for inclusion in the Project Aqua list:

a. the glacial lakes, crater lakes and tarns of Marion and Prince Edward Islands within Project Aqua sites (24) and (25);
b. Rondevlei (Wilderness), southern Cape Province, Project Aqua site (10);
c. Groenvlei, southern Cape Province, Project Aqua site (11).

In addition, the following lakes are situated partly in existing nature reserves, are considered adequately protected and are proposed for inclusion in the Project Aqua list:

d. De Hoopvlei, southern Cape Province, Project Aqua site (12).
e. Barberspan, western Transvaal Project Aqua site (23)

The four largest lakes in South Africa do not fall within any existing conserved area. It is recommended that the prospects for conservation be very carefully investigated as all of these should, if at all possible, be conserved as Project Aqua sites:

f. Soetendalsvlei; southern Cape Province.
g. Lake Sibaya, northern Zululand;
h. the Kosi lakes system and estuary, northern Zululand;
i. Lake Fundudzi, Vendaland in the northern Transvaal.

It is further recommended that representative Cape west coast vleis, Cape acid vleis and Soetendalsvlei, southern Cape Province, be investigated, the former in collaboration with project CT(1), with a view to the conservation of representatives of each, the first kind hopefully within a prospective CT vegetation conservation area.

*4.14 Estuaries*

In the previous section investigation into the conservation prospects of the Kosi Estuary was recommended. This appears to be the sole remaining relatively undisturbed Natal mangrove estuary. In addition, the Heuningnes Estuary, which lies partly within the Department of Forestry De Mond Reserve and partly in various farms, but which is considered to be adequately conserved, is proposed for inclusion in the Project Aqua list site (13).

As has been mentioned (3.14) Marion and Prince Edward Islands, proposed for inclusion in the Project Aqua list as sites (24) and (25), include a number of pools at high tide level and in the surf splash zone.

*5. First South African Project Aqua List*

*Cape Province*

(1) Jonkershoek-Eerste River catchment within the Jonkershoek Forest Reserve (including the Jonkershoek Forest Influences Research Station), southwestern Cape Province (within a prospective CT vegetation conservation area).

(2) Holsloot River (Breë River system) catchment within the Louwershoek and Klein Drakenstein Forest Reserves, southwestern Cape Province.

(3) Touws (or Touw) River (Wilderness) entire catchment (Groenkop and Bergplaas Forest Reserves, private farms and Ebb and Flow Nature Reserve), southern Cape Province.

(4) Groot River (Nature's Valley) entire catchment and estuary (Bloukrans Forest Reserve, Nature's Valley Township and Tsitsikama Coastal National Park), southern Cape Province.

(5) Storms River entire catchment and estuary (Tsitsikama and Blueliliesbush Forest Reserves and Tsitsikama Forest and Coastal National Park), southern Cape Province (within a prospective CT vegetation conservation area).

(6) Buffalo River catchment within the Pirie Forest Reserve, eastern Cape Province (within a prospective CT vegetation conservation area).

(7) Kuruman 'eye' and miniature lake within the Kuruman Municipal Park, northern Cape Province.

(8) The pan within Die Pan Provincial Nature Reserve, western Cape Province.

(9) Salt and brack pans within the Kalahari Gemsbok National Park, northern Cape Province.

(10) Rondevlei (Wilderness) within the Rondevlei Provincial Nature Reserve, southern Cape Province.

(11) Groenvlei within the Goukamma Provincial Nature Reserve, southern Cape Province.

(12) De Hoopvlei in the De Hoop Provincial Nature Reserve and on several private farms, southern Cape Province.

(13) Heuningnes River and Estuary (several farms and Department of Forestry De Mond Reserve), southern Cape Province.

*Natal*

(14) Mooi River (Tugela River system) catchment within Highmoor Forest Reserve, Game Pass farm and the Kamberg Nature Reserve, Natal Drakensberg.

(15) Mlanbonjwa River catchment (Tugela River system) within the Cathedral Peak Forest Reserve (including the Cathedral Peak Forest Influences Research Station), Natal Drakensberg.

(16) Nyamiti Pan (Usuthu-Pongolo River system) and its own catchment within the Ndumu Game Reserve, northern Zululand.

*Transvaal*

(17) *Serranochromis meridianus* refuge in the Sabie River within the Kruger National Park, eastern Transvaal.

(18) *Nothobranchius orthonotus* refuge in pools in the upper Mtomene Stream catchment (Nwanedzi River system) in the Kruger National Park, eastern Transvaal.

(19) *Nothobranchius rachovii* refuge in pans north of the Mtomene Stream catchment (Nwanedzi River system) in the Kruger National Park, eastern Transvaal.

(20) Houtbosloop catchment (Crocodile-Incomati River system) within the Mokobulaan and Uitsig Forest Reserves (including the Mokobulaan Hydrological Project Site), eastern Transvaal.

(21) Debegeni River (Groot Letaba – Olifants – Limpopo River system) catchment within De Hoek Forest Reserve.

(22) Tsende River (Groot Letaba system) within the Kruger National Park, eastern Transvaal.

(23) Barberspan (Hartz-Vaal-Orange River system) (Barberspan Provincial Nature Reserve and several farms), western Transvaal.

*Sub-Antarctic Islands*

(24) Marion Island.

(25) Prince Edward Island.

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