

A. Proposal

Inclusion of *Harpagophytum procumbens* in Appendix II in accordance with Article II 2(a).

Inclusion of *Harpagophytum zeyheri* in Appendix II in accordance with Article II 2(b) for reasons of look-alike problems.

B. Proponent

Germany

C. Supporting Statement1. Taxonomy

1.1 Class Rosopsida

1.2 Order Scrophulariales

1.3 Family Pedaliaceae

1.4 Species *Harpagophytum procumbens* (BURCH.) DC. ex MEISSNER 1840

Harpagophytum zeyheri DECNE. 1865

1.5 Synonyms *Uncaria procumbens* BURCH. 1822; *Harpagophytum burchellii* DECNE.

1.6.1 Common names

Beesdubbetje, Devil's Claw, Duiwelsklou, Grapple Plant, Grapple Thorn, Kanako, Kamangu, Kloudoring, Ouklip, Rankdoring, Sengaparile, Skerpioendubbeltje, Teufelskralle, Toutje, Tou, Tswana, tubercule de griffe du diable, Woodspider (var. pers. comm.; WATT & BREYER-BRANDWIJK 1962; WENZEL & WEGENER 1995)

1.6.2 Trade and pharmaceutical names

Harpagophytum, Radix Harpagophyti (procumbenti), Harpagophyti tuberi

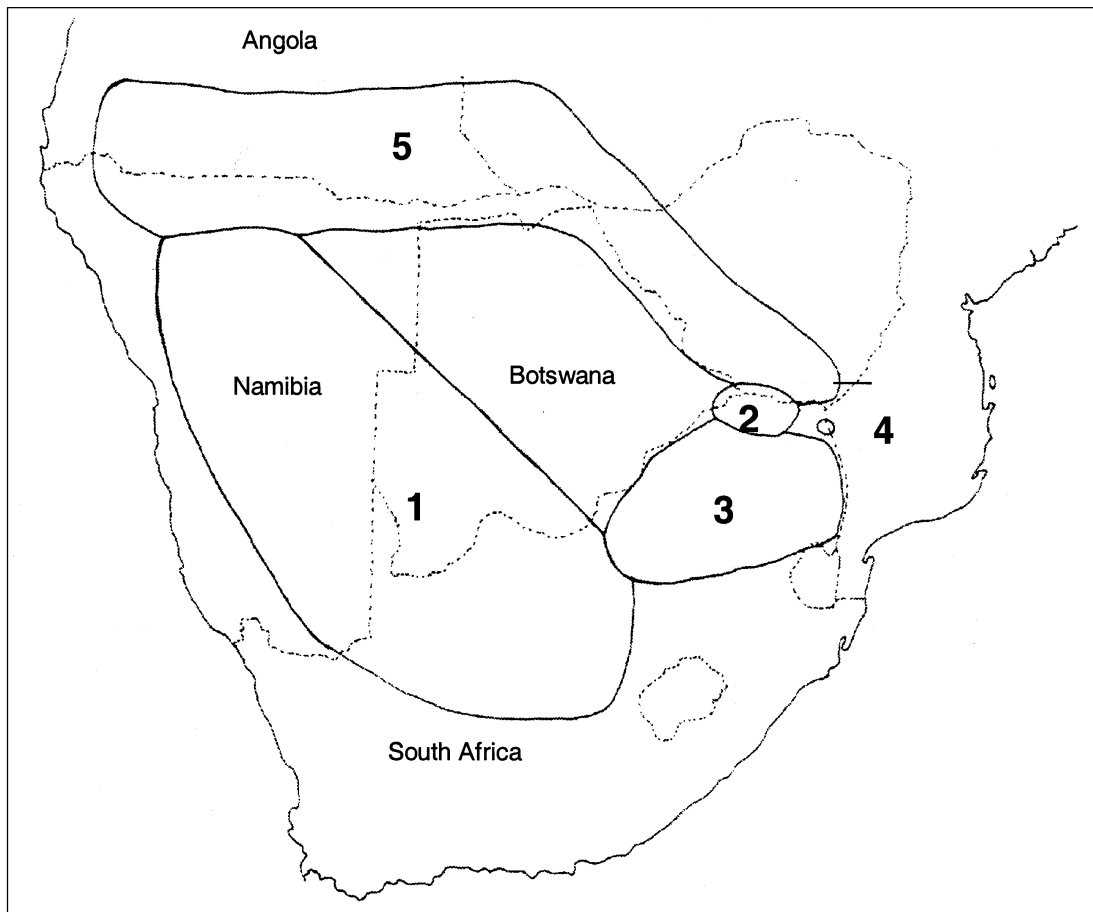
2. Biological Parameters

2.1 Distribution

The genus *Harpagophytum* occurs between 15 degrees and 30 degrees latitude in Namibia, Botswana, South Africa, Angola, and also to a lesser extent in Zambia, Zimbabwe and Mozambique (IHLENFELDT & HARTMANN 1970). The genus comprises two species (*H. procumbens*, *H. zeyheri*) with five subspecies. Each subspecies has a distinct distribution area (figure 1): *H. procumbens* ssp. *procumbens* is found in most of the sandy parts of Namibia and Botswana south of the distribution area of *H. zeyheri* ssp. *sublobatum* and in the Northern Cape region of South Africa. *H. procumbens* ssp. *transvaalense* occurs in a small distribution area in the NE tip of Transvaal, South Africa, on the border to Zimbabwe. *H. zeyheri* ssp. *sublobatum* grows in Angola and the northern parts of Namibia, Botswana, and the NE tip of South Africa. *H. zeyheri* ssp. *zeyheri* is found in the Transvaal, South Africa, as well as *H. zeyheri* ssp. *schijffii*, which only occurs in a very restricted area on the border to Mozambique.

2.2 Habitat availability

Small parts of the distribution area of *H. procumbens* show a decline of habitat availability due to expansion of land use (agricultural expansion) as indicated by comparisons of field research undertaken in the 1970's and since 1995. This is especially true for the northern Transvaal, South Africa, where *H. procumbens* ssp. *transvaalense* occurs (IHLENFELDT, pers. comm.). Habitat availability depends on the status of land use practices. In heavily overgrazed farmland or communal land with advanced stages of bush encroachment as well as in grass dominated savanna, *Harpagophytum* is likely to disappear due to low competitive strength.



2.3 Population status

The very patchy distribution of *H. procumbens* – even on favourable soil and suitable habitat – makes it difficult to estimate an overall figure of plants per hectare for the total area of distribution. The area covered by one population rarely exceeds 200 x 200 m (1-4 hectare) (HACHFELD, STROHBACH, pers. comm.). In South Africa, *H. procumbens* (*ssp. transvaalensis*) grows in scattered groups of about 10-50 individuals comprising mature large caudexes and smaller plants (CRAIB 1999). Age classes can often be clearly classified and are likely to have originated from seed which germinated during the same rain event. NOTT (1986) states that wild populations of *H. procumbens* normally reach a density of 5-7 plants per hectare, but locally populations sizes of up to 1200 plants per hectare may be reached.

According to literature, the genus was formerly very abundant and considered a problem plant by Namibian farmers. This led to an intended and strong decrease of the species starting in the 1950's until the 1970's owing to uprooting of plants by the farmers. It was not before the medicinal value of *H. procumbens* was widely recognised when large-scale exploitation began, at first starting on a very local basis and spreading to most of the distribution area by today. Due to rising demand the exploitation level has increased to a considerable extent.

2.4 Population trends

Information given here is derived from field studies, literature and personal communications from Namibia and Botswana. Depending on the region and the country one finds a varying decline in individual populations of *H. procumbens*. This is due to varying harvesting intensities and harvesting techniques of different ethnic groups as well as to the knowledge and access to markets and buyers respectively.

Studies from Botswana as well as Namibia indicate an obvious decline of wild plants due to exploitation in most of the communal areas of the countries (according to personal communications with Namibian farmers and forestry officers). Again, one finds not only a patchy natural distribution of the plant itself but hitherto also a patchy and locally focussed exploitation of the resource. It can be stated that up to now the exploitation-related decrease of *H. procumbens* is mostly concentrated

on the communal areas (owned and administrated by a local community) of Namibia. So far the commercial farm land (owned and administrated by private farmers) is only scarcely involved in the harvest. Nevertheless, recent studies in Namibia (HACHFELD, pers. comm.) show a growing interest of farmers in this additional income possibility and it can be expected that the exploitation of *H. procumbens* in commercial areas will increase soon.

Natural fluctuations occur depending on the amount of rainfall. These fluctuations have an effect on the harvesting techniques as well as the quantities of material harvested because in dry years also the small tubers of the young plants are likely to be dug out. This reduces the capability of the population to survive during and recover after the drought period.

In addition, exporters and middlemen report that lately the sliced material of *H. procumbens* is of smaller size than it used to be some years ago which indicates a reduction in the existence of old plants with large storage tubers (BERG, ENGELBRECHT, pers. comm.). Additionally, some harvesters claim they had to go further distances in order to find plants for harvest (ENGELBRECHT, pers. comm.)

For South Africa no data on population trends are available so far.

2.5 Geographic trends

No significant large scale geographic trend can be reported. On a small scale level though, personal communications indicate a disappearance of *H. procumbens* on some previously exploited farms or specific community areas (MINISTRY OF ENVIRONMENT AND TOURISM, DIR. OF FORESTRY, 1998; pers.comm. with Namibian farmers).

2.6 Role of the species in its ecosystem

H. procumbens is a species occurring in areas with low annual rainfall (100-200 mm/year; BLANK 1973). It is found mostly on deep, red, sandy soils of the Kalahari but also in whitish sandy soils and clay pans (NOTT 1986). Typical habitats are alluvial or overgrazed plains and fossil dunes (BLANK 1973). The vegetation type *H. procumbens* mainly occurs in comprises typical savanna vegetation with trees (e.g. *Acacia* spp.) and grass cover. The plant is reported to be sensitive towards grass dominance and favours open, trampled and partly overgrazed tracks or areas (IHLENFELDT & HARTMANN 1970, MOSS 1982, NOTT 1986).

Especially in dry years with little herb cover, the sprouts and flowers of *H. procumbens* are grazed by sheep, goats and cattle. A report from South Africa states that the plants in the northern province (*H. procumbens* spp. *transvaalensis*) are heavily grazed irrespective of the rainfall (CRAIB 1999). Antelopes and gazelles make use of the rhizomes which they dig out to supplement their sparse water uptake (BLANK 1973, HACHFELD, pers. comm.).

2.7 Threats

One of the main threats to populations of *H. procumbens* is the large scale harvest of the secondary storage tubers especially when paired with detrimental harvesting techniques. The increasing demand for *H. procumbens* on the international market has already led to over-exploitation of the species, e.g. in Botswana and some parts of Namibia. Personal communications (B. HACHFELD) as well as various authors (e.g. MARSHALL 1998; OLIVIER, no date; STROHBACH 1995) give strong evidence that (i) non-sustainable harvesting techniques have been applied in the past, (ii) over-exploitation has occurred already and (iii) increasing demand will be the major threat to the species in the future.

H. procumbens lately underlies an increasingly higher harvesting pressure since the other species of the genus (*H. zeyheri*) is not officially registered as a medicinal plant and therefore is not authorised as an ingredient of any pharmaceutical products. The consequence is a shift of exploitation activities from the distribution area of both species in northern Namibia to a strong concentration on areas with only *H. procumbens* within the last couple of years.

Additional threats do exist through grazing especially in years with low rainfall and little other fodder for live stock as well as through antelopes and gazelles depending on the underground storage organs as a water resource. Newly emerged shoots which are grazed by antelopes and livestock are avoided once the clawed fruits begin to form. The tubers are able to sprout fresh shoots if they have been grazed back. Nevertheless, the grazing leads to a restricted production of new fruits and seeds and thus reduces the possibility of natural regeneration by seed germination.

H. procumbens is reported to be sensitive to grass dominance and bush encroachment. The seed germination and establishment of seedlings require stable soil water conditions only ensured during good rainy seasons. In order to produce secondary storage tubers of a size suitable for exploitation, a growth period of a minimum of 3-4 years with only little grazing and no harvesting is required.

3. Utilization and Trade

3.1 National utilization

Even though *Harpagophytum procumbens* is reported to be in high demand by traditional medical practitioners in Botswana and Namibia (MARSHALL 1998), trade in this species clearly focuses on international rather than on domestic markets.

H. procumbens is used for a variety of medicinal purposes. The active ingredients are the glucosides Harpagosid, Harpagid, Procumbid, Furan, and Pyran (JADOT & LECOMTE 1992, TUNMAN & BAUERSFELD 1975, TUNMAN & LUX 1962, TUNMAN & STIERSDORFER 1964). The therapeutic effect is derived only from the complete extract, whereas isolated glucosides show only little to no effects (EICHLER & KOCH 1970, FLEURENTIN & MORTIER 1997, ZORN 1958). The medicinal uses of *H. procumbens* are numerous, it is used for the treatment of arteriosclerosis, gastro-intestinal problems, diabetes, hepatitis, and neuralgia. It also shows some indications for reduction of spasmodic blood pressure as well as positive effects on liver, gallbladder and kidney diseases (STÜBLER 1987, VOLK 1964, WATT & BREYER-BRANDWIJK 1962, WENZEL & WEGENER 1995). The herb has potent anti-inflammatory characteristics and anti-arthritis activity with no notable side effects (ANON. 1998).

The highest amount of medicinally valuable ingredients is located in the secondary storage tubers which branch off the main tuber in up to 2m depth and a range of 1,5 m (NOTT 1986, WENZEL & WEGENER 1995). These tubers can store up to 90 percent water and can reach a length of 20-30 cm. To harvest the tubers, in most cases the whole plant is dug out, leaving big holes sometimes of 2m depth and a diameter of 1-2 m in the field (SCHNEIDER 1997). In some areas this non-sustainable method is traditionally not applied and more gentle techniques are used, e.g. the main tuber remains in its original position and is not removed from the soil at all. Or else, in the process of harvesting, the main tuber is removed from the soil, but is replanted at the end of the harvesting process. In both cases, the plant has a possibility to grow again and to produce new tubers to be harvested in a few years time (DE JONG 1985, VEENENDAAL 1984). Unfortunately, due to rising demand for *Harpagophytum*, the percentage of non-sustainable harvesting techniques rises dramatically as well. The harvested tubers are cut into small slices when still fresh and are dried on the ground, grass or on paper for at least five days (KGATHI 1988).

Harpagophytum is primarily traded as dried sliced root tubers. So far, processing to retail products does not take place in the range countries themselves but in Europe. Two German companies hold patents on extraction techniques for *Harpagophytum* (LOMBARD, pers. comm.) which raises concern in the region that source countries may lose ownership over the resource (LINDEQUE, pers. comm.). Retail products comprise teas, tablets and capsules. Latest interviews confirm a non-seasonal, all year round harvest of the resource which considerably intensifies the depletion pressure on *H. procumbens* (BERG, LOMBARD, pers. comm.).

There is no stockpiling of either fresh or sliced and dried material of *H. procumbens* in significant amounts. Prices are determined by availability, depending on annual rainfall and therefore underlie considerable fluctuations.

3.2 Legal international trade

Trade in *Harpagophytum procumbens* is primarily for commercial export purposes. The material in trade almost entirely consists of dried and sliced root tubers and exclusively originates from the wild.

Export of *H. procumbens* from its three main range states (Botswana, Namibia and South Africa) is significant and strongly increasing. Exporting companies are still seeking for new markets. Among the range states, **Namibia** is the major exporting country. Figures for Namibia given in table 1 clearly show the significant rise of exports, in particular within the last six years.

Table 1. Exports of <i>Harpagophytum procumbens</i> from Namibia . * Jan-April 1986; nd = no data available. Sources: NOTT (1986); MARSHALL (1998); Ministry of Environment and Tourism, DSSS.			
Year	Export [kg]	Year	Export [kg]
1973	28,161	1986*	91,078
1974	nd	1987	nd
1975	180,000	1988	nd
1976	180,000	1989	nd
1977	190,000	1990	nd
1978	nd	1991	20,000
1979	nd	1992	95,000
1980	nd	1993	70,000
1981	84,350	1994	160,000
1982	133,619	1995	290,000
1983	124,291	1996	310,000
1984	107,800	1997	250,000
1985	183,370	1998	610,000

Only fragmentary export figures are available for **Botswana**. According to KGATHI (1988), an average of 17 t of *Harpagophytum* material was annually exported between 1979 and 1985. DIPHOLO (pers. comm.) reports that annual exports have been rising over the recent years to ca. 50 t in 1997/98 and that harvest is expected to increase. Total numbers do not reach Namibian magnitudes but a strong increase in exports of *H. procumbens* over the past five years is obvious.

Currently, no export figures are available for **South Africa**. Even though large Kalahari sandveld areas in South Africa harbour populations of *H. procumbens*, little exploitation takes place in this region so far. One exporter operating in this area claims to be the only harvesting, collecting and exporting operator in South Africa (OLIVIER, no date). KOEN (pers. comm.) reports that harvesting only takes place in the Northern Cape Province and exports amount to 6-7 t annually. There are a number of other companies also exporting *H. procumbens* from South Africa, but they obtain their stock from sources in Namibia and Botswana. These South African exporters seem to play an increasingly important role in the international trade of *H. procumbens*, which is probably due to more close and direct connections to the European markets compared to Namibian traders. The number of containers (each container holding an average of about 8 t of dried plant material) of *H. procumbens* sold to South African exporters by Namibian traders rose from 2-3 containers in 1995 to 25 containers in 1998 (LOMBARD, pers. comm.).

Main importing countries are Austria, Belgium, France, Germany, Greece, Italy, Japan, United Kingdom, USA, Spain, Sweden, and Venezuela (MARSHALL 1998, NOTT 1986). Usually the raw material is exported from the countries of origin and is manufactured in the importing countries (e.g. Germany).

3.3 Illegal trade

No information on illegal trade was provided by range states during the consultation process.

3.4 Actual and potential trade impacts

Since a few years the actual impact of trade in *H. procumbens* has been especially strong for *H. procumbens* as it was found to have more active ingredients than *H. zeyheri*, the other species occurring in Namibia. Exploitation efforts in Namibia are concentrated on areas where *H. procumbens* solely occurs.

As the demand for medicinal products of *H. procumbens* is still rising, it is expected that the

exploitation will increase rapidly in the forthcoming years. This will have an increasingly severe impact on the wild populations, especially in those areas where the plant has not been traditionally used by the local people. Traditional knowledge of sustainable harvesting techniques is so far only known by ethnic groups like the San people. In other areas where such a knowledge is lacking, quite often the whole plant is permanently removed from the soil instead of harvesting only the side roots with the tubers. A plant needs at least 3-4 years before new storage tubers are developed and have accumulated enough harpagoside to be harvested again. With an increase of demand and thus exploitation, one can therefore expect the trade to become a major threat to the survival of *H. procumbens*.

3.5 Artificial propagation

A German phyto-pharmaceutical company, in collaboration with a French researcher, is running a Devil's Claw cultivation project in Namibia (SCHMIDT & al. 1998). They claim to have succeeded in vegetative propagation of high-yielding chemotypes and to have established the parameters for an increase in biomass production with limited irrigation. The magnitude of production is disputed by several observers in the industry in Namibia. Furthermore, the necessity of additional irrigation of the propagules concurrently could be in conflict with the limited water resources in the countries of origin. Cultivation trials are also done in South Africa and possibly Marocco (LOMBARD, LINDEQUE, pers. comm.). Hence, projects to cultivate *H. procumbens* do exist, but the quantities harvested from artificial propagation play by no means a role in current international trade.

4. Conservation and Management

4.1 Legal Status

4.1.1 National

In **Namibia**, *Harpagophytum* species are protected under Schedule 9 of the Nature Conservation Ordinance of 1975. From that year on a permit was required for the collection, transport, possession, and/or sale of *Harpagophytum*. However, as early as 1986, this system was considered to be ineffective and from 1987 on, permit requirements were restricted to commercial traders (MARSHALL 1998). In order to export *Harpagophytum* from Namibia, a phytosanitary certificate in addition to other documents (LOMBARD, pers. comm.).

In **Botswana**, *Harpagophytum* species are protected under the Agricultural Resources Conservation Act of 1977 by which harvest and trade are regulated and export requires a permit. To date, however, no export monitoring is done by the government, despite a continuing trade in *Harpagophytum* since enactment of the legislation in 1977 (MARSHALL 1998).

In **South Africa**, a permit system on provincial level is in place (KOEN, pers. comm.) but no further information on the protection of *Harpagophytum* species is available.

4.1.2 International

None

4.2 Species management

For **Namibia**, the only public sector involved in the trade of *H. procumbens* is a project of the non-governmental organisation CRIAA SA-DC, called the *Sustainable Harvested Devil's Claw Project*. In this project rural communities are assisted to ascertain the quantity of their resource, to establish quotas and sustainable harvesting techniques for the production of high quality products. Direct and economically feasible access to the market is aimed at in order to generate as much income as possible for the harvesters in the rural and almost exclusively marginalised and poverty stricken communities. The programme co-operates closely with the *National Botanical Research Institute* in Windhoek.

In **Botswana**, several studies of an environmental research programme of the University of Botswana had been carried out in the 1980's on the biology and population biology of *H. procumbens* under harvesting pressure, as well as on the resource potential and possible management strategies in Botswana (BURGHOUTS 1985, DE JONG 1985, HULZEBOS 1987, KGATHI 1987 & 1988, KOK 1986, LELOUP 1985, NTSEANE 1993, SEKHWELA 1994, SEKHWELA & NTSEANA 1994, VEENENDAAL 1984). Nevertheless, so far no monitoring programme does exist for *Harpagophytum* in Botswana.

There is no information available for population monitoring or management structures of

Harpagophytum in South Africa.

In each of the three main range states only small populations occur within nature reserves.

4.3 Control measures for international and domestic trade

Apart from the existing national harvesting and export permit system for Namibia and Botswana (see chapter 4.1.1 and MARSHALL 1998), there is a lack of instruments controlling international trade of *Harpagophytum* trade between range states (e.g. from Namibia and Botswana to South Africa). The trade with South Africa seems to become increasingly important but is not subject to any form of control or registration to date.

5. Information on Similar Species

Even though *H. procumbens* and *H. zeyheri* can easily be distinguished in the field, it is impossible to tell them apart in the form of dried and sliced tubers which is the trade commodity.

Both *H. procumbens* and *H. zeyheri* grow in Namibia with *H. zeyheri* occurring more in the northern and northeastern parts of the country (the higher rainfall areas). Both species are harvested and traded as Devil's Claw in Namibia. The various Pharmacopoeia which cover the use of Devil's Claw in phytomedicines in the European Union and the USA stipulate that Devil's Claw is derived from *H. procumbens*. The level of inclusion of *H. zeyheri* in Namibian export stocks is high, which has implication, among other matters, for the increased pressure on the *H. procumbens* populations. CHUBASIK & al. (1996a,b) only recently were able to detect a mixture of *H. procumbens* and *H. zeyheri* in commercial watery Devil's Claw extracts. Material originating from Angola, which certainly is *H. zeyheri*, is increasingly entering into export stocks in Namibia (LOMBARD, pers. comm.).

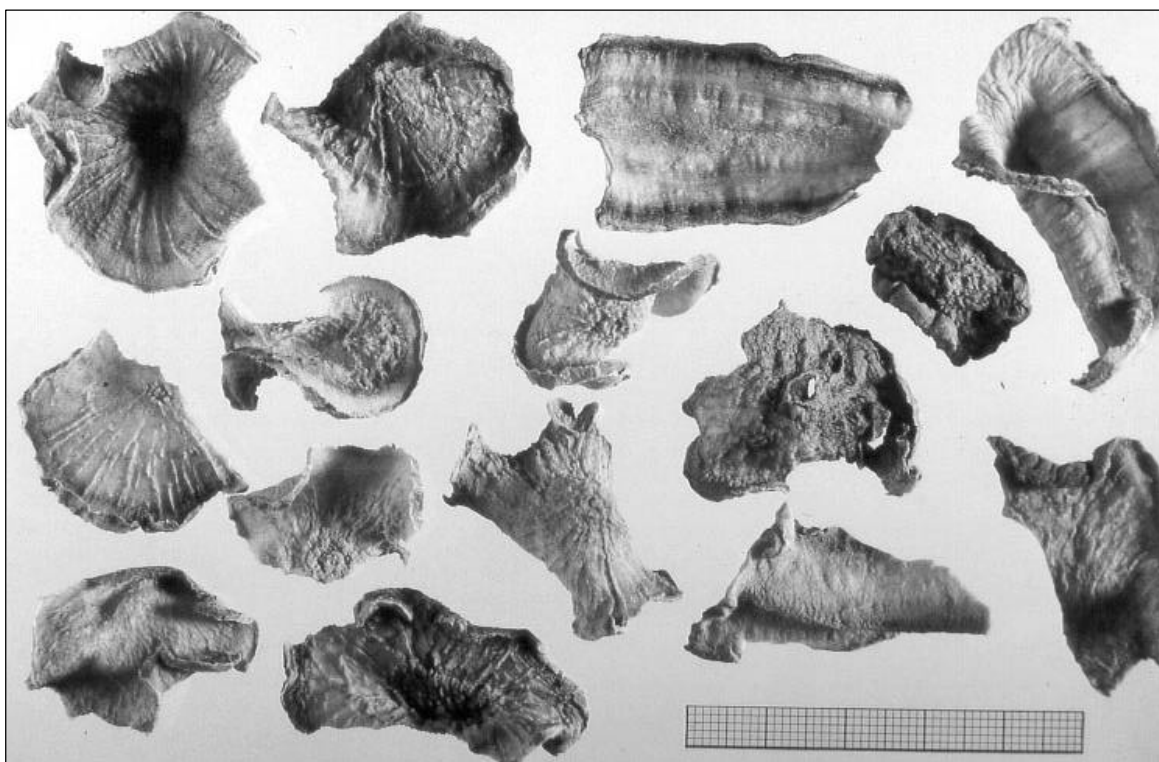


Figure 2. Dried sliced root tubers of *Harpagophytum procumbens*, the commodity in international trade. Photo: U. EULER.

According to NOTT (1986), between 1985 and 1986, about 50% of the harvested wild material was mixed *H. procumbens* and *H. zeyheri* material. During that time most of the material came from the northern regions of Namibia (*H. zeyheri*), but only a very small amount from the Gobabis area in Namibia. The Gobabis area is located in the eastern part of the country and only harbours *H.*

procumbens. Nowadays, after the active ingredients in both species were analysed, harvest clearly focuses on *H. procumbens*, and thus the Gobabis area is heavily exploited today (ENGELBRECHT, KRAFFT, VERSVELD, pers. comm. with Namibian farmers) .

Other species harvested together with *Harpagophytum* are *Elephantorrhiza* spec. (Fabaceae) and *Acanthosycios naudians* (Cucurbitaceae). Both can be easily distinguished by their bitter taste and dark colour and are therefore sorted out before export (CZYGAN & al. 1977; WENZEL & WEGENER 1995).

6. References

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