SAPIA NEWS

SOUTHERN AFRICAN PLANT INVADERS ATLAS

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ARC • LNR
Excellence in Research and Development

WORKING FOR WATER

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Inside this issue:

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Articles and photos by Lesley Henderson unless otherwise acknowledged

Focus on Cacti in South Africa

Drought resistance, ease of growth, unusual shapes, beautiful flowers, artistic arrangement of spines, edible fruits—are features which make the cacti irresistible to the plant collector and gardener. But beware! **Many of these plants are truly dangerous—capable of transforming productive land into useless, impenetrable thickets, causing huge mortalities of livestock and devaluation of land.** There have been extremely successful control campaigns against some of the worst invaders but these successes are being undermined by a suite of new invaders. This newsletter aims to inform the public about the many cacti that are invasive in South Africa. While some are beneficial, providing edible fruits and fodder, many have no other purpose than decoration. An appeal is made to the public not to cultivate any of the declared species and where they occur, to control them using the best method available. Several species are still in the early stages of invasion and landowners can contact the **National Cactus Working Group** and **SANBI's EDRR programme** for assistance (see page 9 for details).

Typical example of the early stages of cactus invasion. Here, the less-spiny, mamillate form of chainfruit cholla (*Cylindropuntia fulgida* var. *mamillata*) was planted as an ornamental at a farmstead. The plants continue to flourish and expand their range long after the house was abandoned.

The Weeds and Invasive Plants website: www.agis.agric.za/wip is currently not being managed due to ongoing operational problems at AGIS.

Requests for information from the SAPIA database and submission of records of invasive plants should be sent directly to Lesley Henderson at L.Henderson@sanbi.org.za.

SAPIA newsletters are posted at the ARC website: www.arc.agric.za under 'News Articles'.

History of invasive cacti and their control

It has been estimated that at least 200 species of cacti have been introduced into South Africa, mainly for their ornamental value. The first species to be introduced was the sweet prickly pear (*Opuntia ficus-indica*), more than 350 years ago by the Dutch East India Company, for its edible fruits and as a fodder and hedge plant.

The first sweet prickly pear plants that were introduced were spineless cultivars, but by the 1880s, spiny forms had emerged and had become invasive in the eastern Cape. From as early as 1883 various methods of mechanical and chemical control were tried but without much success. By 1932 the infestations extended across the length of South Africa from the southern Cape to the far north. In the Cape alone it had invaded 20 000 square km (~ the same area as the Kruger National Park). Half of the area invaded consisted of dense infestations which resulted in little natural vegetation for grazing animals and led to huge livestock mortalities. The highly irritant spines on the prickly pear plants also rendered them unpalatable. In 1932 a biological control campaign was started using two of prickly pear's natural enemies which were specially imported—these were the cochineal insect and the prickly pear moth. Spectacular results were achieved with biological control and huge tracts of land were cleared. Today, after 70 years of biological control, the populations of sweet prickly pear have stabilised and pose no further threat to agriculture and the environment despite pockets of infestation in some nature reserves.

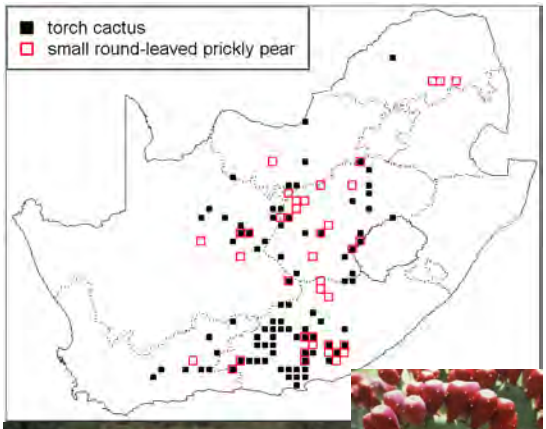
Spineless robusta or blue-leaf cactus was introduced into South Africa in the 1920s and was widely cultivated in the Karoo as a drought fodder plant. Today, these plants are widely naturalised but are not yet considered a problem. However, recently there has been a reversion to the spiny form in a few localities, and these plants are of concern.

Most of the remaining invasive cacti in South Africa have only been used for ornamental purposes. They are fast becoming as much of a threat to agriculture and the environment as the sweet prickly pear in the early 1900s. Some species can be effectively controlled biologically—but the implementation often falls short of what is required, and the public could be of assistance. For other species there are currently no prospects for biocontrol and to make matters worse, it appears that, apart from the dedication of a few landowners, little attempt is being made to control them using other methods. The small round-leaved prickly pear (*Opuntia engelmannii*) **(photo 1)** and torch cactus (*Echinopsis schickendantzii*) **(photo 2)** are two glaring examples. Their current known distributions are shown in the adjacent map.

Methods of propagation and dispersal: Cacti can reproduce sexually from seed and vegetatively from any detached plant part—stems and stem sections, buds and fruits. Some species are totally sterile i.e. do not produce viable seed, but can propagate and disperse very effectively from detached plant parts. Birds, monkeys, baboons and people disperse seed by eating the fruits. Spiny plant parts can attach themselves to passing animals, people and vehicles.

Dense stand of sweet prickly pear, E Cape

The control of sweet prickly pear was declared a national priority in the early 1900s after it had invaded, and rendered useless, vast tracts of land, mainly in the eastern Cape and Karoo. There was overwhelming support from landowners and farming organizations at that time for biological control because any value of the prickly pear was vastly outweighed by its importance as a pest plant.



Control methods: Cacti are very difficult to kill because they are able to survive for long periods out of the ground and can regrow from detached plant fragments.

Mechanical methods are only recommended for one or a few plants. Plants must be chopped down and stem bases dug up. Plants must then be buried very deeply, or stacked and burnt, or small plants without fruit attached, can be crushed to a pulp using a heavy implement—or by driving over with car tyres.

Biological control is available for several species. See pages 4–8. Contact Hildegard Klein at ARC-PPRI for advice: KleinH@arc.agric.za Tel 012 356 9841

Chemical control: the registered herbicide, MSMA, which is effective against many species, has been withdrawn from use by state departments because it can be highly toxic to grazing stock and wildlife. It should only be used with utmost caution and under supervision. Glyphosate has been registered for use against cacti. Contact Shaun Cozett for advice: S.Cozett@sanbi.org.za Tel 021 799 8743

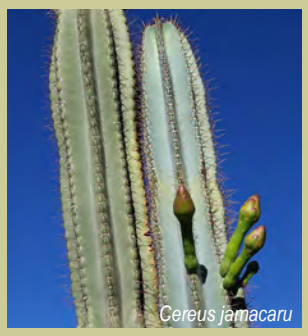
Legislation: Several cacti are declared category 1 invaders (prohibited and must be controlled) under the Conservation of Agricultural Resources Act (CARA), Act 43 of 1983, and amended in 2001. Several more species have been proposed under the revised CARA regulations and draft National Environmental Management: Biodiversity Act, Act 10 of 2004, but await promulgation. See pages 4–8.

Taxonomy and features used in identification

The family Cactaceae, with ~ 1500 species, is native to North and South America. All cacti are alien to Africa with the possible exception of a slender epiphyte, *Rhipsalis baccifera*, which occurs in forested habitats. Approximately 30 species, in 11 genera are known to be naturalised in South Africa.

The great majority of cacti are leafless, spiny, terrestrial, stem-succulents. **Growth habit** ranges from low-growing dwarf shrubs to erect or sprawling shrubs, climbers and trees. **Stems** may be segmented or unsegmented, cylindrical, columnar, spherical, tubercled (with knobby protuberances), ribbed, winged or flattened (cladodes). **Spines** vary in number, size, shape and colour. **Flowers** are showy, usually solitary and radially symmetric, with numerous colourful segments (tepals), nocturnal or diurnal, and pollinated by insects, birds and bats. The ovary, which develops into the fruit, is enveloped in a pericarp (fleshy receptacle), sometimes referred to as a floral tube. **Fruits** are berries, usually fleshy, and range from smooth to scaly, hairy, bristly or spiny.

Stems—some examples



Columnar, unsegmented, ribbed

Cylindrical, segmented, tubercled

Segmented, flattened (cladodes)

Segmented, winged

Flowers

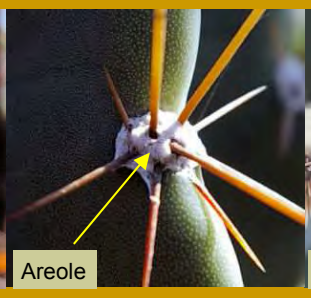
ovary enclosed in pericarp

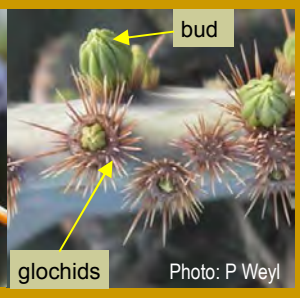
Fruits—some examples

smooth

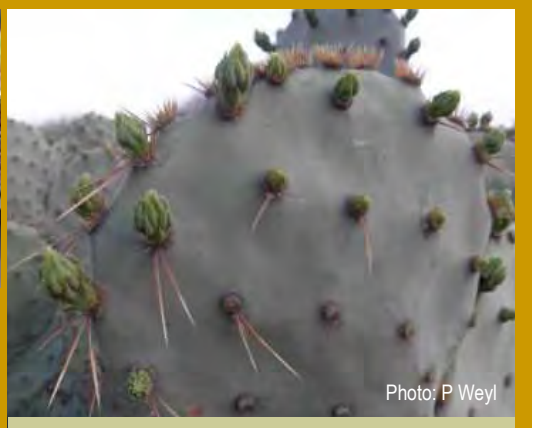
spiny

hairy





Areoles are the hallmark of the Cactaceae. An areole is a highly modified axillary bud. It is a cushion-like structure, bearing abundant hairs giving a felted or woolly appearance. Areoles give rise to spines, new growth, flowers and often glochids, which are small, fine bristles, readily detachable and easily lodge in human skin causing much irritation.



cladode with scattered areoles (*Opuntia engelmannii*)

New book: Detailed information, photos and maps of the naturalised and invasive cacti in South Africa can be found in: Walters, M., Figueiredo, E., Crouch, N.R., Winter, P.J.D., Smith, G.F., Zimmermann, H.G. and Mashope, B. 2011**. Naturalised and invasive succulents of southern Africa. ABC Taxa, Volume 11**. The entire book can be downloaded at the following website: www.abctaxa.be/

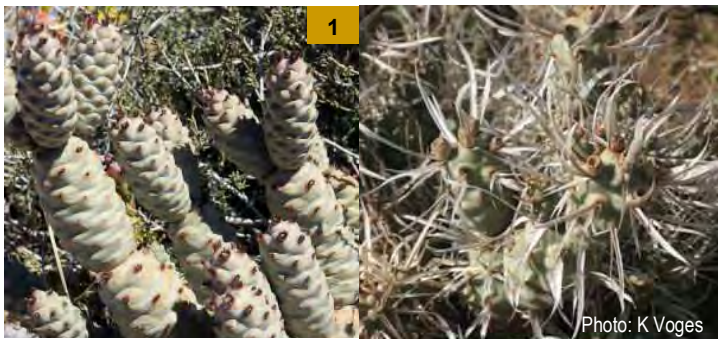
Key to the naturalised and invasive cacti in South Africa

CARA category 1 (prohibited) Proposed category 1 Targets of early detection Effective biocontrol

Low-growing shrubs ~ 0.2–0.5 (–1) m

Stem sections globose to cylindrical

stem segments resembling pine cones, easily detaching; spines usually absent (when present, flat, papery); glochids prominent; flowers white; fruit dry-walled; seed winged and corky…**1.** **pine cone cactus (*Tephrocactus articulatus*)**



Stem sections cylindrical

<u>very densely spiny; stems obscured;</u> spines covered with whitish or yellow papery sheaths

flowers pink ……**2.** **pink-flowered cholla (*Cylindropuntia pallida*)**

flowers yellow……**3.** **yellow-flowered cholla (*Cylindropuntia tunicata*)** (not confirmed as naturalised)

<u>stems not obscured by spines</u>

terminal segments slightly flattened, easily detached; spines sturdy; flowers deep yellow with red outer tepals….. ...**4.** **jointed cactus (*Opuntia aurantiaca*)**

terminal segments cylindrical, narrow, spines bristle-like, flowers white or pale yellow……**5.** **bur cactus (*Opuntia salmiana*)**

Stem sections flattened

sprawling, usually spineless, glochids prominent; flower buds and fruits narrow, elongated; flowers yellow often with orange centre…..**6.** **creeping prickly pear (*Opuntia humifusa*)**

erect to sprawling, surface velvety, spineless, areoles with dense clusters of yellowish glochids; flowers yellow……..……**7.** **teddy bear cactus (*Opuntia microdasys*)**

Climbers and scramblers

Stems woody

branches whip-like, resembling *Bougainvillea*; young stems with succulent leaves and paired spines; older stems with clusters of straight spines; flowers whitish, in clusters; fruits ~ round, c. 2 cm diam., orange, sometimes spiny.....**8. pereskia or Barbados gooseberry (*Pereskia aculeata*)**


Photo: G R Nichols

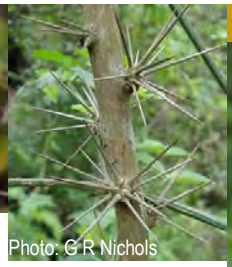


Photo: G R Nichols


8

Stems succulent

robust, clambering to 4–10 m tall, with markedly angular stems

stems 3-winged, with wavy, horny margins, producing aerial roots; flowers very large, white, nocturnal; fruit red, smooth, with large fleshy scales.....**9. pitaya or night-blooming cereus (*Hylocereus undatus*)**

stems 3–4(–5) angled; flowers large, white, nocturnal; fruit red up to 7 cm diam., scales conspicuous.....**10. climbing harrisia (*Harrisia balansae*)**

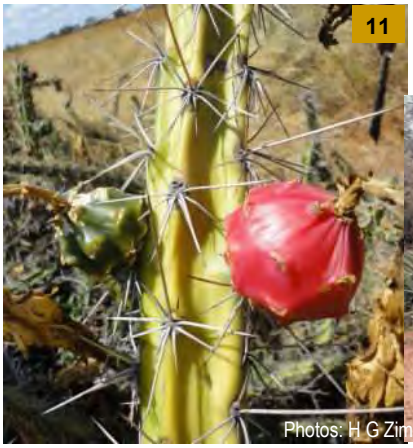

Photo: H G Zimmermann
10


9

less robust, sprawling or clambering to 3 m high, stems ribbed

ribs not tubercled; 6–8 radial spines; flowers white, large, nocturnal; fruits red, globose, not spiny..... **11. midnight lady (*Harrisia pomanensis*)**

ribs of old stems strongly tubercled; 1–3 (–7) radial spines; flowers white, large, nocturnal; fruits pinkish red, globose, shortly spiny.....**12. harrisia cactus (*Harrisia martinii*)**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Photos: H G Zimmermann


Photo: M J Wells
12

Shrubs and trees (~ 1–10 m or more)


13
Photo: H G Zimmermann

Stem sections cylindrical and very narrow, < 1.5 cm wide

branch segments very slender (3–5 mm diam.), grey-green to purplish; spines sheathed, hard, 0–1 (–3); flowers small greenish yellow; fruits yellow to red, spineless.....**13. pencil cactus (*Cylindropuntia leptocaulis*)**

Stem sections cylindrical, > 1.5 cm wide, and tubercled (with knobby protuberances)


14

leaves persistent, elongated

leaves 4–8 cm long; spines 1–2 (–3), up to 5 cm long; flowers scarlet to orange or greenish yellow; fruits green, pear-shaped……**14. long-spine cactus (*Austrocylindropuntia subulata*) (= *Opuntia exaltata*)**

leaves up to 1.5 cm long; spines 2–5 (–8), 1(–3) cm long; flowers scarlet.....**15. *Austrocylindropuntia cylindrica* (= *Opuntia cylindrica*)**

leaves absent or deciduous

very densely spiny; stems almost obscured by interlacing spines

spines 2.5 –3.5 cm long, barbed, covered with whitish, papery sheaths; flowers pink; fruits yellow, shallowly tubercled, forming chains in older plants……**16a. chain-fruit cholla (*Cylindropuntia fulgida* var. *fulgida*)** (previously incorrectly called *Opuntia rosea* in South Africa)

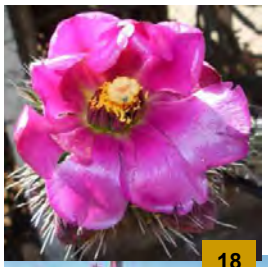
Photos: H G Zimmermann


16a
Photo: S Neser

less spiny; stems not obscured by spines

fruits shallowly tuberculate

spines short (1–2 cm), tubercles nipple-like.....**16b. *Cylindropuntia fulgida* var. *mamillata***
some stem sections broad, deformed or 'crested'.....**boxing-glove cactus (forma *monstrosa*)**


18

fruits strongly tuberculate

tubercles of stems widely spaced, 2–5 cm high; flowers purplish red; fruits yellow, tubercled, spineless, often proliferating……**17. imbricate cactus (*Cylindropuntia imbricata*) (= *Opuntia imbricata*)**

tubercles of stems crowded, 0.5–1.5 cm high; flowers pink to reddish purple, white, yellow; fruits yellow, tubercled, spineless, rarely proliferating……**18. cane cholla (*Cylindropuntia spinosior*)**


Photos: B Mashope


17


16b
Photo: D Sharp
forma *monstrosa*

Stem sections columnar and ribbed

Multistemmed shrubs, up to 2 (–3) m tall

stem < 6 cm diam., sometimes arching; flowers not restricted to top of stem, white tinged red outside; floral tube with white bristles; fruit red, white hairy……..**19.** **serpent cactus (*Peniocereus serpentinus*)**

stem usually 8–10 cm diam., erect; flowers restricted to top 10 cm of stem, white, floral tube covered with long black hairs; fruit green, black hairy……**20.** **torch cactus (*Echinopsis schickendantzii*)** (previously referred to as *E. spachiana* in South Africa)

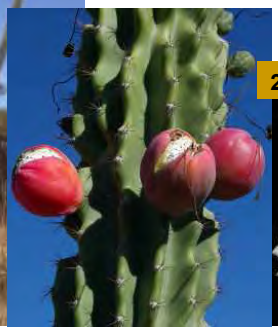
Single-stemmed, low-branching shrubs or trees, up to 10 (–15) m tall

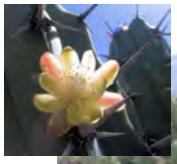
ribs 5–6, low; spines shorter and stouter than in *Cereus;* flowers very small (c. 2.0 x 2.5 cm), creamy, diurnal; fruit 1–2 cm diam., dark purple……**21.** **bilberry cactus (*Myrtillocactus geometrizans*)**

ribs usually 6–8, prominent (wavy in monstrous forms); flowers large, white, nocturnal; fruit more than 40 mm across, red, pink or orange

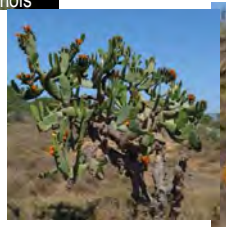
flowers up to 18 cm long; fruit splitting along 3 lines…….....**22.** **queen of the night (*Cereus hildmannianus* subsp. *uruguayanus*)** (possibly naturalised)

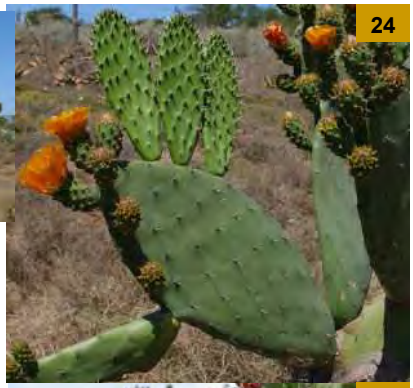
flowers 20–29 cm long; fruit splitting along 1 line on the underside…..…**23.** **queen of the night (*Cereus jamacaru* subsp. *jamacaru*)**





Stem sections flattened (cladodes)





developing a sturdy trunk with age

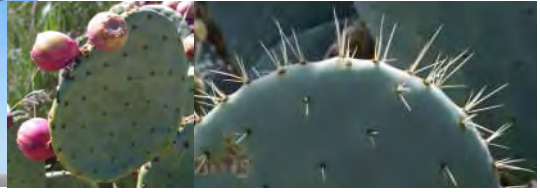
cladodes longer than broad

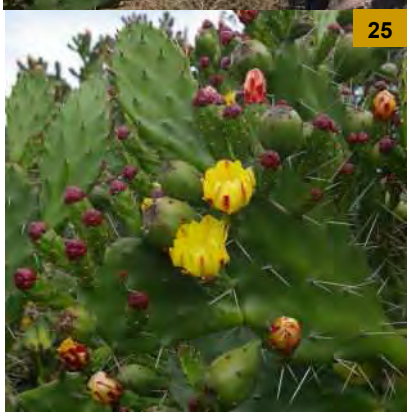
cladodes green to grey-green, spiny or spineless, flowers orange, fruits yellowish turning reddish……...**24.** **sweet prickly pear (*Opuntia ficus-indica*)** (only spiny plants)

cladodes bright green, thin, spiny; flowers yellow, outer tepals with red markings; fruits reddish purple……**25.** **drooping prickly pear (*Opuntia monacantha*)**

cladodes ~ rounded

cladodes blue-green, usually spineless (cultivars) or 2–12; flowers pale yellow; fruits purple, red, ~ globose ……...**26.** **blue-leaf cactus (*Opuntia robusta*)** (only spiny plants)



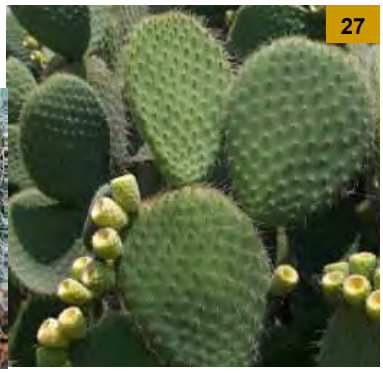


not developing a trunk

cladode surface velvety

radiate spines 1–2 cm long and central deflexed spine to 7 cm long, giving a bearded appearance on old cladodes; flowers yellow; fruits yellowish……. ……..**27. Aaron's beard prickly pear (*Opuntia leucotricha*)**


Photo: H Klein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cladode surface not velvety

cladodes ~ round

cladodes slightly blue-green, areoles sunken, closely spaced; spines in a sub-spiral arrangement; flowers yellow, fruits yellow…….....**28. saucepan cactus (*Opuntia spinulifera*)**


28

cladodes green to grey-green, broader at the apex than base; glochids rusty brown, prominent on crests of cladodes; spines 1–3, up to 5 cm long, straight to slightly curved; flowers yellow, fruits red to purple.....**29. small round-leaved prickly pear (*Opuntia engelmannii*) (= *O. lindheimeri*)** this is a very variable species

only E Cape variety


29

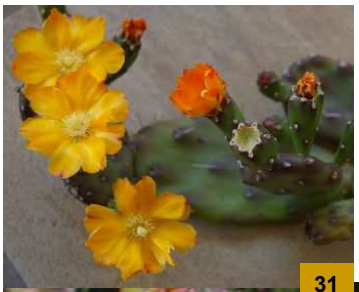
cladodes longer than broad

cladodes green to bluish green; glochids many; flowers yellow; fruits purplish, with a distinct neck….**30. Australian pest pear (*Opuntia stricta*)**

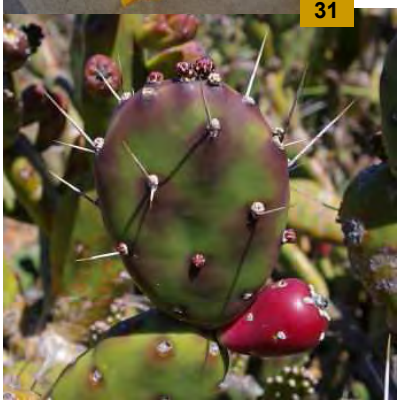

30a

spines 0–3 restricted to cladode margins.....**a. var. *stricta***

spines 4–7(–11), coarser and scattered……**b. var. *dillenii***



cladodes green with purple blotches, thick; glochids ~ absent; spines 0–3, unequal, up to 6 cm long; flowers orange; fruits reddish…**31. orange tuna (*Opuntia elata*)**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30b
Photo: S Neser


30a
Photo: T Coleman

National Cactus Working Group

A National Cactus Working Group has recently been established. The co-ordinator is Shaun Cozett of the Early Detection and Rapid Response programme (EDRR) of the South African National Biodiversity Institute (SANBI) (Tel 021 799 8743; S.Cozett@sanbi.org.za)

The role of the working group is to:

- co-ordinate cactus research and management nationally—to know what is being done, by whom, and to avoid duplication
- ensure that the correct methods of control are being used
- improve co-ordination and communication between Agriculture, Working for Water and EDRR
- compile a list of undesirable cacti
- liaise with cactus nurseries
- co-ordinate communications related to cacti
- develop a database of invasive cacti

SANBI's EDRR programme and targets of early detection

The EDRR programme is attempting to eradicate several invasive cactus species before they become widespread problems. These cacti are a serious threat to biodiversity and grazing of livestock and game.

If you have seen any of these cactus species (pages 4–8) on your property, or elsewhere, please get in touch with the EDRR programme at alienplants@sanbi.org.za. Awareness pamphlets are availabe for distribution.

mamillate form of chain-fruit cholla (*Cylindropuntia fulgida* var. *mamillata*), **yellow-flowered cholla** (*Cylindropuntia tunicata*), **pine cone cactus** (*Tephrocactus articulatus*), **teddy bear cactus** (*Opuntia microdasys*), **midnight lady** (*Harrisia pomanensis*), **climbing harrisia** (*Harrisia balansae*), **bur cactus** (*Opuntia salmiana*), **spiny blue-leaf cactus** (*Opuntia robusta*).

Other species still under consideration include: cane cholla (*Cylindropuntia spinosior*), pitaya (*Hylocereus undatus*), orange tuna (*Opuntia elata*), serpent cactus (*Peniocereus serpentinus*), saucepan cactus (*Opuntia spinulifera*), Aaron's beard prickly pear (*Opuntia leucotricha*), and bilberry cactus (*Myrtillocactus geometrizans*).

ARC-PPRI, WEEDS RESEARCH PROGRAMME

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ARC • LNR
Excellence in Research and Development

The Weeds Research Programme of the ARC-Plant Protection Research Institute is responsible for research on the ecology and control of invasive alien plants in South Africa. These plants were introduced either intentionally (e.g. for ornamental use or agroforestry purposes), or accidentally (e.g. in livestock feed) and now threaten biodiversity and agriculture. In addition, they reduce run-off from water catchments, thus diminishing flow in streams, and adversely affect the quality of life of communities.

- Biological control
- Chemical control
- Bioherbicides
- Integrated control
- Monitoring the emergence and spread of invasive alien plants

We are on the Web:

www.arc.agric.za

Quick link:

Invasive alien plants

see Plant Protection News

for current news from the Weeds Research Programme