

---

## A TORTOISE

---

**Class:** REPTILIA  
**Order:** TESTUDINES  
**Family:** TESTUDINIDAE  
**Year assessed:** 2008



### **Distribution:**

Native to Madagascar, this species has a very small distribution. It is known from the Baly Bay region in northwestern Madagascar, over an area of approximately 700 km<sup>2</sup>; its range within this area is 25 to 60 km<sup>2</sup> (Durrell *et al.* 1989, Glaw and Vences 1994, Bour 2007). As a result of historical exploitation and habitat loss, the species is now restricted to five small subpopulations which are discontinuous from each other. The area of suitable habitat may extend up to 70-92 km<sup>2</sup> (DWCT survey results 1999-2000), while the area of occupancy may be restricted to just 12.4 km<sup>2</sup> (Pedrono 2008).

### **Countries of Occurrence:**

Madagascar

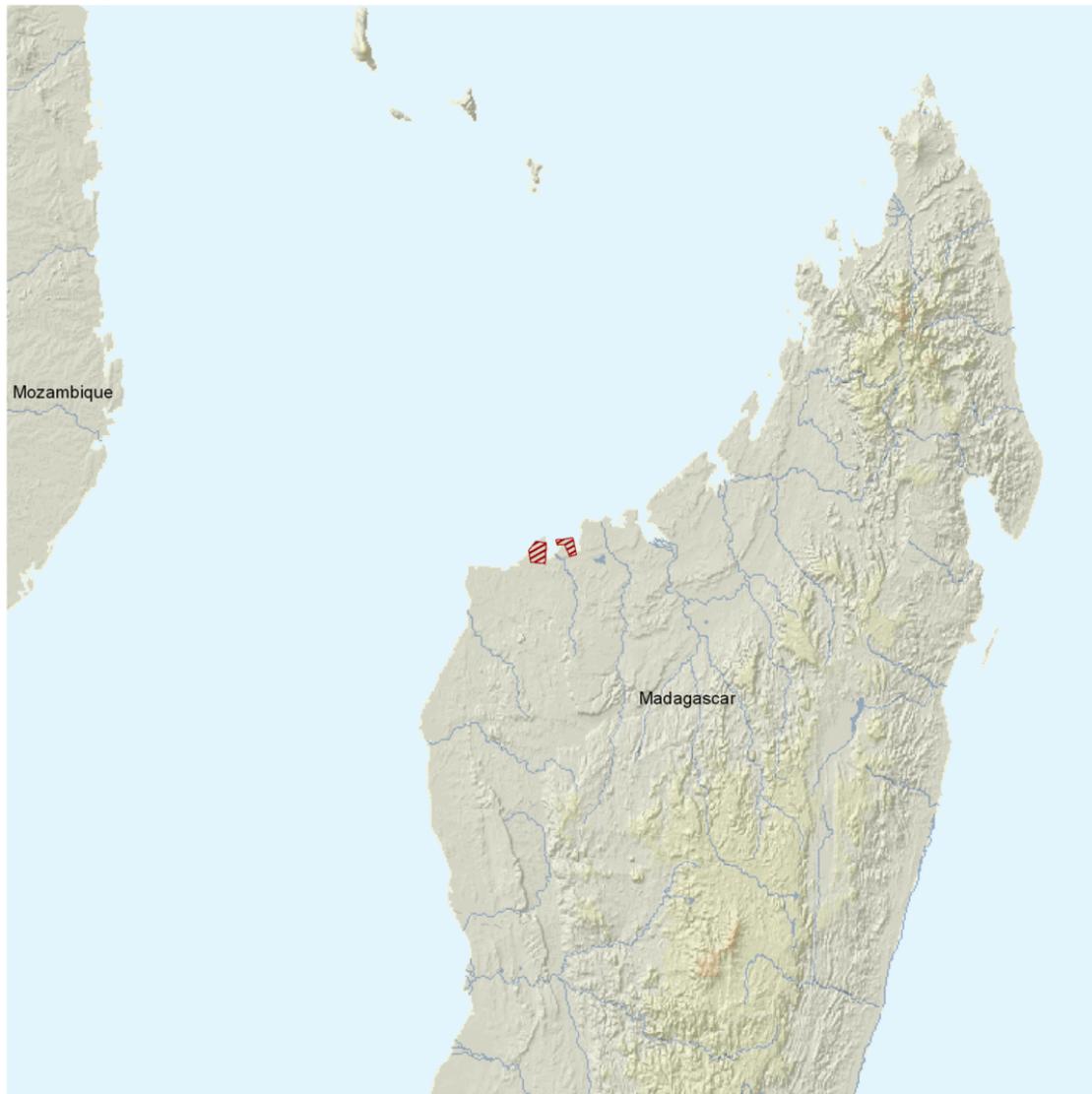
### **Population:**

Historically, the population of this tortoise has been depleted to less than 1,000 animals for several decades since about 1941, as a result of local/regional consumption and habitat burning. In the late 1990s, the total wild population was estimated to be about 600 individuals (with a possible range of 440 to 770), found within five subpopulations: two to the east of the Andranomavo river (Sada and Beheta) and three to the west of the river (Ambatomainty, Betainalika, Andrafiafaly) (Smith *et al.* 1999, Pedrono 2000). Based on distance sampling surveys and the extent of suitable habitat, by 2005 DWCT estimated a maximum of 800 wild animals.

However, recent impacts (illegal collection for the international pet trade) have reduced the estimated population substantially, causing sharp declines. The population is currently estimated to possibly be as low as 400 individuals, of which 200 are adults (G. Pedrono pers. comm. 2008).

Based on a Population Viability Analysis performed for this species (Pedrono *et al.* 2004) and recent level of poaching for international trade, and by analogy with a similar species in the same genus, this tortoise is at extreme risk of extinction in the wild within 10 to 15 years, a time period far less than one generation length of 42 years. It is nearly certain to go extinct within the next generation if current threats continue unabated.

**Population trend:** ↓ Decreasing



range type

-  native (resident)
-  native (breeding)
-  native (non breeding)
-  reintroduced
-  introduced
-  origin uncertain
-  possibly extinct
-  extinct

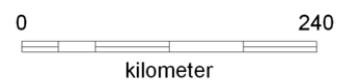
-  national boundaries
-  subnational boundaries
-  lakes, rivers, canals
-  salt pans, intermittent rivers

data source:  
IUCN (International Union for Conservation of Nature)



azimuthal equal area central point: 0° E, 0°

map created 09/30/2008



THE IUCN RED LIST OF THREATENED SPECIES™

### **Habitat and Ecology:**

The species is found in the Baly Bay region, over an area of approximately 700 km<sup>2</sup>, though only 66 km<sup>2</sup> of this is considered suitable habitat. This region is comprised of dry deciduous forest, savanna, and mangrove swamps. The climate is tropical with a distinctly seasonal rainfall patterns. These tortoises utilize bamboo-scrub habitat, which is considered to be a secondary stage of the dry deciduous forest (Curl *et al.* 1986). Bamboo-scrub habitat consists of a mosaic of shrubs, bamboo, savanna grasses, and open, non vegetated areas. The shrubs are generally less than 2 m tall and the dominant species include *Bauhinia* sp. and *Terminalia* sp. Bamboo (*Perrierbambos madagascariensis*) occurs in dense thickets within the habitat. Andrianandrasana (2000) estimated there are 7,975 ha (79.75 km<sup>2</sup>) of suitable habitat of which 6,669 ha (66.69 km<sup>2</sup>) have tortoises occupying them. Elevation is less than 50 m above sea level (Smith *et al.* 1999a and b).

Adult male tortoises are larger and heavier than females. Mean adult male length and weight is 414.8 mm (range 361-486 mm) and 10.3 kg (range 7.2-18.9 kg) respectively. Mean adult female length and weight is 370.1 mm (range 307-426 mm) and 8.8 kg (range 5.5-12 kg) respectively (Pedrono and Maxwell 2001).

According to Smith (1999), grasses and forbs in open rocky areas of bamboo scrub habitat appeared to be important food items. Feeding was observed from October through May. Tortoises were observed to feed upon herbs, forbs and shrubs (*Bauhinia* sp. and *Terminalia* sp.) rather than grasses. Tortoises were never observed feeding on live bamboo; however, on several occasions they consumed leaf litter that included dead bamboo leaves. Tortoises were also observed feeding on dried carnivore and African bush pig feces (Smith 1999).

Smith (1999) estimates sexual maturity at a minimum of 15 years old. A study by Pedrono *et al.* (2001) showed the reproductive period was from 15 January to 30 May and tortoises produced 1-6 eggs (mean 3.2) per clutch and up 4 (mean 2.45) clutches per season. Despite low densities the egg fertility rate was 71.9% and resulting hatching success was 54.6% (Pedrono *et al.* 2001). This yields an estimated annual production of  $3.2 \times 2.45 \times 54.6\% = 4.3$  hatchlings per reproducing female. By analogy with a similar species in the same genus, the average age of reproducing animals per generation time is estimated as being 42 years (Madagascar WS 2008).

### **Use and Trade:**

The species is harvested from the wild for food and for sale in the pet trade. Poached wild animals and stolen captive-bred juveniles have been reported in the international pet trade.

### **Threats:**

The tortoise's restricted distribution and threatened status are believed to result from exploitation in historical times and from frequent human-caused fires, which were deliberately started to create and improve grazing conditions for Zebu cattle (Juvik *et al.* 1981, Curl *et al.* 1985). This threat is being addressed; according to Lewis *et al.* (2005), "since 1995, the local communities, with the assistance of the Water and Forests Department and Durrell Wildlife, have annually burnt the savannah fringes during the wet season creating a system of natural firebreaks". Outbreaks of fires within tortoise habitat have continued to decrease annually. Less than 50 ha (0.5 km<sup>2</sup>) of tortoise habitat was burnt in 2004, though larger areas of habitat were burnt in other years.

The other major and ongoing threat comes from illegal collection for the international pet trade (Lewis *et al.* 2005, Pedrono 2008); marked wild animals have been recorded from pet trade in Asia and the threat of poaching is increasing. Despite some successful enforcement and confiscation actions, the species remains in extremely high demand in the global illegal pet trade, which severely threatens the remaining wild animals. A 25% population decline over one generation (42 years) would be met by poaching levels as low as three animals every two years; current (2008) documented confiscation numbers exceed this.

### **Conservation Measures:**

The species is protected under Madagascar national law and is also included in CITES Appendix I (Lewis *et al.* 2005). The species' area of occurrence at Soalala (area west of Baly Bay; 113,000 ha) was considered a "Site of Biological Interest" but it held no legal protection status (Nicoll and Langrand 1989), until in 1997 the Baly Bay area was gazetted as a national park (Lewis *et al.* 2005). The parks authority has had a permanent presence (eight personnel) at Soalala since 2001. There is also a network of 40 village 'para-rangers' who actively watch out for possible smugglers and fire outbreaks.

Durrell Wildlife Conservation Trust established a conservation program for the tortoise in 1986 that strongly integrated local people (Durbin *et al.* 1996). A summary of early research concerning the species was provided by Bour (2007). The history of Durrell Wildlife Conservation Trust's 'Project Angonoka' was described by Lewis *et al.* (2005): Project Angonoka began in 1986 as a project to safeguard this species. The project was established as collaboration between Durrell Wildlife Conservation Trust (then known as Jersey Wildlife Preservation Trust) and the Water and Forests Department of the Government of Madagascar, together with support from the Worldwide Fund for Nature (WWF). Given the extreme rarity of the species, the initial goal was the establishment of a captive-breeding project. This was successfully achieved. In December 2004, the captive project had 224 captive-bred juveniles from 17 founder adults (10 males, 7 females). From the 1990s, work progressed to ecological research on the species in the wild, and developing conservation strategies with the surrounding local communities. The latter work formed the basis of community-led firebreaks and with the communities themselves proposing the creation of a park to safeguard the tortoise and the remaining forests.

Ongoing monitoring of the species' occurrence in the global pet trade is needed, along with effective enforcement and repatriation and/or safe, conservation-oriented maintenance of confiscated animals in appropriate facilities.

---

## A STURGEON

---

**Class:** ACTINOPTERYGII  
**Order:** ACIPENSERIFORMES  
**Family:** ACIPENSERIDAE  
**Year assessed:** 2009



### **Taxonomic Notes:**

This sturgeon is restricted to the main channel of the Yangtze and the Pearl Rivers and the East and South China Seas. Though there is still disagreement about the taxonomy of the Pearl and Yangtze River populations, Chinese scholars commonly divide this species into two populations; one is the Pearl River Sturgeon, which spawns in spring, and is close to dying out. The other is the Yangtze River Sturgeon, which spawns in autumn and still maintains a certain amount below the Gezhouba Dam.

### **Distribution:**

This sturgeon is the most southerly distributed of the Acipenseriformes. It was historically recorded in southwestern Korea and in western Kyushu, Japan. In China this species was historically found in the Yellow, Yangtze, Pearl, Mingjiang, and Qingtang rivers. However, it is now considered extirpated in the Yellow, Mingjiang, Qingtang and Pearl rivers (Chen 2008). This species has also recently been extirpated from the upper reaches of the Yangtze River, above the Three Gorges dam. It currently occurs in the middle and lower reaches of the Yangtze River, below the Gezhouba dam, and close to shore in the Yellow and East China Sea (The Changjiang Aquatic Resources Survey Group 1988, Chen 2008). Currently, there is just one remaining spawning ground (a 4 km stretch of river), which is situated below the Gezhouba dam.

### **Countries of Occurrence:**

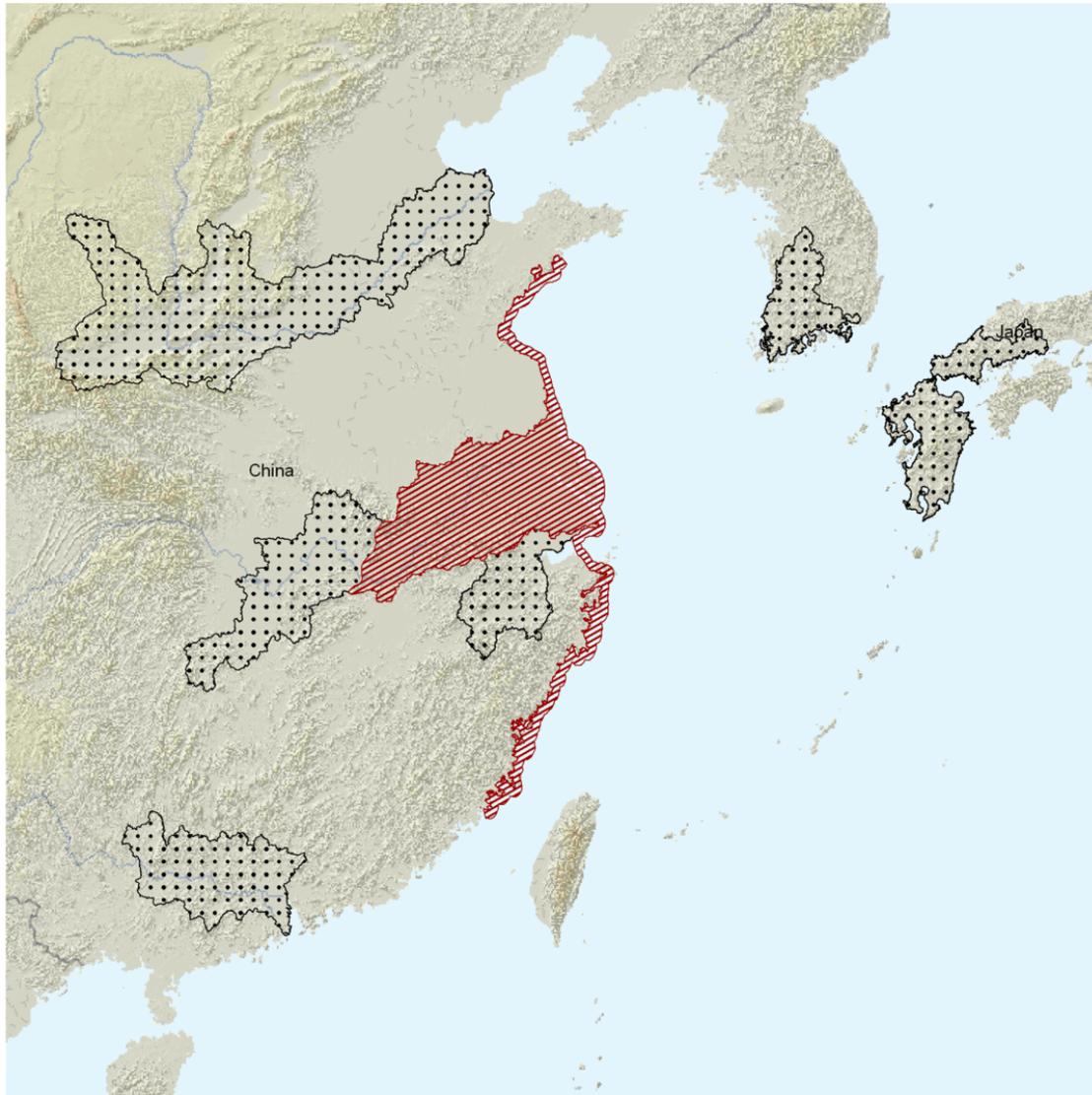
Possibly Extinct in China; Japan; Democratic People's Republic of Korea; Republic of Korea

### **Population:**

In the 1960s, this stock supported a major commercial fishery, but catches in the late 1970s had declined to about 500 fish per year (The Changjiang Aquatic Resources Survey Group 1988).

In the 1970s, the total spawning population of this species was estimated at 10,000 individuals. In 1981, the construction of the Gezhouba dam isolated the upper reaches of the Yangtze River. In 1983 and 1984, the mean spawning stock size was estimated at 2,176 individuals (946 and 4,169 as 95% confidence intervals). Available data from acoustic surveys show that between 2005 and 2007, the total spawning stock of this species was 203-257. This data indicates a 97.5% reduction in the total spawning population over a 37 year period. This decline is expected to continue.

During 1996-2001, studies using tag-recapture methods, population structure analysis and sonar counting indicated that the spawning stock in the Yichang spawning area (mid-lower reaches of the Yangtze River) had decreased since the completion of the Gezhouba Dam. Annual estimates of



range type

-  Historical
-  Native (resident)

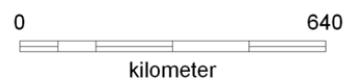
-  national boundaries
-  subnational boundaries
-  lakes, rivers, canals
-  salt pans, intermittent rivers

data source:  
IUCN Sturgeon Specialist Group



azimuthal equal area central point: 0°, 0°

map created 03/03/2010



spawning adults within the 40 km (including the 4km long spawning area) ranged from 199 to 473 (Chang 1999, Wei 2003).

Between 1983 and 2007, more than 9 million juveniles were released into Yangtze River to increase wild stocks. Prior to 1996, only the larvae were released as techniques had not been developed to cultivate fry, so survivability is expected to be very low (Wei 200, Chen 2008). After 1999, improvement in hatchery techniques allowed juveniles to be raised and the released, but the contribution to wild stocks is considered to be less than 10% (Wei 2003, Zhu 2003).

**Population trend:** ↓ Decreasing

### **Habitat and Ecology:**

This species is large and anadromous (spending at least part of its life in salt water and returning to rivers to breed). Young of this species live in estuarine and nearshore habitats. When the species becomes sexually mature, it migrates up-river. Nearly mature adults (early stage III) arrive at the mouth of the Yangtze River in June or July. The adults do not feed while in the river.

Adults reach the middle sections of the river in September or October, where they overwinter. Ripe individuals were formerly found as far inland as the Jingsha River during the following October and November, where they spawned. Prior to construction of the Gezhouba Dam, the migration distance was as long as 2,500 to 3,300 km. Spawning sites often occur in turbulent sections of the river with rocky substrate and steep cliffs on both banks.

The roe is very large and it sinks and sticks to gravel until hatching. The hatched fries descend from the river to sea near the coast where they grow. They feed mainly on zoobenthos and other bottom invertebrates.

Juvenile sturgeon of 7 to 38 cm tail length occur in the Yangtze River estuary from the middle of April through early October. These are presumably one-year-old individuals. Juveniles weighing a few kilograms can be found in coastal waters near the river mouth. Individuals from 25 to 250 kg in weight were registered in some fishing grounds of East China Sea and Yellow Sea. This species attains a length of more than 3 metres.

The age at first maturity for males is 10-16 years and for females, 14-26 years. If 50% of the males are mature for the first time at roughly 16.5 years and females at 20 years, and longevity is 40 years, generation length can be estimated to be 16.5-20 years.

### **Use and Trade:**

This species is harvested in the wild for food at a national and international scale. It is also collected for research and artificial breeding programmes.

### **Threats:**

This species has been historically overfished. In the 1970s, fishing was unlimited, but seasonal (occurring mostly between October and November). Gear types include gill nets (upper reach) and row hooks (middle reach). Due to its life history characteristics, once depleted, stocks of this species take a long time to recover. Fry are also captured by traditional Chinese fishing methods (drift nets in the river and set nets at the river mouth).

Habitat fragmentation, alteration, destruction and changes to hydrological conditions also significantly impact this species. The construction of the Gezhouba dam in 1981 blocked the migration routes of this species, making it impossible for it to reach spawning sites in the upper reaches of the river. Currently, there is just one remaining spawning ground (a 4 km stretch of river), which is situated below the Gezhouba dam.

In 2003, the Three Gorges dam was constructed 40 km upstream of the Gezhouba dam. This has changed the hydrological regime (lowering the water level of the river in autumn and winter) and affected the water temperature.

Additionally, an increase in the amount of shipping traffic in the Yangtze River could be detrimental to this species.

New evidence shows that water pollution is a potential factor causing the decline of this sturgeon species. Synthetic chemicals in water could contribute to the population decline of this species by significantly decreasing both the quality and quantity of eggs and spawning frequency of fish (Hu 2009).

### **Conservation Measures:**

Current conservation measures in the Yangtze River include the strict limitation of harvest, the establishment of protected areas and ongoing restocking programmes.

Commercial fishing has been closed since 1983, and now just small numbers (less than 40 individuals in recent years) are caught for scientific or propagation purposes.

In 1988, this species was listed a Class I State protected animal. In 1996, a Nature Reserve was established, protecting the spawning population. In 2002, a Nature Reserve in the Yangtze River estuary was established to protect juvenile sturgeons gathering there. This species was listed on CITES Appendix II in 1998.

In 1983, the Yangtze River Fisheries Institute artificially spawned this species (Fu et al. 1985). From 1983 to 2007, more than 9 million sturgeon (including larvae) were released into Yangtze River to increase the stock (Xiao *et al.* 1999, Chen 2007).

Currently, adult sturgeons are captured on spawning ground to be used for artificial breeding. Efforts are being made to rear and breed this species in captivity so that captive adults can be used for stocking in the future.

---

## A CYCAD

---

**Class:** CYCADOPSIDA  
**Order:** CYCADALES  
**Family:** ZAMIACEAE  
**Year assessed:** 2009



### **Distribution:**

This cycad species occurs in South Africa in the biodiversity hotspot region known as the Maputaland-Pondoland-Albany hotspot, which is an important centre of plant endemism. It is uncertain how widespread or abundant this species was prior to human settlement, but there are historic records of populations being scattered through the Albany and Bathurst districts of the Eastern Cape Province. This scattered distribution could be because these plants often grow on rocky outcrops, habitats that are naturally widely spaced within the landscape (Kemp 1986, Norstog and Nicholls 1997, Whitelock 2002) or it could be an artifact of habitat transformation, i.e. the cycads have persisted in areas least affected by land use. The altitude at which the plants are found varies between 200 and 600 m asl.

The extent of occurrence for this species is estimated to be 560 km<sup>2</sup>. Because of its widely scattered distribution, the species is estimated to occupy a total area of only 9 km<sup>2</sup>. A continuing decline in the area of occupancy is likely, as there is intense collection pressure on the species and harvesting of individuals from the wild is expected to continue into the future.

### **Countries of Occurrence:**

South Africa (Eastern Cape Province)

### **Population:**

The current wild population is estimated to number between 60 and 100 mature individuals. The actual number is uncertain because the last official count was done more than 10 years ago, when microchips were inserted into all remaining plants. Since then, not all plants have been monitored and, in a recent survey of plants to gather DNA material, there seemed to be less than 60 plants in the wild (da Silva et al. MS). The population is extremely fragmented, as plants are widely scattered, with most individuals separated from each other by >1 km.

This cycad is in a precarious state with no natural seed set, and populations continue to decline. Based on plants in collections and studies of matched photographs, the population is estimated to have declined by 80-85% over the past 100 years. Data prior to this time period are not available.

The sex ratio is ca. four males to one female, so that the effective population size is extremely small. All subpopulations comprise less than 20 plants, which is non-viable for supporting pollinators; there

appears to have been no recruitment for more than 50 years. A further population decline of at least 30% is expected to take place within the next 30 years.

This is a very slow-growing, extremely long-lived species. Females reach maturity at 30 years of age, while males reach maturity at 25 years. Longevity can be 300 years. Based on these figures, the generation length is estimated to be at least 100 years.

**Population trend:** ↓ Decreasing

### **Habitat and Ecology:**

Plants grow on rocky outcrops and hill slopes, usually amongst scrub bush vegetation, but also in open grassland. They can also be found along dry river courses. The distribution area of this cycad occurs in the following vegetation units: Kowie Thicket, Suurberg Quartzite Fynbos and Suurberg Shale Fynbos.

The soils in this region are mainly Glenrosa and Mispah forms. Other soils may occur. Lime soils are rare or absent. The underlying geology of this area is quartzitic sandstone, shale and micaceous siltstone.

The annual rainfall varies between 600-1,250mm and is fairly evenly distributed during the year, though a summer peak in rainfall usually occurs. Frost does not normally occur. The summers may be hot and fairly dry.

### **Use and Trade:**

This species is highly prized by cycad collectors, and is frequently taken illegally from the wild. Captive bred individuals that are replanted into the wild are often illegally collected as well, and are sometimes illegally sold as individuals and/or seeds.

### **Threats:**

This cycad now occurs in areas where the predominant land uses are cultivation (pineapples and chicory) as well as stock farming. The impact of land use on this species is difficult to assess, but the early reports of Pearson (unpublished letters) and Chamberlain (1919) imply that at least some habitat was lost as a result of agricultural activity. Repeat photography, using photographs first taken between 1906 and 1945, indicated that all the plants occurring at seven different sites had disappeared by 1996 (Donaldson and Bösenberg 1999). However, the disappearances at these sites cannot be attributed directly to land use as, in most cases, the areas in which the plants occurred were neither ploughed nor cleared. Nonetheless, in other sites plants have likely disappeared due to habitat clearing.

Trade in cycads is currently the greatest threat and probably explains the decline observed in the repeat photography study (this species became popular among collectors in the late 1800s/early 1900s). The removal of relatively large numbers of plants by collectors has been recorded with some plants recovered by law enforcement and conservation agencies. The demand for wild collected plants remains high because this species is regarded as scarce and it is one of the most highly valued species in the cycad trade. Based on collection patterns and the species' distribution, experts consider there to be 2 locations.

Population modelling of other species in the same genus showed that species such as this one are extremely sensitive to the removal of adult plants, as population persistence over long periods relies on adult survival and not seedling recruitment (Raimondo and Donaldson 2003). As a result, the species is very vulnerable to trade in mature plants.

It also seems likely that the natural pollinators are extinct. No natural seed set has been recorded in recent years and the current cohort of adult plants indicates that the last recruitment event was more than 50 years ago.

**Conservation Measures:**

This species is listed on Appendix I of the CITES Appendices and is listed in the national Threatened or Protected Species regulations, which prohibit trade in wild plants. None of the plants occur naturally within any reserves but plants have been introduced to two small nature reserves within the original distribution range. At one site, mature plants were replanted in the reserve after they were illegally removed from the wild. In the second case, a trial planting of seedlings was also undertaken to establish a new population.

A Population and Habitat Viability Assessment was developed in July 2006 and this was followed by the development of a species management plan in 2009. The plan will be implemented in 2010.

*Ex situ* conservation collections have also been established at several botanic gardens. One of the largest, is at Kirstenbosch National Botanical Garden, which has 19 mature plants. Genetic studies showed that the Kirstenbosch collection has similar levels of genetic diversity to wild stocks and represents all wild genotype groups.