

## Invasive grasses in the Galapagos Islands

### Abstract

In the Galápagos Island, several grass species are very severely invasive now while others may become invasive in future. Laegaard in 2003 reported a total of 94 species of grasses from Galápagos. *Pennisetum purpureum* y *Panicum maximum* are probably now the most invasives grass species in inhabited islands as Santa Cruz, Isabela, and San Cristóbal. However there are also several other species that in our opinion are threatening to become seriously invasive. Key words: *Pennisetum purpureum*, pasto elefante, *Panicum maximum*, pasto guinea, *Cynodon nlemfuensis*.

### Resumen

En las islas Galápagos, actualmente encontramos algunas gramíneas potencialmente invasivas, algunas se mantienen como las más severas, mientras que otras podrían volverse una amenaza en el futuro. Laegaard en el 2003, reportó un total de 94 especies de gramíneas en las islas. *Pennisetum purpureum* y *Panicum maximum* son probablemente la peor amenaza para las islas pobladas como Santa Cruz, Isabela y San Cristóbal. Sin embargo existe otro grupo de especies que para nuestra opinión amenazan con invadir seriamente los ecosistemas isleños. Palabras clave: *Pennisetum purpureum*, pasto elefante, *Panicum maximum*, pasto guinea, *Cynodon nlemfuensis*.

### Introduction

Introduced plants are usually not considered very interesting for botanists. However, the present study is a part of an ongoing project of the Charles Darwin Research Station on introduced and invasive plant species in the Galápagos Islands. Invasive plants are a very serious threat to vegetation types in many parts of the world, both in natural and in secondary vegetation. They migrate into local vegetation and by competition can threaten or even eradicate local species. Both on local and world scale they are often just as destructive to native plant life and ecosystems as pollution from human activities.

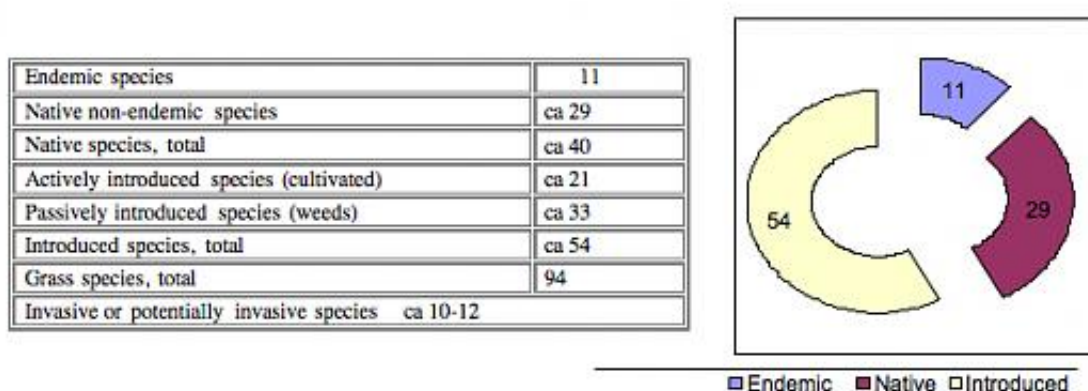
In Galápagos several grass species are more or less invasive now - some very severely invasive - while others may become invasive in future. Therefore it is important, both scientifically and for the management, to know which species are there, when did they arrive and especially to know if they may be potentially invasive.

Textbooks and review articles, e.g. Williamson 1999, on invasive plants generally say that it is impossible to predict which species will become invasive in a certain area. Generally, this is correct. But from observations in the Galápagos and a knowledge of the behavior of some of the species in the mainland of Ecuador and elsewhere some of the species that are present now will be discussed with their characteristics and their potentiality as invaders.

### Results and Discussion

A total of 94 species of grasses are at present reported from Galápagos, Laegaard 2003. We will never know for sure how many there were before the first humans visited the islands in 1535 and others settled to live there in 1832. According to Wiggins & Porter 1971, eleven species are endemic and are of course native and about 29 others can with some confidence be considered native. About 54 species have been introduced (Figure 1).

Some of these have been actively introduced for some purpose, for example, corn, sugar cane, and lemon grass for human consumption, several species of for cattle grazing and a few for ornamental or other purposes, e.g., various species for lawns and some bamboos. It is considered that about 21 species have been actively introduced. The rest, about 33 species, are considered to have been accidentally introduced as weeds. Most of these are annuals.



**Figure 1. Number of grass species in the Galapagos islands**  
**Figura 1. Numero de especies gramineas en las Islas Galapagos.**

The majority of all grasses are light demanding and with sufficient light many of them are opportunistic, that is, when there is an open area they are often able to invade it before or at least together with other plants. On the other hand, some of these species are weak competitors, which means that over some time they will lose the struggle for light, water, and nutrients to other plants. But some are both opportunistic and strong competitors and among these we find the invasive species.

*Pennisetum purpureum*, pasto elefante, is probably now the most invasive grass species in and around cultivated areas of Santa Cruz, Isabela, and San Cristóbal. It is most common at mid-elevation and in open areas, especially in previously cultivated fields where it is "fighting" with other very severely invasive plants as *Rubus niveus* and *Psidium guayava*, Soria et al. (2002). It is not common in the dry, coastal lowland. It is high and dense, 2-5 m high, growing in loose tussocks with short rhizomes but also effectively reproducing by seeds.

*Panicum maximum*, pasto guinea or chilca, is also clearly an escape from cultivation; it is also invasive and often occurs with *Pennisetum purpureum* along roads etc. at mid-elevation. It is more resistant to drought than *Pennisetum purpureum* and is often rather common in the dry lowland. It is also forming loose tussocks and has effective seed reproduction.

These two species of grasses are the only ones that are now widely spread as invasives. However they are also the species that have been for the longest time in the Galápagos, both are included in the Flora of the Galápagos Islands from 1971, which only few of the following species are. During fieldwork in 2003 it was observed that while both are widespread as invasive in Santa Cruz and San Cristóbal they are more or less confined to fenced fields in Isabela - maybe because they were introduced later to that island.

Several other species of grasses are in our opinion threatening to become invasive. This is based on observations in Galápagos and often also in the mainland of Ecuador. They can sometimes be observed as dense stands along roads or in borders of fields. Some are spreading actively by rhizomes or stolons, others by seeds. It is acknowledged, that maybe only few of these will in future become seriously invasive but it is recommended that they are all kept under observation.

*Cynodon nlemfuensis* is of SE African origin, it is low growing, rarely more than 50 cm high, often without flowering and confined to propagation by its very long stolons. It is growing very dense and is a very strong competitor. In the mainland of Ecuador it is recently introduced but now well established as invasive from sea level to about 2000 m in areas with dry climate. In Galápagos it has only been observed in a couple of places but it is feared that it may in future become the most severely invasive of all grass species.

*Digitaria eriantha*, previously known as *D. decumbens* or *D. pentzii*, is also from SE Africa. The species has only very recently been recorded from the mainland of Ecuador (A.M. Vega, pers. comm.) but it has for several years been cultivated for grazing at mid-altitudes of S Cruz. It is widely naturalized along roads and trails here. It is low and rather soft and does not seem very strong as a competitor but it should

be kept under observation.

*Urochloa mutica* is widespread in Africa and has been spread by humans to all tropical regions, also the Americas, at an early stage. It is somewhat invasive in mainland Ecuador but only in areas with swamps or at least with moist ground. It has been observed at several places in Galápagos but as wet ecosystems are rare in the islands there is not much risk that it will become a serious invader.

*Melinis minutiflora*, pasto miel, is from E Africa. It is very widespread and invasive in dry parts of mainland Ecuador. It is considered one of the worst invasive plants in Hawaii. It has only been observed in few places in Galápagos. Here it forms very dense stands that more or less exclude other plants but it seems that so far it is not widely spreading. However it should be kept under strict observation and maybe eradicated if possible.

*Urochloa (Brachiaria) decumbens* and *U. brizantha* belong to a group of several rather similar species that have been introduced from tropical Africa to be cultivated for cattle grazing. Four species are cultivated and naturalized in the mainland of Ecuador but only two have been introduced to Galápagos, probably only a few years ago. So far none of them have spread much outside the sites where they are cultivated. But they should be kept under observation as experience in the mainland of Ecuador has shown that they can become seriously invasive.

*Setaria sphacelata* is also of African origin. Only in a couple of places in Galápagos it has been observed as cultivated for grazing. In the mainland of Ecuador it can become invasive but mainly at higher altitudes and in rather moist climate.

*Axonopus micay* is a native to the mountain regions of mainland Ecuador. It has recently been introduced to S Cruz where it has been sown in fenced fields for cattle grazing. We still do not know if it can become seriously invasive but there are indications that it is spreading by seeds to surrounding areas.

*Zoysia matrella* var. *pacifica* (also known as *Z. tenuifolia*) is a very low and dense grass that has been introduced for cultivation as lawns and has become rather common in several towns. It is known from the mainland of Ecuador that it can spread outside cultivated lawns and it may become invasive because of the very dense growth that more or less excludes other plants.

*Chloris inflata* is the only accidentally introduced annual, weedy grass that here is considered somewhat invasive. It is very common and forming dense stands in the towns of Puerto Ayora and Puerto Moreno and along some roads. It is very resistant to dry climate. In the very dry season of 2003 even many native grasses were not able to produce seeds but *Chloris inflata* was flowering profusely and producing numerous well developed seeds.

*Leersia hexandra* is a widespread species in all tropical regions. There are no previous records in the Galápagos but recently a large stand was found in Santa Cruz. It is not quite clear if it is native or accidentally introduced but it is here supposed that it is native. At least some of the stand has clear characteristics of invasiveness with very dense growth that more or less exclude other plants.

*Paspalum vaginatum* is native in the mainland of Ecuador and most probably also in Galápagos. In Isabela the species is common along coastal lagoons near Villamil but it has also invaded the town and is now dominant in many open areas as along roads, in waste places, etc. No explanation can be offered for this but it is clearly of interest for further studies.

## Conclusions

It has been found that most of the invasive and potentially invasive grass species in Galápagos have been introduced for grazing of cattle and other domestic animals. It seems that the properties that make them tolerant to permanent grazing and some trampling are the same properties that make them strong competitors. Many have their origin in Africa. This is probably biased because most of all grasses that are cultivated for grazing in all tropical regions are of African origin. The reason for this may be that grasses of African savannas have through a long evolutionary history been subject to heavy grazing from numerous large herbivores.

## References

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