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*Full Length Research Paper*

# A survey of farm-level practices on endangered *Leucadendron* species and the future influence of ecotourism development on the Agulhas plain

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**Large parts of the Agulhas Plain (AP) contribute to the commercial export cut flower industry of South Africa while many threatened and endemic species are destroyed by local authorities and cut flower harvesters. The Western Cape is the largest area where threatened Red Data species are not at all known and the illegal harvesting of these species continues. *Leucadendron platyspermum* was the most harvested of the surveyed species with the biggest harvests mainly reported from orchard plantations. Agriculture was perceived to be the lowest threat to the environment, compared to alien invasive species which was reported to be the biggest threat. Fire was seen as the most important factor to enhance the re-growth of species in nature. Permit possession of farmers were high, however the misuse of permits and the lack of authorities visiting farms was evident. The ecotourism potential of the Agulhas Plain remains undeveloped, although respondents reacted positively to conservation and the promotion of ecotourism on the Agulhas Plain. Training in the conservation of Red Data species remains low as a lack of information on Red Data species exists. A big concern is that very few Red Data species are propagated to increase the awareness of these species.**

**Key words:** Land management, *Leucadendron laxum,* training, permits, propagation.

## INTRODUCTION

South Africa has become a major tourist destination, with ninety percent of tourists visiting the country for its beautiful scenery and large diversity of plant species (Cowling, 1993). Most of these plant species form part of the Cape Floral Kingdom (CFK) in the Western Cape which is documented as a world heritage site under exceptional habitat threat (Cowling and Richardson, 1995). A total of 51% of tourists visit the Western Cape Province and these trends are expected to grow (Agulhas Biodiversity Initiative, 2008). One region, the Agulhas Plain (AP) which harbours species such as *Leucadendron stelligerum,* forms a large part of the CFK and has been recognised to have one of the most distinctive, diverse and the highest density of endemic flora in the world (Coetzee and Littlejohn, 1994). The potential of future ecotourism in this area remains undeveloped (Cowling and Richardson, 1995) and many parts of the land are threatened with the loss of endemic species. One of the reasons is the continual over-harvesting of cut flowers from threatened plant populations. Over exploitation of these species, such as *L. laxum* has caused them to be included in the Red Data list of endangered species (Hilton-Taylor, 1996; Mustard et al., 1997; Robyn and Littlejohn, 2002).

Species harvested on the AP have an estimated net income of 1.15 million American dollars per year, with cut flower orchard yields from approximately 120 farms estimated at 200, 000 dollars per year (Agulhas Biodiversity Initiative, 2008). This fast developing flower export market (Cowling and Richardson, 1995) has necessitated that many *Leucadendrons* be cultivated in field-grown orchards (Robyn and Littlejohn, 2002). Unfortunately, many species are also continually harvested from the wild. This study was initiated with the concern that these threatened Red Data species on the AP are fast disappearing and that the ecotourism potential would be seriously damaged for future generations. Threats which were identified include the expansion of agriculture on the

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AP, alien invasive species, fire management, unsustainable harvesting of flowers and coastal development through urbanization (Agulhas Biodiversity Initiative, 2008).

This study aimed to collect data from farmers, cut flower growers and exporters to identify solutions for the conservation of the natural habitat and the growing need to develop ecotourism opportunities on the AP. The information from this study could help to reduce the destruction of endemic and threatened species and could encourage sustainable ecotourism development on the AP.

## METHODOLOGY

### Description of the study area

The survey study was conducted within the wild cut flower growing areas of the Eastern, Southern and Western Cape, South Africa to obtain a broader understanding of the core issues which affect the destruction of the natural habitat and the influence it might have on future ecotourism development of the CFK.

### Selection of focus group

The South African Protea Producers and Exporters Association (SAPPEX) was selected as a research focus group. Permission was obtained from SAPPEX to ensure the protection of the rights of the survey respondents. Participants were purposely selected to fit the criteria of desirable participants, as many members of SAPPEX (landowners, farmers, producers and exporters) are actively involved in the wild cut flower industry and their contributions would be invaluable to the survey.

### Secondary data collection

A literature study was conducted to ascertain and comprehend the scope and depth of the investigation for purpose of this study. Consequently the policies of the Department of Nature Conservation were also reviewed. The focus was on developing ideas through the gathering of information from smaller samples. The application of exploratory research is considered relevant as little documentation exits regarding the activities of producers on cut flower farms. The secondary data collection involved investigation into the current methods and practices of individuals involved in production and agriculture.

### Survey questionnaire

A self-administered survey questionnaire was aimed at collecting data, assessing the threats, determining the needs of cut flower producers and ascertaining knowledge, skills, values and attitudes regarding activities and responsibilities in the conservation and protection of four selected threatened Red Data *Leucadendron* species. The quantitative research approach was adopted. Information was collected using standard open-end questions (Struwig and Stead, 2001; Hancock, 2002) comprised of closed questions with sets of answers to choose from. The questionnaire used 19 statements that contained various selection criteria which were grouped into 7 dimension factors, each concerned with a different variable. The dimensions included: geographical area, Red Data species, cut flowers, training, land management, legal factors and propagation. The questionnaire was pre-tested with a group of horticultural students. After appropriate revisions of the pre-tested instrument, a large-scale questionnaire survey was compiled. Geographical questions were placed in the beginning of the questionnaire to make the respondent feel at ease. Information was carefully assessed to ensure reliability and validity in using representative samples and structured collection procedures to generate data (Struwig and Stead, 2001). All participants were treated in the same way. The sensitivity of privacy and illegal harvesting of cut flowers was considered, as participants would not be willing to supply information freely. All questionnaires were anonymous and participants were informed that the questionnaire was voluntary and responses would be treated in strict confidence to provide more reliable information. The questionnaire was also translated into Afrikaans, as many Afrikaans speaking respondents would be more willing to participate if the questionnaire was in their home language. One hundred and twenty one questionnaires were posted to participants to allow for fair numbers of participation. It was decided that participants could also request electronic copies and return them by e-mail to ensure faster returns. E-mail questionnaires allowed for 14 days to be returned whereas questionnaires that were posted allowed a return of 30 days.

### Statistical analysis

The responses were coded and analysed using a Statistical Package of Social Sciences (SPSS) 14.0 and most of the data collected was analysed using Code Book analysis with descriptive statistics and proportions (Sprent, 1993).

## RESULTS AND DISCUSSION

Of the 121 questionnaires sent, thirty-four respondents (22.6%) returned the questionnaire within one month. As the background information of the study population was available, the number of respondents (n = 34) was sufficient to represent the growers in the study area to collect the most valuable data. As the number of respondents was lower than expected all members were

**Table 1.** The distribution of respondents according to their geographical location in South Africa (n = 34).

| Province | Name of places | Number of respondents (n = 34) | Percentage respondents (%) |
|---|---|---|---|
| Eastern Cape | Kareedouw | 1 | 3.0 |
| Southern Cape | Barrydale, Knysna, Riversdal | 6 | 18.2 |
| Western Cape | Ceres, Citrusdal, Botrivier, Elim, Elgin, Gansbaai, Hermanus, Kleinmond, Porterville, Napier, Somerset Wes, Stanford, Stellenbosch, Riversondered, Stanford, Worcester | 27 | 78.8 |
| **Total** | | 34 | 100 |

**Table** 2. Distribution of respondents according to harvesting status, occurrence and categories of threat to Red Data species (n = 34).

| Question | Criteria | Yes (%) | No (%) |
|---|---|---|---|
| Do you harvest the following endangered species for cut flower purposes? | *L. elimense* subsp. *elimense* | 2.9 | 97.1 |
| Do you harvest the following endangered species for cut flower purposes? | *L. laxum* | 2.9 | 97.1 |
| Do you harvest the following vulnerable species? | *L. platyspermum* | 17.6 | 82.4 |
| Do you harvest the following vulnerable species? | *L. stelligerum* | 2.9 | 97.1 |
| Do you harvest any other Red Data species? | Other Red Data species | 64.7 | 35.3 |
| Are any of these *Leucadendron* populations threatened by the following practices? | Farming practices | 2.9 | 97.1 |
| Would you rate the following to be a threat to Red Data species? | Alien plants | 20.6 | 79.4 |
| Would you rate the following as a threat? | Fire | 17.6 | 82.4 |
| Would you consider the following to be a threat to Red Data species? | Road works | 2.9 | 97.1 |
| Would you agree that these *Leucadendron* populations are not threatened? | No threat | 61.8 | 38.2 |

taken as a sample representing the industry. The number of survey respondents in each area is summarized in Table 1. Many cut flower farms are owner managed; therefore more personalized interest and contact responses were received.

## Geographical study area

A total of 76.5% of the respondents participated from the Western Cape, 17.6% from the Southern Cape and 2.9% from the Eastern Cape (Table 1). Participants were all members of SAPPEX and were either involved in growing or exporting cut flowers. As some respondents reflected small numbers of growers from individual areas (reflective of the actual populations), especially the Eastern Cape, an area-to-area analysis was not feasible. More fittingly, data were aggregated to represent one large geographic region.

## Threatened Red Data species

The study reported that *L. platyspermum* is the most harvested (17.6%) *Leucadendron* compared with the other three threatened *Leucadendron* species. As was expected, respondents reported that *L. platyspermum* is mainly harvested from planted fields (Table 2). Some respondents indicated that this species is not threatened as it occurs over many hectares of the Southern Cape. *L. platyspermum* is highly sought after for its female cones and the possibility exists for respondents to indicate that this species is not over harvested or threatened. It is interesting to see that some respondents indicated that they did not know the Red Data status of *L. platyspermum.* The Protea Atlas (2008) classifies *L. laxum* and *L. stelligerum* as endangered species and *L. elimense* and *L. platyspermum* as vulnerable species. These results are alarming and indicate that many respondents are uninformed in conservation of Red Data

**Table 3.** Distribution of respondents according to their cut flower harvesting status (n = 34).

| Question | Criteria | Yes (%) | No (%) |
|---|---|---|---|
| Do you harvest endangered Leucadendron cut flowers from the following areas? | Natural stands | 17.6 | 82.4 |
| Do you harvest these cut flowers from the following areas? | Broadcasted seeds | 8.8 | 91.2 |
| Do you harvest endangered cut flowers from commercial orchards? | Planted orchards | 38.2 | 61.8 |
| Do you harvest these species from any other areas? | Other areas | 5.9 | 94.1 |
| What quantity of these species do you harvest? | Less than 20 kg | 0 | 100 |
| Do you harvest approximately the following quantity? | 20 – 199 kg | 2.9 | 97.1 |
| Do you harvest more than the following quantity? | More than 200 kg | 47.1 | 52.9 |
| When harvesting from natural areas do you practice the following harvesting technique? | Cut all flowers that are ready | 5.9 | 94.1 |
| Do you practice the following technique during harvesting? | Cut 50% of all flowers | 23.5 | 76.5 |
| Do you prefer to practice the following harvesting technique? | Cut 2/3 of all flowers | 14.7 | 85.3 |
| At harvesting do you practice the following technique? | Prune while you cut | 17.6 | 82.4 |
| Would you suggest any other than the above harvesting measures? | Other | 8.8 | 91.2 |
| Which market do you supply? | Local | 32.4 | 67.6 |
| Do you supply the export market? | Export | 61.8 | 38.2 |
| Do you supply different markets to the above? | Other | 2.9 | 97.1 |
| Do you harvest any seed from Red Data species? | No harvesting | 67.6 | 32.4 |
| Do you harvest any seed for the following use? | Broadcast seed | 11.8 | 88.2 |
| Do you harvest any seed for the following use? | Collect and sell | 2.9 | 97.1 |
| Do you harvest any seed for the following use? | Collect and grow | 8.8 | 91.2 |

species. Only 2.9% of respondents reported harvesting *L. elimense* subsp. *Elimense, L. laxum and L. stelligerum* (Table 2). Other *Leucadendron* species that were picked regularly (64.7%) *were L. acuminate, L. catharinae, L. galpinii, L. glabrum, L. horifolia, L. marii, L. rubrum, L. salicifolium, L. strictum, L. tinctum* and *L. xanthoconus* and over-harvesting of *Berzelia alopercuroides, Brunia laevis, Brunia stokoeii, Erica fastigiata, Erica leucanthera, Erica perspicua, L. elimense, L. laxum* and *Mimetes hirtus* was reported. It was expected to see that over-harvesting of Red Data species continues and that the habitat remains under threat.

Response on threatened populations varied according to category (Table 2). Respondents indicated that alien invasive plant species are the biggest threat to *Leucadendron* populations, although the 20.6% response seems very low (Table 2). These results are in contrast with reports that the spread of alien invasive species has been recorded as the second biggest threat to bio-diversity on the AP, where 14.7% of the natural habitat is lost and 40% is infested (Agulhas Biodiversity Initiative, 2008). According to Turpie (2004) the overall CFK area is the most heavily invaded with alien species. It was interesting to see that this result was followed by fire (17.6%) from respondents who should have reasonable knowledge that species will recover after fire. The least perceived threats to Red Data populations were farming practices (2.9%) and road works (2.9%), (Table 2). These results are in contradiction with the fact that agriculture has been identified as the largest cause of habitat destruction through cereals, dairy pastures, vineyards and cultivated flowers (Lombard et al., 1997). It appears that the respondents do not realize the impact of agriculture on the natural environment.

## Cut flower practices

In Table 3 a total of 38.2% of respondents harvest the Red Data Leucadendron species from cultivated orchards. The increase in orchard planting is a result of the Agricultural Research Council (ARC) fynbos unit's priority for farmers to cultivate more than 70 commercially viable Proteaceae species for the export market (Dodd and Bell, 1993; Coetzee and Littlejohn, 1994).

17.6% of the respondents harvest Leucadendron species from natural stands (Table 3). Some respondents (8.8%) also reported harvesting these *Leucadendrons* species from broadcasted seed fields (Table 3). Seed broadcasted into nature will germinate once conditions become favourable. Sustainable flower harvesting levels of some species are unknown and damage to the habitat continues due to over harvesting, poor harvesting techniques and removal of flower heads, the seed carriers of future generations (Agulhas Biodiversity Initiative, 2008).

**Table** 4. Distribution of respondents according to their training status (n = 34).

| Question | Criteria | Yes (%) | No (%) |
|---|---|---|---|
| Do you have the following training in cut flower harvesting? | Formal education | 17.6 | 82.4 |
| Have you received any training from the following? | Short courses | 44.1 | 55.9 |
| Is your training mainly the following? | Self trained | 47 | 53 |
| Do you have any training different to the above? | Other | 17.6 | 82.4 |
| Has your staff been trained in the following? | Invasive species identification | 67.6 | 32.4 |
| Has your staff been trained in the identification and conservation of the following? | Rare species | 14.7 | 85.3 |
| Does your staff receive training in the following? | Potential cut flower species | 35.3 | 64.7 |
| Does your staff have training in none of the above? | None of these | 14.7 | 85.3 |

In the question about quantity of *Leucadendrons* harvested (Table 3), 47.1% of the respondents reported harvesting more than 200 kg per year. Only 2.9% reported to harvest 20 - 199 kg (Table 3). Establishing inventories on volumes harvested by farmers is important to keep record of quantities harvested during each year. At the same time harvester competence can be calculated which in turn will aid in general conservation cultivation (Robyn and Littlejohn, 2002). Robyn and Littlejohn (2002) also reported that the biggest factor in the loss of biodiversity and habitat destruction is the continued over-harvesting of endemic species.

The results from Table 3 show that a total of 17.6% of the respondents stated that they prune while they harvest flowers from natural stands and 23.5% of the respondents reported that they harvested fifty percent of the flowers. 14.7% Claimed to harvest two thirds of the flowers per a plant and 5.9% harvest all the flowers on a plant (Table 3). It is alarming to see that some respondents are not practicing sustainable harvesting of cut flowers. Other respondents practised field harvesting, using contractors and plantation harvesting.

As was expected, most Red Data *Leucadendrons* are exported (61.8%), although 32.4% of the respondents reported their flowers are destined for the local markets (Table 3). Some respondents reported that the source of harvested material such as *L. platyspermum* determines its marketable quality, as field harvesting results in lower quality compared with flowers taken from orchards. A general response was provided that illegal harvesting and selling should be arrested, while conservation authorities should do more in communicating and visiting landowners, cut flower sellers and exporters.

A total of 67.6% of the respondents reported no seed harvesting from the four Leucadendron species (Table 3). It is interesting to see that 11.8% of the respondents reported they harvest seed from these *Leucadendrons* to use in broadcasted seed plantings (Table 3). According to Coetzee and Littlejohn (1994) approximately 1000 ha of *Leucadendrons* are cultivated from seed dispersal plants in the natural habitat. Only 2.9% of the respondents collect seed for selling purposes and only 8.8% collect seed to grow new plants (Table 3). The collection and selling of seed and growing new plants from seed is an essential part of increasing plant production in other areas. This study supports the Agulhas Biodiversity Initiative (ABI) (2008) suggestion that the cut flower industry should develop as a conservation industry to reduce pressure on endangered species. Sustainable flower harvesting should promote the future development of ecotourism on cut flower farms and alleviate the threat to the biodiversity and increasing land usage on the AP (Cole et al., 2000).

## Training in cut flower growing and propagation

It is interesting to see that only 17.6% of the respondents had formal training, 44.1% have completed short courses in cut flower growing and 47% of the respondents were self-trained (Table 4). Cut flower short course training used to be one of the principle methods of the ARC in promoting indigenous cut flower enterprises. Employee training is important in the protection of the red data species. A total of 67.6% of employees were trained in alien invasive species and 35.3% were trained in potential cut flower species. It is alarming to see that only 14.7% of the staff received training on endangered species and 14.7% of the respondents reported none of these training methods and make use of contract labour for harvesting (Table 4). These results indicate a greater need for more specialised training in the identification and protection of Red Data species. Training is important to protect sensitive habitats in locating them and managing them appropriately. Education on farms should be enhanced with training programs and information pamphlets on illegal harvesting and protection of Red Data species.

## Land management practices

On the question relating to grazing in natural habitats, a total of 70.6% of the respondents stated that they do not allow livestock to graze in the natural habitat. Only 5.9% allowed grazing on a rotational basis, while 2.9% allowed

**Table 5.** Distribution of respondents according to land management practices (n = 34).

| Question | Criteria | Yes (%) | No (%) |
|---|---|---|---|
| Do you allow your livestock to graze in natural areas in the following way? | Controlled | 2.9 | 97.1 |
| Do you practice grazing of livestock in natural areas in the following way? | Uncontrolled | 0 | 100 |
| Does your livestock graze in the natural habitat in the following way? | On a rotational basis | 5.9 | 94.1 |
| Do you agree that livestock should not graze in the natural habitat? | Yes | 29.4 | 70.6 |
| Do you practice grazing of livestock in these areas in any other way? | Other | 5.9 | 94.1 |
| Do you think the following factor is responsible for the reproductive phases of Proteaceae species? | Fire | 61.8 | 38.2 |
| Does the following factor play a role in the reproductive phases of Proteaceae species? | Rodents | 35.3 | 64.7 |
| Does the following factor play a role in the reproductive phases of Proteaceae species? | Insects | 38.2 | 61.8 |
| Does the following factor play a role in the reproductive phases of Proteaceae species? | Birds | 47.1 | 52.9 |
| If not satisfied with the above do you know of any other reproductive strategies? | Other | 5.9 | 94.1 |
| Are you aware that some species may require fire to stimulate germination of seed? | No | 29.4 | 70.6 |
| Would you say that you do not practice controlled fires and that you agree with the following? | Allow nature to continue | 23.5 | 76.5 |
| Do you practice controlled fires to stimulate new reproductive growth and do you agree that fields should burn on the following intervals? | Every 3-4 years | 5.9 | 94.1 |
| Do you practice controlled fires to stimulate new reproductive growth and do you agree that fields should burn on the following intervals? | Every 6-7 years | 6 | 94 |
| Do you practice controlled fires to stimulate new reproductive growth and do you agree that fields should burn on the following intervals? | Longer than 7 years | 14.7 | 85.3 |
| If not any of the above do you recommend any other method? | Other | 20.6 | 79.4 |

controlled grazing in the natural habitat (Table 5). Cowling (1993) reported that most of the marginal agricultural land on the AP is unsustainable for livestock and that farm land would generate greater wealth if the land was developed for ecotourism activities. Other studies showed that close to half of the cattle farms on the AP rely on natural habitat grazing, where cattle often graze along wetlands (Agulhas Biodiversity Initiative, 2008). These areas where the destruction of endangered species continues are mainly the natural habitat for *L. laxum*. Landowners should create a balance in using plants, animals and natural resources to generating an income on their land (De Villiers, 2002). This revenue could be used in several ways including in the planning and developing the ecotourism activities on the AP.

Fire was reported as the highest (61.8%) factor in enhancing the re-growth of plants (Table 5). A total of 23.5% of the respondents said that nature should be allowed to continue its own fire regeneration. Some respondents (5.9%) reported that land should burn every 3 - 4 years, 6% reported land should burn every 6 - 7 years, and 14.7% reported fire needed to burn the habitat at intervals longer than 7 years. From our study and reports from other researchers, fires are important in the maintenance of the biodiversity of the CFK (Table 5), (Kruger, 1983; Cowling, 1987; Bond and Van Wilgen, 1996). It has been known for many years that planned and unplanned fires in the CFK assist in the germination of various indigenous plant species (Kruger, 1983; Cowling, 1987; Bond and Van Wilgen, 1996). This is due to both the heat of the fires and the chemicals that are present in the smoke of burning plant material (Brown and Duncan, 2006). Unplanned burning can have a large negative impact on post-fire regeneration and therefore

**Table** 6. Distribution of respondents according to legal factors regarding trading of indigenous plant species (n = 34).

| Question | Criteria | Yes (%) | No (%) |
|---|---|---|---|
| Are you satisfied with the way conservation bodies issue harvesting permits? | Farm visits from conservation authorities | 38 | 62 |
| Have you been issued with a permit successfully? | Permits have been issued successfully | 70.6 | 29.4 |
| Are you aware that you need a permit? | Permit possession / awareness | 2.9 | 97.1 |
| Do you know the application procedure for permits? | Permit application procedure | 5.9 | 94.1 |
| Do you have the following permit? | Permit to sell protected flora | 76.5 | 23.5 |
| Do you have the following permit? | Permit to grow protected flora | 58.8 | 41.2 |
| Have you been issued with the following permit? | Permit to cut with permission | 11.8 | 88.2 |

**Table 7.** Distribution of respondents according to propagation practices of Red Data species (n = 34).

| Question | Criteria | Yes (%) | No (%) |
|---|---|---|---|
| Do you propagate any Red Data species? | Propagation | 41.2 | 58.8 |
| Do you propagate any Red Data species from the following? | Seed | 20.6 | 79.4 |
| Do you propagate any Red Data species from the following? | Cuttings | 14.7 | 85.3 |
| Do you propagate any Red Data species from the following? | Layering | 0 | 100 |
| If not one of the above methods, do you use any other methods? | Other | 2.9 | 97.1 |
| Are these propagated plants used for the following? | Reintroduction into cleared areas | 11.8 | 88.2 |
| Are your propagated plants used for the following? | Selling | 0 | 100 |
| Are these propagated plants used for the following? | Planted into cut flower orchards | 20.6 | 79.4 |
| Do you use propagated plants for the following purpose? | As mother stock | 11.8 | 88.2 |

the further extinction of species (Cowling and Richardson, 1995; Coetzee and Littlejohn, 1994).

Birds were rated by 47.1% of the respondents as being essential in the reproductive phase of *Leucadendron* species. It is well known fact that birds are an important part of the CFK reproductive system (Paterson-Jones, 2000). According to Ryan and Bloomer (1999) more than 270 bird species have been recorded on the Agulhas Plain. A total of 38.3% of the respondents reported insects and 35.3% reported rodents to be important in the reproductive phases of *Leucadendron* (Table 5).

## Legal factors related to indigenous cut flower species

In Table 6, the knowledge regarding the issuing of cut flower harvesting permits was high. A total of 70.6% of the respondents stated that they were issued with permits successfully (Table 6). Only a few respondents (2.9%) had little knowledge of which permits are required for cut flower harvesting and 5.9% did not know the application procedure for permits. It is apparent that respondents were well informed about permit granting. Earlier documentation by Neiteler (2004) reported that conservation authorities were slow with the granting of permits. This study showed that farm visits by conservation authorities to those who have been granted permits was only 38% (Table 6). Our study is in agreement with the ABI, (2008) findings which reported that a lack of capacity exist in the Western Cape Nature Conservation Board (WCNCB) to: a) promote sustainable flower harvesting b) distribute endangered species list and c) to become more vigilant in farm visits. The general lack of information, support from authorities and feedback from cut flower associations were general concerns received by respondents regarding the availability of published information on Red Data species. Permission to use virgin land for any other activity besides production requires a site inspection, permit and possibly an impact study before any activity can commence (Littlejohn, 2002).

It was clear that permit possession was high, with 76.5% respondents having permits to sell protected flora, 58.8% to grow protected flora and 11.8% to cut flora with permission from landowners (Table 6). A general concern was raised by some respondents that permits get abused and illegal harvesting of Red Data species is not covered by the permits and reported incidents are not followed up with prosecutions. Vehicles should carry permits and buyers should ensure that suppliers are in possession of permits (Sappex News, 2002; Littlejohn, 2002). Landowners should be more concerned in sustainable cut flower harvesting to protect and conserve the natural heritage of the CFK.

## Propagation techniques

In this question respondents were asked to report how they propagate threatened Red Data species. Respondents reported that propagation of Red Data species was mainly done from seed (20.6%) and cuttings (14.7%), although 41.2% reported that they did not propagate any of these species (Table 7). Some respondents (2.9%) indicated other, but did not explain their methods. These results show either a lack of interest or knowledge of propagation of Red Data species. The need for developing and promoting propagation techniques of plants is important to expand plant availability of threatened species as well as cut flower stock material. Seed propagation is necessary when plants are reintroduced in the natural habitat. However, if seed from other areas are introduced into an existing area, new genes can change the biodiversity of that habitat (Littlejohn, 2002). Under such circumstances, vegetative propagation is necessary to retain the characteristics of species, especially those required for cut flower purposes (Hartmann et al., 2006).

Plants that are propagated by farmers are mainly used for new orchard plantings (20.6%), reintroduction in cleared areas (11.8%) and mother stock (11.8%). No plants are propagated to be sold (Table 7). Farmers should play a major role in growing endangered plant species and re-introduce cultivated plants into their natural habitat. The results of propagating species remain low and very little propagation is done to reintroduce threatened plant species into the natural habitants. From this background, there is a great need to develop new scientific methods for the vegetative propagation by identifying cheaper and sustainable techniques that could be used by flower growers with little financial resources.

## Conclusion

The Agulhas Plain has been perceived as one of the most scenic destinations that can offer a variety of opportunity for unique plant species viewing in the natural habitats. Unfortunately, threatened Red Data species and their habitat are continuing to be destroyed as landowners, local communities and conservations authorities are not vigilant in identifying and conserving these sensitive and vulnerable habitats. It has been postulated that the main reasons for decline in the numbers of Red Data species of the CFK are the expansion of agriculture, lack of propagation skills and the spread of invasive plant species in the natural habitants. Another major constraint was the lack of information on the identification of Red Data species. Unless these problems are addressed, the environmental destruction of the natural habitat and the exploitation of Red Data species will continue and the potential to improve the ecotourism industry of this area will remain undeveloped. There is no question whether foreign and national tourists will visit the Agulhas Plain if the natural habitat of threatened Red Data plant species can be preserved and the current poor infrastructure for ecotourism activities can be developed, as the current economic climate makes travelling to South Africa an affordable destination. The need for scientific development of vegetative propagation exists to promote and save Red Data species such as *L. elimense* subsp. *Elimense, L. laxum,L. platyspermum and L. stelligerum*.

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Birds were rated by 47.1% of the respondents as being essential in the reproductive phase of *Leucadendron* species. It is well known fact that birds are an important part of the CFK reproductive system (Paterson-Jones, 2000). According to Ryan and Bloomer (1999) more than 270 bird species have been recorded on the Agulhas Plain. A total of 38.3% of the respondents reported th Africa's Unique Floral Kingdom. Fernwood Press, Cape Town, pp. 7-31.

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