An innovative South African approach to mentoring novice professionals in Biodiversity Management

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Abstract

The impact of invasive alien species is a global concern. In South Africa there are a limited number of trained and experienced Biodiversity professionals therefore mentoring of young scientists is crucial to address the effective management of the country's rich resources and combatting the impact of invasive alien species. In 2008 the South African National Biodiversity Institute established an Early Detection and Rapid Response Programme to manage invasive plant species. As South Africa still has a legacy of under-development of young scientists from communities disenfranchised under Apartheid, this programme has had to employ many inexperienced staff. An innovative mentoring initiative was embedded into the programme to develop staff capacity and to provide access to established networks of experienced scientists in invasion biology and environmental sciences to transform and diversify the demographics in these fields. This article discusses this programme, its outcomes, monitoring and evaluation after the first year.

Key words: Mentoring, biodiversity, inexperienced scientists, invasion biology, environmental sciences

Introduction

How would a large country tackle the threat of invasive alien species to its rich biodiversity with few experienced biodiversity professionals? This project focuses on developing capacity in the field of invasive alien plant management, particularly management of early detection activities. This article reports on the mentoring programme, its monitoring and its evaluation after the first year.

Development of a National Early Detection and Rapid Response Programme for invasive species management has not been attempted in South Africa before. This new programme had to develop processes, structures and staff in order to begin this important task. A mentoring initiative was embedded into the programme to build and diversify staff capacity in terms of race and gender. Regional co-ordinators in all nine provinces of South Africa would be responsible for: establishment of regional co-ordination units, development of relationships with stakeholders (known as 'spotters') who would provide information on species of concern, develop a surveillance strategy for species of concern, identify areas at high risk of invasion and monitor these and identify species of concern. Regional co-ordinators in three provinces had direct support from and management responsibility for a plant taxonomist and an assistant to support the taxonomist.

South Africa in 2009 still had a legacy of under development of young scientists from communities that were disenfranchised under Apartheid. As a result the most experienced scientists (with 20 years or more experience) are all white and middle-aged and in most cases men. This was the group from which mentors could be drawn. The relatively inexperienced team came from different backgrounds that reflect South Africa's rich diversity. Mentoring was framed as 'offline help by one person to another in making significant transitions in knowledge, work or thinking' (Clutterbuck, 2001).

The majority of staff members began their employment between December 2008 and March 2009. Most staff members were relatively new to the field of invasive alien species and all needed to deliver on fairly complex targets relatively quickly. In order to develop skills of individuals, give them access to established networks and expose them to experienced scientists in the fields of invasion biology and environmental sciences a mentor programme was devised, developed and implemented.

The purpose of this article is to describe how the South African National Biodiversity Institute (SANBI) used mentoring to develop skills for biodiversity professionals, change the demographics in the profession and began to manage the invasive alien plant issue which is of global concern.

Invasive species a global concern

The impact of invasive alien species is a global concern. The estimated annual impact of plant invaders in a few countries has been calculated as follows: Australia - $AU 4 billion (Sinden, Jones Hester, Odom, Kalish, James and Cacho, 2004.), New Zealand - $NZ 100 million (Williams and Timmins, 2002), Germany - € 167 million total cost of impact of 20 invasive species (Reinhardt, Herle, Bastiansen, and Streit ,2003). The control costs of a single wetland invader, Purple Loosestrife, *Lythrum salicaria*, in the United States of America is calculated at $US 45 million per annum (ATTRA, 1997). Similarly the control costs of Paperbarks, *Melaleuca* species, which invade the Florida Everglades damaging wetland diversity and tourist potential, is estimated at between $US 3 million to 6 million per annum (Pimental, Lach, Zuniga, and Morrison, 2000). The cost of restoration of *Fynbos* in the Cape Province of South Africa after invasion by *Pinus*, *Hakea* and *Acacia* species was estimated at $US160 million in 2000 (Turpie and Heydenrych, 2000). Governments are obliged by the Convention on

Biological Diversity to: "as far as possible and appropriate prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" (Article 8h of the Convention on Biological Diversity (http://www.cbd.int/)). Enlightened Governments are devoting significant resources to prevent the spread and to control the impact of invasive alien species. South Africa's much acclaimed Working for Water (WfW) Programme focuses on management of established invasive alien plants which reduce available water flow through increased transpiration. The budget of this programme for 2010-2011 was SAR 908 million. In this financial year it aims to clear invasive alien plants from 781,700 hectares of land and create 25,300 job opportunities. This is a massive investment in the management of up to 30 established invasive alien plant species.

The Southern African Plant Invader Atlas has records for approximately 660 different plant species that have to a greater or lesser extent become naturalized in South Africa. A number of experts using a range of selection criteria classified eighty four of these 660 invasive alien plant species as emerging invasive alien plants (Nel, Richardson, Rouget, Mgidi, Mdzeke, Le Maitre, Van Wilgen, Schonegevel, Henderson and Neser, 2004). In order to assess these emerging species and begin to take action WfW Programme invested in an Early Detection and Rapid Response (ED&RR) Programme to be managed on their behalf by the South African National Biodiversity Institute (SANBI).

Resources invested in early detection can significantly stretch effectiveness of limited human and financial resources. If small amounts are invested in containment, eradication attempts and early recourse to bio-control then the impact of the emerging species can be greatly reduced and possibly eliminated. Investment in staff capacity-building through mentoring makes the implementation of this approach easier.

In this paper a short review of mentoring in science and for diversity is followed by the section describing the design and development of the ED &RR mentoring programme.

Review of mentoring in sciences and for diversity in South Africa

Mentoring has been acknowledged as a potent development process for young professionals and researchers and the organisations which employ them (Clutterbuck, 2001; Cohen, 1995; Kram, 1988). De Janasz and Sullivan (2004) point out that mentoring develops competence in three areas of the mentee's career: consolidating professional identities (knowing why), knowledge and skills (knowing how) and networking and relationships (knowing who). They suggest that young professionals benefit most from having several mentors to assist in their growth and development especially when they begin their careers. It is desirable for them to establish a network of developmental relationships to achieve success in their careers.

There is international acknowledgement that mentoring is a valuable process in training scientists both at undergraduate and post-graduate levels (Eves, Davis, Brown, & Lamberts, 2007; Katz, 2007). In a general review of mentoring Wells, Ryan, Campa & Smith (2005) demonstrate the value of mentoring

and offer mentoring guidelines for wildlife professionals. Their article is theoretical and does not give any examples of mentoring programmes specifically established in this field.

The American Association for the Advancement of Science, Africa Project, 2001 (http://www.aaas.org/international/africa/conservationbiology) conducted a workshop to share information about the status of conservation biology throughout Africa and to discuss ways to strengthen it, especially through regional and international collaboration. The organisation notes that mentoring is increasingly considered important to recruiting and retaining students in many fields. It also notes that mentoring partnerships must be pursued as a two-way process. They must begin from a premise of complementarity between partners, rather than one of dependency. This is really important in the context of transformation as an African value system.

South African literature which documents mentoring programmes in biological sciences is scarce. Downs (2010) reports on a vacation apprenticeship, as a type of mentoring, for undergraduate students interested in biological control in South Africa. This type of mentoring is used internationally with undergraduate science students. Although South African initiatives and funding at postgraduate level by the National Research Foundation aims to encourage an increase in the number of postgraduate students entering employment in scientific research, especially Black and female students (NRF, 2008), these students are scarce.

In order to develop capacity in priority roles the Capacity Development Programme component of the Cape Action for People and Environment (CAPE) Biodiversity Conservation and Sustainable Development (BCSD) project co-ordinated an in-service training programme. In order to facilitate this, a mentor training programme was offered on three different occasions. Fourteen different organizations participated in this training and 57 mentors were trained (CAPE, 2010). It is not clear how many individuals these trained mentors supported however during the six year project 179 people were mentored and trained through these capacity building initiatives.

Stone and Coetzee (2005) conducted a study of the mentoring of women in two South African information technology (IT) organizations which showed the major barriers to mentoring for women in these organizations. Barriers include:

- lack of opportunities to obtain mentors,
- lack of management support,
- exclusion from male-dominated networks,
- poor representation of women in top management,
- prejudice or discrimination against women,
- misinterpretation of sexual boundaries in cross-gender relationships,
- pressure to adapt traditional male managerial attitudes and values,
- lack of suitable female mentors,
- legacy sex-role expectations,

- difficulty relating to male role models,
- issues of intimacy and sexual tension in cross-gender relationships,
- lack of experience in forming and sustaining mentoring relationships, and
- lack of willingness among senior females to mentor their junior counterparts.

Although these findings are similar to those found in other parts of the world, it is also possible that many of these barriers exist for race and culture as well. It is not easy for Black scientists to find mentors in scientific fields predominantly managed by Whites. Establishing a successful research career in institutions with predominantly Eurocentric and Western values and cultures is challenging for Black scientists in South Africa. Having a mentor in such circumstances can be especially beneficial (Mott, 2002; Geber, 2006) in negotiating the implicit customs within an institution.

Transformative mentoring which is designed to bring about change in organisations and workplaces (and not only in the individual) is seldom reflected in the biodiversity literature. The transformative nature of career mentoring cannot be ignored in biodiversity management institutions where changing policies and practices in the workplace is politically and socially important (Geber 2004). Transformation is an important new function of mentors and their purpose as role models is emphasized by the context of this mentoring research. Mentors traditionally provide both career development functions and psychosocial functions, such as those described by Kram (1988) and Cohen (1995), but mentors in Africa also act as agents of change that help achieve transformation and the equity goals of institutions.

Most models of mentoring, either developmental or sponsorship, focus on the individual (Clutterbuck, 2001). There are few models of mentoring which focus specifically on transformation. Hay (1995) writes about it but does not present a model. The transformational mentoring model (Geber 2004) evolved as result of a study of early career academics at several South African universities. It is an indigenous African model important for considering organisational and social transformation. Training using the transformational model in South Africa is focused on the development of mentors and mentees in a reciprocal way where cultural and ethnic diversity informs the learning of all participants to dispel the effects of racial discrimination and Apartheid. The cross-cultural issues of mentoring in South Africa for diversity are not issues of minorities being integrated into dominant cultures as is the case in the USA. (Clutterbuck, & Ragins, 2002).

Prior to 1992, Apartheid laws excluded Black South Africans (African, Indian and Coloured) from established White universities. Those who completed postgraduate studies at university after 1992 form a pioneering group of professionals and scientists in their communities. But there are very few Black role models in the sciences and most mentors at present are White, many of whom had little interaction with Black people except at the level of manual and domestic labour. Social interaction between racial groups is also very recent. Transformative mentoring is used to bring about change in organisations through professional development.

The design and development of the ED&RR Mentoring Programme

In September 2008, the National Co-ordinator was the only employee of the ED&RR Programme. Regional Co-ordinators, Taxonomists, Herbarium Assistants and a National Office staff were recruited between September 2008 and May 2009. The Early Detection team grew from one staff member to a team of eleven by February 2009. Table1 outlines the race, sex and positions of the different employees. The National Co-ordinator recognized the need to develop the capacity of staff members and initiated a mentoring programme.

SANBI's procurement system did not include the provision of mentor support. In order to expedite the initiation of the mentor programme the National Co-ordinator called for quotations from known experts in the field of Invasive Alien Plant research and management and listed the selection criteria. The mentors were required to have: a minimum of 20 years' experience in their field of expertise, biodiversity management and life sciences technical skills ; an understanding of how to build a professional mentor relationship; an understanding of the field of work of the mentee; and experience of managing staff and capacity development. Taxonomic experts were more difficult to access and after a series of informal requests to taxonomists currently working in the field a few suitable and available mentors were identified. Mentors submitted competitive quotations to carry out the work. As the price range of these quotations varied a standard rate was negotiated and agreed between all the mentors. All the mentors with over twenty years' experience were white. Two of the nine mentors chosen were female.

Staff members were given a choice of mentors and the National Co-ordinator allocated mentors based on provincial location and suitable expertise. The allocation of mentors is outlined in Table 1.

At the mentoring training workshops in 2009, all participants were asked to indicate their willingness to have qualitative information disclosed during the monitoring and evaluation processes during national and international conference presentations. Their anonymity was guaranteed and permission for the use of site photographs of themselves and their spotters was given. Permission to use the mentoring data in an academic journal was given.

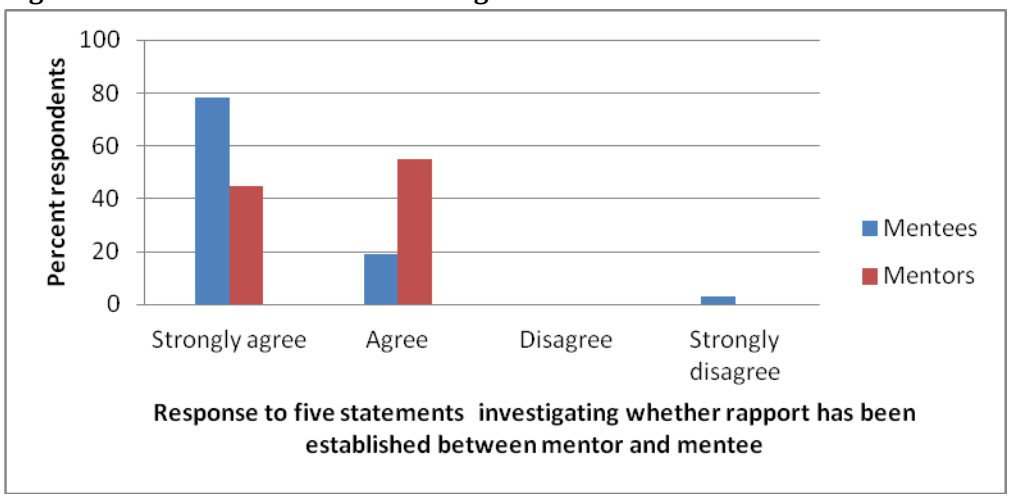
Table 1: The demographics of the ED&RR programme Staff and Mentors at May 2009

Position	Province	Mentee		Mentor	
		Sex	Race	Sex	Race
Regional Co-ordinator	KwaZulu-Natal	Female	Black	Male	White
Regional Co-ordinator	KwaZulu-Natal	Female	Indian	Male	White
Taxonomist	KwaZulu-Natal	Male	White	Male	White
Herbarium Assistant	KwaZulu-Natal	Female	Black	Male	White
Regional Co-ordinator	Western Cape	Female	Black	Male Female	White White
Regional Co-ordinator	Western Cape	Female	White	Male Female	White White
Herbarium Assistant	Western Cape	Female	Black	No suitable mentor found	
Regional Co-ordinator	Gauteng	Male	Black	Male Male	White White
Taxonomist	Gauteng	Female	Black	Male Female	White White
Herbarium Assistant	Gauteng	Male	Black	Male Female	White White
National Administrator	National	Female	Coloured	Female	White
Communications Manager	National	Female	Black	Male	White
National Co-ordinator	National	Male	White	Male	White

The training for, the mentors and staff, was developed around the Transformational model of mentoring (Geber, 2006). Transformational mentoring involves the establishing of learning alliances for professional development and a commitment to social and organisational change (Geber 2003). Mentoring with a transformation emphasis is particularly important in mentoring training where mentors guide less experienced colleagues in order to help them achieve requirements for educational and organisational change which is part of the South African national agenda.

An indigenous transformational mentoring model was used because transformation should be an overt objective that is carefully integrated into the mentoring agenda. Unless transformation is integrated into the agenda the chances are that the changes which happen during the mentoring process will be limited to personal and some professional development and will not affect the overall change of the organisation and its equity goals. Indigenous mentoring resonates with African cultural values and the model evolved in South Africa where the traditional models did not embrace the African sense of co-operation and urgent drive for transforming society (Geber 2009).

Figure 1: Transformational Mentoring



Source: Geber, 2004

The indigenous transformational mentoring model shown on Figure 1 distinctly reframes mentoring in a transformation context and emphasizes the holistic nature of mentoring for young professionals and their mentors. Transformation is the over-arching concept in which mentoring takes place and the training in this programme highlighted that.

The training of participants included:

1. Interactive discussions on:
    - what mentoring is,
    - four conceptual frameworks generally used in mentoring,
    - goals of ED&RR Mentoring programme,
    - benefits of having a mentor,
    - benefits of being a mentor,
    - benefits to the organisation, and
    - cross-cultural, cross-gender issues in diversity mentoring .
2. Participants discussed the phases of the mentoring process, Clutterbuck (2001), and the behaviours which would lead to successful progress through each stage. .
3. Attention was also given to role modelling and the transformation agenda of the ED&RR programme.

The mentoring agreements and contracts were finalized in mid May 2009 with a budget allocation for 16 hours mentoring per trainee per month for six months to mid November 2009. The contract included a clause that would allow extension of the mentor support to March 2010. The allocation of this amount of budget and time to this type of mentoring support is unusual in any organisation especially a biodiversity organisation where budgets for this type of activity are limited.

Review of ED&RR Mentor Programme

Methodology

The methodology used to review and evaluate the ED&RR Mentor Programme was a qualitative interpretative study of the mentoring partnerships that were established between mentor and mentee. Participants were asked to provide information about their partnerships with their mentors and mentees, and how they experienced the transformational nature and the context of the partnerships. The ED&RR staff and their mentors gave intensive, rich and in-depth data about the partnerships. Patton (2002) suggests using few, information-rich cases in order to learn a great deal about concerns central to the purpose of the research.

The data was collected at different times during the programme.

1. There was a mid-year review in August 2009, mentors and mentees reported via a written survey. This was supplemented with a meeting to find out whether mentors would be willing to continue with the programme for another five months to March 2010. The day long review with mentees and mentors was carried out face-to-face by a SANBI Human Resource specialist. The participants were asked about the amount of time they spent in mentoring activities, what goals the mentees has set themselves and what other career issues the mentors addressed with them.
2. In January 2010, after the mentor support had run for ten months, there was a second day long review with seven of the nine mentors and all mentees present to give verbal and written feedback on the programme. The mentor and mentees met separately in two focus groups with the mentoring trainer and researcher who is the first author of this paper, to discuss how their relationships were developing, the achievement of the goals. The participants then came together to discuss the benefits of the programme to each individual and to SANBI. Notes were taken by a project manager from WfW and the ED&RR administrator who provided these to the authors for analysis.

The data was analyzed in the process of 'making sense of the data' (Merriam, 1998, p.178) by coding according to the categories suggested by the literature review. The thematic content analysis of all the interviews was conducted according to the constant comparative method described by Maykut and Morehouse (1994). The method allows the researcher to construct categories or themes by 'continuous comparison' of items or units of data with each other in order to find recurrent patterns in the data (Merriam, 1998). Three main categories of data were uncovered in this process and these are discussed in the section detailing the findings of the study.

Findings

The data was collected through interviews with participants and documentation on the programme. The data analysis was informed by the theoretical perspective of transformational mentoring used in this study and the findings are reported according to the major themes which emerged: time spent in mentoring; goal setting and, after the mid-year review, achievement of goals, shown as tangible outcomes; and the progress of mentoring relationships.

Mid-year review

The mid-year review asked a number of questions of both mentors and mentees. These questions where completed individually and then discussed in a separate group sessions for mentors and mentees held in August 2009.

The responses to the questions reflected general satisfaction with the programme.

Time spent in mentoring

Mentors indicated that they had met with their mentees between three and seven times since the start of the programme. Some did field trips with mentees lasting up to three days. The majority of mentees felt that they spent enough time with their mentors. Others felt that all the activities they had planned were completed in the time available. All mentees agreed that they had spent quality time with their mentors. Individuals indicated that: '(They) a*chieved good things in a short period', 'I always learnt more than I expected'* and '(The) q*uality of discourse was excellent'*.

The allocation of 16 hours per mentee per month for the first six months is exceptional and extremely unusual. Most formal mentoring programmes devote much less time to the process, considering four hours per month as a minimum (Cohen, 1995). In practice, very few mentees get more than that. Mentees have sought assistance on a range of issues such as:

- Identifying unknown plants; plant location; how to approach nurseries regarding Invasive Alien Plants and setting priorities for species of concern
- Organizational skills (e.g. work-plan and workshops), time management, problem solving skills, negotiation skills, operational management and administration
- Development of a communication strategy
- Management (decision making); networking skills; communication skills;
- Self-development for my role and overall understanding of my role
- Development of research skills through assistance in publications and paper writing

Mentors thought that they could address all the issues raised, but felt the mentees would be the best judge of how effectively they addressed these. One mentee raised issues around conflict management and resolution that were outside the focus area of productivity and performance outputs, the mentor felt that they were able to address this issue.

At the stage of the mid- programme review, only one mentee did not feel mentorship was working for them. Mentees identified a number of elements of the programme that worked well for them including:

- The mentor's expertise and experience in alien invasive species in the region being unparalleled.

- The mentor was available whenever assistance was needed; he was very active in corresponding via e-mail and provided contact information on important people in the field who can contribute to the success of the programme.
- Mentors were always very approachable and kind.

The mentors had a range of experience one mentor felt their mentee was quite skeptical at first meeting but more receptive later. Another indicated his mentee was highly receptive and has acted on almost every piece of advice given to her. Mentees were enthusiastic when specific training courses were identified by mentors and mentees themselves.

Goal setting

Mentees listed a wide assortment of goals to be achieved and skills to be developed or improved including:

- Personal development planning goals and skills included:
    - Improved productivity,
    - Separate work from personal life,
    - Finishing current studies and embarking on further studies
- General project management goals and skills, as follows:
    - Development of networking skills,
    - Writing of project proposals,
    - Administration and implementation of projects,
    - Problem solving and innovative thinking,
    - Scientific skills, and
    - Communication skills and specifically scientific communication skills,
- Project specific goals and skills:
    - Review of Key Performance Areas related to their specific jobs,
    - Work on priority lists of plant species,
    - Operational management of plant populations,
    - Ability to judge when a species is an emerging invasive alien plant or not,
    - Identification of places where invasive aliens are most likely to occur, and
    - Field research methods pertinent to emerging invasive alien plants.

The mentors felt they were able to provide the necessary assistance to help mentees achieve these goals. Mentees have been encouraged to publish their earlier research and complete their degree and higher degree qualifications. Mentors have guided their mentees to appropriate course work and literature to develop their project management skills. One mentor outlined that progress with his mentees had been made in these areas:

- meeting key persons and experts that are crucial for the success of the programme,

- getting to know other institutions and departments that deal with Early Detection and Rapid Response,
- field trips with practical exercises on how to go about detecting new Invasive Alien Plants,
- how to identify and detect new Invasive Alien Plants,
- detecting and discussing specific cases of new emerging invaders and how to assess the risks,
- identifying and knowing stakeholders who would identify and report on emerging invasive alien plants ("spotters"),
- dealing with the public (nursery owners) with practical cases, and
- surveying pet shops and nurseries for potential Invasive Alien Plants.

Year-end review

All participants met in Cape Town for two days to review the programme at the end of the first year. They had been made aware of the phases of mentoring during their training the previous year. They filled in a survey to gauge how well they had progressed through the various stages of their mentoring relationships. The Mentoring Phases Survey (Clutterbuck, 1999) appears in Appendix A. Results from survey are laid out in tables 2 to 5 and figures 2 to 5.

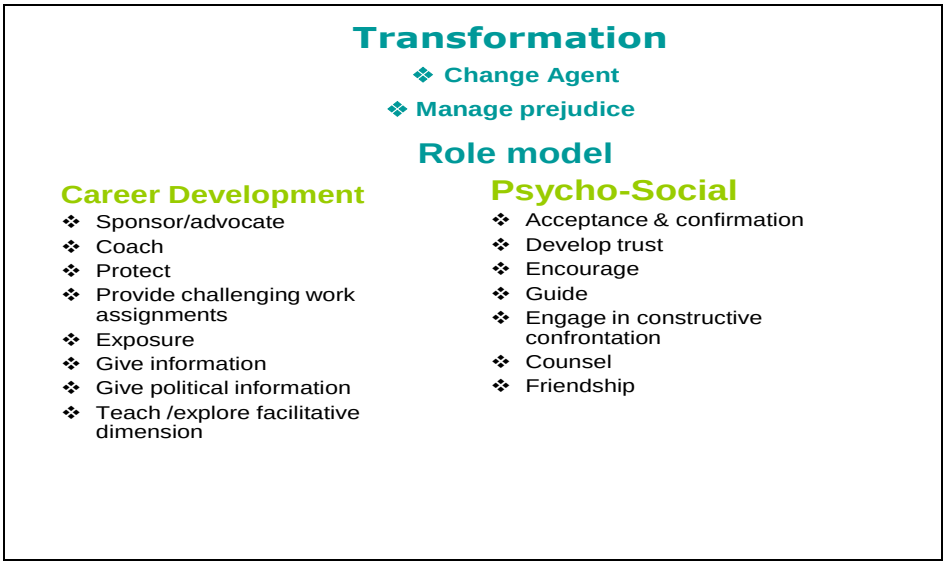
In the *Building Rapport Phase* of mentorship 90% of mentees and mentors said that they did establish rapport with each other. The responses to each question are shown in Table 2

Table 2: List of questions used to measure the Building Rapport phase of mentorship.

Building rapport: Five questions concerned the initial stage of the mentoring relationship	
Question:	**Response and result**
'We have established a good understanding of each other'	Most mentees (90%) expressed agreement to strong agreement with the statements only one male mentee with a male mentor reported disagreement with sense of understanding of his mentor and his sense of being understood and respected. All the mentors also agreed or strongly agreed with these statements.
'We understand and respect each other's feelings and opinions'	
'I feel relaxed n our meetings'	Were unanimously agreed to by both mentors and mentees. This is indicative a feeling of respect and mutual liking which was established early in the relationships.
'We understand and respect each other's feelings and opinions'	
'We respect the confidences we share'	

Figure 2 illustrates the responses:

Figure 2: Combined average of responses to the five statements used to measure the Building Rapport phase of mentorship.



In the *Direction Setting Phase* of mentorship about half of the mentees said that they did set direction with their mentors. The responses to each question are shown in Table 3.

Mentors support mentees in their own work related aspirations and goals, as expressed by one of the mentees:

> *My mentor doesn't tell me what to do but he encourages me to take initiatives and then assists me to turn them into a reality.*

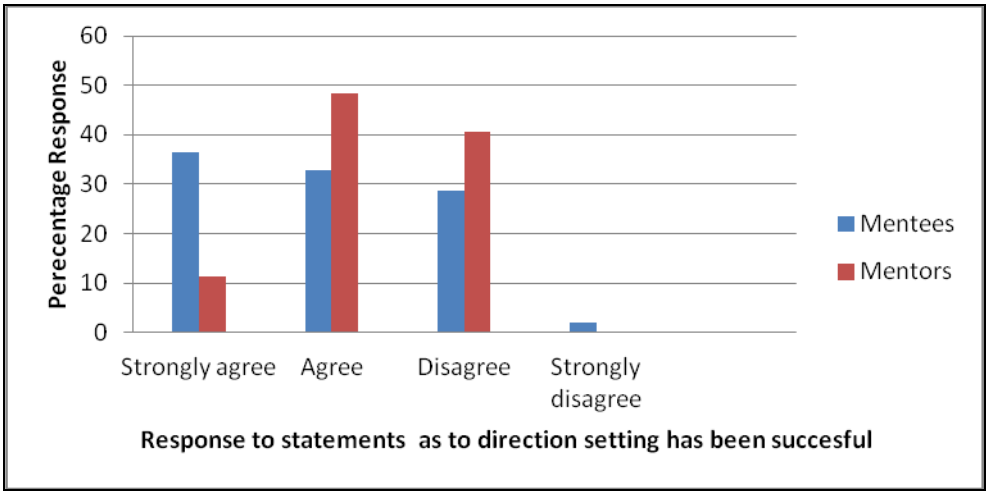
Table 3: Questions used to measure direction setting by mentor and mentee

Direction setting: Four questions concerned the second stage of the mentoring relationship	
Question:	**Response and result**
'We have established clear goals for the relationship'	The responses from mentors and mentees to these phrases indicate that there is much less agreement about **the goals, objectives and purpose of the mentoring**. While the majority of mentees do feel that they have set clear objectives and goals, at least 30% of them have not. Almost half the mentors (40% and 50%) do not feel that they have established clear goals and objectives for their relationships with
'We have agreed the objectives, a broad route towards them and ways of measuring progress'	

	particular mentees. This is a cause for concern and needs to be addressed by the mentees and mentors with encouragement from the National Co-ordinator.
'We are beginning to surface differences of opinion and to work through them constructively'	The responses to these phrases show clearly almost half the mentors (40%) and mentees (50 %) disagree with these statements. Mentors may not be sufficiently aware of cultural issues here as most of the pairs are in cross-cultural relationships. The issue of **surfacing differences and challenging the mentor** has yielded results that are consistent with African culture where it is not considered appropriate or polite to challenge or disagree with older people.
'The mentee is comfortable challenging the mentor'	

Figure 3 shows that there is a much less positive response to the issues concerned with direction setting.

Figure 3: Combined average of responses to the four statements used to measure direction setting by mentor and mentee



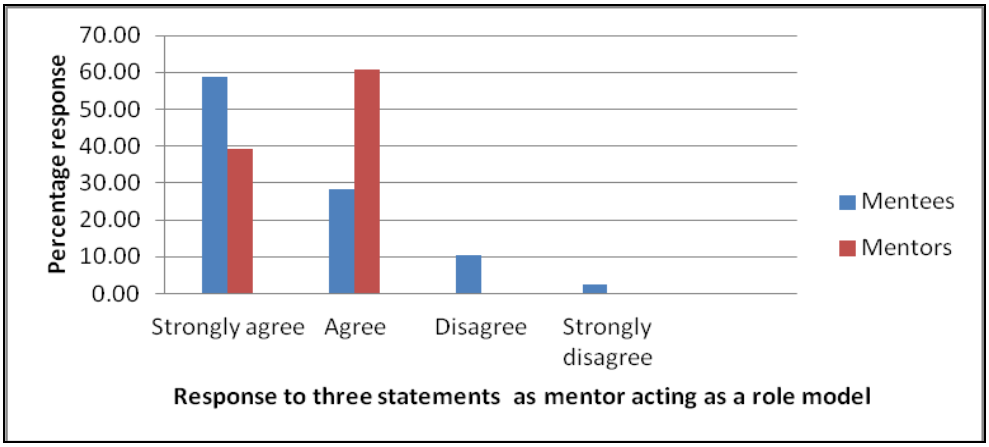
In the *Progress Phase* of mentorship shows the mentor's function as a role model and the mentees and mentors satisfaction with the progress made. The responses to each question about the mentor as a role model are shown in Table 4.

Table 4: Questions used to measure mentor's performance as a role model

Progress making: questions concerned with the third stage of the mentoring relationship	
Question:	**Response and result**
'The mentor is increasingly setting our meeting agenda'	58% of mentors agree and 52% or mentees agree or strongly agree with this statement. Ten months since the programme got underway the pairs of mentor and mentee had made some progress towards their goals, where these have been clearly set. It is evident from the responses to the statements **mentors still have control over what is discussed in meetings** and the mentees have less say in what is discussed.
'Responsibility for managing the relationship rests increasingly with the mentee'	80% of mentors disagree and 62% of mentees disagree or strongly disagree with this statement. Mentors do seem to be aware of their control over what is learnt and discussed and that the relationships in general have not matured as much as could be expected at this stage, nor are mentees directing the relationship as much as they should. This may reflect African cultural values where young people are expected to listen to their elders and not make demands for their own needs (Geber and Nyanjom, 2009).
'*The mentor intentionally acts as role model for academic or scientific work'*	The responses to these three statements show that this is the case except for two mentees who disagree with these statements. One of the major functions of the mentor is to act as a role model and the more intentionally they do the better.
'The mentor intentionally acts as role model for professional working with others'	
'The mentor intentionally acts as role model for personal interactions with others'	

Figure 4 shows that most mentees and mentors acknowledge the function of the mentor as a role model and that role modeling did take place.

Figure 4: Combined average of responses to three statements used to measure mentor's performance as a role model



Role modeling in practice was particularly evident on field trips, as described by one mentee:

> *During the early mentorship, my mentor took me and my colleagues to Kubeyini Private Nature Reserve and taught us how to spot invasive alien plants, techniques of data collection, how to conduct surveys and writing a report. He taught my colleagues and I how to spot invasive alien plants and how to survey for emerging species.*

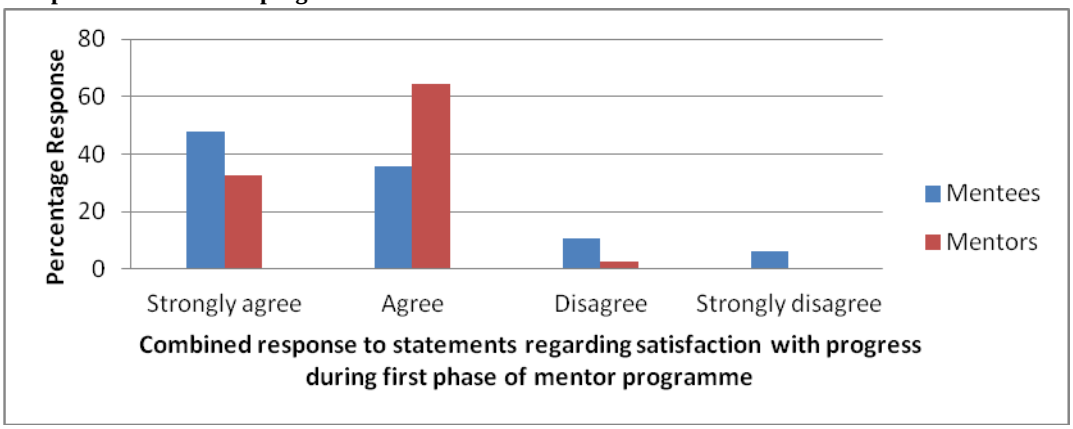
The satisfaction of mentees and mentors with progress made in the programme is shown in Table 5.

Table 5: Questions used to measure satisfaction with progress during first phase of the mentor programme

Satisfaction with progress	
Question:	**Response and result**
'The mentor is satisfied with the mentee's progress to date'	The mentors are satisfied with their **mentees' progress** although two mentees do not feel that there mentors are satisfied with their progress.
'The mentee is satisfied with her/his progress to date'	The majority of mentees are satisfied with progress but some mentees expressed dissatisfaction.
'We have a positive, supportive relationship'	Most mentors and mentees agree that **their relationships are positive and supportive**, although one mentee does not agree.
'The mentee copes more confidently with new or demanding situations than when our relationship began'	Most mentees and mentors agree also that the mentees cope more confidently with new or demanding situations than at the beginning of the programme.
'We have celebrated the achievement of goals and milestones'	The response to question five indicated that although there were successes to celebrate time was not taken to overtly celebrate these successes. 67% of mentees disagreed or strongly disagreed and 50% of mentors disagreed with statement five. This needs to be addressed in future as time needs to be taken to reflect and congratulate one another on milestones achieved.

Figure 5 shows that most mentees and mentors are satisfied with the progress made in the programme.

Figure 5: Combined average of responses to the four statements used to measure satisfaction with progress during the first phase of the mentor programme



This is a typical response expressing satisfaction with mentoring from a mentee:

> *I'm not sure if I am expected to put a figure to the value of the mentoring – if so, I will score it 11 of out 10! I think the value of mentoring is so important in such a new and dynamic programme. Since no such previous entity exists to compare standards with, mentoring really helps guide and shape employees in delivering the outputs of this ever-changing programme –the programme develops and shapes itself all the time, and the mentor really guides/steers the employee along the right path amidst these changes*

Goal achievement and tangible outcomes of mentoring after one year

One of the ways of evaluating the effectiveness of the programme is to look at the tangible outcomes. The tangible outputs of each mentee after one year are outlined in Table 6.

Table 6: Tangible outcomes of the mentoring programme after one year

	Female	Male
Articles in local newspapers	2	
Newsletters	2	
Draft surveillance strategy document		1
Posters presented at International Conference	2	
Project or Research proposals	2	1
Data collection	1	1
Survey of sites for monitoring	1	
Taxonomy		1

The tangible outputs of mentees in the programme illustrates that all the men and women researchers have produced tangible outcomes which are critical to the success of the ED&RR programme as these raise awareness of the need for such a programme in South Africa. The number of articles accepted for publication in national journals also does this. Not one had published anything before participating in the programme. One mentee confirmed this when he said: "I have published a number of articles, before that I never wrote any article." The programme keeps track of tangible outputs and further statistics will be forthcoming.

The less tangible achievements are more difficult to assess. In their self-report participants indicate that they have made huge strides in their personal awareness, interpersonal and communication skills. One mentee voiced her growing insight into her work in biodiversity when she said:

> *The biggest realisation and lesson for me has been the importance of ethics in research but at the same time how vulnerable ethics are as 'rules for behaviour' in the scientific endeavour and how easily these rules can be distorted. This came as a formidable shock to me. But I have also learnt that this sort of thing is not uncommon. Through the mentoring programme, I realised that it can and should be managed, and that one needs to be astute and thoughtful about the approach to take when responding to such issues, to try to be constructive but firm and to always consult existing and accepted policies. So I think learning how to respond to such issues, with the help of my mentor, has been a significant lesson and a very valuable experience.*

The findings of this study have several implications for institutions and programmes which are designed to support new researchers. The feedback provided by mentors and mentees highlight these not only for the ED&RR programme but for mentoring of biodiversity professionals as a whole in South Africa.

Discussion

In addition to the results from the survey of mentoring phases, the mentors and mentees were separated into two groups and were asked several general questions which form the basis of this discussion. Feedback from the mentees about their experiences is discussed in the first part of the section and feedback from the mentors in the second. Several unanticipated consequences of the mentoring and the cost of the programme are also discussed.

Mentees' expectations

Mentees' expectations of their mentors in achieving their goals included being guided, advised and pointed in the right direction. They expected support and to learn to understand the work environment. They expected their mentors to share experiences with them but also for the pairs to learn together. They expected their mentors to promote the ED&RR programme and help with relationship building with

others in the field. Most of the mentees' expectations were met and in many cases exceeded for both their professional and personal growth although some mentees felt that they had not fully used the relationship for their personal growth.

Mentees reported on specific areas of research where their mentors had helped them with their higher degree studies and other research proposals. Mentees commented that having access to the mentors' networks enabled them to do their research fast and avenues, which they were previously unaware of, opened to them. They said that their research was more innovative than they could have anticipated. This confirms the findings of de Janasz, & Sullivan (2004) and Geber & Nyanjom(2009).

A mentee who was given access to her mentor's networks said this:

> *My mentor has leveraged his scientific networks (local and overseas networks) on our behalf. For example, he has put us in touch with Martin Hill and Julie Coetzee for Lythrum salicaria discussions (Rhodes University); Bernd Blossey (Cornel University, US) for further assistance with Lythrum salicaria; Ted Center and Paul Pratt in the US (for assistance with Melaleuca quinquenervia management). These are big names, people who are known around the world for scientific and management advances in their respective fields of work. Connecting with these individuals through my mentor has enabled us to expand the ED&RR professional network and gives us credibility as a group and as individuals to seek advice from these experts*

Mentees also spoke about how the mentoring had affected other areas of their lives. Several mentees have begun to see themselves in a new light, as professionals in an important national programme. One man mentioned his perfectionist tendencies and how his mentor had helped him not to feel a failure when he could not do things to his own very exacting standards. Another said that he had more confidence in confronting issues and could now make his viewpoint heard. Some realized that they were not alone in having to deal with confrontational issues and did not need to take these personally, that others had had similar experiences and had coped with them. The women said that they were less passive and more assertive with others.

The mentees have experienced several very important shifts in thinking during their mentoring relationships to date. They said that they had started to think of themselves as biodiversity professionals. They are no longer simply graduates or postgraduates working for the ED&RR programme, but serious players in their field and competent young professionals, increasing their expertise and experience and are now taken seriously when they interact with other stakeholders in their regions.

> *I have learnt that there will always be obstacles or problems in one's path – instead of focusing all one's energy on this "crisis," it is important to always look at the bigger picture and move on to other tasks that actually need completing – the little things will solve themselves out hopefully!*

I've also realized that there is only so much one person can do– I can't ALWAYS do EVERYTHING, ALL the time….I need to prioritize my tasks such that I am the first and most important beneficiary, then I can assist others, and I have to learn to say NO sometimes.

They said that the connections they had made through their mentors' networks had allowed them to operate at levels beyond their expectations and to speak to senior officials and CEOs much earlier in their careers than they would have otherwise. Nevertheless they could still make individual contributions outside SANBI to the wider community. They now have some influence in the field because their mentors have expert reputations.

They spoke about their growing confidence in seeing themselves and acting as biodiversity specialists and that such personal development was important to them. The way they think about ecology and biodiversity has changed and is less rigid and more open to the changes in the science they are engaged in.

The mentees said that the field trips with their mentors were very valuable and necessary and that they learnt an enormous amount during the field trips. The field trips were included in the 16 hours per month which the mentors spent with the mentees and some mentees felt that there was not enough time for their other meetings and would have liked more time in their daily work spaces as well.

They discussed individually the benefits of having a mentor. Mentees now initiate actions more easily than at the beginning of the programme. They are able to think laterally more frequently and behave more effectively. They consider that they have made faster progress than they would have without their mentors. They have learnt many skills from their mentors, changed the way they do things and their knowledge of the field is clearer.

They saw quite specific benefits to SANBI of having a mentor. Mentees said that they had learnt the ropes more quickly and didn't waste organisation time getting up to speed. The ED&RR programme benefitted because mentees didn't make too many mistakes or spend a lot of time getting to know the issues of regional concern on their own.

Feedback from mentors

There was valuable feedback from mentors about their experiences in the programme. Mentors expectations of their mentees in achieving their goals included the mentees' showing a strong commitment to the mentoring process; enthusiasm for the subject; honesty about what individuals want to achieve (not just what they think their mentors want to hear) and interest in their career and job satisfaction. Most of the mentors' expectations were met.

Mentors discussed which expectations were not met: they did not expect the mentees to have so much organisational bureaucracy to put up with or so many interpersonal problems within SANBI. They did not expect their mentees to show such huge backlogs in knowledge of the field; problem solving and

critical thinking; lack of skill in dealing with crucial stakeholders and making presentations on the ED&RR programme; or inability to set priorities for different activities.

Mentors reported on specific areas of research where had helped their mentees with their proposals and studies for higher degrees. They helped to identify specific research projects, how these fit into the ED&RR programme and the application of the research to the programme. Some mentors were clear about how the research should lead to action in preventing the spread of alien invasive species. They had to do work with mentees to make the transition from thinking about things to doing something concrete.

Mentors also spoke about important shifts in thinking during their mentoring relationships to date and how the role of being a mentor had affected other areas of their lives. They saw their role as much wider than they had originally envisioned it. They had anticipated the transfer of the knowledge of specific alien invasive plants to their mentees but their role demanded their advocacy on behalf of their mentees with other agencies and on behalf of the ED&RR programme with senior management at SANBI. They had to make clear a lot of unwritten rules in engaging important players and had to model and coach mentees in how to interact with senior members and CEOs of other stakeholder groups. De Janasz & Sullivan (2004) emphasize these roles in mentoring.

The mentors said that the field trips with their mentees were essential and rewarding when they saw how much they could teach the mentees in the field. Some mentors felt that they would have liked to allocate more time to this project if they had known how much wider their role turned out to be. Mentors were able to broach certain lack of skills in mentees in an informal way in the field – they felt that this would not have been possible in the formal work environment. Some mentors would have liked to devote more time to mentoring in this programme because they regard it as very important.

Mentors discussed the benefits of having a mentor. They said that their mentees had learnt the ropes more quickly and didn't waste organisation time getting up to speed. Mentors were concerned about how seriously SANBI is about 'owning' the ED&RR programme and the mentoring of the team. Very little appreciation is actually shown to the team.

Mentors saw quite specific benefits to SANBI of being a mentor. One mentor in particular was able to act as a champion for the programme and made contact with the SANBI Chief Executive Officer. The ED&RR programme benefitted because they could lobby other institutions like The Departments Water Affairs; Environmental Affairs, and Agriculture to make the programme known and understood and appreciated. They may be able to help SANBI negotiate with other institutions on certain complex issues.

Unanticipated consequences of the mentoring are highlighted.

Several unanticipated consequences for participants and SANBI were surfaced during the reviews. Mentors were able to identify the processes which were working really well and also identify gaps in the existing ED&RR programme. They felt that they could provide an influential support group for the

National Co-ordinator and actively advocate for him and the programme with SANBI senior management.

The impact of the programme is being felt at different levels in society, several municipalities, farmers and Reserve managers have contacted mentors to ask for Early Detection surveys and where to obtain herbicides to eradicate invasive species.

A week-long training course to broaden knowledge of Invasive Alien Species management for was suggested by a mentor. This course will be attended by the ED&RR team and other external practitioners.

SANBI itself has benefitted in that the team is still intact and functioning well, so no additional costs of recruiting and training have been incurred. The mentors have given the team sharp focus and helped it to function effectively quite quickly, so much so that the programme may be used as a model by SANBI for other programmes in the organization. Mentors have gained insight into individuals and encouraged them as individuals and team members.

Cost of the programme

The mentor programme was not cheap. In order to get scientists and professional with fifteen to twenty years experience to devote this amount of time to work with young scientists costs a great deal. During the first year mentors were requested to submit quotations to carry out the work. The amounts quoted varied quite greatly and it was negotiated that each mentor be paid ZAR500 per hour. This amount is less a great deal less than the South African Government stipulated rates of between ZAR650 and ZAR1200 per hour for a professional with 15 years experience. Generously all the mentors agreed to this rate. The total cost of the mentor programme between May 2009 and March 2010 was ZAR345 000 this equates to 690 hours of mentors time at ZAR500 per hour.

Conclusion

Transformation of the field of management of invasive alien plants which affects novice biodiversity professionals is highlighted in this article. The ED&RR programme has transformational mentoring integrated into the programme and the ongoing success of the mentoring is evident from the responses of the participants. The retention of all mentees for more than two years was a benefit of mentoring.

The investment in the ED&RR mentoring programme was extraordinary. The money and time spent by mentors meant a rapid capacity development among mentees. This is evident in the range of goals and skills they managed to achieve and develop in a relatively short time. The programme also built capacity in mentors as, through experience, they learned how to do cross cultural mentoring better. The programme provided access to mentoring especially for young Black women that they are unlikely to have accessed without a formal programme (Stone, 2005).

The programme is probably unique in South Africa in that every member of the programme was provided with a mentor, not only the young scientists. All the mentors were trained and all the team members who had been appointed early in 2009 so that everyone had a common understanding of the process. Ongoing support and monitoring of the team and the mentors have proved beneficial, keeping participants on track and focused on the mandate of the ED&RR programme within SANBI and not going beyond its remit.

The mentoring programme has spread awareness of the need for such professional development in Science / biodiversity in South Africa as revealed by the mentor feedback. There have already been important benefits to South Africa in terms of early detection, see unanticipated outcomes

Concern was expressed by SANBI's supply chain management that the mentor group was not sufficiently representative of South African race groups. The lack of experienced mentors from groups other than White was again apparent during the second year of the mentor programme. An advert requesting mentors for the second year of mentoring was placed in the national press and on SANBI's website. Although interest was expressed from a range of different people from a diversity of backgrounds the suitable mentors were again mainly white and male. Staff members chose their mentors for the second year of the programme and most selected to stay with their mentor from the previous year. Staff members who had been mentored by two mentors previously retained one of their former mentors and chose a different mentor for the second year of the programme. New staff members all selected white male mentors even though there was a diversity of other possible mentors.

The mentoring of young researchers in the ED&RR programme stands out as rare and exceptional example of good practice in mentoring and the design and implementation of a mentoring programme for capacity building of young biodiversity researchers and practitioners. The tangible outputs of the programme are testimony to this and further outputs are being consolidated. The programme continues to attract funding to implement the management of biodiversity and the alien invasive issue which is of global concern. Biodiversity programmes in South Africa and worldwide initiatives can benefit from such mentoring programmes.

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Appendix A

Early Detection and Evaluation of Invasive Alien Plants - Mentoring phases survey

Name:

Name of my mentor /mentee:

Date:

	Strongly Agree	Agree	Disagree	Strongly Disagree
Building Rapport				
We have established a good understanding of each other				
I feel relaxed n our meetings				
We understand and respect each other's feelings and opinions				
We respect the confidences we share				
I feel confident in the relationship				
Direction setting				
We have established clear goals for the relationship				
We have agreed the objectives, a broad route towards them and ways of measuring progress				
We are beginning to surface differences of opinion and to work through them constructively				
The mentee is comfortable challenging the mentor				
Progress making				
The mentor is increasingly setting our meeting agenda				
Responsibility for managing the relationship rests increasingly with the mentee				
The mentor intentionally acts a s role model for academic or scientific work				
The mentor intentionally acts a s role model for professional working with others				
The mentor intentionally acts a s role model for personal interactions with others				
The mentor is satisfied with the mentee's progress to date				
The mentee is satisfied with her/his progress to date				
We have celebrated the achievement of goals and milestones				
We have a positive, supportive relationship				
The mentee copes more confidently with new or demanding situations than when our relationship began				

(Clutterbuck, 1999)