

Conservation education and habitat restoration for the endangered Sagalla caecilian (*Boulengerula niedeni*) in Sagalla Hill, Kenya

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ABSTRACT

The Sagalla caecilian (*Boulengerula niedeni*) is an endangered amphibian endemic to Sagalla Hill in the Taita Hills. This burrowing worm-like species prefers soft soil with high moisture and organic matter. The major threats to the Sagalla caecilian are soil erosion caused by steep slopes, bare ground and water siphoning/soil hardening from exotic eucalyptus trees. The purpose of this study was to get a better understanding of the local people's attitude towards this species and how they can contribute to its continued conservation through restoration of its remaining habitat. In this study, it was found that 96% of Sagalla people are aware of the species, its habits and its association with soils high in organic matter. It was also found that 96% of Sagalla people use organic manure from cow dung in their farms. Habitat restoration through planting of indigenous plants was found to be ongoing, especially on compounds of public institutions as well as on private lands. Although drought was found to be a challenge for seedlings development especially on the low elevation sites, destruction by livestock especially during the dry season is also a major threat. In this study, it was recommended that any future habitat restoration initiative should include strong chain-link fencing to protect the seedlings from livestock activity. Recognizing that the preferred habitats for the species are in the valleys, systematic planting of keystone plant species such as fig trees (*Ficus*) creates the best microhabitats. These are better than general woodlots of indigenous trees.

Keywords: Local people; Caecilian; Awareness, Protection, Habitat rehabilitation

INTRODUCTION

The Sagalla Caecilian (*Boulengerula niedeni* Müller, Measey,

Loader & Malonza, 2005) is an elongated, slender, brownish, limbless, tailless, soil-burrowing amphibian about 300 mm in body length (Figure 1). Its colour varies depending on the microhabitat substrate, with specimens in well-shaded sites e.g., between banana plants and in high altitude areas tending to be dark brown, whereas those in lower elevations being light brownish. Superficially it resembles a large earthworm, but differs by its serpentine mode of movement while on the soil surface. Due to its snake-like movement many people on first sight think that it is a snake. It differs from snakes by having moist smooth skin, segmented body and a pointed pigment less head as opposed to snakes, which have dry, scaly skin, with pigmented heads.

The Sagalla caecilian is endemic to Sagalla Hill, one of the mountain blocks of the Taita Hills (Müller et al., 2005). On Sagalla Hill, *Boulengerula niedeni* is found in low densities in farms and patches of indigenous forests (<3 ha remaining) at altitudes of between 1 000-1 500 m (Malonza, 2008; Malonza et al., 2010; Malonza & Veith, 2012). The caecilian prefers moist, organically rich soft soils. In farmlands, these caecilians can be found mainly in soils rich in organic manure or under organic debris, the base of terraces, under fig trees and along the edge of streams; whereas, in the indigenous forest it is common in decomposing dead logs, at the base of palm plants and in forest leaf litter (Malonza, 2008; Malonza et al., 2010). Since 2014 it is globally categorized in the IUCN Red list as Endangered but before then as critically endangered. In the entire Sagalla Hill highland region the proportion of its preferred habitat is very small. There is continuing decline in its area of occupancy, extent and quality of habitat due to increased

Received: 20 February 2016; Accepted: 10 May 2016

Foundation items: This study was supported by the Mohamed bin Zayed Species Conservation Fund (MBZ) on the education (project number 11251778) and awareness work by US Fish & Wildlife Service (USFWS) project award number F11AP00359 on habitat restoration work

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DOI:10.13918/j.issn.2095-8137.2016.3.159

human population. The current estimated extent of occurrence is less than 20 km² and area of occupancy of the fragmented sites is about 7.06 km² (Malonza et al., 2010).



Figure 1 Sagalla caecilian *Boulengerula niedeni* (in life) (upper) and its general habitat (lower)

By preferring organically fertile moist soft soils for burrowing, its major threat is soil erosion and compaction or hardening. Hence all activities that promote soil erosion (e.g., poor farming practices), hardening and drying of soil (e.g., from eucalyptus trees), results in the decline of the caecilian population. Currently the high slopes of Sagalla Hill are covered with exotic eucalyptus and pine trees (Sagalla forest plantation ca. 70 ha) planted around 1956. During its growth over the years eucalyptus trees in particular (due to their water draining habits) have resulted in drying out of springs and hardening of the soil surface reducing the amount of habitat suitable for the Sagalla caecilian. These negative effects of eucalyptus on ground water has also been witnessed elsewhere in India (e.g., Joshi & Palanisami, 2011)

In conservation of this species the main challenge is how to convince the local people to conserve the caecilian habitat, as they view the caecilian as having no direct tangible benefit. In order to conserve the species and restore its habitat,

conservation education and awareness is important. Given that the species superficially resembles both an earthworm and a snake, there is need to get a clear understanding of the attitude and perception of the local people toward the caecilian so as to promote conservation of the species and its habitat. The fact that the Sagalla caecilian prefers organically moist fertile soil means that the species is an indicator of good healthy soil required by the local farmers for crop production. The species is actually an ecosystem service provider in that it helps with organic matter decomposition and soil aeration, both important for seed germination and seedling development. This means both the local farmers and the caecilian require organically rich soil for their survival, resulting in a form of mutualism. One way to achieve this would be through a conservation campaign for the local people to understand the species biology, environmental importance, threats and conservation initiatives. This campaign should inform the locals about the tangible threats to their survival, e.g., soil erosion and water siphoning effects of Eucalyptus, which can be justified by a cost-benefit analysis over time. Consequently in the process of mitigating the causes of these threats for their own benefits, they will be indirectly conserving the Sagalla caecilian by restoring or improving its habitat. One of the ways to improve the species habitat is through replanting indigenous trees on Sagalla Hill. One of the main objectives of this study was to create awareness by demonstrating the link between human requirements and those of the Sagalla caecilian, thereby, changing peoples' perception of the species towards a more positive orientation that will, in turn, aid in the conservation of the environment for both human and the amphibian.

MATERIALS AND METHODS

Study area

Education and awareness surveys were done during three visits; 22 March-05 April 2011; 04-18 December 2011 and 05-21 March 2012 in the highland area of Sagalla hill. Sagalla hill is one of the mountain blocks of the Taita Hills, which is the northern-most block of the Eastern Arc Mountains (Lovett, 1990). The Eastern Arc Mountains is one of the sections of the Eastern Afromontane biodiversity hotspot in Africa (Sloan et al., 2014). Sagalla hill is a dry land rocky hill located close to Voi town (S3°23', E38°34', 560 m a.s.l.) separated from the town by the Mombasa highway (Figure 2). It rises from an altitude of about 600 m a.s.l. from the Tsavo plains to about 1 500 m a.s.l.. The lower slopes of the hill are covered by *Acacia-Commiphora* bushland and woodland giving way to a sub-montane vegetation zone at about 1 000 m a.s.l. and above. The highland area of the hill is densely populated by small-scale farmers mainly growing crops and fruit plants such as; maize, bean, banana, sweet potatoes, pawpaws, citrus, avocado and mango. The upper slope of the hill (mainly above 1 300 m a.s.l.) is covered with exotic eucalyptus and pine trees.

Survey sites

The following major sites and their environs were visited: (1) Mwalangi market area (S3° 30.657', E 38°34.593', 1 095 m a.s.l.), Sagalla

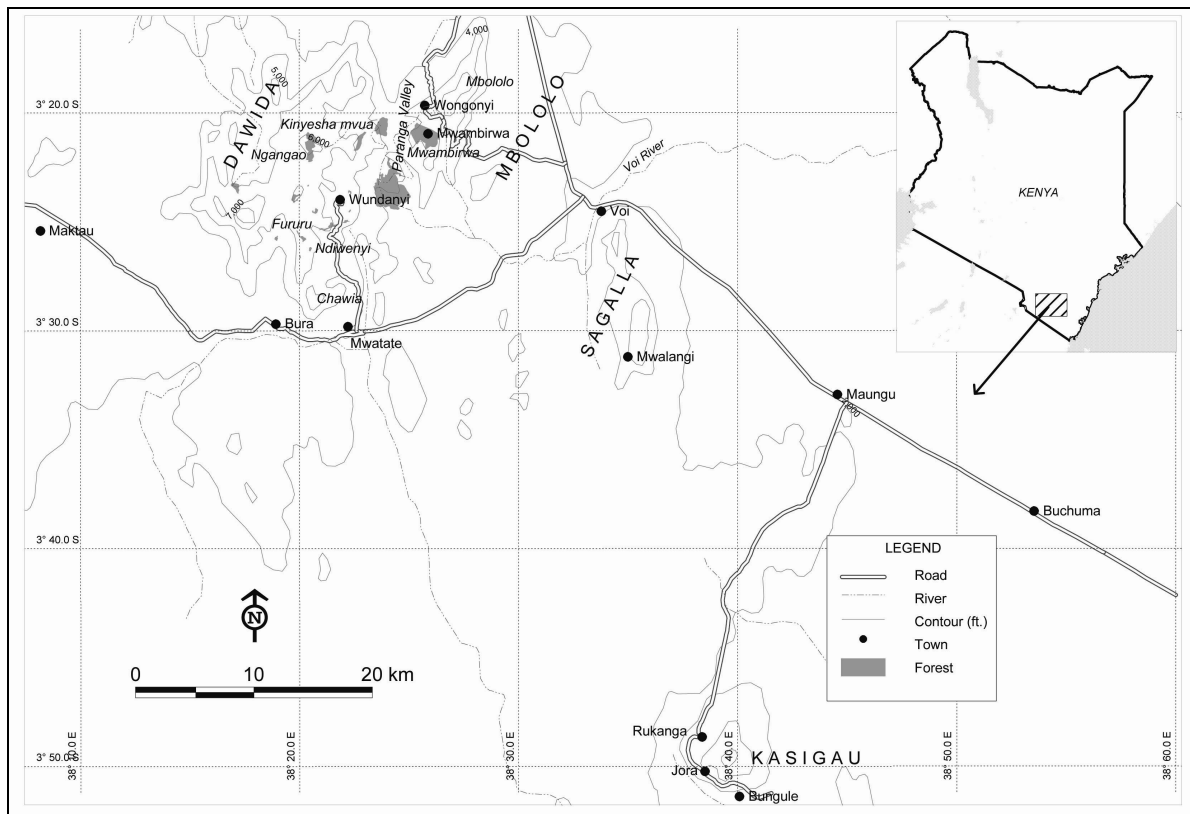


Figure 2 Map of the Taita Hills showing the main block Dawida and the three isolates of Mbololo, Sagalla and Kasigau (Inset a map of Kenya showing the location of Taita Hills) (adopted from Malonza et al., 2010)

chief camp (S3°30.769', E38°34.533', 1 102 m a.s.l.), Wray primary school and Mwackichuchu mixed secondary school (S3°30.587', E38° 34.574', 1 108 m a.s.l.); (2) Talio primary school (S3°31.641', E38° 34.841', 1 080 m a.s.l.); (3) Mlondo primary school, Sagalla health centre, Our Lady of Perpetua Succour Girls Secondary School (S3° 29.810', E38° 34.913', 1 108 m a.s.l.); (4) Kanyanga market area, Sagalla youth polytechnic (S03° 28.937', E38°34.974', 1 098 m a.s.l.); (5) Kizumanzi primary school, Serengi valley (S3°28.579', E38°34.213', 1 137 m a.s.l.); (6) Mghange area (S3°29.403', E38°35.649', 1 260 m a.s.l.); (7) Sagalla primary school, Kishamba area (S3°29.770', E38°35.698', 1 387 m a.s.l.); (8) Marie primary school (S3°31.064', E38°35.553', 1 418 m a.s.l.), Dambi area (S3°31.063', E38°34.968', 1 249 m a.s.l.); (9) Kwen-Tole area near the forest Sagalla forest station (S3°30.514', E38°34.952', 1 300 m a.s.l.); (10) Suluni-Bule area, upper Kizumanzi catchment (S3°29.126', E38°35.585', 1 332 m a.s.l.).

Research methodology

In this social survey a structured questionnaire was used to collect data on various aspects by employing the best practice as recommended by White et al. (2005). Respondents or interviewees were randomly selected within the general area of Sagalla where the Sagalla Caecilian is known to inhabit.

Community conservation education and awareness

This survey was done during the wet seasons of March-April and November-December, a period when caecilians are easily found due to their dependence on soil moisture. In the first survey (22 March-05 April 2011), a structured questionnaire was administered randomly by visiting and interviewing local people in their farmlands or homesteads. The respondents were asked questions ranging from whether one knows the species; its new Ki-sagalla name of "*Kilima-mrota*" and its habits (see Appendix 1A). Only one person was interviewed at a time and when more than one where found together only one was interviewed and educated as the rest listened. However, at the end all present were allowed to ask questions for general education and awareness creation. Most of the people interviewed were those found farming except on Sundays when majority were at home (before or after church service) and not in farms. In addition, group education and awareness of the species biology, importance, threats and conservation were given to schools and public meetings. For general awareness all the six primary schools (Wray, Talio, Mlondo, Kizumanzi, Marie and Sagalla), and Mwackichuchu mixed day and boarding Secondary School were visited. One education/awareness session was given at a public meeting of about 200 people organized by the Sagalla location administrative chief at Kanyanga market.

In the second awareness survey (04-18 December 2011) the respondents were randomly chosen as they were encountered and asked additional more specific questions to those of the first survey, such as; species micro-habitats, importance, threats and habitat conservation methods and the execution procedure followed was similar to that of the first survey (Appendix 1B). However, most of the people interviewed were those within their homesteads because during this period many had finished weeding and were not available within the farmlands. During both the first and second interviews a live caecilian was carried for hands-on demonstrations. In general, surveys were conducted systematically but respondents were chosen randomly in most of the Sagalla areas where the species is known to occur.

In the third and last survey, the major aim was to take stock of major activities done so far by the various institutions, government agencies, and among other organizations within Sagalla that promote the conservation of the caecilian and its habitat. These include; planting indigenous trees, replacing exotic trees, e.g., eucalyptus, soil erosion prevention, e.g., terracing, increased use of organic manure, and public education on the species among others. The head or a representative of all the six primary schools, three secondary schools (Mwakichuchu, Sagalla Girls' and Kizumanzi), Sagalla Youth Polytechnic, Sagalla Health Centre, Wray Memorial Museum, Sagalla Forest Station, and Taita-Taveta Wildlife Forum were asked to point-out what their institutions have done so far from a given checklist (Appendix 1C). Two sets of laminated posters (A0 mostly English) and A4 (with Kiswahili translation) of summarized information on the species were distributed to all the institutions. Only data from the structured interviews was used in the analysis while information from public group education was used in a descriptive way where applicable.

Habitat restoration

This was done during the rainy seasons of November-December and March-April mainly between November 2012 and April 2015. The purpose was to restore and enhance the quality of habitat for the Sagalla caecilian and ultimately increase the species population size. The goal is to reduce the direct threats to the species, namely soil erosion and water draining or siphoning effects of exotic plants especially eucalyptus trees in the area. Indigenous tree seedlings were sourced from local people's tree nurseries. They were then planted in collaboration with local people under the supervision of a Sagalla resident and Taita-Taveta Wildlife Forum field officer. Planting was done on public institutions compounds including all the primary schools, Youth polytechnic, St. Marks ACK Church/Wray Memorial Museum, Sagalla chiefs' camp, Lata Dam and on farmlands of members of interested farmers.

Data analyses

Data was analysed with chi-square-Test to test whether the respondents' knowledge or awareness of the caecilian biology and its conservation depends on their level of education or age. The respondents' level of education was determined by asking their level of education (primary, secondary, colleague/university

or none for those who have not entered as formal education class. Age was determined from respondents' who provided their respective age in years.

RESULTS

The respondents

In the first survey a total of 89 (43 males, 46 females) respondents were interviewed while in the second survey the total was 90 (42 males, 48 females). On education 20 years and below was the baseline for primary and secondary while between 20 and 60 plus for those above secondary in tertiary level (college and University). Considering these in the analysis the average age of 40 years (above or below) and secondary education level were used as reference points to determine the interviewee response. In Kenya the age of 20 years is the average youthful age while 60 years is the retirement age from active work. So the average i.e., 40 is considered the prime or most productive age class.

How many know the Sagalla caecilian?

The Sagalla people very well know the Sagalla caecilian as observed from the first (96%) and second (96.5%) surveys, respectively. Even those who claimed not to know when shown a live specimen acknowledged that they had seen it. However, proportionally few people (26%) have heard or are aware of the new Ki-Sagalla name for the caecilian, i.e., *Kilima-mrota*. Those who were aware heard it mainly from their neighbours (40%). Others heard from the 2006 Wray primary school name search competition pupils, Taita-Taveta Wildlife Forum Officer, grandmother, visitors searching for the caecilian, and visiting Tsavo National Park staff or seen from my first survey mini-poster (flier) posted on the Chief's camp notice board. Only 11% had heard or learnt about the name from school pupils or students. Therefore, many on the first sight still call it *Mng'ori* or *mwamng'ori* a general Taita name that refers to a large earthworm. However, a good number (41%) can differentiate it from an earthworm and even blind snakes.

The attitude and beliefs of people towards the Sagalla caecilian

Despite the caecilian's superficial resemblance to a snake majority (85%) of the respondents said they did not kill them on sight as they are harmless and some (39%) could point out the species importance in helping organic decomposition and only killed accidentally if cut while tilling or weeding. Only 9% said that they purposely killed them because they look like snakes and think that they can bite or eat/cut roots of sweet potatoes and other food crops. However, 63% of those who normally kill the caecilians said they will stop after understanding that they are harmless and constitute a very important part of the environment by helping in soil aeration, organic manure decomposition and feeding on termites that are crop pests.

Where and when do you find caecilians?

A proportionally large number of Sagalla people (90% and 94% of the first and second survey respondents respectively) clearly

know where and when to find *Sagalla caecilians*. Most of them (95%) clearly associated the species with wet areas and easily found mainly during the rainy season within microhabitats organically fertile soils. In *Sagalla* farms such microhabitats include base of bananas, terraces, and base of remnant *Ficus* trees and palm plants, near cattle sheds, along water streams including those fringed with indigenous plants or the exotic and invasive shrubs like *Tithonia diversifolia* and *Lantana camara*. When asked whether they use organic manure or artificial fertilizers, almost all (96%) said that they prefer and will continue using the organic (mainly cow dung manure). Many clearly pointed out that they have never used artificial fertilizers.

The influence of age and level of education on knowledge of the species habitat requirements, importance, threats and conservation initiatives

Results from December 2011 data, showed that the respondents who were below or above 40 years of age, were 44% and 38% respectively knowledgeable but with no statistically significant difference (χ^2 test, $df_1=1.17$, $P=0.28$). In reference to the level of education it was found that the 55% and 29% of the respondents whose education level was below and above secondary school respectively were knowledgeable but with no significant difference (χ^2 test $df_1=1.98$, $P=0.16$).

Knowledge on importance of the *Sagalla caecilian* to the environment

Information was sought from the respondents on their knowledge on the importance of the *Sagalla caecilian*. Some of the expected responses included helping in soil aeration and decomposition of organic manure, pest control (eat termites), and a symbol of high organic soil fertility. The majority (61%) seemed unaware of any importance of this species to the environment. However, some (39%) seemed to point out a few of them which they learned from neighbours and/or environmental education seminars. Again after understanding the species microhabitat requirements, the majority (86%) could point out some of the activities for protecting the species and its habitat. These include; terracing, not burning farm trash, not killing, increased use of organic manure, planting indigenous trees and

banana plants.

Knowledge on threats to the *Sagalla caecilian*

Almost all (99%) the *Sagalla* people interviewed were aware of the water sucking (a negative impact) effects of the eucalyptus trees. In addition, after getting a clear picture of the habitat requirements of the species, over half (57.5%) of the respondents could point out some of the things threatening the survival of the caecilians.

Majority of the people (95%) preferred planting indigenous over exotic trees. Some of their reasons for this choice are that indigenous trees increase soil moisture, add humus, and have medicinal value. Other trees, like *Ficus* trees, do not inhibit crops growing underneath. The few who preferred exotics pointed out *Grevillea robusta* trees that do not have inhibitory effects on crops and adds to soil fertility. Some also mentioned planting of exotic fruit plants and planting of exotics for timber only within wastelands.

Habitat restoration for conservation of the *Sagalla caecilian*

During the last assessment on current conservation activities for the species 93% of the institutions had at least planted indigenous trees within their compounds. The native tree, *Croton megalocarpus*, was found to be the most successful due to its fast growth and resistance to drought. This tree and other native trees could also be seen within people's homesteads. Two primary schools (*Sagalla* and *Marie*) in the high altitude areas, had replaced almost their entire exotic species with indigenous trees. However, the challenge was the intensive sprouting of young eucalyptus saplings in *Marie* primary school after deliberate burning. In general, a good number of institutions (57%) had even replaced some of their exotic pine and eucalyptus trees with native species. Most of the institutions and/or their representative interviewed had done at least some of the activities that promote the conservation of the *Sagalla caecilian* and/or their habitat (Table 1). During the current habitat restoration programme over 10 000 seedlings have been planted in most of the schools and other institutions.

Table 1 Results of the conservation initiatives assessment of 14 institutions during the March 2012 survey

Initiative	Percentage (%)
Planting indigenous trees on communal/private lands	93
Replacing exotic plants (e.g., Eucalyptus, pine) with indigenous trees	57
Farm terracing and reinforcing with Napier grass or its equivalent, e.g., stone piles among others ways	86
Planting more banana plants as a source of food and control of surface runoff	43
Increased use of organic manure (cow-dug, compost, farm trash)	78
Not burning farm trash but letting it to decompose	93
Educating others on the presence and importance of the <i>Sagalla caecilian</i> in the environment	71

DISCUSSION

Over 95% of the preferred habitat for the *Sagalla Caecilian* is

on privately owned land and mostly valley floor farmlands. On *Sagalla Hill* caecilians have only been found in suitable sites within indigenous forest patches and farms, while none have been found in the exotic plantations of pine and eucalyptus

(Malonza, 2008; Malonza et al., 2010). The exotic plantation was established in 1956 and it is assumed that the caecilians (then not discovered) were there but disappeared due to habitat alteration. From past and current works it is clear that the Sagalla people are, and continue to be aware, of the Sagalla caecilian and the conservation initiatives. Respondents' age and level of education on knowledge of the species habitat requirements, importance, threats and conservation initiatives was found to be insignificant. Therefore, old people and those who have low education level (primary and below) have a lot of knowledge. This implies that knowledge about the species biology, importance, threats and conservation is independent of age and education level. This means that understanding this species only requires indigenous knowledge that can be passed from one generation to another by older experienced generation and not necessarily in school. Basically this means this knowledge is just not taught in schools and the only way people learn about the caecilian is through practical experience by specific educational endeavours since it is not included in the standard curriculum.

This survey shows that very few people purposely kill caecilians because of their resemblance to snakes, but no direct field observation was made of a farmer trying to kill a caecilian. The perception that anything resembling a snake in morphology and movement deserves to die is quite widespread across Kenya (Wojnowski & Malonza, 2010). The local people's preference and continued use of organic manure in farmlands is very encouraging and boosts all efforts for the conservation and protection of the Sagalla caecilian.

Planting and replacing exotic trees both on peoples land as well as on the government forest plantations is the ultimate solution to enhance this species survival., Eucalyptus trees in particular have been found to have negative impacts on the water table by depleting ground water causing the soil to dry up and become hard e.g. in India (Joshi & Palanisami, 2011) and in Ethiopia; (Tilashwork, 2009). The human population in Sagalla is relatively dense and continues to increase. The current work is focussed on replanting indigenous trees in areas owned by public institutions. Most of these institutions are located on high grounds susceptible to soil erosion and unsuitable for caecilians. This decreases the impact of this endeavour, and with the increased human activity within these institutions foot traffic contributes to soil compaction.

The most preferred microhabitats with high abundance of Sagalla caecilian are those on stream valleys (Malonza, 2008). Therefore habitat restoration through planting of indigenous trees in the general area increases the cumulative amount of microhabitats for the caecilian. On private farms the most preferred natural microhabitats are bases of remnant *Ficus* species (fig trees). This means increasing their density will immensely contribute in increasing the species preferred microhabitats. Some Sycamore fig trees, *Ficus sycamorus*, occurred on valleys on the low elevations in Sagalla. This and other fig tree species are known keystone fruit trees attracting a high number of birds and other animals (e.g., frugivores/insectivores). Droppings of birds and their fruits drop on the base increasing organic manure after decomposition. Fig trees

are fast growing, drought resistant, retain soil moisture, live long and increases soil fertility. In addition they do not inhibit crops growing underneath, thus allowing farmers to grow vegetables and other crops. Naturally one mature fig tree can occupy a big area creating a substantial microhabitat that can harbour a viable caecilian population. Traditionally the Sagalla people respect and protect fig trees and these trees also do not produce good fuel wood/charcoal hence left for beauty and/or to increase soil fertility. Therefore, one way for long-term conservation of the Sagalla caecilian lies in increasing the number of fig trees within the stream valleys. This should involve careful and systematic species selection depending on the elevation of a particular site. A small fence can be made around the young seedling to prevent destruction by livestock. Given that they are less preferred by livestock due to their milky sap and are fast growing, they will definitely get established within few years. Because farmers are aware of the importance of this species each can be encouraged to plant at least one seedling depending on the size of their farm.

The long-term success of the conservation of the Sagalla caecilian is through promoting activities that have tangible benefits to the local people and indirectly benefit the caecilians as well. Currently, many Sagalla people are aware of the presence of the Sagalla caecilian in their area. However, you can still find a number of people with little information about the species habits, threats and conservation of the caecilian and its preferred habitat. To make education and awareness campaign an ongoing process AO, A2, A3 and A4 laminated posters were distributed in all institutions including the village headmen through the area administrative chief.

ACKNOWLEDGEMENTS

Many thanks go to my colleague Joash O. Nyamache of Herpetology Section and Peter G. Kisombe from Sagalla for their assistant during the community education and awareness. Liverson Mwanyumba Manga of Wray Memorial Museum-Sagalla helped in supervising the planting of indigenous trees. David Wojnowski of Georgia State University, USA provided invaluable comments and correction in the final version of this manuscript and Benny Bytebier of University of KwaZulu Natal-South Africa on an earlier version. Many thanks go to Sagalla people for allowing me to take their time during interviews and volunteering to plant trees.

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APPENDIX 1 The questionnaires and the checklist used during the farmers and institution interviews

A Questionnaire I

Site details: **Date:**

1. Respondent gender: i) Male ii) Female
2. Your age group in years:
i) Less than 20 ii) 21-30 iii) 31-40 iv) 41- 60 v) over 60
3. Your education level:
i) Primary ii) Secondary iii) College/University iv) None
4. Do you know the Sagalla caecilian? Yes/No
5. If Yes! Are you aware of its new Ki-sagalla name (*Kilima-mrota* = burrowing and slender)? Yes/No
6. If No! Do you think the name denotes/or is suitable for the caecilian? Yes/No
7. If No! Are you willing to start using its new name over the general local name of *Mng'ori* which refers to both caecilians and earthworms for its identity? Yes/No
8. Do you normally kill these caecilians on sight? Yes/ No
9. If Yes/No! Why (Please specify)
10. Would you stop killing these caecilians if informed that they are harmless? Yes/ No
11. In which micro-habitats do you find caecilians? i) Everywhere under soil ii) others (Please specify)
12. Are you aware that they mostly prefer soils high in organic manure? Yes/ No
13. If Yes! Are you aware that this shows that they are good indicators of high soil fertility? Yes/No
14. Are you aware that organic manure (animal manure) is cheaper and lasts longer in soil than inorganic manure (fertilizers)? Yes/No
15. Are you aware about the water draining effects of eucalyptus trees? Yes/No
16. If you are informed that this caecilian occurs **only** in Sagalla and nowhere else in the world, would you be proud to protect it and its habitats for posterity? Yes/No
17. Would you prefer planting indigenous or exotic trees in your farm? Indigenous, exotic. Others (specify)
18. With this knowledge about the uniqueness and importance the Sagalla caecilian would you advocate to all Sagalla people for its continued protection? Yes/No

B Questionnaire II

Site details: **Date:**

1. Respondent gender: i) Male ii) Female
2. Your age group in years: i) less than 20 ii) 21-30 iii) 31-40 iv) 41-60 v) 51-60 vi) over 60
3. Your education level:
i) Primary ii) Secondary iii) College iv) University v) None
4. Do you know the Sagalla caecilian? Yes/No
5. If yes: How can you differentiate it from an earthworm/blind or worm snake? Are you aware of its new Ki-sagalla name "***Kilima-mrota***"? Yes/No
6. If yes! How did you come to know the name? i) School pupils/student ii) Another farmer/ neighbour iii) Baraza, iv) others (Please specify) Where (sites) and when (season) do you normally find caecilians
7. Name some importance of the Sagalla caecilian
8. What threats do you know that face the caecilians?
9. Name ways in which you can do to protect or conserve the Sagalla caecilian? What other information do you know about the Sagalla caecilian?

C The Checklist

Institution (Respondent): **Date:**

The following are some of the major activities that can be done to promote the conservation of the Sagalla caecilian and its habitat:

Which ones have you or your institution done?

1. Planting indigenous trees on communal/private lands.
2. Replacing exotic plants (e.g. Eucalyptus, pine) with indigenous trees.
3. Farm terracing and reinforcing with Napier grass or its equivalent, e.g. stone piles etc.
4. Planting more banana plants as a source of food and control of surface runoff.
5. Increased use of organic manure (cow-dug, compost, farm trash).
6. Not burning farm trash but letting it to decompose.
7. Educating others on the presence and importance of Sagalla caecilian in the environment.