Dambari Wildlife Trust

# REPORT ON THE FOURTH YEAR OF THE MATOBO BIODIVERSITY MONITORING PROJECT.

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Toshiba

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## Acknowledgements

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***Funding partners***

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**The Matobo Biodiversity Monitoring Team in 2015**

Field Education Officer Cedric Maforimbo ran the project with assistance from Curators, Curatorial and Technical Assistants from the Departments of Entomology and Ornithology in the Natural History Museum of Zimbabwe (NHMZ). This team comprised the following: Dorothy Madamba, Kudzai Mafuwe, George Malunga, Wallace Majaya, Kudzanai Dhliwayo, Boneface Magwizi (retired at the end of 2015) and Raphael Chahwanda (retired at the end of 2015). Museum staff assisted with bird and insect identification, as well as with demonstrations of the use of field equipment, specimen presentation and display techniques. We wish to express our thanks to Messrs Magwizi and Chahwanda, who were highly experienced and very knowledgeable, for their invaluable assistance on the programme since its inception and wish them happiness in their retirement. In a bid to build the capacity of Zimbabwe's future conservation professionals, we included on the team local university students who were carrying out their industrial attachment module at Dambari Wildlife Trust (Tatenda Muhloro, Lorraine Tokwe, Elson Macheka and Prince Gudoshava) and at NHMZ (Lydia Marimbe, Golden Mutema, Babongile Sibanda and Sibusisiwe Moyo) at various times of the year.

**Recruitment and Membership**

Recruitment of members into our conservation clubs, who are mostly form 3s (3rd year of secondary school) is done in the first term of school each year in January. The pupils are allowed to remain in the club up to the second term (July) of the following year when they are in form 4. Most members remain in the club into the next year, leaving only to prepare for their major Ordinary Level public examinations.

In 2015, 48% of pupils who opted to join the club at the beginning of the year remained regular members (attended at least 50% of club meetings), which was a drop from 2014 club regulars (58% of recruits). Although the number of children recruited and that became members has dropped (Fig. 1), close to 100 pupils across the five schools were regular club members and all but two contributed data to the project over the year.

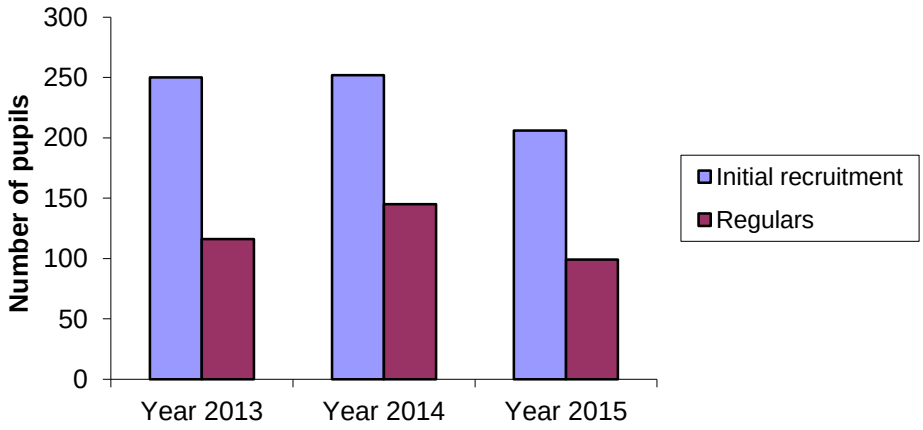


**Figure 1:** Trends in club membership from 2013 to 2015. Club registers were not kept in 2012.

**Thematic Data Collection**

In 2015, we continued with term themes, which have been in effect since the third term of 2012. Under this system, the biodiversity monitors are trained up in and conduct guided data collection of particular taxa in each school term. This allows for among-year comparisons of trends.

Following data collection, pupils are taught how to summarize and display information so that they learn the full suite of skills required for biodiversity monitoring. Botany and ornithology are the themes in the first two terms, whilst entomology is taught in the third term.

**Term 1 – Botany**

The biodiversity monitors were given an introductory lecture, with visual aids, on vegetation at the beginning of the term, and were introduced to the equipment and methods that are used to collecting scientific information on vegetation. Thereafter, at sites adjacent to their schools, they were given hands-on training in the use of the Point Centred Quarter Method, which is used to determine woody plant dominance and tree density. They conducted further transects independently. Data were analysed using Ecological Methodology (Krebs, 2002). Bazha Secondary School had the highest estimated woody plant density whilst Silozwe High School had the lowest (Table 1). Evidence of degraded rangeland at Matopo Mission was made obvious by the dominance of *Lantana camara* and *Dichrostachys cinerea* (Table 1). Due to timetable clashes it was not possible to take Tohwe Secondary pupils through the practical.

**Table 1:** Estimated woody plant density and two most common species at each school.

| School | Density ± standard error (trees/ha) | No. species | Dominant tree species |
|---|---|---|---|
| Bazha | 9683.3 ± 89.7 | 10 | *Pterocarpus rotundifolius* (41%); *Terminalia sericea* (23%) |
| Matopo | 427.5 ± 12.5 | 8 | *Lantana camara* (53%)*; Dichrostachys cinerea* (28%) |
| Silozwe | 259.4 ± 5.6 | 11 | *Terminalia sericea* (42%); *Lippia javanica* (13%) |
| Whitewater | 1493.2 ± 33.9 | 15 | *Terminalia sericea* (35%)*, Combretum molle* (16%) |

The biodiversity monitors also continued the herbarium project which commenced in 2013. The aims of this project are to avail information on the vegetation that are present in the areas around each school thus allowing species inventories to be drawn up. The biodiversity monitors collected the leaves, seeds, pods and bark of various trees and pressed them using plant presses which were donated by Dambari to each school. The collection is housed at Dambari Field Station pending expert identification.

**Photo 1:** Under the supervision of Field Officer Cedric Maforimbo, a biodiversity monitor at Tohwe Matobo Secondary School demonstrates the use of a quadrat.

**Photo 2:** Biodiversity monitors at Bazha Secondary School mount pressed plants onto herbarium sheets.

### Term 2 – Ornithology

After a Powerpoint presentation introducing the biodiversity monitors to avian ecology, we took the pupils on nature walks in and around their school properties with an emphasis on birds. During these walks, we taught the children how to use binoculars and gave pointers on how to identify a range of common birds. We also conducted a nature walk in the third term to look for migrant bird species that typically arrive in Zimbabwe after September.

**Photo 3:** Retired NHMZ Ornithology Curatorial Assistant Boneface Magwizi speaks to biodiversity monitors at Silozwe High School about birds as they watch them through binoculars.

In 2015, we continued the multi-year populations survey which we commenced in 2013 of the eight species of threatened, invasive, or culturally significant birds. This was done with the aid of sighting charts which the biodiversity monitors shaded.

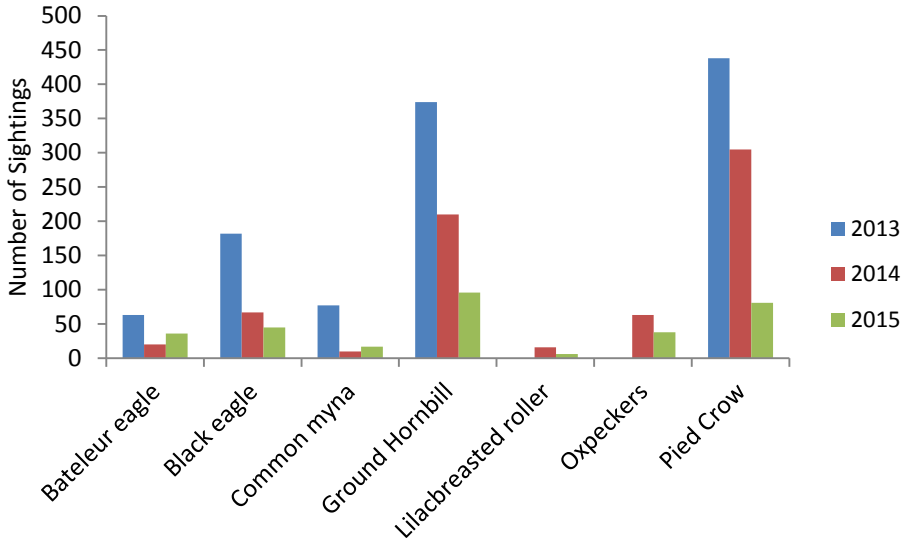


**Figure 2:** Recorded sightings of selected birds through the years.

The number of records of birds of interest has declined since 2013 (Fig. 2), but this is not necessarily a reflection of reduced abundance of these birds. Children duplicated records in 2013, and recorded the number of individuals per group rather than a group of birds constituting a single sighting. More rigorous recording has been implemented since then. Sampling effort should also be taken into account in order to compare trends among years; this is an issue that we will try to address in 2016.

### Term 3 – Entomology

Since 2012, pitfall traps have been set at the schools every wet season in order to monitor species and population trends of terrestrial invertebrates. Dambari has carried out the project in partnership with NHMZ, and specimens are added to the NHMZ collections.

Following an introductory talk to the biodiversity monitors on the biology and importance of insects, we provided the biodiversity monitors at each school with a 'look and learn' in setting one pitfall trap, and thereafter, gave them the opportunity to set the remainder of the ten traps. The traps are maintained over the wet season (term times only), with club members checking traps regularly and transferring specimens to collection jars. The collected insects are identified and accessioned by Entomology staff at the NHMZ.

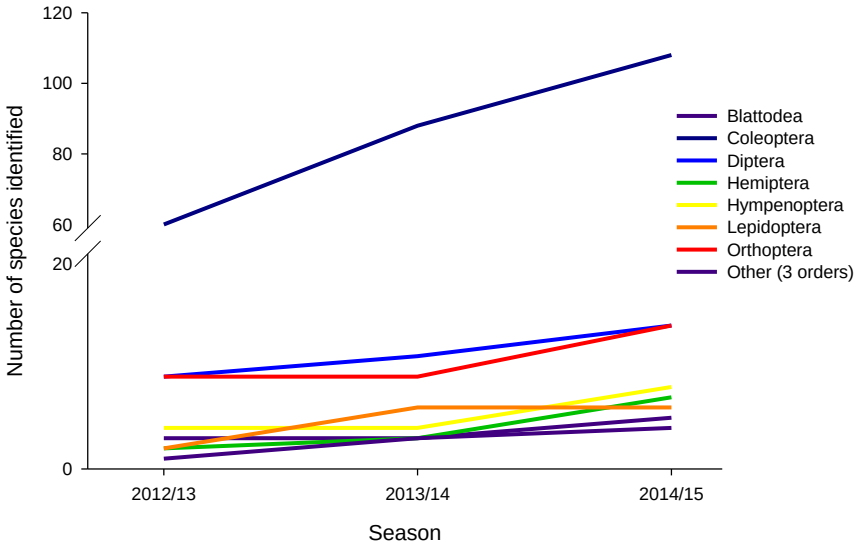


**Figure 3:** Cumulative number of species identified from pitfall traps since the 2012/13 wet season.

A steady increase in the number of species identified is evident (Fig. 3). Unsurprisingly for terrestrial traps, beetles (Coleoptera) were the most speciose group. Preservation challenges, particularly in 2013/14 and 2014/15 resulted in the loss of some soft-bodied specimens. Revised protocols have been introduced to reduce the wastage of specimens.

**Photo 4:** Biodiversity monitors at Tohwe Matobo Secondary School set pitfall traps under the guidance of NHMZ Entomology Technical Assistant Wallace Majaya.

With the assistance of Raphael Chahwanda, a Technical Assistant in the Department of Entomology and insect traps kindly provided by NHMZ, we demonstrated the utility of various insect traps that are used in research. These included malaise traps, bait traps, sweep nets and beating trays.

### Ad-Hoc Recordings

Throughout the year, the biodiversity monitors recorded their sightings of birds, insects and mammals on an *ad hoc* basis, that is, en-route to and from school, on errands between villages and whilst cultivating or harvesting in the fields. This was done on simple data sheets which we issued. Whilst the number of observations fluctuated among years, since 2013 there has been a four-fold increase in the number of children that contributed sightings (Fig. 4). This corresponds closely with the provision of animal identification cards and the increase in the number of organisms recorded (Fig. 4), indicating that active, unguided participation is dependent on

children's ability to name what they encounter. The most dramatic increases in species accumulation are for birds and invertebrates, for which identification cards were provided in 2014 and 2015.

**Photo 5**: Biodiversity monitors at Whitewater High School assist NHMZ Entomology Technical Assistant Raphael Chahwanda to erect a malaise trap in preparation for a demonstration on how it operates.

**Photo 6:** A biodiversity monitor at Bazha Secondary School demonstrates the use of a sweep net to catch flying insects.

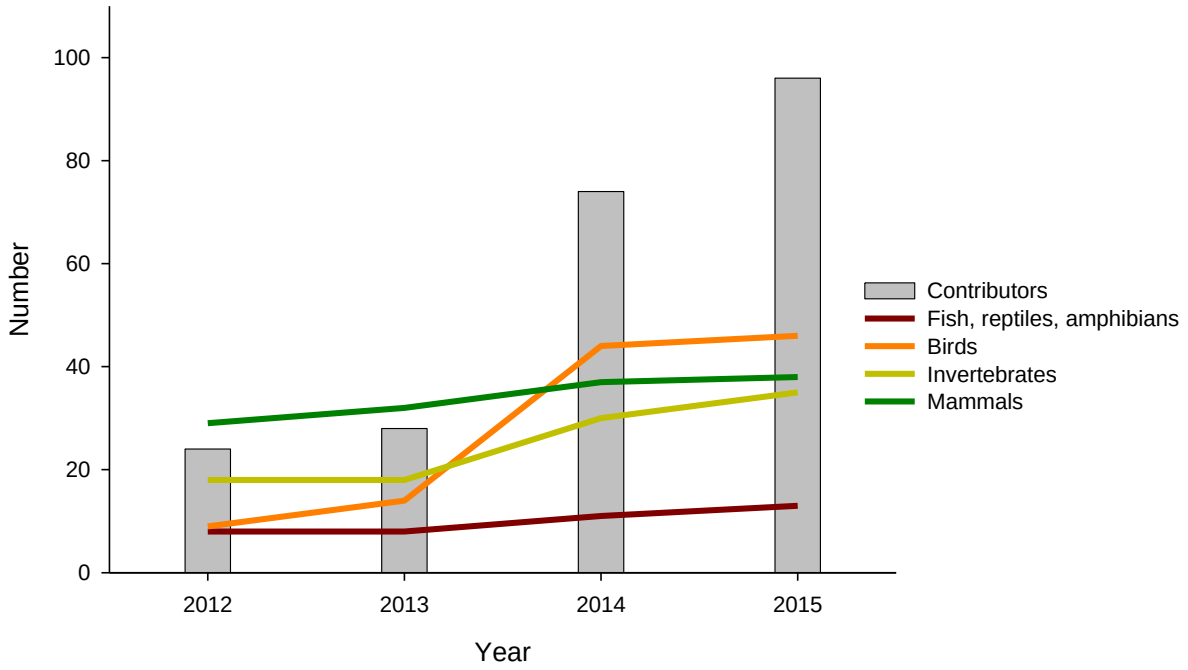


**Figure 4:** Number of members that contributed ad hoc sightings of wildlife (bars) and the cumulative number of species of major groups recorded on datasheets since 2012 (lines).

### Learning Aids and Awareness Materials

Various environmental awareness materials were made available to biodiversity monitors, their teachers and communities in which the schools are located. These materials were either produced in-house or donated to Dambari by other organisations and individuals.

### Awareness Posters

Three environmentally themed posters, one in each school term, were produced and made available for display at the schools during the year. These posters were produced either in

celebration of world commemoration days or for the promotion of environmentally-friendly practices. The commemoration days were Africa Environment Day (3 March) and the International Day for the Eradication of Poverty (17 October) in the first and third term. In the second term, the poster highlighted the various methods which the pupils and communities can employ to make their school yards and domestic gardens bird-friendly, which would be beneficial for their ecosystem and at the same time enable them to observe and thus learn about birds at the same time.


**Photo 7:** Poster commemorating Africa Environment Day and Wangari Maathai Day**.**

### Species Identification Cards and Biodiversity Monitoring Methods Handbook

Each term we produced double-sided, pocket-sized identification cards which highlighted species of the group that we focused on in that term. These cards bore a photograph of the species, written information on its key identification features, size, habitat, feeding ecology and breeding habits. Over the year, pocket cards for 24 plants, 24 birds, 12 invertebrates and 12 frogs were produced. We also produced a child-friendly reference handbook which detailed ecological research methods and equipment.


**Photo 8:** Methods of attracting birds to yards and gardens were highlighted on the second term poster.

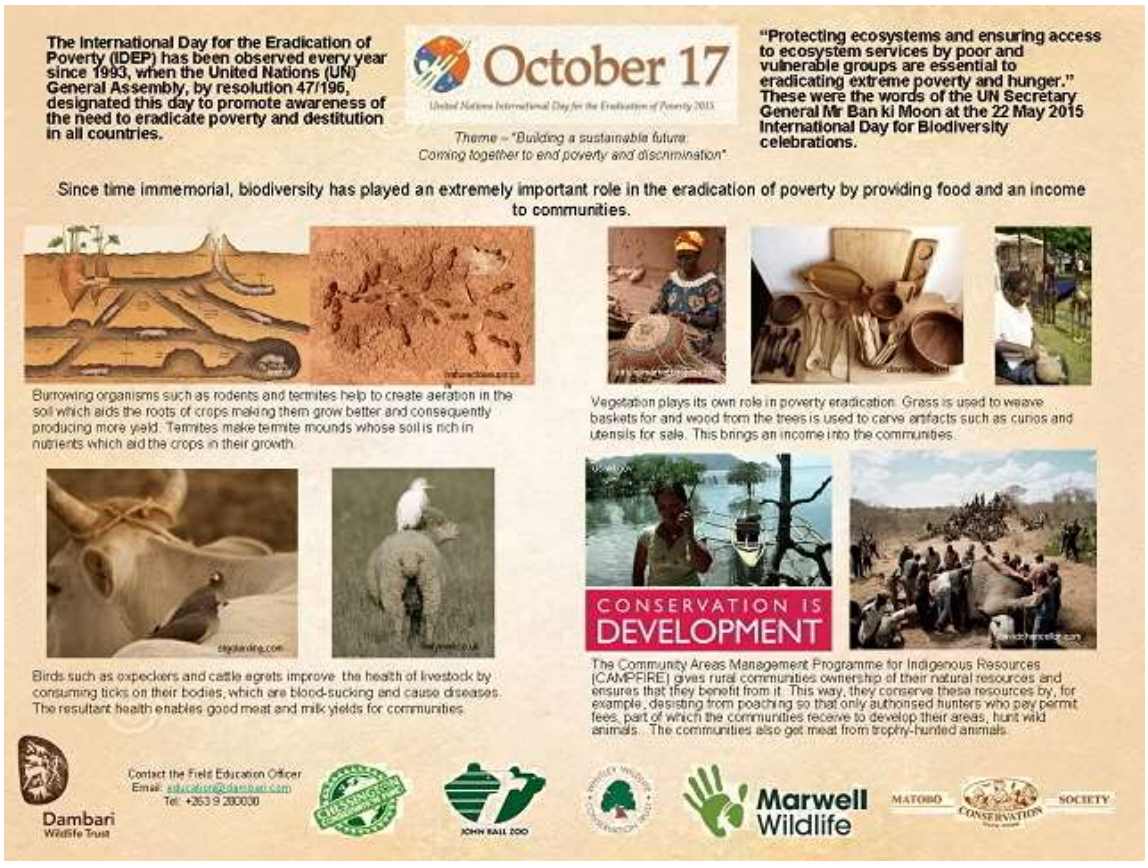


**Photo 9:** The role of biodiversity in alleviating poverty was featured on the third term poster.

**Newsletters and artistic contributions**

In order to keep stakeholders, sponsors, authorities and interested parties aware of our activities, we produced a newsletter every term detailing the activities of the term. In addition, we included natural resource inspired poems, drawings and stories by the biodiversity monitors in a bid to provide them with a platform to express themselves and showcase their literary and artistic abilities, as a medium of sharing ideas between the different communities and to keep up enthusiasm. The following are excerpts from the newsletters:

**Photo 10:** MBMP Field Officer teaches biodiversity monitors at Matopo High School a concept using the Biodiversity Monitoring Methods Handbook which was produced in-house at Dambari.

**Our Land and Our Vegetation**

Our land is our prosperity
Our land is the life of the majority
As we have the authority
Let us protect it like our property

Those of us who live in rural areas
I kindly encourage you to avoid deforestation
Deforestation without afforestation
Deforestate and afforestate

Let us unite and become one
Make use of our land, build dams
Not allow soil erosion and gulley formation
We as Dambari pupils will take the lead
It is my duty, your duty, our duty to take the lead

By Thubelihle Tshuma, Whitewater High School

**Conservation**

It is everyone's duty
Conservation is like hospitality
To our flora and fauna
We should conserve our resources
Animals do not burn human habitats
So why should we burn theirs
Conservation is important

Historically, conservation is like
The strong regiments of Tshaka
Who worked hard to defend the state

Everyone arise
And let's defend our flora and fauna
If they could talk, they would warn us
Let's work together and defend our environment
Like the strong army of Tshaka!

By Tinashe Mututwa, Silozwe High School

**Photo 11**: African Pygmy Kingfisher by Gabriella L. Makandidze of Matopo Mission High School.


**Photo 12**: Cobra by Thabani B. Ngwenya of Bazha Secondary School.

**Biodiversity Games and DVDs**

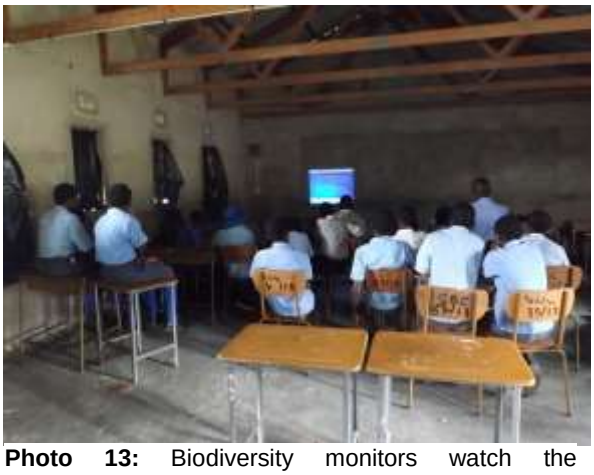

**Photo 13:** Biodiversity monitors watch the documentary *Queen of Trees* beamed on a wall.

It is well known that children learn best when information is conveyed during an enjoyable activity. Resultantly, we gave the children the opportunity to play environmentally themed board games which rendered to the biodiversity monitors important lessons on human practices and natural events that either promote or endanger bird and insect welfare. These games were "Cranes in Crisis" (developed by Helene Marshall of the Southern African Crane Foundation) and "It's a Bug's Life" (developed by Roberta Griffiths and Anne Westoby). Both are board games that are played with a die and counters, with the winner being the player whose counter reaches the final spot first. Winners received Dambari branded parker pens with environmental messages as prizes.

On the last schools' visit of the year, we screened the documentary *Queen of Trees* for the biodiversity monitors, which showcased the symbiotic relationship between fig trees and fig wasps as well as other important roles of fig trees in the ecosystem. The documentary also highlighted important aspects of the food web and food chains.

**Trip to Matopos National Park**

The majority of pupils in our participating schools have never been in the Rhodes Matopos National Park for recreational purposes, despite living within a 10 km radius of the Park boundary. We therefore put up a fundraising campaign on crowd funding site Indiegogo and sent appeals to our project partners, stakeholders and individuals who are interested in our work to assist us with funds to take the biodiversity monitors from all the participating schools into the national park to see the fauna and flora. This would also afford the pupils from the different schools an opportunity to meet, share ideas and experiences as well as network. We received an overwhelming response from organisations and individuals across the globe, and managed to secure adequate funds to cover the full cost of transport, park entry fees and a light lunch for 80 pupils, 10 teachers, guest speakers and drivers. The Dambari Team would like to sincerely thank all the contributors. Unfortunately, the Ministry of Primary and Secondary Education faced some challenges in processing our application to conduct the trip and needed more time. Consequently, the trip was postponed to March of 2016 when first term activities are drawing to a close.

**Club Promotion**

Four of our five participating schools held their Speech and Prize-Giving Ceremonies in September and October. At each event, the schools kindly gave us a slot on their programmes, in which we expressed our gratitude to the schools and the patrons of each conservation club for their support of our programme by presenting framed certificates of participation and appreciation respectively. We also endorsed Bazha Secondary School and their conservation club patron, Mrs L. Ndlovu (née Mlala) as the most participative school and patron in our programme. We sponsored prizes for the two Most Committed outgoing Conservation Club Members at each school and these were received by the following: Admire Tshalibe and Ndumiso Mhlanga (Bazha Secondary School), Mlungisi Ndlovu and Solani Dube (Silozwe High School), Prince Tshuma

and Solomon Ncube (Whitewater High School), Ndabenhle J. Ncube and Khaliphani Ncube (Tohwe Matobo Secondary School) and Sindiso Kanhukamwe (Matopo High School). We also donated refreshments to each school as a contribution to the day's celebrations. After each event, we set up a stall which displayed community awareness posters and spoke to parents and pupils who came to enquire about the clubs.

**Photo 14:** Sindiso Kanhukamwe receives her prize for being the most committed conservation club member at Matopo High School.

**Photo 15:** Mr A. Tshuma, headmaster of Bazha Secondary School receives a framed certificate from Field Officer Cedric Maforimbo in recognition of the school's outstanding commitment to the club.

**Project Evaluation**

Tracking the effectiveness of any programme is essential, as this enables positive adjustments to be made to the programme thus maximising its effectiveness. We achieve this by administering anonymous pre- and post- training questionnaires to the pupils each year. These questionnaires contain questions that seek to gauge changes in their knowledge and attitude towards natural resources throughout the programme. In 2015, we administered the post-training questionnaire to the cohort that had been recruited in 2014, and were able to compare the results of this with their pre-training questionnaire.

Substantial gains have been made since the project's inception. For example, the proportion of new recruits able to define "conservation" in a meaningful manner is typically low (5-16%); on leaving the clubs the following year, and without actively reinforcing terminology, a significant increase was demonstrated (Fig. 5). This increase was most marked for the 2014 cohort, which recorded a 12-fold increase in knowledge (Fig. 5). Members of the 2015 cohort are still members of the club and will be tested in the second term of 2016 when they leave.

Notable improvements in children's sense of ownership of and responsibility for their natural resources were also recorded. When asked who they believed was responsible for protecting natural resources in their communities (between communities or authorities such as the Government and the National Parks and Wildlife Management Authority), there was an increase in the proportion of children who felt that the responsibility lay with the local community in the 2012 and 2014 cohorts (Fig. 6). Again, the greatest increase was noted for the 2014 cohort (Fig. 6).

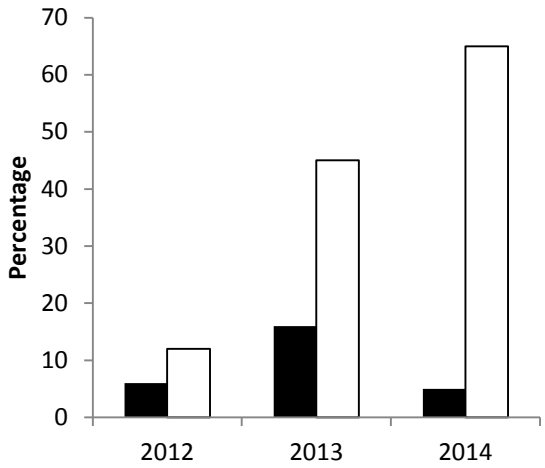


**Figure 5**: Changes in club members' knowledge of the definition of the word "conservation" from the time of recruitment (black bars) to leaving the club (clear bars).

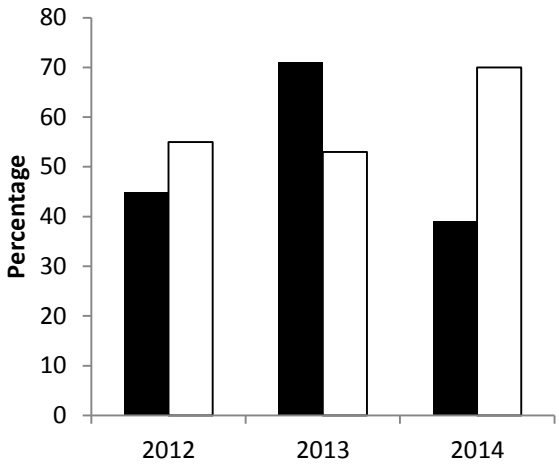


**Figure 6:** Percentage of children at recruitment (black bars) and on leaving the club (clear bars) who believed the local community should be responsible for conservation as opposed to any authority.

## Conservation Club Workshops

We conducted two workshops with the biodiversity monitors in the second term. The first was on biological classification of organisms whilst the second was a scavenger hunt which culminated in an interactive lesson on the adaptions of various organisms for survival.

**Photo 17:** Biodiversity monitors spread out as they forage for insects to identify and classify biologically.

**Photo 16:** A biodiversity records what makes an insect an insect.

## National Mushroom Survey of Zimbabwe

Local mycologist, Cathy Sharp, is conducting a nationwide survey of children's mushroom knowledge. This involves asking children to draw and annotate what they understand by the word "mushroom". In the third term, we took Cathy to our participating schools and their primary schools to collect data for the Matobo leg of her survey. The pupils drew the mushrooms that they know and thereafter she gave each class a talk on identification of edible and inedible mushrooms, with the aid of

**Photo 18:** Mycologist Cathy Sharp teaches pupils at Silozwe High School how to distinguish between edible and toxic mushrooms.

posters which she left at each school. She also donated two volumes of her mushroom field guides.

**Southern African Rufford Foundation Conference, South Africa**

On the 17th of April 2015, Field Officer Cedric Maforimbo gave a presentation on the Matobo Biodiversity Monitoring Programme at the two-day Southern African Rufford Foundation Conference which was held at the South African National Biodiversity Institute (SANBI) in Kirstenbosch, Cape Town, South Africa. The talk featured the activities, successes and challenges of the programme thus far. Marwell Wildlife UK kindly sponsored the trip. A presentation on the project was also made at the Reach a Young Soul (RAYS) Trust Symposium which was held at the Natural History Museum on the 26th of February 2015 and at a Museum Conservation Club meeting on the 27th of February 2015 for primary school children.

**Tropical Biology Association Field Course, Tanzania**

On the 26th of June to the 26th of July 2015, Field Officer Cedric Maforimbo attended a Field Course in Tropical Ecology and Conservation which was run by the Tropical Biology Association at Amani Nature Reserve in Tanzania. The course covered current concepts and techniques in ecology, conservation biology, experimental design and sampling methods which were delivered through a series of lectures and seminars. This training has proven useful in the running of this education programme.

**Appendix 1: Organisms recorded on data sheets by biodiversity monitors between 2012 and 2015, arranged alphabetically by group.**

| | | | |
|---|---|---|---|
| **Amphibians** | **Fish** | | |
| Frog | Unspecified | | |
| Tadpole | | | |
| | | | |
| **Birds** | | | |
| Barbet, crested | Falcon (unspecified) | Owl (unspecified) | Starling, red-winged |
| Bishop, red | Go-away bird, grey | Oxpecker (unspecified) | Starling, violet-backed |
| Bulbul, dark-capped | Guineafowl, helmeted | Quelea, red-billed | Stork, white |
| Egret, cattle | Hamerkop | Raven, white-necked | Sunbird (unspecified) |
| Chat, boulder | Hawk (unspecified) | Roller, lilacbreasted | Swallow, barn |
| Crow, pied | Heron, grey | Secretarybird | Vulture (unspecified) |
| Dove (unspecified) | Hornbill, ground | Shrike, magpie | Waxbill (unspecified) |
| Duck (unspecified) | Hornbill, yellow-billed | Spurfowl, Natal | Waxbill, blue |
| Eagle (unspecified) | Kingfisher (unspecified) | Sparrow (unspecified) | Woodpecker (unspecified) |
| Eagle, African Fish | Mousebird, red-faced | Sparrow, house | |
| Eagle, bateleur | Myna, common | Spurfowl, Swainson's | |
| Eagle, Verreaux's | Ostrich | Starling, Cape glossy | |
| | | | |
| **Insects** | | | |
| Ant | Butterfly | Fly, maggot (blowfly) | Moth |
| Antlion | Cockroach | Grasshopper | Praying mantis |
| Aphid | Cricket | Hornet | Stalk borer |
| Bee | Dragonfly | Ladybird | Termite |
| Bee, mopane | Dung beetle | Locust | Termite (alate) |
| Beetle | Fly, horse | Mealie bug | Termite, harvester |
| Bug | Fly, house | Mosquito | Wasp |
| | | | |
| **Other invertebrates** | | | |

| | | | |
|---|---|---|---|
| Centipede | Scorpion | Snail | Crab |
| Millipede | Spider | Tick | |
| | | | |
| **Mammals** | | | |
| Baboon, chacma | Giraffe | Mongoose, banded | Sable |
| Badger, honey | Hare, scrub | Mongoose, slender | Springhare |
| Bat, unspecified | Hedgehog | Monkey, vervet | Squirrel, bush |
| Bushbuck | Hippopotamus[2] | Mouse, unspecified | Steenbok |
| Bushpig | Hyena (unspecified) | Pangolin | Warthog |
| Cat, African wild | Impala | Porcupine, African | Waterbuck |
| Cheetah[1] | Jackal (unspecified) | Rabbit, red rock | Wildebeest, blue |
| Dassie, unspecified | Klipspringer | Rat, unspecified | Zebra, plains[2] |
| Dog, wild[1] | Kudu, greater | Rhino, black[2] | |
| Duiker, common | Leopard | Rhino, white[2] | |
| | | | |
| **Reptiles** | | | |
| Chameleon, flap-necked | Agama, blue-headed | Monitor, water | Tortoise (unspecified) |
| Cobra, unspecified | Lizard (unspecified) | Puffadder | |
| Crocodile, Nile | Mamba, black | Python, African rock | |

[1] Possible (but unlikely) records that were not verified.

[2] Recorded in the National Park.