Darwin Initiative Main and Post Project Annual Report

To be completed with reference to the "Writing a Darwin Report" guidance: (http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Submission Deadline: 30th April 2019

Darwin Project Information

Project reference	24030
Project title	Controlling an invasive aquatic plant for improved biodiversity and livelihoods
Host country/ies	Zambia
Lead organisation	BirdLife International
Partner institution(s)	BirdWatch Zambia (BWZ); Centre of Agriculture and Bioscience Information (CABI); Zambia Environmental Management Agency (ZEMA)
Darwin grant value	£299,016
Start/end dates of project	1 July 2017 to 31 March 2021
Reporting period (e.g., Apr 2018 – Mar 2019) and number (e.g., Annual Report 1, 2, 3)	Apr 2018 – Mar 2019, Annual Report 2
Project Leader name	Paul Kariuki Ndang'ang'a
Project website/blog/Twitter	https://www.birdwatchzambia.org/darwin-project/
Report author(s) and date	Chaona Phiri, Clara Nanja, Paul Kariuki Ndang'ang'a

1. Project rationale

This project seeks to control the aquatic alien invasive Kariba weed (*Salvinia molesta*), a free-floating fern. The control is by introducing a host-specific weevil *Cyrtobagous salviniae*, also known as Salvinia beetle, a natural enemy to the weed. The weevil's damage causes the plants to turn brown and eventually sink and rot. This process has not been documented to reduce dissolved oxygen in water due to the slow and gradual rate at which it happens. This is expected to improve habitat conditions for waterbirds and other biodiversity. Fish stocks are also expected to increase thereby improving livelihoods of >2,500 fishermen households that are dependent on the swamp.

The Lukanga Swamp is located approximately 50 km west of the city of Kabwe, in the Central Province of Zambia. It is recognised as an Important Bird and Biodiversity Area (IBA) and Ramsar site covering approximately 3300 km². This swamp has been infested by the invasive Kariba weed (*Salvinia molesta*) which currently covers about 2000 km² (>60% surface area) of the site. Because this weed forms a thick mat on water, it has led to reduced fish catch as most of the fish has moved further into the swamps, to areas not infested by the Kariba weed. This has led fishermen to use more effort and, in some cases, use incorrect fishing gear such as mosquito nets and poisons to catch more fish. This weed has led to a reduction of both sunlight and oxygen underneath which ultimately may lead to reduced fish and other aquatic life.

This biological control method has previously been successfully used in Zambia to control the Kariba weed on Lake Kariba by the Zambia Electricity Supply Corporation (ZESCO), Kafue Fisheries – one of Zambia's fisheries along the Kafue river and at a privately-owned lodge in Chilanga, 30km from Lusaka. All the biological attempts using this agent have been a success with latter being the latest place at which total control has been achieved as neither the weed nor the weevil are currently present.

2. Project partnerships

- BirdLife International, the lead organisation, is working in collaboration with BirdWatch Zambia (BWZ) - the BirdLife Partner in Zambia, Centre for Agriculture and Biosciences International (CABI) through their partnership with the Zambia Agriculture and Research Institute (ZARI), Zambia Environmental Management Agency (ZEMA), and the Ministry of Fisheries and Livestock through the Department of Fisheries (DoF). BirdLife International, through its Africa Partnership Secretariat, has been overseeing the overall management of this project, providing technical guidance project implementation and monitoring the impacts of project activities from project inception. BirdLife has also been providing training and support to BWZ in financial management for the project.
- BWZ is the implementing organisation whose role is to work closely with the Meembe local Site Support and farmers Group (SSG), CABI, ZEMA, ZARI, DoF, BirdLife and other relevant stakeholders on the proposed activities at the site. BWZ is responsible for all project planning and implementation activities on the ground.
- CABI is one of the leading global experts in the use of biological control to manage pest invasions. CABI's most recent commitment to the project has been the purchase of the weevils from a rearing plant in Durban, South Africa. These were imported to kick start the weevil introduction into the Lukanga swamp and the mass rearing ponds. CABI has also been offering backstopping on project activities.
- Although ZARI is not listed as a formal partner, the institution is the local authority providing technical backstopping to our project. ZARI provided *Cyrtobagous salviniae* import permits as well as the Pest Risk Assessment that were used during negotiations with ZEMA to downscale the Environmental Impact Assessment (EIA) to an Environmental Project Brief (EPB). Additionally, the ZARI staff member attached to the project has been accompanying the team on weevil management training and monitoring activities.
- The Department of Fisheries is mandated with overseeing the implementation of national fisheries programmes such as monitoring of fish stocks in various waterbodies. On this project, they are responsible for providing backstopping and are fully involved with weevil monitoring activities. Additionally, this year, they have also played in huge role in supervising the construction of weevil-rearing ponds. ZEMA, the environmental regulations agency was responsible for ensuring that all environmental requirements are met before approval of the biological control activities. These involved reviewing reports and conducting a site inspection prior to authorising the introduction of the biological control agent into the Lukanga swamp.

  All of the project partners have offered valuable technical guidance from their experiences with biocontrol processes, project planning and involvement with project activities. All of them, except BirdLife represented nationally by BWZ its partner, are based in the host country and this has greatly enhanced inter-organisational relationships.

3. Project progress

3.1 Progress in carrying out project Activities

Output 1: Environmental Impact and Risk Assessment guiding mitigation measures for biologically controlling *Salvinia molesta*.

A consultant hired by BWZ conducted assessments on fauna and flora, hydro-geological features, socio-economic aspects as well as cultural/belief analysis of the Lukanga Swamp area. The consolidated report was then submitted to BWZ for review after which the document was

submitted to the Zambia Environmental Management Agency (ZEMA). Prior to decision making, ZEMA consulted relevant and affected stakeholders to give their views regarding the then proposed biocontrol intervention on *Salvinia molesta* in the Lukanga swamp. ZEMA also conducted a site inspection to verify location of site, assess the extent of *Salvinia molesta* in the swamp and other likely effects that the weevil may cause. (ZEMA reviewed the submitted Environmental Project Brief (EPB) based on the information provided by BWZ through the consultant. The review result was an approval in July 2018 for BWZ to go ahead with the proposed biocontrol activities.

Output 2: Fishing community members have increased the capacity and interest to participate in Salvinia control.

Prior to the biocontrol approval by ZEMA, awareness talks were conducted only at a small scale to specific groups, particularly traditional leaders and strategic community members. After the approval, the team scaled up on the awareness talks in and around the project site. These talks have been centred around good weevil management practices including Dos and Don'ts such as desisting from: plastic pollution, burning inside the swamp, taking *Salvinia molesta* out of the swamp, chemical use and the use of incorrect fishing gear. The community is encouraged to keep up with good fishing techniques/gear, stick to existing canals when navigating around the swamp and to leave the Salvinia in the Swamp.

These are an on-going undertaking and targets fishermen, traders, shop owners, school pupils in and round the swamp, in the schools, at the clinic and market places. We have also continued to provide detailed project updates to the local traditional leadership and liaise with them on increasing the catchment for these awareness raising talks.

About 10 meetings have been held with the 3 different communities around the project area, 2 with the school in Waya, 4 at the harbour in Waya, 1 at the fisheries office in Waya, 2 at the council office in Chilwa and another at the chief's palace in Chiyuni. Most of these talks have been conducted with a bias towards the community in Waya because it is the location where the weevils have so far been released at 11 points in the swamp as well as 2 mass rearing ponds constructed and filled with weevil-infested Salvinia. The meeting at the chief's palace in Chiyuni was to officially introduce BWZ and the project and get buy-in into the project activities scheduled to begin soon in this area. These meetings were attended by a total of 386 males and 135 females making a total of 521 individuals.

Output 3: *Salvinia molesta* control in Lukanga Swamp improves habitat for wetland biodiversity including increased fish stock leading to increased food security for fishing community households.

Once approval was received from ZEMA for the biocontrol to start, BWZ imported 2,200 weevils from Edgecombe mass rearing facility in Durban, South Africa. Of these, 2100 weevils were released at 11 points in the swamp closest to Waya harbour while 100 weevils where retained for breeding in troughs prior to the mass-rearing in the ponds at Waya and the troughs in Chilwa. The weevils introduced in these mass rearing facilities where collected from the initial troughs at the BWZ office. A small population is still being mass reared in the troughs at the BWZ office. The black adult weevils are small (about 2mm long) and can live for several months but the total life cycle, dependent on temperature, is completed in 31-68 days. Young larvae feed on the buds (growth tips) and roots while older larvae tunnel into the rhizomes causing leaves to darken and drop off. Adult feeding damages the growth tips and young leaves. Damaged plants become waterlogged and sink. The presence of damaged growth tips is the most characteristic indicator of the presence of the weevils. Depending on climate and extent of Salvinia infestation, mats sink within 1-3 years. The decision to import the weevils was made after visiting the previously identified source for weevil collection within Zambia (Kafue fisheries) and discovering that this site had a total complete control of the *Salvinia molesta* that resulted in starvation and death of the weevils.

Two concrete mass rearing ponds have been constructed at Waya and filled with weevil-infested Salvinia. These are mass rearing ponds from which weevils for introduction into new points on the swamp will be collected. The two ponds are 5 x 8 x 1.5m and 5x3 x1m respectively.

All of the weevil release points, mass-rearing concrete ponds and troughs have been undergoing scheduled monitoring to assess weevil performance (monitoring data form attached in annex 4).

This monitoring assesses various parameters, including observed browning of the weeds from weevil damage on the Salvinia leaves, 'gunshot' holes on Salvinia leaves and the extent of spread of the weevils from initial point of introduction.
A post baseline survey prior to weevil introduction was undertaken. This was to assess the level of infestation six months after the baseline survey was conducted. At the same time, the fish Catch Per Unit of Effort (CPUE) was measured using a weighing balance, but only covering 47% of the salvinia un-infested part of the swamp and during which only a few fishermen were encountered. The infested areas were difficult to access and had no fishermen on site who could provide any relevant details. This is evidence that most fishermen have moved to the un-infested sites to increase their catches. The results indicated an average CPUE of 0.76/hr as project baseline figure. However, a more detailed fish catch assessment led by the Department of Fisheries, to cover the entire 3300km² of the swamp is scheduled for September/October 2019. It is only from this assessment that a true indication of CPUE will be obtained.
Two weevil management training sessions have been done in Chilwa and Waya. A total of 7 weevil monitors have been trained so far. These are responsible for monitoring the weevils in the troughs, ponds and in the swamp as well as giving onsite information of weevil performance or any related information in the absence of the BWZ staff.

Output 4: Project partners maintain and build on the outcome of the project and promote biological control of alien invasive species in areas under aquaculture across Zambia for livelihood improvement and biodiversity conservation.

Two Project Steering Committee (PSC) meetings have been held in the second and third quarter of the year (see PSC ToRs and minutes in Annex). There have been additions to the PSC membership: the Provincial Fisheries Officer for Central province and a representative from the International Crane Foundation (ICF), bringing the PSC membership to 7. These meetings have been conducted to share project progress, success, failures and lessons learnt. They have also provided a platform for collective feedback, strategic guidance and exploring means of mainstreaming the project into operations of various government and non-government institutions.

The project team visited one national higher learning institution (Rusangu University) to conduct awareness raising talks with the natural resources students. The talks focussed on the diversity and impact of invasive species in Zambia as well as the methods used to control invasive species. The team further shared their experience with the previously attempted manual control and the current biocontrol project activities on *Salvinia molesta.*

Output 5: Project management, impact monitoring and evaluation structures and processes ensure that the project objectives are achieved on schedule and within budget

Three monitoring visits have been conducted to assess weevil performance. This has ensured that data on project impact is collected, documented and analysed. Additionally. These monitoring exercises have influenced decision making regards activity schedules and next steps. Project budget monitoring has been ongoing with the guidance from BirdLife finance team. These have been aided by strategies including making projections for quarterly and yearly activities versus expected expenditure.
The BirdLife team had a supervision visit on BWZ team to conduct a financial training and provide technical support. Within the visit was a scheduled PSC meeting at which the project progress, failures and lessons learnt where shared. It was at this meeting that the PSC TORs where adopted and the M &E Framework formulated. These give guidelines of the responsibilities of the committee and outlines the project outputs and outcomes and stipulates who is responsible for conducting these activities respectively. The PSC members, BirdLife team and the BWZ team visited the project site to assess the situation after the introduction of the biological agents. The observation was that the high level of infestation needs a large number of weevils to control it in a shorter period of time. The project team plans to import two more consignment during the next reporting period. Although we hope to cover costs for this from the 'Operating costs' budget line, we are not completely confident that this would be enough. No delays are foreseen in obtaining import permits since the EPB allowing the process was already approved and BWZ is now conversant with the process.

3.2 Progress towards project Outputs

Output 1: Activities for the biological control of Salvinia have been approved by ZEMA following a review of all of documents submitted for the completion of the EPB process

Output 2: The fishing community at Lukanga Swamp have been made aware of the project and the good weevil management practices, including the 'dos' and 'don't's' for successful biological control of the Salvinia. Attendance and participation in awareness raising meetings has been overwhelming resulting in directly reaching 521 individuals, including fishermen, traders, shop owners and pupils so far. Seven fisheries officers and 11 community members have been trained as weevil monitors have also been trained so far. Community participation has highly been exhibited especially during the pond construction phase. The community has also been heavily involved in monitoring activities. These awareness and training efforts will continue.
A total of 7 fisheries officers and 11 community members have been trained on weevil management practice which include weevil and leaf 'gunshot' identification as well as monitoring.

Output 3: Upon approval by ZEMA the biocontrol process of *Salvinia molesta* was started with the importation of 2,200 weevils and their introduction at 11 points in the Lukanga Swamp and mass rearing facilities (two ponds in Waya and 4 troughs). Evidence from the weevil 'gunshot' holes on the Salvinia leaves on the swamp is now showing at an average radius of about 9m from each of the 11 points of release. It is hoped that as the Salvinia is cleared over larger areas, fish stocks for the fishing community will improve as will be assessed by comparing future fish CPUE data against the baselines.

Output 4: Project partners including CABI, ZARI, Department of Fisheries, ICF, ZEMA, the CBD and Ramsar national focal points have extensively contributed to the progress attained so far by providing data and technical support and guidance. These partners who are also the core PSC members have had two PSC meetings in the third and fourth quarter.

Output 5: Project progress was monitored through PSC meetings, supervision visits by BirdLife staff, field visits by PSC members and regular field monitoring visits by the project team. Preliminary technical and financial reports were submitted by BWZ to BirdLife, reviewed and used as basis for advising project implementation. These have ensured that progress is monitored with reference to the logical framework as well as making sure that the project is on track. A half year report was submitted to Darwin Initiative in a timely manner.

3.3 Progress towards the project Outcome

Outcome: Biological control of Salvinia molesta in Lukanga Swamp enhances livelihoods and food security for 2,500 fishing households, and restores 2,000km² of suitable habitat for biodiversity and provision of ecosystems services

As of 30 March 2019,27km² had been cleared of Salvinia based on GIS calculation of area covered by the weevils, approximately 6 months post weevil introduction. The weevils were released at 11 points in the swamp within a 5km radius. The rate of spread of the weevils at each point is an average of 9m from the point of release. The control rate is expected to increase exponentially with an increase in the number of weevils which is highly dependent on temperature. In an effort to increase the number of weevils, we are considering importing two more consignments; based on the size of the swamp and the level of infestation. The initial plan was to import 5,000 weevils, however, Zambian law does not allow the importation of more than 2,000 biological species in a single consignment, thus the need to follow-up with separate consignments. This will certainly increase reproduction rate of new weevils and ultimately reduce the weed control period. We plan to receive and introduce the first follow-up consignment in September 2019 and the second one in January 2020. A weighing balance was procured to measure fish Catch per Unit of Effort (CPUE). The June 2018 follow-up biodiversity assessment showed an average CPUE of 0.76kg/hr, though it didn't cover the entire swamp and only few fishermen were encountered. Comparative follow-up CPUE measurements will be conducted in June 2019, as well as during the fish catch assessment by the department of fisheries scheduled for 2020 and will help determine if fish stocks are increasing as a result of Salvina control and benefiting the local communities.

A submission from the Provincial fisheries official recommended using zooplankton and phytoplankton as indicators of water quality rather than solely relying on dissolved oxygen. These parameters will be measured in the biodiversity assessment scheduled for June/July and September/October 2019 as well as during the end of the project biodiversity assessment.

3.4 Monitoring of assumptions

Assumption 1: *Salvinia molesta* control in Lukanga Swamp improves habitat for wetland biodiversity including increased fish stock leading to increased food security for fishing community households.

Comments: The Salvinia control using *Cyrtobagous salviniae* started in October 2018. Weevil efficacy is already evident from the 'gunshot' holes noted only on the Salvinia leaves round the weevil release sites. At present, the weevils are present at 11 points within a 5km radius of the swamp translating into approximately 27km² of Salvinia cleared as of March 2019. Gunshots have been estimated to cover an average perimeter of at least 9m from each of the 11 weevil release points, Salvinia clearance is evident from the gunshots and the browning of the Salvinia caused by the weevils around the release sites. Since the June 2018 biodiversity assessment, the next biodiversity assessment is scheduled for June/July and September/October 2019. This will assess the quality of habitat around the swamp using a detailed comparative analysis of Salvinia infested sites vs non infested vs weevil introduced sites.

Assumption 2: No major risks that may hinder control programme; ZEMA approves the EIA report in a timely manner.

Comments: ZEMA approval to undertake biocontrol activities was received in July 2018; about 6 months after the planned date. This delayed a start of the biocontrol by well over 5 months as it only began in October 2018. The major implication of this will be the need for more weevils to mitigate the time lost which could have been spent mass rearing more on site. We are hoping that the costs for this can be covered within the project 'operating costs' budget line, but are not completely confident about this.

Assumption 3: Traditional leaders give their full support and endorsement letters in support of the biological control.
Comments: In addition to the four traditional leaders that gave consent letters last year, six others have shown keen interest and support for the biocontrol activities. They have since participated in weevil introductions and community mobilisation to facilitate awareness talks.

Assumption 4: Successful collection of biocontrol agent from Kafue Fisheries (here in Zambia) Project site conditions favourable for biocontrol agent multiplication; Biocontrol agent spreads and mixes well in-situ.

Comments: The collection of the biocontrol agent from Kafue fisheries was unsuccessful as the previously infested waterbody had a total control of the weed and the weevils died.
However, the biocontrol agent was imported from South Africa, released into the swamp and mass rearing ponds. The weevil procuring costs were covered by CABI as a partner contribution to the project while the project covered courier costs. Conditions in both the swamp and the concrete mass rearing ponds are favourable for breeding and survival as illustrated by the monitoring data collected so far.

Assumption 4: Biocontrol agent spreads and mixes well in-situ
Comments: The agent has been released into the Swamp and is currently thriving well in-situ present within a 5km radius in which the 11 release points are in the swamp since October 2018. Evidence of all life cycle stages have been seen at each release points and in the mass rearing ponds and troughs.

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The project's main target is habitat restoration and improving the livelihood of the local communities by improving their income, increasing fish stock and creating a habitat that supports biodiversity and ecosystem services.

4. Contribution to the Global Goals for Sustainable Development (SDGs)

The SDGs below have been achieved during the 2018-19 financial year of this project with regards to the activities that have taken place. These will continue to be achieved throughout the lifetime of the project.

1 (No poverty) – control of Salvinia has started, though at a low scale at this stage, with the areas cleared of the weed expected to be increasing in fish stock availability for fishing community. Clearer achievement is expected once biocontrol activities cover larger areas, providing significant evidence of the ultimate improvement/restoration of the wetland and access to more fish, an ecosystem service linked to various livelihood initiatives around the swamp.
2 (Zero Hunger) - as in Goal 1, evidence for this will be clearer when larger areas are cleared of Salvinia, achieving the goal through the improved fish stock and the increase in trading activities.
5-Gender equality – Both males and females have been fairly encompassed and treated fairly in participating in project activities and awareness raising. As can be seen from the various meeting participant lists, PSC and other consultative meetings have had representations of 29 males and 26 females, whereas community sensitisation work reached 386 male and 135 females.
17-Partnership for goals- More project partners (see updated partner list) have been identified and some already took keen interest in the project activities. The project has increased our exposure to other potential collaborating partners and has provided opportunities to participate at invasive species workshops and other fora all in a quest to improve on global partnerships for sustainable development.

Achievement of the following will be more evident once the bio-control activities are at a large scale and the results will be documented in future reports.

1-No poverty-
2-Zero hunger
3-Good health and wellbeing
15-Life on land

The project is also expected to indirectly contribute to the attainment of the following SDGs;
Goal 6: Ensure availability and sustainable management of water and sanitation for all;
Goal 12: Ensure sustainable consumption and production patterns;
Goal 13: Take urgent action to combat climate change and its impacts

5. Project support to the Conventions, Treaties or Agreements

The project will make a contribution towards the achievement of Zambia's latest National Biodiversity Strategy and Action Plan (NBSAP - 2015) strategic goals B, C and D, which aim at: reducing the direct pressures on biodiversity and promote sustainable use, improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity and enhance the benefits to all from biodiversity and ecosystem services respectively. Furthermore, the project is contributing to achievement of Aichi Targets 1, 5, 6, 9, 11, 12, 14, 17 and 18 of biodiversity. Both the NBSAP and Aichi targets are principal instruments for implementing CBD obligations at national level. In addition to that, the project will also contribute to the Ramsar reporting system as well as site updates.

6. Project support to poverty alleviation

The main aim of the project is to control *Salvinia molesta* by introducing *Cyrtobagous salviniae*, a weevil, thereby improving conditions for waterbirds, other biodiversity and the livelihoods of >2,500 fishermen households.

Lukanga Swamp is important for the local fishing community, and it contributes about 20% to Zambia's fish. It is one of Zambia's major fisheries supplying protein to at least four large cities.

Because most of the fishermen supply fish to traders making an income for the households, once the fish stock increases, poverty is expected to reduce at the household level within the communities living around the Swamp.

Expected direct impacts will be an increase in the Catch per unit of Effort, increased sunlight and oxygen which will be noted once the biocontrol intervention takes greater effect.

In the past six months since introduction of the biocontrol agent, evidence of initial stages of Salvinia clearance by the weevil has been recorded and is expected to increase exponentially over time as weevils breed and spread, and as further efforts are made to spread the weevils to more points in the swamp.

7. Project support to gender equality issues

The project has so far been working with both males and females from the local Site Support Group (SSG) and the local community members. The construction of the weevil rearing ponds was mostly done by men with a little assistance from the females.
Currently gender representation has been an average of 30% women and 70% men with only 25% of the total being youths. Cultural beliefs have been identified to be the major factor limiting the participation of some groups, especially women. The project has since identified ways, including targeting women groups within the community, to increase participation in the coming year to ensure a more equal representation in its activities by recruiting additional members from the under-represented categories. Approaches include calling for deliberate meetings with women only in isolated places, without male interference, and at health posts which are mostly dominated by women.

8. Monitoring and evaluation

This year, an additional biodiversity survey was done prior to weevil release into the swamp. The survey was a biodiversity assessment as well a ground truthing exercise to verify Salvinia presence in the areas observed to be infested the map developed from satellite imagery in 2017.

After the weevil release, monitoring has been done to assess weevil performance in the release. Additionally, areas where no-weevil's have been released are also being monitored for comparison purposes.

Moving forward, mass rearing of the weevils will continue to facilitate weevil release into additional points in the swamp. Monitoring activities will also be sustained to continue to assess project performance. Weevil introduction and trough mass rearing will be set up in Chiyuni - the remaining entry point from which the weevils have not yet been introduced. This will be done in April and May of 2019 once we have a good number of weevils from the rearing ponds.

The PSC meeting will continue to be conducted quarterly as scheduled. This continues to be a platform to meet all committee members and provide information of project progress, successes, failures and lessons learnt.

9. Lessons learnt

- Stakeholder partnerships have been greatly appreciated. It is through the good partnership we have with ZARI that the process of acquiring the weevil import permit was eased. Additionally, CABI procured the weevil consignment and created linkages with the mass rearing facility in South Africa (Edgecombe) and also facilitated for the delivery of the consignment to BWZ.

- We have shared our experiences about the biocontrol intervention at every opportunity and this has enhanced partnerships and data sharing with partners. Further, this has enhanced invitations to participate at workshops and meetings like the CABI African invasive species Summit held in Gaborone, Botswana (27th- 31st March 2019). In fact, the ZARI representative at the summit significantly referred to this project in his presentation.
- Weevil monitoring has been helpful as a tool for helping making decisions regarding management of the biocontrol process. All the monitoring visits done have stimulated ideas of how to move forward in terms of areas to consider as potential release sites. This includes deciding not to release weevils so close to the harbour in case of low rainfall that attracts inward human and animal activity in the swamp causing disturbance to the release sites.
- Training of on-site weevil monitors has worked to the project's advantage since monitoring of the mass-rearing ponds and troughs is always ongoing, and feedback is received on a weekly basis regarding weevil activity or any other concerns.
- Women participation at awareness raising talks is still low and this is attributed to cultural beliefs that prevent women from attending or participating in meetings attended by men. Therefore, we have learnt that women do have their own groups for various discussions within the community and these will now become the target audiences for meeting with women and also giving them a platform to speak about how they are affected by *Salvinia molesta*.

10. Actions taken in response to previous reviews (if applicable)

Five major issues highlighted during the general assessment of the last annual report have been addressed as follows:

1. Clear roles and responsibilities of each partner institution with specific targets and activity timeline have been outlined in the M&E framework (Annex 4.3)
2. The M&E framework has been re-formed and is now consistent with the project log frame.
3. Project steering committee ToRs and meeting minutes are attached in Annex 4.2
4. The analysis of the project's contribution to CBD and SDG targets has been expanded and given in detailed analysis in section 6 and 7 respectively.
5. As the weevils (biocontrol agent) was only introduced 6 months ago, the restoration target will be reviewed during the preparation of the half year report (October 2018) after the team is able to estimate more accurately the rate at which the Salvinia is being cleared.

11. Other comments on progress not covered elsewhere

Due to the vastness of the swamp and the level of weed infestation, there is a consideration for importation of another weevil consignment. This will certainly, increase weevil area coverage in the swamp. This consignment will enhance mass rearing and increase points of weevil release in the swamp. Ultimately, this will reduce on the weed control period. Currently, only 27km² has been cleared. This cannot not be used to extrapolate how long the control will take as weevil reproduction and activity is temperature dependant. However, increased numbers of weevils guarantee control in a much shorter period of time.

Unfortunately, three of the eleven points in which weevils were released have been disturbed by livestock. This was as a result of receding water levels during the peak of the dry season as well as the drought currently being experienced by the western half of Zambia. One of these sites has recovered from the disturbance with some leaf 'gunshots' being observed during the February 2019 monitoring. Furthermore, some leaf 'gunshots' have also been observed about 1km away from these disturbed points and we thus suspect that the displaced weevils may be in this area.

12. Sustainability and legacy

The exit strategy still suffices as it leaves capacity with the local community members as well as the fisheries officers**.** Developing capacity of 7 fisheries officers and 11 community members who are stationed at the project site and are frequently monitoring and patrolling the project area will

ensure sustained monitoring of the spread of the species. These individuals are optimistic and motivated to sustain monitoring as they want to ascertain the viability of the biological agent And its impact on Salvinia. Furthermore, further training and participation during the weevil introduction will enable fisheries officers to continue such activities if newly infested area discovered during their routine patrols. These monitoring activities are now mainstreamed into the twice monthly patrols of the fisheries department and the fisheries management committee which consist of 5 of the 11 trained community members.

Additionally, the Ministry of Lands and Natural Resources is currently developing a proposal for a project that seeks to access climate adaptation funds for "Building the Resilience of Local communities in Zambia through the introduction of Ecosystem based Adaptation in Priority Ecosystems: wetlands and forests" of which the Lukanga Swamp is one of the target sites. The request for collaboration letter is attached in annex 4.4. This is an excellent indication of country commitment and investment on related and/or similar initiatives. Specifically, if approved for funding by GEF, the above-mentioned project seeks to use the lessons and documentation from our project to import more weevils and facilitate the satellite imagery exercise at the end of the project.

13. Darwin identity

The Darwin logo has been used on all project correspondence which includes reports and awareness materials. Two reports have been developed from the weevil introduction and monitoring activities. These reports are targeted to be reference materials for the office and relevant stakeholders on the project and any interested. It also targets scholars including students that are keen on understanding the process and activities involved with biological control of invasive species especially *Cyrtobagous salviniae.* Awareness raising materials with the logo include invasive species booklets and identification guides. Posters with Darwin logo also have been developed and stuck at the fisheries office, clinic and at the shops at the harbour in the project site. The Darwin Initiative continues to be very well been recognised as a distinct project sponsor with a clear identity.

The project has been very well publicised on the BWZ website (https://www.birdwatchzambia.org/darwin-initiative-project/).

BWZ has developed a website link that reports/publicizes activities resulting from the Darwin funding. This link is attached to the current organisational website. The intention is to show progress on the work and disseminate information on the biocontrol of *Salvinia molesta.*

14. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2018 – 31 March 2019)

Project spend (indicative) since last annual report	2018/19 Grant (£)	2018/19 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Monitoring & Evaluation (M&E)				
Others (see below)				
TOTAL				

******During this reporting period we have overall underspent on the annual budget by* ***£2,669****. If possible, we would like to request Darwin Initiative to allow carrying forward this amount to the third project year so that it can be used in importation of two more weevil consignments and absorbing any additional field travel costs*

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2018-2019

Project summary	Measurable Indicators	Progress and Achievements April 2018- March 2019	Actions required/planned for next period
Outcome Biological control of Salvinia molesta in Lukanga Swamp enhances livelihoods and food security for 2,500 fishing households, and restores 2,000km² of suitable habitat for biodiversity and provision of ecosystems services	0.1 From a baseline of >20kg/hr at the start of the project, fish catch effort increased to >30kg/hr 0.2 By the end of project Salvinia molesta cover reduced by 2,000km² with increased (from baseline) numbers of Wattled Crane and other water birds 0.3 Capacity building in project management for the Site Support Group-SSG (a farmer's group with whom BWZ has worked doing IBA monitoring for 8 years)	Weighing balance was procured and CPUE measured at 0.76kg/hr in only 47% of the un-infested part of the swamp during the June 2018 survey. At present, 27km² has been cleared from the 11 release points in the swamp. All of these points lie within a 5km radius and each point has evidence of leaf 'gunshots' at an average of 9m from the point of release. As a result of training in biosecurity and monitoring training the capacity of 7 fisheries officers and 11 community members has been built, in addition to the 23 Site Support Group members who fully understand and appreciate the project activities.	Import second and third consignment of weevils to maximise on introductions and area covered by the weevils. This will be done in September 2019 and January 2020 when temperatures are high and good for weevil success.
Output 1. Environmental Impact and Risk Assessment guiding mitigation measures for biologically controlling Salvinia molesta.	Approval by Zambia Environment Management Authority (ZEMA) for Salvinia control work to start by mid of year 1	The EPB report together with other supporting documents; reports from stakeholders, traditional leaders and Fisheries offices and site inspection reports were reviewed prior to authorisation of the biocontrol activities. The approval from ZEMA was received (see letter in Annex 4.1) and has no conditions attached that has a bearing on the planned activities.	
Activity 1.1 Hire a consult to conduct EIA		A consultant was hired (Masterteck Enterprises) who undertook assessments leading the EPB. This activity is completed and there will be no other consultant activities. ZEMA approved the EPB authorising the biocontrol activities. .	
Activity 1.2, Conduct EIA		The EIA was downscaled to an EPB and this has since been completed. This was completed in year 1.	

Activity 1.3, Consultant submits draft EIA report to BWZ for review		The EPB report was completed and the ZEMA approval has since been given.
Activity 1.4, Final revised EIA report submitted to ZEMA		This was done and completed.
Output 2. Fishing community members have increased the capacity and interest to participate in Salvinia control.	2.1 By end of Year 1 >100 community members sensitised and trained in the biocontrol process. 2.2 By end of Year 3 at least 50% of sensitized fishing community members voluntarily participating in monitoring of *Salvinia molesta*, fish stocks and birds.	521 (386 male, 135 females) community members (about 15% of households close to the swamp) have already been sensitized on the biocontrol process and they appreciate the initiative and they have shown interest to participate in the Salvinia control. The sensitisation has been based on good weevil management practices that to ensure a success biocontrol process. Seven weevil monitors have been trained and are voluntarily participating. Eleven community members underwent a small-scale weevil management training where they were taught on identifying weevils and leaf 'gunshots'. They were also involved in pond construction activities. Additionally, because of their proximity to the troughs and ponds, they voluntarily look out and ensure safety of these facilities, changing water and sensitising more community members.
Activity 2.1. Conduct awareness talks on site, discussing the control program and methods		10 talks have been conducted. These have targeted fishermen, traders, shop owners, pupils and traditional leaders. A total of 521 individuals have been reached. Additionally, we spoke to officers from the Ngabwe council office (a council in one of the three districts in which the Lukanga falls) about the intervention. The ratio of male to females stands at 70:30 respectively. Strategies to increase on the women ratio have been identified and will be implemented. The community appreciates the initiative and see it as a benefit for themselves. They understand the intervention and are anxious to see and benefit from the results.
Activity 2.2. Community mobilisation of participants, time table development, etc		At present 7 weevil monitors have been trained. 4 from Waya and 3 from Chilwa. These are responsible for monitoring weevil activity especially in the ponds and troughs as well as in the swamp together with the project staff. The 11 community members have been trained on weevil and leaf 'gunshot' identification. They also ensure the troughs and ponds are free of any disturbances both from humans and animals. These are mandated to give weekly phone updates of weevil activity or any other eventualities.
Output 3. Salvinia molesta control in Lukanga Swamp improves habitat for wetland biodiversity including increased fish stock leading to increased food security for fishing community households.	3.1 From a baseline of >20kg/hr at the start of the project, fish catch effort increased to <25kg/hr and <30kg/hr by project mid-term and project end respectively thereby benefiting 2,500 fishing households 3.2 By the end of project 2,000km² of currently invaded area under biological control of Salvinia molesta and with increased species richness of waterbirds	A Scale has been procured for measuring the catch per Unit of Effort before the start of biocontrol activities, at mid-term and end of project. This decision was made after having a meeting with the fisheries officers regards biodiversity baselines. CPUE was measured during the post baseline survey. The results indicate that it takes an average of 0.76kg/hr. This was measured from the 47% of the swamp that is not infested by the Salvinia. An overall swamp current CPUE figure will be obtained once DoF who provided the initial figures undertake a full fish catch assessment in September/October 2019. The biocontrol agents have been released into 11 points in the swamp. From the 3 monitoring visits conducted, the weevils seem to have adapted well in-situ. There is evidence of gunshots/bullet holes in the leaves (holes made by weevils in the Salvinia) at a spread rate of 9m radius from point of release.

Activity 3.2 Establishment of on-site weevil breeding ponds		2 mass rearing concrete ponds (5 x 8m x 1.5m and 5x3m x1m) have been constructed and troughs procured for the purpose of rearing weevils in sites that do not have suitable sites for excavation and construction of ponds. Two out of the three entry points into the swamp have these rearing facilities established while weevil introduction/release has not been done on one entry point; it is scheduled for April and May 2019
Activity 3.9 Documentation, including video footage of weevil and no weevil released sites		The project team developed two reports from the activities of the year; weevil introduction report and the weevil monitoring report. The weevil introduction report gives the details of the biocontrol agent that was introduced into the Lukanga swamp highlighting the process of release, site selection and involved parties. The Weevil monitoring report highlights results from the monitoring visits that have been done. It explains the importance of monitoring and what parameters are considered for monitoring. It highly elaborates the importance of these parameters and how they relate to the control of *Salvinia molesta*. The monitoring report will continuously be updated from every monitoring visit until end of the project. Pictures of weevil release and non-weevil release sites where taken at the point of weevil release and point selection respectively. https://www.youtube.com/watch?v=JEVzXomsLKY&t=6s
Output 4 Project partners maintain and build on the outcome of the project and promote biological control of alien invasive species in areas under aquaculture across Zambia for livelihood improvement and biodiversity conservation.	4.1 Experience on biocontrol of invasive weed shared with at least 2 national institutions in 2 sites where it is a threat to biodiversity and fishing at project mid-term and project end	BWZ visited one national institution (Rusangu University) to discuss invasive species in Zambia and the biocontrol intervention in Lukanga. Highlighting the current status and its success thus far. More universities have shown interest to be visited and receive presentations about invasive species and their control. We are currently in liaison with some of them to ensure this is done. Project information was shared at the Invasive species summit hosted by CABI in Gaborone, Botswana (27th – 30th March 2019) As part pf the expert panellists, We discussed in detail the impacts of invasive; Social, Economic and environmental. The project updates; success, failures and lessons learnt have been shared with the PSC members who are from different governmental and non-governmental institutions. These meetings have been conducted three times within this project year.
Activity 4.1 Meeting with key stakeholders to share progress, successes, failures and lessons		Two steering committee meetings have been conducted in the third and fourth quarter. These have been attended by the project leader and finance coordinator from BirdLife, BWZ staff listed on the Darwin project, representatives from the Department of Fisheries, CABI, ZARI, World Wide Fund (WWF), International Crane Foundation (ICF), Zambia Environmental Management Agency (ZEMA) and the Ramsar focal point. These meetings are a platform to share progress, successes, failures and lessons learnt as well as receive feedback and backstopping moving forward. This committee has formulated Terms of Reference to guide its proceedings until the end of the project. It has also formed a Monitoring and Evaluation framework that highlights clearly shows an activity schedule and who is responsible. Additionally, a meeting was held with a limnologist in a quest to enquire what other parameters can be used assess water quality in addition to testing for water quality.

Output 5. Project management, impact monitoring and evaluation structures and processes ensure that the project objectives are achieved on schedule and within budget	5.1 Partners and staff with project contractual agreements and full understanding of project requirements, including reporting 5.2 Biodiversity and socio-economic baselines, with follow-up monitoring & evaluation system in place 5.3 Documentation of biocontrol agent activity and progress published annually in the State of the Wetlands annual report as well as IBA status and trends reports which are all publically shared documents	A post baseline survey was done to assess biodiversity before the beginning of the biocontrol activities. 3 monitoring visits have been done and all of them well documented to show the biocontrol agent activity and the progress thus far. So far, the agent has moved an average of 9m from each of the 11 initial points of release. The browning of the Salvinia in release sites is gradually evident from infested weeds that seem to disintegrate easily and brown from the point of weevil attack.
Activity 5.1 Contract project partners and staff		This was done before project inception and all project staff fully understood the project and its activities.
Activity 5.2 Undertake project induction/inception and quarterly meetings		Project inception/induction was done. 2 Quarterly meeting have been held since the ZEMA approval was given.
Activity 5.3 Set/confirm biodiversity and socio-economic baselines		These baselines were set and have been done. Additionally, a post baseline survey was conducted.
Activity 5.4 Undertake project monitoring and reporting involving partners		A Monitoring and Evaluation framework has been formulated.

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed)

Project summary	**Measurable Indicators**	**Means of verification**	**Important Assumptions**
Impact: Control of invasive alien species from areas under aquaculture in Zambia increases the resilience of 2500 fishing households and conserve wetland biodiversity.			
Outcome: Biological control of *Salvinia molesta* in Lukanga Swamp enhances livelihoods and food security for 2500 fishing households, and restores 2000km² of suitable habitat for biodiversity and provision of ecosystems services	0.1 From a baseline of >20kg/hr at the start of the project, fish catch effort increased to <30kg/hr by the end of the project, benefiting 2,500 fishing households (consisting of 21,000 people in total) 0.2 By the end of project *Salvinia molesta* cover reduced by 2000km² with increased (from baseline) numbers of *Wattled Crane* and other water birds 0.3 Capacity building in project management for the Site Support Group-SSG (a farmer's group with whom BWZ has worked doing IBA monitoring for 8 years)	0.1 Reports from baseline and end of project participatory fishing community assessment surveys 0.2 Reports based on baseline and end of project mapping and biological surveys 0.3 Capacity surveys of CBO/SS	0.1 Successful introduction and activity progress of the biocontrol agent once present on site.
Output 1 1. Environmental Impact and Risk Assessment guiding mitigation measures for biologically controlling *Salvinia molesta*.	1.1 Approval by Zambia Environment Management Authority (ZEMA) for *Salvinia* control work to start by mid of year 1	1.1 EIA report 1.2 Approval letter from ZEMA.	1.1 No major risks observed that may hinder control program 1.2 ZEMA approves the EIA report in a timely manner

Output 2 2. Fishing community members have increased the capacity and interest to participate in *Salvinia* control.	2.1 By end of Year 1 >100 community members sensitised and trained in the biocontrol process. 2.2 By end of Year 3 at least 50% of sensitized fishing community members voluntarily participating in monitoring of *Salvinia molesta*, fish stocks and bird	2.1 Capacity assessment reports 2.2 Monitoring datasheets and reports	2.1 Traditional leaders give their full support and endorsement of the initiative 2.2 Community members appreciate the initiative as a solution
Output 3 *Salvinia molesta* control in Lukanga Swamp improves habitat for wetland biodiversity including increased fish stock leading to increased food security for fishing community households.	3.1 From a baseline of >20kg/hr at the start of the project, fish catch effort increased to <25kg/hr and <30kg/hr by project mid-term and project end respectively thereby benefiting 2500 fishing households 3.2 By the end of project 2000km² of currently invaded area under biological control of *Salvinia molesta* and with increased species richness of waterbirds	3.1 Reports from baseline and end of project participatory fishing community assessment surveys 3.2 Reports based on baseline, midterm and end of project mapping and biological survey	3.1 Successful collection of biocontrol agent from Kafue Fisheries (here in Zambia) Project site conditions favourable for biocontrol agent multiplication 3.2 Biocontrol agent spreads and mixes well in-situ
Output 4 Project partners maintain and build on the outcome of the project and promote biological control of alien invasive species in areas under aquaculture across Zambia for livelihood improvement and biodiversity conservation.	4.1 Experience on biocontrol of invasive weed shared with at least 2 national institutions in 2 sites where it is a threat to biodiversity and fishing at project mid-term and project end	4.1 Lesson-sharing workshop reports 4.2 Media report	

Output 5. Project management, impact monitoring and evaluation structures and processes ensure that the project objectives are achieved on schedule and within budget	5.1 Partners and staff with project contractual agreements and full understanding of project requirements, including reporting 5.2 Biodiversity and socio-economic baselines, with follow-up monitoring & evaluation system in place 5.3 Documentation of biocontrol agent activity and progress published annually in the State of the Wetlands annual report as well as IBA status and trends reports which are all publically shared documents	5.1 Site visits 5.2 Reports and on-site footage	5.1 Biocontrol agent spreads and mixes well in-situ

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)
1.1 Hire a consult to conduct EIA
1.2 Conduct EIA
1.3 Consult submits draft EIA report to BWZ for review
1.4 Final revised EIA report submitted to ZEMA
2.2 Conduct awareness talks no site, discussing the control program and methods
2.3 Community mobilisation of participants, time table development, etc
3.1 Training of participants; first institutional partners then community members
3.2 Establishment of on-site weevil breeding ponds
3.3 Weevil collection and release into on-site ponds
3.4 Rearing of weevils by community members supervised by BWZ staff
3.5 Releasing the weevil into trial sites within the swamps
3.6 Monitoring of released weevil
3.7 Release weevil into additional sites
3.8 Maintain on-site breeding ponds
3.9 Documentation, including video footage of weevil and no weevil released sites
4.1 Meeting with key stakeholders to share progress, successes, failures and lessons
4.2 Newspaper article on overall project activity
4.3 TV interview sharing on-site video footage
5.1 Contract project partners and staff
5.2 Undertake project induction/inception and quarterly meetings
5.3 Set/confirm biodiversity and socio-economic baselines
5.4 Undertake project monitoring and reporting involving partners

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
12	GIS software installed on BWZ office computer.							
6A	Education and training on *Cyrtobagous salviniae.*	Male	Zambian		7			
20	Procured materials including computers and computer hardware							
22	2 weevil ponds and 8 troughs			2	8			
23	1 Accounts officer and 1 Education officers staff time.	Both male	Zambians	2	2			

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)
June 2018 Baseline Biodiversity survey	Report	Clara Nanja	Female	Zambian		
The introduction of Cyrtobagous salviniae, a host specific weevil for controlling the invasive Salvinia molesta in the Lukanga swamp, Zambia	Report	Christelle Makonga and Clara Nanja	Female	Zambian		
Monitoring of Cyrtobagous salviniae in the Lukanga swamp	report	Francis Ng'ona and Clara Nanja	Male	Zambian		
The first introduction of *Cyrtobagous salviniae* in the Lukanga Swamp	Newsletter articles	Christelle Makonga, Francis Ng'ona	Female, Male	Zambian		The Wattled Crane, vol 48, No 11; Pg 10 - 12
A Monitoring trip to the Lukanga Swamps with BirdWatch Zambia	Newsletter article	Guida Bellcross, 2018	Female	Zambian		The Wattled Crane, Vol 48, No.11; Pg 6-8
Weevil Introduction & Monitoring in Ngabwe district	Newsletter article	Francis Ng'ona and Clara Nanja	Male, Female	Zambian		The Wattled Crane, Vol 49, No 2; Pg 2- 4
CABI's Invasive Species Policy Summit	Newsletter article	Chaona Phiri	Female	Zambian		The Wattled Crane, Vol 49, No 2: Pg 5-6

Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	