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 2020

1 Darwin Project Information

Project reference	24030
Project title	Controlling an invasive aquatic plant for improved biodiversity and livelihoods
Territory(ies)	Zambia
Lead organisation	BirdLife International
Partner institutions	BirdWatch Zambia (BWZ); Centre of Agriculture and Bioscience Information (CABI); Zambia Environmental Management Agency (ZEMA)
Grant value	£299,016
Start/end dates of project	1 July 2017 to 31 March 2021
Reporting period	Apr 2019 – Mar 2020, Annual Report 3
Project Leader name	Paul Kariuki Ndang'ang'a
Project website	https://www.birdwatchzambia.org/darwin-project/
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1. Project summary

This project seeks to control the aquatic alien invasive Kariba weed (*Salvinia molesta*), a free-floating fern which has infested Lukanga Swamp Important Bird and Biodiversity Area and Ramsar site located in Central Zambia. The site covers approximately 3,300 km², of which an estimated 60% was infested by the invasive Kariba weed (*Salvinia molesta*) at the start of the project, as highlighted by the satellite image analysis conducted. As this weed forms a thick mat on water, light penetration and dissolved oxygen are reduced, thereby affecting fish abundance, as well as suitable habitat available for other aquatic species such as birds. As the site is a major fishery, reduced abundance of fish has led fishermen to use more effort and, in some cases, use incorrect fishing gear such as mosquito nets and poisons to increase their catch.

Our project seeks to control the infestation in the swamp by the use of 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.

This biological control method has been successfully used in Zambia to control the Kariba weed on Lake Kariba in 1994 by the Zambia Electricity Supply Corporation (ZESCO), in 2014 on Kafue Fisheries, one of Zambia's fisheries along the Kafue River and at a privately owned lodge in Chilanga, 30km from Lusaka in 2009. Total control was achieved in the latest attempt at the lodge

in Chilanga as neither the weed nor the weevil are currently present. Through this Darwin-funded project in Lukanga Swamp, the biocontrol agent has been introduced into approximately 30% of the infested area.

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.
- BirdWatch Zambia (BWZ) is the implementing organisation whose role is to work closely with the Meembe local Site Support and farmers Group (SSG - see below), 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. While they procured and facilitated the transportation of the weevils from a rearing plant in Durban, South Africa, they have primarily provided technical support, both virtually and at quarterly PSC meetings through a representative from the Zambia office.
- The Department of Fisheries is mandated with overseeing the implementation of national fisheries programmes such as monitoring fish stocks in various water bodies. During Year 3 of the project, they have provided support and have been fully involved with weevil monitoring activities. Additionally, DoF took a leading role in the gillnetting surveys conducted in December 2019 to ascertain fish catch per unit effort (CPUE). They also assessed plankton populations to understand water quality in Salvinia-infested and recently controlled areas, and compiled survey reports.
- The Zambia Environmental Management Agency (ZEMA) is the government agency mandated by local legislation to be advisor and overseer advisor on all environmental management projects. In 2020, ZEMA ensured that BWZ was included as a stakeholder providing input in the formulation of a conservation plan for the Lukanga Swamp, which is being conducted by an independent consultant. During Year 3, ZEMA also sought BWZ's collaboration for mapping *Salvinia molesta* within the country. ZEMA has also continued to provide backstopping at the quarterly project steering committee meetings and virtually.
- The Meembe local Site Support and farmers Group (SSG), local traditional leaders and other community members are our key stakeholders on the ground. This year community members have been helping with project activities such as monitoring and by adhering to the "do's and don'ts" that enable weevils to flourish. They also help in cleaning the environment. The traditional leaders also join monitoring visits, and one of them is hosting a weevil mass rearing trough at his home, thus helps with nurturing the weevils.
- All of the project partners have offered valuable technical guidance from their experiences with biocontrol processes, project planning and involvement with project activities. While all partners have been consistent with attending quarterly meetings while others such as the International Crane Foundation (ICF) have requested BWZ's involvement in activities regarding mapping another invasive species, *Mimosa pigra* in Western Zambia. Additionally, through the Ramsar Focal Point, the project team has contributed to compiling information for use in the ongoing update of Ramsar Information site for based on the project outcomes so far. In addition, the Ministry of Lands and Natural Resources recommended the project team to make endorsements for instruments and methods for implementing the Ecosystem Based Adaptation project in Lukanga and Bangweulu swamp catchments within Zambia. All of the project partners, aside from BirdLife, which is represented nationally by its partner BWZ, are based in the host country, which has greatly enhanced inter-organisational relationships. In addition, collaborations with project steering committee members have resulted in multi-sectoral and integrated commemorations of important conservation days such as World Environment Day and Wetlands Day.

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*

Activity 1.1 Hire a consult to conduct Environmental Impact Assessment (EIA)
Activity 1.2 Conduct EIA
Activity 1.3 Consult submits draft EIA report to BWZ for review
Activity 1.4 Final revised EIA report submitted to ZEMA

Activities 1.1-1.4 were successfully completed in Year 1 and did not form part of the Year 3 work plan. A letter of approval from ZEMA is provided as evidence.

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

Activity 2.1. Conduct awareness talks on site, discussing the control program and methods

During Year 3, the project reached at least 2,345 individuals, 1,800 offsite (during the BWZ's 50th Anniversary exhibitions showcased in Lusaka) and 545 on site, who have been sensitised on the biocontrol intervention and its effectiveness. Out of these, 1,271 (54%) were male and 1,074 (46%) were female, in comparison to 521 (30% females and 70% males) individuals in Year 2 and 72 (30% Females and 70% males) individuals in Year 1. The project team held awareness raising campaigns at community meetings, schools and harbours prior to undertaking weevil monitoring activity in the swamp. The sessions aimed to educate the community on the dos and don'ts of the biocontrol agent and methods, including refraining from throwing of plastic into the swamp, manually removing *Salvinia* and using chemicals when fishing which can harm the weevil population

The project team held 12 awareness raising engagement meetings on site and off site. These were with fishermen, traders, local community members as well as community leaders, to update them on the progress of the project as well as discuss avenues through which the community leaders could help improve community participation and learn more about the project, for example, organising and coordinating village meetings.

The project team visited one national higher learning institution, LIUTEBM University in Lusaka, to conduct awareness raising talks to 35 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.*

We conducted an extent/impact of awareness study from the 9-16 September 2019 to determine whether the local community members knew about the ongoing biological control intervention of *Salvinia molesta* control in the swamp. A total number of 93 questionnaires were administered using purposive sampling within three villages approximately 5 kilometres apart covering a total stretch of about 15 kilometres. Our findings revealed that distance has a significant effect on the number of people reached with awareness raising as the further away from the swamp, the less people know about the project activities. In contrast, in areas close to the swamp, 65% of the sampled population were aware of the project while 35% were not. This study also included an awareness raising extent survey to assess how project information had been disseminated within Waya, Lyombe and Nansenga villages. The report indicates that more individuals closest to the swamp are more aware of the project than individuals up to 8 kilometres from the harbour of the swamp.

Activity 2.2. Community mobilisation of participants, timetable development, etc.

Five additional weevil monitors and nine community volunteers were trained during the reporting period. They, together with those trained previously have been providing phone feedback to the

project team every fortnight. They undertake project activities such as replenishing *Salvinia molesta* in mass rearing avenues, awareness raising, cleaning and clearing sites as well as taking part in weevil monitoring activities. So far, all weevil monitors trained from the start of the project have been retained.

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.

Activity 3.1 Training of participants; first institutional partners then community members

In Year 3, the team trained five weevil monitors and nine volunteers, as seen in Activity 2.2, in weevil management and monitoring techniques who are responsible for weevil mass rearing in fibre and plastic troughs on site as well as taking part in the quarterly monitoring activities. Since the start of the project, the team has trained 16 community members as weevil monitors and the training material used are provided here.

Additionally, as referenced in the project's recently approved Change Request, the fish Catch per Unit of Effort (CPUE) baseline provided by the Department of Fisheries during the proposal stage was found to be unreliable and two gillnetting surveys were undertaken in place of this. Members of the Department of Fisheries headquarters trained three fisheries officers in Waya in gillnetting survey techniques including net setting, hauling, fish identification, dissecting, sexing, and data entry. The training was extended to eight community members who participated in the gillnetting survey and related activities. DoF conducted the training prior to the start of the survey and the technique was practiced during the survey by all trained participants.

Activity 3.2 Establishment of on-site weevil breeding ponds *NB: Since the project start various avenues for weevil mass rearing are being used, including concrete ponds and troughs, both on-site and off-site*

Two fibreglass troughs were delivered to Chilwa Island commencing the mass rearing efforts on this site. Two more troughs have been employed for upscaling mass rearing at the BWZ office. Total mass rearing avenues are now 16: concrete ponds (6), fibreglass (6) and plastic troughs (4). So far we have not observed any differences in effectiveness between the different avenues used.

Activity 3.3 Weevil collection and release into on-site ponds *NB: Since project start various avenues for weevil mass rearing are being used, including concrete ponds and troughs, both on-site and off-site*

Weevils were collected from three existing mass rearing avenues and released into eight new mass rearing avenues: four at DoF headquarters in Chilanga - 25km south of Lusaka (off site), two at BWZ office (off site) and two on Chilwa Island (onsite). Off-site rearing of weevils at the BWZ and DoF offices is done in order to have a close watch by the technical experts on how weevils are behaving and to be sure that the right conditions are being offered. Also, we are only able to apply newly learnt techniques (temperature control and addition of fertilisers) off site, due to proximity and availability of electricity. It also acts as an insurance, just in case something happens to the ones on site.

Activity 3.4 Rearing of weevils by community members supervised by BWZ staff

In Year 3 of the project, mass rearing avenues are being used in three locations. The 16 mass rearing avenues are currently operational in the form of concrete ponds (6), fibreglass (6) and plastic troughs (4). The team recently collected infested *Salvinia molesta* from three mass rearing avenues and released them into eight new rearing sites off site.

Activity 3.5 Releasing the weevil into trial points within the swamps

This activity was completed in Year 2 and reported in the Year 2 Annual Report.

Activity 3.6 Monitoring of released weevils

Weevil monitoring has been carried out at all 25 release points and 8 control points. Results show that weevils from eight out of the initial 11 release points have moved and merged with each other. This is from evidence of observed continuous weevil activity from one point to the other. From the weevil monitoring activities conducted in December 2019, the average distance covered by the weevils from a release point monthly is approximately 34 m, at which point the weevils were estimated to be covering about 662 km^2 (c. 30% of the infested 2,200km^2 and c. 45% of the 1,500 km^2 area targeted by end of project). The rate at which the infestation is cleared is dependent on the number of weevils introduced. The higher the number of weevils, the faster the infestation is cleared. Thus, mass rearing of weevils is a cardinal component of the process. Monitoring reports are available here.

Activity 3.7 Release weevils into additional points

The biocontrol agent was introduced into an additional 14 release points during Year 3, bringing the total to 25 release points in the swamp. Weevils released at the initial 11 points have spread and merged with each other, an indication of increased weevil activity and progress regarding the intervention. From the weevil monitoring activities conducted in December 2019, the average distance covered by the weevils from a release point monthly is approximately 34 m, at which point the weevils were estimated to be covering about 662 km^2 (c. 30% of the infested 2,200km^2 and c. 45% of the 1,500 km^2 area targeted by end of project).

Activity 3.8 Maintain on-site breeding ponds

Maintaining of the mass rearing concrete ponds and plastic troughs in use continued to ensure successful weevil rearing. Maintenance for the concrete ponds included filling cracks in the ponds and clearing the surrounding areas. The plastic troughs were maintained through cleaning dead *Salvinia* that accumulate at the bottom on the troughs as well as maintaining water valves.

Activity 3.9 Documentation, including video footage of weevil and no weevil released points

The project team developed two weevil monitoring reports highlighting results from the monitoring visits conducted in 2019. The reports highlight the importance of monitoring as a tool to assess weevil activity and success rate. It further explains parameters such as extent of weevil spread, *Salvinia* discoloration (browning) and number of gunshots (bullet-shaped holes caused by weevil perforations on the *Salvinia* leaves) as factors considered during monitoring. The reports highlight the importance of these parameters and how they relate to the control of *Salvinia molesta*.

During interviews with community members, the team recorded short video clips asking them what they thought was responsible for clearing *Salvinia* in some sections of the swamp and the impact this has had on them. The clips will be incorporated in the 15-minute documentary scheduled to be aired on national TV to profile the project. This is scheduled for third quarter of project year 4.

Biodiversity and weevil monitoring outcomes have been submitted the Zambia Ramsar Focal Point for use in updating of the online Ramsar information site for the Lukanga swamp. The online site is currently under review with the last update having done in 2005.

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.

Activity 4.1 Meeting with key stakeholders to share progress, successes, failures and lessons

The project conducted four quarterly steering committee meetings attended by project staff, representatives from the DoF, CABI, ZARI, World Wildlife Fund (WWF), International Crane Foundation (ICF), ZEMA and the Ramsar focal point. These meetings were a platform to share progress, successes, failures and lessons learnt as well as receive feedback and support moving

forward and plan on the sustainability of the project. Minutes of these meetings are shared with all PSC members.

Two virtual meetings were held between the lead and implementing organisations. One was a mid-year review meeting to assess project activities, while the other was an end of year planning and evaluation meeting that attracted representation from the PSC committee members, BWZ board members. It reviewed progress so far and discussed the sustainability of the current investment and outlining a 5-year plan for the Lukanga swamp. Meeting minutes are available here.

Activity 4.2 Newspaper article on overall project activity

The project was featured in an article entitled *the Lukanga Swamp Restoration Project* in the July/August 2019 issue of the *Nkwazi* inflight magazine (page 52-53), Zambia's leading consumer lifestyle publication that aims to inspire a mix of business, travel, arts and culture.

Activity 4.3 TV interview sharing on-site video footage

In Year 3, the project team attended a live radio programme on United Voice Radio in October 2019 which served as an awareness-raising tool. The TV interview activity is ongoing, but not completed. The project has identified a TV platform to access. A combination of introductory footage, community meetings, biodiversity assessment and onsite-real time footage recorded by TV crew will be compiled into a 15-minute documentary to be aired on national TV to profile the project, its approach and results. This activity is scheduled for the third quarter of the project year 4.

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

Activity 5.1 Contract project partners and staff

This activity was completed in Year 1 and reported in the Year 1 Annual Report.

Activity 5.2 Undertake project induction/inception and quarterly meetings

The project induction and inception meetings were completed in Year 1. Project Steering Committee meetings are held on a quarterly basis. The project is approaching its end in 2021 and therefore, the BWZ team has had discussions with guidance from BirdLife on critical aspects of the project, such as its sustainability beyond the life of the project, the exit strategy, financial management and fundraising to cover observed needs.

Activity 5.3 Set/confirm biodiversity and socio-economic baselines

The biodiversity and socio-economic baselines were set at the project inception. However, the Fish Catch Per Unit of Effort (CPUE) baseline used at project start was found to be a gross scale extrapolation. With approval from Darwin it was agreed that new CPUE baselines would be set in 2019 using Gillnetting surveys. Two Gillnetting surveys have been conducted and are being compiled by the Department of Fisheries, with preliminary results showing a baseline CPUE of 2kg/boat/night using unmodified standard fishing gear.

Activity 5.4 Undertake project monitoring and reporting involving partners

A Monitoring and Evaluation framework was formulated in the second project year. The team conducted two monitoring surveys (May and October-November 2019) on the weevil's performance in the swamp at the three entry points of the swamp (Waya, Chiyuni and Chilwa). The monitoring outcomes were helpful in guiding a decision to make a change request proposing

a more realistic ambition of the project. In particular, we changed the outcome and output indicators to focus more on how much the biocontrol agent will have spread rather than how much infestation will have been controlled by the end of the project. Apart from this, during the monitoring visits the team conducted regular weevil nurturing and pond maintenance works in all mass rearing avenues. The monitoring exercises have influenced decision making regarding activity schedules and next steps. Project budget monitoring has been ongoing with the guidance from BirdLife finance team. These have been aided by various strategies, including making projections for quarterly and yearly activities versus expected expenditure.

So far the approximate area covered by the biocontrol agent (weevils) is about 662km² (30% of *Salvinia* infested areas), and we realise that the extent of *Salvinia* infestation may have increased as compared to the beginning of the project (baseline), due to the invasive nature of the weed.
During the International Congress for Conservation Biology (ICCB) in Kuala Lumpur, Malaysia (21-25 July 2019), the BWZ participant shared with some invasive species experts about this project and sought their expertise. She also used every opportunity to share project experience and progress with other conference participants. She met participants from Palestine who were presenting about their biological control of *Salvinia molesta* using *Cyrtobagous salviniae*, using a similar project approach with BWZ. The Palestinian participants shared insights and ideas that been helpful to the project, especially regarding enhancing mass rearing. The team has since embarked on upscaled mass rearing efforts of the weevils to improve the efficacy of *Cyrtobagous* mass rearing efforts. Currently, application of new methods learnt from Palestinian colleagues (heating of water and addition of fertiliser) to improve mass rearing, is only being applied at the office site closer to the project team, who are managing it. This is because it requires closer monitoring, technical capacity, electrical power for controlling water temperature and controlled fertiliser input, which are not currently fully set up on-site. The new method is proving to be effective.

3.2 Progress towards project Outputs

Output 1: Environmental Impact and Risk Assessment guiding mitigation measures for biologically controlling *Salvinia molesta*
This was successfully completed in Year 1, and a letter of approval from ZEMA was provided as evidence - see here.

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

The total number of individuals to whom awareness was raised this year was 2,345 both onsite and offsite. These individuals have been sensitised on the biocontrol intervention and its effectiveness with an emphasis on good weevil management practices to ensure a successful biocontrol process, and highlighting the Do's and Don'ts during the intervention.

The increased number of community members aware of the project and the results of the cleared canal has triggered interest by the community to learn more about the project.

Cumulatively 16 weevil monitors have been trained around the site and are voluntarily participating in weevil nurturing and weevil monitoring. During project Year 3 nine more community members (bringing total to 20) volunteered on project activities helping with replenishing *Salvinia molesta* in mass rearing avenues, awareness raising, cleaning and clearing sites as well as taking part in weevil monitoring activities. The monitors and volunteers are kept updated on project progress through involvement during field visits, especially weevil monitoring so that they appreciate the project impact. We do not foresee significantly increasing the number of weevil monitors and community volunteers since we have observed the current number to be more or less sufficient for the task available.

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.
Since October 2018 and importing 2,200 individual weevils the project has introduced the biocontrol agent in the swamp in a total of 25 release points (11 initial points in project year 2 and an additional 14 points in project year 3) into the swamp. From the weevil monitoring activities

conducted, it was observed that the average distance covered monthly by the weevils is approximately a radius of 34m, an increase compared to the previously recorded 9m in the last report. This could possibly be attributed to data precision with increased release points, as well as displacement of the weevils due to navigation by fishermen in the swamp from the release point. The maximum weevil movement distance from the point of release recorded so far was 2,400m. The approximate area covered by weevils as estimated from the December 2019 survey was about 662km², and could have by now increased further given the estimated monthly weevil movement rates. Additionally, the monitoring surveys indicate that cleared sections of the swamp have attracted water birds as well as community social activities such as swimming. Please see photographic evidence of a cleared canal. Measurement of extent of cleared area will be carried out in Year 4 as planned.

Preliminary results from gillnetting surveys conducted in two entry points of the swamp (Waya and Chiyuni) to assess the CPUE baseline provided an indication of 2kg/boat/night as CPUE using unmodified standard fishing gear. The biodiversity assessment carried out in this project year increased the sampling area as the swamp is more accessible hence increasing sightings of flagship bird species such as the globally threatened Wattled crane.

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.

BWZ visited one national institution (LIUTEBM University) to discuss invasive species in Zambia and the biocontrol intervention in Lukanga, highlighting the project's status and its success thus far. The project progress 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 in all the quarters of this project year.

This year BWZ was part of the stakeholders that had an input in the formulation of a conservation plan for the Lukanga swamp, an activity being conducted by an independent consultant. In addition, BWZ participated in collaboration for mapping *Salvinia Molesta* within the country and mapping another invasive species *Mimosa Pigra* in Western Zambia.

Output 5: Project management, impact monitoring and evaluation structures and processes ensure that the project objectives are achieved on schedule and within budget
Project progress was monitored through PSC meetings, supervision virtual meetings with BirdLife staff, field visits by PSC members and regular field monitoring visits by the project team. BWZ submitted interim technical and financial reports to BirdLife every January and July, which BirdLife reviews and uses to advise on project implementation. These interim technical reports 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 is submitted to the Darwin Initiative every October.

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.

The Year 2 Annual Report review recommended that the project revise our original outcome indicators based on our monitoring observations. In response, we revised the indicators as follows as contained in the approved Change Request:

- Outcome indicator 0.1 changed from "From a baseline of >20kg/hr at start of project, fish catch per unit effort (CPUE) increased to <30kg.hr by end of project, benefiting 2500 fishing households (consisting of 21,000 people in total) to "Fish catch per unit effort (CPUE) baseline established using a gillnet survey in 2020, and shows at least a 10% increase by the end of project".
- Outcome indicator 0.2 changed from "By the end of project *Salvinia molesta* cover reduced by 2,000km² with increased (from baseline) numbers of Wattled Crane and other water

birds" to "By end of project weevil (*Salvinia molesta* control agent) introductions covering at least 1,500km² of *Salvinia* infested area, and *Salvinia* cover shows at least 25% reduction with increased (from baseline) numbers of Wattled Crane and other water birds"

As stated in the approved Change Request, we identified that the previously provided fish CPUE baseline estimates were unreliable. In response, the project conducted fish CPUE baseline gillnet surveys in Waya and Chiyuni, which are among the entry points of the swamp. Preliminary results show that the CPUE in the swamp is 2kg/boat/night using unmodified standard fishing gear. The project focussed on introducing weevils into the swamp and monitoring the invasive weed clearing process. Ensuring that weevils cover as much of the swamp as possible will increase the likelihood that the *Salvinia* is cleared even if it happens after the life of the current project. In line with the revised outcome indicators, as of December 2019 the project had introduced weevils into 662 km^2 of the targeted 1,500 km^2. It is predicted that by the end of the reporting period (31 March) the weevils might have spread even further. Mass rearing of additional weevils is underway to ensure that these are introduced at more release points in order to accelerate covering of the remaining parts of the targeted area by the end of the project.

3.4 Monitoring of assumptions

Assumption 1: Successful introduction and activity progress of the biocontrol agent once present on site.
Comments: The Salvinia control using the weevil *Cyrtobagous salviniae* started in October 2018. Weevil efficacy is already evident from the 'gunshot' holes noted in the *Salvinia* leaves (not in any other plant species) around the weevil release sites. Since the beginning of biocontrol activities, over 2,000 weevils have been introduced in the swamp at 25 points (11 initial points in project year 2 and 14 additional points within project year 3), with 8 points being control points, bringing the total current monitoring points to 33. However, weevils from at least 11 points have moved and merged with each other. An average distance of approximately 34m is covered by the weevils monthly with a maximum distance of 2,400m from one release point since initial introduction in October 2018. Weevils have covered an approximate area of 662 km^2, which is approximately 30% of the infested area of the swamp. These results have been obtained from site monitoring activities that focused on observing the extent of the weevil spread, *Salvinia* discoloration (browning), number of gunshot holes within the release and recording any effect of the weevil on associated plants.

Additionally, eight control points (non-weevil release sites) have been selected and georeferenced for comparison with the weevil release sites. At present, one control point has merged with a release point, demonstrating a great extent of weevil spread. Furthermore, we conducted a biodiversity assessment in July 2019. Fifty-two 3km transects were surveyed compared to 32 in 2018 and 11 in 2017), with 60 species of birds totalling to 20,335 individual birds recorded. The results showed that *Salvinia molesta* is still a predominant threat to the swamp with 58% of transects infested. New locations for possible introduction of the biological control weevils were identified, and will be targeted for further weevil releases during the next reporting period.

Assumption 2: No major risks that may hinder the 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 the start of the biocontrol by well over 5 months as it only began in October 2018.

Assumption 3: Traditional leaders in the project area give their full support and endorsement letters in support of biological control.
Comments: In addition to the four traditional leaders that gave consent letters last year, six others are now participating in various project activities such as weevil introductions and community mobilisation to facilitate awareness talks in Chiyuni.

Assumption 4: Successful collection of biocontrol agents from Kafue Fisheries (here in Zambia) Project site conditions favourable for biocontrol agent multiplication;

Comments: Biocontrol agent imported in Year 2 (October 2018) and conditions in both the swamp and the various mass rearing avenues are favourable for breeding and survival as illustrated by the monitoring data collected so far.

Assumption 5: Biocontrol agent spreads and mixes well in-situ
Comments: The biocontrol agent has been released into the swamp and is currently thriving well in-situ. At present weevils have covered an approximate area of 662 km² which is approximately 30% of the infested area of the swamp. Evidence of all life cycle stages of the weevil have been seen at each release point and in the mass rearing ponds and troughs as well as the fact that 8 of the introduction points have merged and weevil activity is recorded continuously over a 3.5km stretch. Monitoring was conducted twice, in May and October/November 2019 as indicated in the combined monitoring report.

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

The project's main target is to restore the swamp habitat of a major fishery to ultimately improve the livelihood of an estimated 22500 fishing community members in the surrounding local community as reclaimed habitat increases fish catches thus more income and suitable habitat that supports biodiversity and additional ecosystem services. Invasive species infestations are currently among the top threats to native biodiversity as they alter the overall habitat. By controlling the invasive alien *Salvinia molesta*, the project will restore and enhance one of Zambia's key wetland ecosystems and contribute to poverty alleviation due to increased fish catches.

The project conducted a biodiversity assessment in July 2019. Fifty-two 3km transects were surveyed compared to 32 in 2018 and 11 in 2017, with 60 species of birds totalling to 20,335 individual birds recorded. The results showed that *Salvinia molesta* is still a predominant threat to the swamp with 58% of transects infested. New locations for possible introduction of the biological control weevils were identified.

During the project year, some canals have completely been cleared of the Salvinia weed as can be seen from the photographic evidence of a cleared canal. This resulted into resuming fishing activities within these canals. This has increased the surface area for fishing and is ultimately expected to increase fish catch and thus improve livelihoods/reduce poverty.

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

The project activities carried out during Year 3 have contributed to the following SDGs.

1- No poverty – The project has cleared several canals of their *Salvinia molesta* infestation which has eased navigation to major fishing points within the swamp. This has reduced the travel time between fishing grounds and trading areas, thus enabling fishermen to spend more time fishing. The biocontrol agent (Salvinia weevils) has spread to cover approximately 662km^2 by December 2019 indicating good potential for further clearance. The gillnetting surveys done for establishing CPUE baselines have also incidentally indicated a possible increase in the number of fish species and catch compared to the survey conducted by DoF in 2015. We will continue to monitor this to ascertain increased CPUE within the fishery. Higher CPUE would mean reduced poverty for the fishing community due to access to more fish.

2- Zero Hunger – Easier access to the cleared canals for fishing activity by the community means more fish availability for the people and thus reduced hunger. However, evidence of this will be collected in project Year 4 from community members to verify results of the gillnetting surveys in view of increased catch especially from cleared canals.

5- Gender equality – In Year 3, the project team trained five more weevil monitors, two females and three males within the project area. Female participation on the project steering committee has been maintained with about 55% women versus 45% men participating at every quarterly

meeting. On-site and off-site awareness raising meetings have endeavoured to create a balance between male and female participation. During Year 3, awareness-raising sessions reached 2,345 individuals; 1271 (54%) males and 1074 (46% females).

17-Partnership for goals- Through engagement with steering committee members, the project team has had an opportunity to participate in the formulation of a conservation plan for the Lukanga swamp through ZEMA. Furthermore, the project outcomes and activities have contributed to updating the online Ramsar information site through the Ramsar focal point. The project team also provided input and recommendations for the proposed Global environmental Facility (GEF) funded Ecosystem Based Adaptation Project of the Ministry of Lands and Natural Resources.

We anticipate that the project's direct contribution to goals 1- No poverty, 2- Zero hunger, 3- Good health and wellbeing and 15- Life on land will be more evident as the weevil activity increases within the swamp. We will document these results in future reports.

We additionally expect the project to contribute indirectly to 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- Reduce the direct pressures on biodiversity and promote sustainable use

C- Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

D- Enhance the benefits to all from biodiversity and ecosystem services respectively.

Furthermore, the project is contributing to achievement of the Convention on Biological Diversity (CDB) Aichi Targets 1, 5, 6, 9, 11, 12, 14, 17 and 18[1]. Both the NBSAP and Aichi targets are principal instruments for implementing CBD obligations at the national level. The project has also contributed information for use in updating the online Ramsar Information Site, which provides online information on wetlands on International importance.

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 >22,500 households.

Lukanga Swamp is an important national fishery contributing 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 due to increased sunlight and oxygen once the invasive weed is cleared which will be noted once the biocontrol intervention takes greater effect. The CPUE has now been established at 2kg/boat/night and this is expected to improve with increased weevil activity (breeding and subsequent spreading) within and after the project.

[1] For the full targets, please visit: https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf

During the project year, some canals have completely been cleared of the Salvinia weed and this resulted into resuming of fishing activities within these areas. This has increased the surface area for fishing and is ultimately expected to increase fish catch.

7. Consideration of gender equality issues

The project has been working closely with both men and women throughout the life of the project. For example, the team has worked with the Site Support Group, which has both genders in leadership this is an effort to ensure that the views of men and women are taken into account. The team has encouraged men and women to participate in project activities, and in Year 3 has seen the participation of men and women reach almost equal levels, at 46% women and 54% men. In an increased effort to ensure that women participate more in the project activities, the team has also trained both genders as weevil monitors.

8. Monitoring and evaluation

Our project seeks to introduce biological agents to control the invasive *Salvinia molesta* in 1500 km² of the Lukanga Swamp. As indicated through the project's recently approved Change Request, the fish Catch Per Unit of Effort (CPUE) baseline provided by the Department of Fisheries during the proposal stage was found to be unreliable. After further investigation, we discovered that the CPUE was based on extrapolations from data collected from a much larger fishery within the country, and the DoF didn't have capacity and resources for conducting a more detailed fish catch assessment to cover the entire 3,300km² of the swamp in September/October 2019. Our experience and consultations with Fisheries Officers have shown that the originally proposed method of measuring weight of fish captured by the fishermen is not always reliable since fishermen may fail to declare all the captured fish. Experts have advised that we now use the gillnet survey method for establishing other baselines and follow-up assessments. Therefore, to determine the CPUE, two gillnetting surveys were conducted in two entry points of the swamp (Waya and Chiyuni). This activity was conducted with the guidance from the DoF in collaboration with BWZ. Preliminary results from this survey indicate CPUE as 2kg/boat/night using unmodified standard fishing gear. The gillnetting surveys done for establishing CPUE baselines have also incidentally indicated possible increase in the number of fish species and catch compared to the survey conducted by DoF in 2015. To achieve this;

- An Environmental Impact Assessment was completed in Year 1 and weevils were imported from CABI in South Africa. Weevil monitoring in the swamp is undertaken quarterly to document the extent of spread of weevils which ultimately gives an indication of Salvinia control.
- Capacity development through weevil monitoring training and awareness raising within community members was conducted to ensure understanding and participation in the process of biocontrol activities was enhanced.
- An community awareness extent survey conducted in November 2019 has been used as a monitoring tool to assess the extent to which information disseminated to the community is reaching them for the benefit of ensuring that *Salvinia molesta* is not further spread by humans to un-infested areas. The survey also measured the impact of awareness raising efforts undertaken by project team. Due to efforts undertaken to enhance community understanding and interest, five community members were trained as weevil monitors who are now capable of nurturing the weevil mass rearing process on site. Our findings revealed that distance has a significant effect on the number of people reached with awareness raising; as the further away from the swamp, the less people know about the project activities. In contrast, in areas close to the swamp, 65% of the sampled population were aware of the project while 35% were not.
- In Year 3, the project up-scaled mass rearing of weevils and trained additional weevil monitors to nurture the weevils and monitor their populations. The contribution of each of these is indicated through achievements such as weevil introduced at 25 points in the swamp covering slightly over 662 km² and mass rearing being done in two concrete ponds,

and nine plastic troughs all in an effort to increase the number of weevils introduced in the swamp.

- Partners, through the Project Steering Committee quarterly meetings, contribute to the Project M&E in an effort to ensure that the project team is implementing the project based on the agreed approach within the stipulated timeframe. The project team provides updates quarterly during project steering committee meetings.

9. Lessons learnt

- Stakeholder participation has been consistent and has yielded many great results that will have a long-term impact on the project site beyond the scope of the project. Through engagement with steering committee members, the project team has had an opportunity to participate in the formulation of a conservation plan for the Lukanga swamp through ZEMA.
- Furthermore, the project outcomes and activities have contributed to updating the Ramsar information site through the Ramsar focal point. The project team also provided input and recommendations for the proposed Global Environment Facility (GEF) funded Ecosystem Based Adaptation Project of the Zambia Ministry of Lands and Natural Resources.
- It is through stakeholder engagements that the Department of Fisheries recommended the Gillnet survey for rapidly assessing the CPUE. From lessons learnt during this exercise, BWZ and DoF have agreed to use the more widespread and intensive Catch Assessment Survey (CAS) as a technique for analysing CPUE. CAS is more comprehensive, though more costly as it covers more sites, fishermen's catch and involves a much larger team.
- The mass rearing techniques for weevils have been up scaled and adapted from methods learnt from experts from the Northern Territory Government of Palestine. A project team member met the experts during the 29th International Congress for Conservation Biology (ICCB) in Kuala Lumpur, Malaysia (20-25 July 2019). The new techniques involve keeping temperature at optimum (25.5-33℃) in the mass rearing avenues using a heating pad, application of a nitrogen rich fertilizer to improve nutrient quality, which improves growth of all weevil life cycle stages and promotes growth of *Salvinia molesta*. Additionally, the team learnt a technique of counting weevils from mass rearing avenues that provides an indication of how many weevils are available at present.
- The delayed replenishment of fresh *Salvinia* at mass rearing avenues in Chiyuni by the weevil monitors resulted in the loss of over 400 weevils. This was a result of negligence on the part of the weevil monitors and miscommunication with the BWZ project team. This triggered an urgent need to increase the number of local weevil monitors and conduct a weevil monitoring refresher training emphasizing the mass rearing methodology for the weevil success as well as increasing communication with all monitors in all sites every fortnight.

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

	Reviewer Comments	Action taken
1	The indicators in M&E framework (Annex 4.3 are not consistent with those in the project logframe, making it difficult to assess progress. One way to achieve this would be to incorporate baselines and targets that currently only appear in the M&E framework (which are more specific) into the logframe	The indicators in the M&E framework have been incorporated into the logframe.
2	A formal budget change request may be required	The budget request was submitted and approved.
3	Please clarify the membership of the Project Steering Committee	Refer to PSC terms of reference here where a list of PSC member names and affiliation are also indicated.
4	Please provide more information on how the project partnership are maintained on a day	Relevant partners are involved in various collaborative proposal development.

	to day basis	Communication on project updates is not limited to quarterly meetings but also virtual spontaneous communication.
5	Do you have/ can you provide up-to-date figures of the current extent of weed infestation (latest on project website, based on satellite imagery) from July 2017) o the project date? it would be useful to provide annual updates	The satellite image analysis was scheduled to be conducted only at baseline and end of project, not annually. A follow up assessment is scheduled for the third quarter of Year 4.
6	Consider revising Outcome indicators so that targets are more realistic	These have been revised and approved through a Change Request as indicated in the logframe; Annex 2
7	Please include more information on baselines (and how these were measured)	The Fish Catch Per unit of Effort baseline was obtained from the Department of Fisheries. However, this is being revised as further consultations within the Department have confirmed the figures are an extrapolation from a larger fishery and hence not realistic for the Lukanga Swamp. The *Salvinia* coverage baseline was obtained from satellite image analysis conducted in the first year of the project prior to the start of biological control activities. Biodiversity baseline was acquired from BWZ's IBA programme that has conducted routine monitoring for over 8 years in Lukanga.

11. Other comments on progress not covered elsewhere

BirdWatch Zambia has identified and engaged Theresa Ng'ambi, a Zambian musician as a conservation ambassador. Her mandate is to enhance raising awareness on the project and general conservation issues in Zambia. She has so far been engaged in awareness raising off-site. She is scheduled for an on-site appearance in the third quarter of the project Year 4.

Furthermore, BWZ and the Department of Fisheries have engaged intensively on co-creation of funding proposals for a large-scale Catch assessment survey. This is a costly exercise but needs to be conducted as soon as the fish breeding season is over in March 2021. It is planned to be a more extensive exercise to determine a more representative CPUE of the Lukanga swamp. The gillnetting surveys that have been conducted estimated CPUE of 2kg/boat/night. These surveys which were conducted at a small scale due to financial constraints and will be replicated at the end of the project on the same points to ascertain any changes in catch.

Over the last one year, several funding proposals have been developed to sustain and upscale activities and lessons learnt from the Darwin Initiative funded project. This has ultimately led to the development of a generic proposal concept note focused on enhancing the ecosystem functions of the swamp through sustained integrated management for improved biodiversity and livelihoods.

12. Sustainability and legacy

The initially proposed exit strategy still suffices as it leaves capacity within the local community as well as the fisheries officers**.** Developing capacity of an additional two fisheries officers and nine community members who are stationed at the project site and frequently patrol the project area will ensure sustained monitoring of the spread of the weevil activity as well as the status of the Salvinia infestation. The fisheries department has now mainstreamed monitoring of Salvinia weevil into their twice-monthly patrols and the fisheries management committee that consist of five of the nine community volunteers.

In addition ZEMA is currently conducting a project on the Lukanga Swamp that will ensure the formulation of a conservation plan for the swamp. This is an excellent indication of the country's

commitment to conserving the swamp. ZEMA's project is already relying on this Darwin Initiative funded project's inputs, especially baseline data.

13. Darwin identity

The Darwin logo has been used on all project correspondence, which include reports and awareness materials. These reports are used as reference materials by the project office and relevant stakeholders on the project and any interested. The reports also target scholars and 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. This year, awareness about the project reached over 1,000 individuals during an exhibition (one of the activities BWZ did to celebrate 50 years in conservation).

The Darwin Initiative funded biocontrol project falls within BirdLife International's Invasive alien Species conservation programme and BirdWatch Zambia's sites and habitat restoration programs, which is also a major strategic pillar for the organisation. Nationally, the project falls under National Biodiversity Strategic Action Plan (NBSAP) and Wetlands policy implementation plans that aim to achieve two major components - control/eradication of invasive alien species to restore key wetlands and their biodiversity as well as documenting additional or potential threats to wetlands of national or international importance.

Generally, the understanding of the Darwin Initiative in Zambia is limited to individuals and institutions that are mostly involved with research and livelihood initiatives such as the Biocontrol project and general environmental conservation.

The Darwin Initiative continues to be 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.* Apart from this BWZ uses social media like BirdWatch Zambia's Facebook Account to post about the Biocontrol project and project updates that are linked to the Darwin Initiative social media channels.

14. Safeguarding

BirdLife International provides a safe and trusted environment, which safeguards staff, volunteers and anyone who the organisation has contact with, including beneficiaries, project staff, volunteers, and downstream partners. BirdLife has a Code of Conduct in place for staff and volunteers, which sets out clear expectations inside and outside the workplace. The Code of Conduct can be found within BLI's Human Resources Policies alongside a safeguarding policy, equal opportunities policy and whistleblowing policy.

BirdLife's safeguarding policy includes a statement of BirdLife's commitment to safeguarding and a zero-tolerance statement on bullying, harassment and sexual exploitation and abuse. There are clear investigation and disciplinary procedures to use when allegations and complaints are made and clear processes are in place for when a disclosure is made. Additionally, BirdLife has a whistle-blowing policy that protects whistle-blowers from reprisals and includes clear processes for dealing with concerns raised.

In July 2019, BirdLife introduced a Safeguarding Clause in the Project Funding Agreement, a binding contract between BirdLife and Downstream Partners. BirdLife has a Project Funding Agreement with BWZ, which will be amended to include that clause.

15. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2019 – 31 March 2020)

Project spend (indicative) since last annual report	2019/20 Grant (£)	2019/20 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				

We will submit a change request to carry forward £5,117 to cover the variances in costs, most of which were incurred by Covid-19 pandemic circumstances in Feb-Mar 2020 that limited travel and procurement of equipment.

● Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2019-2020

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
Impact *Control of invasive alien species from areas under aquaculture in Zambia increases the resilience of 2500 fishing households and conserve wetland biodiversity*		The biocontrol agent for *Salvinia molesta* has been released into 25 points (11 initial points in project year 2 and 14 points in project year 3) in Lukanga Swamp in Zambia leading to its spread, so far covering >30% of the infested swamp area and predicted to spread further from increased number of weevils, controlling the invasive weed upon which fish stocks, bird populations and other biodiversity are projected to increase in the long term.	
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	1.1 Fish catch per unit effort (CPUE) baseline established using a gillnet survey in 2020, and shows at least a 10% increase by the end of project	Preliminary results from two Gillnetting surveys conducted in two entry points of the swamp indicate a baseline CPUE of 2kg per boat per night	A full fish-breeding season is needed prior to a follow-up survey being undertaken. In this regard, the gill netting surveys will be replicated at the end of the project on the same points to ascertain any changes in catch.
	1.2 By end of project weevil (*Salvinia molesta* control agent) introductions covering at least 1500km² of Salvinia infested area, and Salvinia cover shows at least 25% reduction with increased (from	As of December 2019, approximately 662 km² was covered by weevils following introduction started in October 2018 It is thus anticipated that well over 662 km² will be controlled of Salvinia due to weevil action.	Introduce weevils in an additional 840 km^2.

	baseline) numbers of Wattled Crane and other water birds 1.3 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)	Additional five weevil monitors from the local community have been trained in weevil mass rearing bringing the total number of trained monitors to 16	Refresher training course in weevil monitoring to be conducted on all local monitors.
Output 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	This output was successful and completed in year 1. Evidence in the form of an approval letter is provided here.	
Activity 1.1 Hire a consult to conduct EIA		Completed in Year 1	No further action needed
Activity 1.2 Conduct EIA		Completed in Year 1	No further action needed
Activity 1.3 Consult submits draft EIA report to BWZ for review		Completed in Year 1	No further action needed
Activity 1.4 Final revised EIA report submitted to ZEMA		Completed in year 1	No further action needed
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.	The total number of individuals reached with awareness raising sessions this year was 2,345 compared to 521 individuals in project year 2 and 72 individuals in project year 1. These have been sensitised on the biocontrol intervention and its effectiveness with an emphasis on good weevil management practices to ensure a successful biocontrol process highlighting the Do's and Don'ts during the intervention.	

	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	A weevil monitors' training session was conducted in Chilwa Island at inception of weevil mass rearing activities on Chilwa Island. A refresher training session was conducted in Chiyuni to increase the number of monitors as well as provide clarification on weevil requirements following a mortality report on the entire weevil consignment in the area. Cumulatively, all 16 trained monitors around the site are voluntarily participating. A total of 20 community members volunteer on project activities helping with replenishing *Salvinia molesta* in mass rearing avenues, awareness raising, cleaning and clearing sites as well as taking part in weevil monitoring activities.	
Activity 2.1. Conduct awareness talks on site, discussing the control program and methods		The total number of individuals to whom awareness was raised so far during project year 3 is 2,345 (1800 off site and 545 on site) comprising 1271 (54%) males and 1074 (46%) females. This is in comparison to 521 (30% females and 70% males) individuals in project year 2 and 72 (30% Females and 70% males) individuals in project year 1. The project held a total of 12 engagements whose highlights are; the traditional leaders' meeting that attracted 14 traditional leaders and the area councillor to a meeting that provided an in-depth of the project intervention to all local authorities on Chilwa Island highlighting the biocontrol intervention, the visit to LIUTEBM University and the extensive awareness raised during BWZ's 50th Anniversary exhibitions. Target groups for awareness raising remain fishermen, traders, school pupils and general local community members using posters, village meetings and posters. However, during this year the project team added on a live radio programme as an awareness-raising tool.	We plan to purchase more airtime on radio and national TV to increase awareness on invasive species so as to to reach (using a local radio station) the community around, but further from the swamp; and the wider public (using national TV and radio) to educate them about invasives.. The team targets to raise awareness to 100 individuals every quarter (400 per year) onsite, especially communities living around the swamp so that they know the Dos and Don'ts of Salvinia biocontrol, thus play their part in enhancing efficient control of the weed.
Activity 2.2. Community mobilisation of participants, time table development, etc.		Five (5) weevil monitors and 9 community volunteers were trained and have been providing phone feedback to the project team every fortnight. They undertake project activities such as replenishing *Salvinia molesta* in mass rearing avenues, awareness raising, cleaning and clearing sites as well as taking part in weevil monitoring activities.	Increase local community participation by creating two more site support groups, each with 20 members, by third quarter of project year 4.

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 Fish catch per unit effort (CPUE) baseline established using gillnet survey in 2020, and shows at least 10% increase by end of project 3.2 By end of project weevil (Salvinia molesta control agent) introductions covering at least 1500km² of Salvinia infested area, and Salvinia cover shows at least 25% reduction with increased (from baseline) numbers of Wattled Crane and other waterbirds	Two gillnetting surveys conducted in two entry points of the swamp (Waya and Chiyuni). Preliminary results from this survey indicate that the baseline CPUE on the swamp is 2kg/boat/night using unmodified standard fishing gear. Approximately 662km² was covered by weevils as of December 2019. This follows introductions that started in October 2018.This has resulted in complete clearance of Salvinia off some canals with Wattled cranes and other biodiversity observed in some cleared release points. The extent of Salvinia clearance using satellite image analysis will be measured in project yr 4 as originally planned.	
Activity 3.1 Training of participants; first institutional partners then community members		Three individuals from DoF received training in gillnetting survey techniques. This was also extended to 8 community members who participated in the survey and related activities.	Satellite image analysis training will be conducted with six participating institutions that are part of the project steering committee. Weevil management training to be conducted with the Ministry of Natural Resources Ecosystem Based Adaptation project team once their project begins.
Activity 3.2 Establishment of on-site weevil breeding ponds		Two fibreglass troughs were delivered to Chilwa Island commencing the mass rearing efforts on this site. Two more troughs have been employed for upscaling mass rearing at the BWZ office. Total mass rearing avenues are now 16. (concrete ponds (6), fibreglass(6) and plastic troughs(4).	One trough to be delivered to Waya and will be set up for use in the second quarter of project year 4.

Activity 3.3 Weevil collection and release into on-site ponds	Weevils were collected from 3 existing mass rearing avenues and released into 8 new mass rearing avenues (4 at DoF headquarters in chilanga - 25km south of Lusaka, 2 at BWZ office and 2 on Chilwa (island onsite).	Weevil mass rearing to be resumed in 2 mass rearing avenues in Chilwa by the second quarter of the project year. This will be in an effort to mitigate the mortality experienced in this area within this project year after the refresher training on weevil management with the weevil monitors.
Activity 3.4 Rearing of weevils by community members supervised by BWZ staff	Active mass rearing avenues are 16; 8 onsite and 8off-site. There is currently no mass rearing at one entry point (Chiyuni) after all the weevils died due to monitors not following mass rearing guidelines and negligence.	Weevil mass rearing to be resumed in Chiyuni by the second quarter post refresher training. Enhance close contact with weevil monitors regarding feedback on the weevil rearing avenues, refresher training and enhanced backstopping from the project team.
Activity 3.5 Releasing the weevil into trial points within the swamps	Completed in Year 2	Monitoring of weevil spread from initial release points.
Activity 3.6 Monitoring of released weevil	Weevil monitoring has been done on all 25 release points and 8 control points. Results show that weevils from 8 out of the initial 11 release points have moved and merged with each other. This is from evidence of observed continuous weevil activity from one point to the other. Monitoring reports are available here	Monitoring in all points will be conducted once quarterly.
Activity 3.7 Release weevil into additional points	During Year 3, weevils have been released in additional 14 points within the swamp .	Weevil release is scheduled to be conducted every quarter. The number of release points will be determined by the number of weevils collected from mass rearing avenues.
Activity 3.8 Maintain on-site breeding ponds	Two forms of maintenance have been done; 1.Concrete ponds; filling up cracks in the pond, clearing the surrounding around the ponds.	This is an ongoing process and will be conducted as and when need be.

		2.Plastic troughs; cleaning die-back from the bottom as well as maintaining water valves.	
Activity 3.9 Documentation, including video footage of weevil and no weevil released points		The project team developed two weevil monitoring reports highlighting 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 reports also indicate the extent of spread of weevils and threats to the success of the intervention. Additionally, the team conducted an awareness raising extent survey to show how project information had been disseminated within the community in Waya. The report indicates that more individuals closest to the swamp are more aware of the project than those further up to 8 kilometers from the harbour of the swamp, with 65% aware while 35% were unaware. The team also recorded short video clips during interviews with community members asking them what they think is responsible for clearing off of Salvinia in some sections of the swamp and what impact that has on them. These clips will be incorporated in the documentary Biodiversity and weevil monitoring outcomes have been submitted for use in updating the online Ramsar information site for the Lukanga swamp currently under review.	Weevil monitoring will be conducted in all sites every quarter. The monitoring reports will continuously be updated from every monitoring visit until the end of the project.
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	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 (LIUTEBM University) to discuss invasive species in Zambia and the biocontrol intervention in Lukanga and highlight the project's current status and its success thus far. 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 in all the quarters of this project year.	

improvement and biodiversity conservation.			
Activity 4.1 Meeting with key stakeholders to share progress, successes, failures and lessons		Four steering committee meetings were conducted in all quarters and were attended by project staff, 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 were a platform to share progress, successes, failures and lessons learnt as well as receive feedback and backstopping moving forward and plan on the sustainability of the project. Minutes of these meetings are shared with all PSC members. Two virtual meetings were held between the lead and implementing organisations. One was a mid-year review meeting to assess project activities while the other was an end of year planning and evaluation meeting that attracted representation from the PSC committee members, BWZ board members that reviewed progress so far and discussed sustainability of the current investment and outlining a 5-year plan for the Lukanga swamp. Meeting minutes are available here.	The team will be sharing a concept note with potential funders for review and possibly funding. Additionally, fundraising to sustain current project activities is ongoing. The focus of follow-up work would be: (1) putting in place biosafety measures to prevent future re-invasion of *Salvinia molesta* and other invasive into the swamp; (2) starting up community enterprises especially for women and youth (e.g. vegetable gardens for food security, soil improvement and other income generation activities); (3) supporting start-up of community-led fish farming initiatives - this is to ensure fish supply during an annual 3-month (1st Dec to 1st Mar) fish ban period, generate income for community members, and provide food security while promoting adherence to the fishing ban which allows for fish recoveries in the swamp and decreases disturbance of the invasive control-agent (weevil) activity.

4.2 Newspaper article on overall project activity		An article was published in the Nkwazi inflight magazine, Zambia's leading consumer lifestyle publication that aims to inspire a mix of business, travel, arts and culture www.nkwazimagazine.com	Articles prepared for publication in the BirdLife International online bi-annual magazine, the Darwin Initiative newsletter and BirdLife International website highlighting the project approach, outcomes and community views.
4.3 TV interview sharing on-site video footage		This activity has not been completed yet; however, a TV platform has been identified with the national television.	A combination of introduction footage, community meetings, biodiversity assessment recorded by the project team as well as on site-real time footage recorded by TV crew will be compiled into a 15-minute documentary to be aired on national TV to profile the project, its approach and results in the third quarter of the project.
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	One biodiversity assessment was conducted in July to ascertain the Lukanga's flora and fauna. This assessment covered 52 three kilometre transects and recorded 20,335 birds (60 species), 19 plant species in comparison with the 2018 report that recorded 3840 birds (88 species) and 24 plant species from 32 transects. Two monitoring visits have been conducted documenting the project progress regarding the biological agent activities in the swamp. The latest monitoring activity in December 2019 indicated weevil coverage of approximately 662 km^2 with an average of 34m distance covered every month. A summary state of the wetlands report is planned for publication in February 2021.	

	status and trends reports which are all publicly shared documents		
Activity 5.1 Contract project partners and staff		Activity completed in Year 1	No further action needed.
Activity 5.2 Undertake project induction/inception and quarterly meetings		Project induction and inception completed in year 1. Project steering committee quarterly meetings on going.	Project steering committee meetings scheduled every quarter.
Activity 5.3 Set/confirm biodiversity and socio-economic baselines		These baselines were set at project inception. However, the catch per Unit of effort baseline is under revision as initial figures were a gross scale extrapolation. Two Gillnetting surveys have been conducted and are being compiled by the Department of Fisheries.	The Catch per Unit of Effort baseline from the Gillnetting surveys conducted in December and February indicate 2kg/boat/night as CPUE. These surveys will be replicated at the end of the project on the same points to ascertain any changes in catch.
Activity 5.4 Undertake project monitoring and reporting involving partners		A Monitoring and Evaluation framework was formulated in the second project year	Reviewing of the framework against project outcomes with the steering committee during the second quarter meeting.

● 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	1.4 Fish catch per unit effort (CPUE) baseline established using a gillnet survey in 2020, and shows at least a 10% increase by the end of project 1.5 By end of project weevil (*Salvinia molesta* control agent) introductions covering at least 1500km² of *Salvinia* infested area, and *Salvinia* cover shows at least 25% reduction with increased (from baseline) numbers of Wattled Crane and other water birds 1.6 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)	**1.1** Reports from baseline and end of project participatory fishing community assessment surveys **1.2** Reports based on baseline and end of project mapping and biological surveys **1.3** Capacity surveys of CBO/SSG	Successful introduction and activity progress of the biocontrol agent once present on site.
Output 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	2.1 By end of Year 1 >100 community members sensitised and trained in the biocontrol process.	2.1 Capacity assessment reports	2.1 Traditional leaders give their full support and endorsement of the initiative

Fishing community members have increased the capacity and interest to participate in Salvinia control.	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	2.2 Monitoring datasheets and reports	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 Fish catch per unit effort (CPUE) baseline established using gillnet survey in 2020, and shows at least 10% increase by end of project 3.2 By end of project weevil (*Salvinia molesta* control agent) introductions covering at least 1500km² of Salvinia infested area, and Salvinia cover shows at least 25% reduction with increased (from baseline) numbers of Wattled Crane and other waterbirds	3.1 Reports from baseline and end of project gill net surveys 3.2 Reports based on baseline, mid-term and end of project mapping and biological surveys	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 reports	
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	5.1 Site visits 5.2 Reports and on-site footage	5.1 Biocontrol agent spreads and mixes well in-situ

	IBA status and trends reports which are all publicly shared documents		

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, timetable 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
3.9Documentation, 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
6A	Education and training on *Cyrtobagous salviniae*.			0	11	5	16	12
7	Information leaflets or posters providing advice or guidance on invasive species and weevils (the biocontrol approach)			0	30 posters,10 booklets, 50 wetland info booklets	20, 15 booklets, 3 placards	128	150 information materials
10	Fieldguides/manuals produced to assist work related to species identification, classification and recording			2 species identification, classification and recording	1 species identification, classification and recording	1 species identification, classification and recording	4	5
12	Computer based database to be established and handed over; GIS software installed on BWZ office computers.			1 GIS and satellite imagine analytics			1 GIS and satellite imagine analytics	2
14B	Number of conferences/seminars/ workshops attended at which findings from Darwin project work was presented/ disseminated.			0	1 Invasive species summit	2 BirdLife Africa partnership regional workshop, International Congress for Conservation Biology	3	4

20	Physical assets; computers and computer hardware, scientific equipment and reference material.			2 computers	1 weighing balance	0		
21	Number of permanent educational/research structures established and then continued after Darwin funding has ceased			0	2 concrete ponds' 2 fibre troughs 4 plastic troughs	5 fibre troughs, 5 plastic troughs	18	8
22	Number of permanent field plots and sites established during the project and continued after Darwin funding has ceased			11 transects	32 transects 11 weevil introduction points	52 14 weevil introduction points	52 transects 33 monitoring points (25 introduction, 8 control)	60 transects 30 weevil introduction points
23	Value of resources raised from other sources (i.e., in addition to Darwin funding) for project work							

- **Table 2 Publications**

Report name	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. web link or publisher if not available online)
Monitoring of *Cyrtobagous Salviniae*	Report	Clara Nanja and Francis Ng'ona	Female	Zambia		
Extent/ Impact of Awareness Raising Campaigns on the Lukanga Swamp.	Report	Francis Ng'ona	Male	Zambia		
Assessing the Abundance and richness of the Flora and Fauna of the Lukanga Swamp.	Report	Francis Ng'ona	Male	Zambian		
An in depth into Chilwa - Lukanga Swamp	Newsletter Article	Clara Nanja and Francis Ng'ona	Female	Zambian		The Wattled Crane, Volume 49 No. 11; Pg. 15-16
29th International Congress for Conservation Biology	Newsletter Article	Clara Nanja	Female	Zambian		The Wattled Crane, Volume 49 No. 8; Pg. 5-7
The State of Water Birds in the Lukanga Swamp IBA	Newsletter Article	Chaona Phiri, Mary Malasa	Female,	Zambian		The Wattled Crane, Volume 49 No. 6; Pg. 2-4
2019 BirdLife Southern African Partnership workshop in Victoria Falls, Zimbabwe.	Newsletter Article	Clara Nanja	Female	Zambian		The Wattled Crane, Volume 49 No. 5; Pg. 11-12
Mass Rearing of Cyrtobagous salviniae	Newsletter Article	Chaona Phiri and Clara Nanja	Female	Zambian		The Wattled Crane, Volume 49 No. 5; Pg. 13-15
Two years on the Invasive Species Management project in the Lukanga Swamp IBA	Newsletter Article	Chaona Phiri	Female	Zambian		The Wattled Crane, Volume 49 No. 4; Pg. 10-12
The Lukanga Swamp Restoration Project	Article	Chaona Phiri	Female	Zambian	Nkwazi Magazine	Nkwazi Magazine, Issue 40, pp. 52-53.

- **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.	