

Darwin Initiative: Final Report

To be completed with reference to the “Writing a Darwin/IWT Report” Information Note:
(<https://www.darwininitiative.org.uk/resources-for-projects/reporting-forms-change-request-forms-and-terms-and-conditions/>).

It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Darwin Project Information

Project reference	24030
Project title	Controlling an invasive aquatic plant for improved biodiversity and livelihoods
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), Zambia.
Darwin grant value	£299,016
Start/end dates of project	1 July 2017 to 31 March 2021
Project leader’s name	Paul Kariuki Nding’ang’a
Project website/blog/social media	https://www.birdwatchzambia.org/darwin-project/
Report author(s) and date	Clara Nanja, Paul Kariuki Nding’ang’a, Frank Willems, Swithin Kashulwe (April 2021)

1 Project Summary

The Lukanga Swamp, a recognised Key Biodiversity Area (KBA) and designated Ramsar site, is located approximately 50km west of the city of Kabwe in the Central Province of Zambia (Figure 1). The swamp hosts approximately 360 resident and migratory bird species, including the globally Vulnerable Wattled Crane (*Bugeranus carunculatus*). Other biodiversity in the Lukanga include the semi-aquatic antelopes such as Sitatunga (*Tragelaphus spekei*), Oribi (*Ourebia ourebi*) and a few Red Lechwe (*Kobus leche*). Reptiles include the Nile crocodile, Rock Python and Monitor Lizard. In addition to being a suitable habitat for birds and other biodiversity, the swamp supports over 2,500 fishing households who directly depend on it for their livelihoods, and as one of Zambia’s major fisheries, supplies protein to at least four large cities.

This project sought to control the aquatic invasive alien Kariba weed (*Salvinia molesta*), a free-floating fern which has been present in the Lukanga Swamp KBA since at least 2009. At the start of the project in 2017, an estimated 7.23% (approximately 60% of the open water lagoons) of the site was infested by the weed as found in the 2017 satellite image analysis (Annex 8). The weed formed a thick mat on the water, leading to the reduction of light penetration and dissolved oxygen, thereby reducing the abundance of fish and suitable habitat available for birds and aquatic species. The decrease in fish stocks led fishermen to increase their efforts and, in some cases, use incorrect fishing gear such as mosquito nets and poison to increase their catch per unit of effort (CPUE).

This project introduced the host-specific *Salvinia* weevil *Cyrtobagous salviniae* as the biocontrol agent. The weevil feeds on the weed and this damage causes the plants to turn brown, and eventually sink to the bottom of the water body and rot. Because the weevils are host specific, feeding only on the *Salvinia molesta*, at the point of eradication, they starve to death. The rotten *Salvinia* process has not been

documented as reducing dissolved oxygen in the water due to the slow and gradual rate at which it happens. The project was designed to control the invasive weed and improve habitat conditions for waterbirds and other biodiversity. Fish stocks were also expected to increase, thereby improving livelihoods of >2,500 households that are directly dependent on the swamp. Additionally, the project aimed to develop capacity in *Salvinia* control techniques among local community members at the three entry points (Waya, Chilwa and Chiyuni) into the Lukanga Swamp.

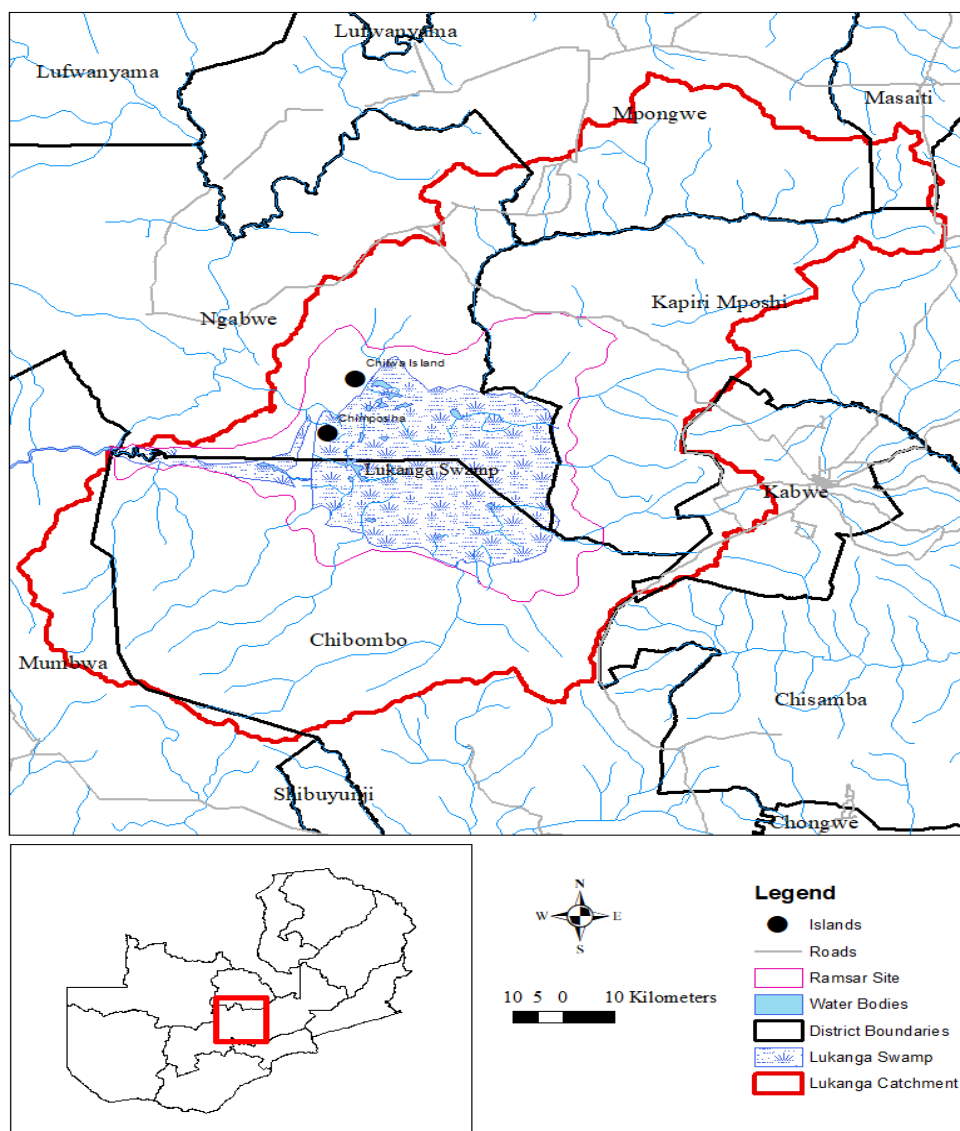


Figure 1: Location of the Lukanga swamp

2 Project Partnerships

BirdLife International, the lead organisation, worked closely with BirdWatch Zambia (BWZ) - the BirdLife Partner in Zambia in implementing the project. Full collaboration in the project included the Centre for Agriculture and Biosciences International (CABI), the Zambia Agriculture Research Institute (ZARI), Zambia Environmental Management Agency (ZEMA), International Crane Foundation (ICF), Department of National Parks and Wildlife (DNPW) and the Ministry of Fisheries and Livestock through the Department of Fisheries (DoF) who were all part of the Project Steering Committee. 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 also provided training and support to BWZ in the financial management for the project.

BirdWatch Zambia (BWZ) was the main implementing organisation locally in Zambia. BWZ worked closely with all relevant national project stakeholders (listed above) both on and off the project site to achieve the project objectives. While this report has been prepared by BirdLife International and BirdWatch Zambia,

all project stakeholders played very significant roles throughout the life of the project and have contributed to and reviewed this report.

CABI is one of the leading global experts in the use of biological control to manage pest invasions. CABI procured and facilitated the transportation of the weevils from a rearing plant in Durban, South Africa in Year 2 of the project. CABI provided technical support through the Project Steering Committee (PSC) for the remainder of the project.

The Department of Fisheries is mandated with overseeing the implementation of national fisheries programmes such as monitoring fish stocks in various water bodies. During the project, they provided support on weevil mass rearing, monitoring, awareness raising, and conducting gillnetting surveys in collaboration with BWZ project staff.

The Zambia Environmental Management Agency (ZEMA) is the government agency mandated by local legislation to be advisor and overseer on all environmental management projects. At project inception, they inspected the site and approved the biological control of *Salvinia molesta* using the host specific *Cyrtobagous salviniae*. ZEMA also nationally profiled this project as a success on managing invasive species management. They invited BWZ to be involved in providing the lessons learnt from the project into the Conservation Plan for the Lukanga Swamp being implemented by Zambia's Ministry of Mines. The plan covers the Lukanga and the Upper Kafue basin to deal with all the impending risks and tackle all the impacts occurring now or in the future, over this ecologically relevant wetland. ZEMA has been a member of the PSC providing backstopping and collaborating on the *Salvinia molesta* mapping on the Kafue river (main river canal of the Lukanga).

The Zambia Agriculture Research Institute (ZARI) is a department mandated by law to enforce the Noxious Weeds Act of 1958 and the Pests and Diseases Act of 1999. ZARI was involved through the Entomology and Plant Protection and Quarantine Services units which actively facilitated the importation and initial release of *Cyrtobagous salviniae* on the Lukanga swamp. ZARI was also involved in drafting of the Environmental Project Brief (EPB) that was submitted to ZEMA for approval before biocontrol efforts could start. ZARI was involved in the importation, drafting the Pest Risk Analysis (PRA), initial release and early monitoring of the impact and feeding damage of the *Salvinia* weevil on the Kariba weed. ZARI was also a key stakeholder of the PSC that provided backstopping throughout the duration of the project.

The local Site Support and farmers Groups (SSGs), local traditional leaders, school pupils and other community members were our key stakeholders at the project site. They were involved in the "beat plastic pollution" campaign within the schools and the swamp as well as awareness raising sessions and weevil monitoring.

Other relevant stakeholders including the Department of National Parks and Wildlife (DNPW), International Crane Foundation (ICF), World Wide Fund for Nature (WWF) and the British High commissioner were part of the Project Steering Committee (List of PSC members and TORs in Annex 9), providing guidance and project support to the team. The PSC met quarterly for updates on the project's successes, challenges, and lessons learnt during the lifetime of the project. Other relevant stakeholders were representatives from; the British High Commission (BHC), Zambia Governance Foundation (ZGF), National Heritage Conservation Commission (NHCC), Wildlife and Environmental Conservation Society of Zambia (WECSZ) and Mizu Eco-Care.

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.

Through the National Steering Committee for Biodiversity, housed by ZEMA, all project partners will sustain their relationship through tackling conservation issues including control of invasive species countrywide.

3 Project Achievements

Please see Annex 2 for summary of progress against the project logframe.

3.1 Outputs

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

The project was required to conduct an Environmental Impact Assessment (EIA) according to national guidelines on controlling and management of invasive species. Following consultations with ZEMA, through meetings and formal letters, the initially proposed Environmental Impact Assessment (EIA) was downscaled to an Environmental Project Brief (EPB). With support from ZARI, the project provided evidence that the proposed biocontrol process had previously been successfully conducted at other sites within Zambia. Unlike an EPB, the EIA process would have been a lengthy and more costly process requiring activities such as a public hearing and review processes. Downscaling from EIA to EPB saved the project some time. This was completed in project Year 1 and a letter of approval from ZEMA was issued (Annex 10).

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

Approximately 4,103 individuals were reached through awareness raising sessions during the life of the project, both at and away from the project site. These individuals were sensitised and educated on the benefits of the biocontrol intervention and its effectiveness with an emphasis on good weevil management practices to ensure a successful biocontrol process, including the 'Do's and Don'ts' during the intervention. A total of 20 local community members (4 women, 16 men) were trained on how to rear, take and monitor the spread of the biocontrol agent (*Salvinia* weevil). They voluntarily participated in these activities especially during the Covid 19 pandemic when BWZ staff could not visit the site as frequently as before. These monitors also participated in various project activities including replenishing *Salvinia molesta* in mass rearing avenues (troughs and ponds), awareness raising, cleaning, and clearing mass rearing sites. Through this project, the community capacity was enhanced through training opportunities, hands-on work on project activities, as well as proposal development in one of the local Site Support Groups - a local conservation group who share a common commitment to the conservation of a particular KBA.

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.

After a successful approval from ZEMA, BWZ initiated the biocontrol process. Unfortunately, the project could not obtain weevils from Kafue Fisheries in Zambia as it had undergone a 100% *Salvinia* control and weevils had died by the time BWZ obtained their permits. As a result, BWZ imported 2,200 weevils from the Edgcombe mass rearing facility in Durban, South Africa in October 2018. This consignment was introduced directly into the swamp while a small portion (about 100) initiated the mass rearing process outside the swamp in permanent concrete ponds and movable troughs. Weevils were initially released in 11 points in Year 2, this was followed by an additional 14 points in Year 3 and 51 points in Year 4, giving a total of 76 weevil release points by the end of the project.

By the end of the project, quarterly monitoring surveys demonstrated the weevils covered approximately 1,870 km². The maximum distance covered by weevils from their initial point of release was 12 kms. The quarterly monitoring assessments assessed various parameters, including *Salvinia* browning, which occurs as weevils suck chlorophyll out of the leaves (from perforating *salvinia* leaves causing gunshot wounds), the extent of weevil spread, threats to weevils, and impacts of the weevil on other biodiversity such as any form of damage on plants.

Overall, the biocontrol intervention resulted in suppressed *Salvinia molesta* spread (Figure 2). It also led to the clearing of the weed from some sections of the swamp, including some canals which now have improved navigation for swamp users especially the fishermen and traders (Figure 3). Through encounters with the fishermen during weevil monitoring surveys and community meetings, they confirmed a noted increase in the surface area for fishing. Figure 3 shows an example of a cleared canal which has now attracted open water loving birds as well as prompted social activities such as swimming, previously not observed in the same sections that had been infested with *Salvinia* during previous annual biodiversity assessments.

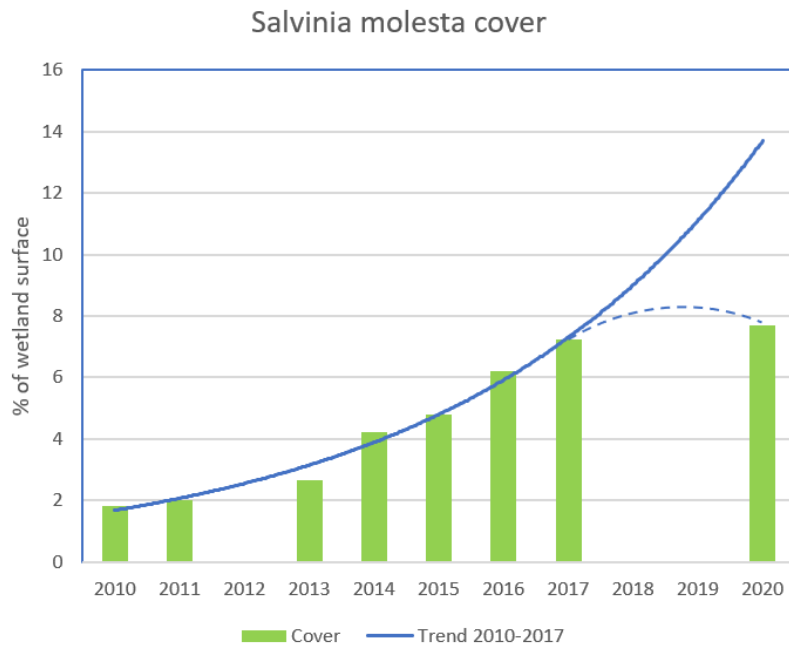


Figure 2: Results of satellite imagery analysis on cover of *Salvinia molesta* in Lukanga, as % of total surface (green bars) and trendline on base of the 2010-2017 data. The difference between projected and measured cover in 2020 reflects the project’s biocontrol impacts.



Figure 3: A photographic comparison of *Salvinia* cover in 2018 and 2019 at one the canals in Waya, Lukanga swamp, showing clearance of the weed. Some birds can also be observed on the cleared canal.

As regards impact of the project on the Fish Catch Per Unit Effort (CPUE), baseline gillnetting surveys conducted in Jan/Feb 2020 showed a CPUE of 2 kg/boat/night from a fleet of 12 fishing nets on the boat. During the end of project gillnetting survey conducted in Jan/Feb 2021 a fleet of 3 fishing nets on the boat, much fewer than those used during the baseline due non-availability of nets within the fisheries department at the time due to damage and commitment to other parallel activities. This gave a CPUE of 1.8kg/boat/night from a fleet of 3 fishing nets. When extrapolated to be standardised with the effort of 12 nets used during the baseline survey in the previous year, this translates to a CPUE of approximately 7.2

kg/boat/night for a fleet of 12 nets. Although the huge reduction in number of nets used could have affected the precision of the results, there seems to have certainly been an increase in the fish stocks, which thereby improved livelihoods as expressed by the fishing dependent community members:

- *“The canals are clear, the birds are back, fishing is easy, navigation is much easier. This has exceeded my expectations of results in a short space of time.”* – Mr Mofu, one of the weevil monitors as he explained that his doubts had been overcome by the evidence of a little insect that is resolving a really major problem that had compromised his source of income, fishing.
- *“The work which was started needs to continue. I have numerous reports from fishermen and traders that canals are clear, navigation is easy, and the fish is easier to catch now. The community is happy and we as the traditional leadership are in full support of the current and future endeavours as BirdWatch Zambia has shown concern towards supporting the livelihoods of the people of the Lukanga community”* - Trackson Chipito, member of the Waya SSG and village headman.

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.

The project progress updates, success, failures and lessons learnt were shared with the Project Steering Committee (PSC) members composed of individuals from 10¹ different governmental and non-governmental institutions during meetings (refer to the project partners section - Meeting presentations and meeting minutes in annex 11). The information that was shared through these engagements influenced stakeholder collaboration on the mapping and ongoing plans to extend the biocontrol intervention to the Kafue River on the Kafue National Park where *Salvinia molesta* infestation has been detected. A total of 10 steering committee meetings were held during the life of the project.

Two site visits were organised with this committee to ascertain progress and meet with some community members for impact analysis. The first PSC site visit was conducted in November 2018 and was attended by 15 individuals from 7 organizations while the second was in October 2020 which was attended by 15 individuals from 6 organisations within the PSC.

Throughout the project period, stakeholders have been reporting sightings of *Salvinia molesta* within the country, seeking control methods and possible expansion of the Lukanga biocontrol intervention to these areas, especially the Kafue flats and the Kafue National Park.

Further partnership has been enhanced through the development of a Conservation Plan covering Lukanga Swamp and upper Kafue Basin by ZEMA and a Conservation Plan covering Lukanga Swamp by the Ministry of Lands and Natural Resources.

BWZ also engaged with two national academic institutions (LIUTEBM and Rusangu Universities) to discuss invasive species in Zambia and the biocontrol intervention in Lukanga. The team held meetings which were attended by 25 Natural Resources students and their 2 lecturers. These meetings highlighted the project's status, its successes and lessons learnt. The target group was natural resources students, environmental educators and their lecturers. The group was targeted with the intention to influence their current and future decision making on conservation issues especially those related to invasive species management.

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, BirdLife International's physical and virtual meetings, field visits by PSC members and regular field monitoring visits by the project team for the introduction of weevils and monitoring in Lukanga. BWZ submitted interim technical and financial reports to BirdLife every January and July prior to the Half Year and Annual reports submitted to the Darwin Initiative. The review of these reports served as a basis for providing further support and making any necessary changes to the project activities to keep the project on track, and to ensure that the project met its objectives. BWZ had bi-weekly check-ins with the field weevil monitors for feedback and technical

¹ Department of Fisheries, International Crane Foundation, Zambia Governance Foundation, Zambia Environmental Management Agency, CABI Africa, Department of Parks and wildlife, WWF Zambia, Ministry of Lands and Natural Resources, Wildlife and Environmental conservation society, Zambia Agriculture Research Institute.

support. The project developed a Monitoring and Evaluation plan, a document that stipulated times and roles. This was reviewed quarterly by the project team to ensure they were on track with project activities and deliverables. Baseline and follow-up assessments of the following field variables helped to track whether the project was having the expected improvements on biodiversity and people's livelihoods: *Salvinia* coverage assessment using satellite image analysis (annex 8), weevil monitoring (data collection sheet in annex 12), fish CPUE assessment using gillnet surveys (Baseline and end of project reports in annex 13) and biodiversity assessments (Reports in annex 14).

3.2 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 ecosystem services.

The outcome indicators were revised and approved in Year 2 through a Change Request, requesting that the overall ambition of the outcome be downscaled as per the revised outcome indicators.

Outcome indicator 0.1 This was 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 2,500 fishing households (consisting of over 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"**.

Results from baseline gillnetting survey in 2020 indicated a baseline CPUE of 2 kg/boat/night from a fleet of 12 fishing nets. Results from the end of project survey in 2021 indicated a CPUE of 1.8 kg/boat/night from a fleet of 3 fishing nets. The number of nets used was reduced due some nets having been damaged and others being committed to other activities of the fisheries department at the time of the end of project survey. When extrapolated to be standardised with the effort of 12 nets used during the baseline survey in the previous year, this translates to a CPUE of approximately 7.2 kg/boat/night for a fleet of 12 nets, a 260% increase by the end of the project. Although the precision of the CPUE measurements could have been affected by the number of nets used and other factors, there certainly seems to have been an increase in fish stock thereby improving livelihoods for the fishing community members. With time, further positive impacts are expected to improve livelihoods as a result of *Salvinia* clearance by the biocontrol agent.

Outcome indicator 0.2 This was revised 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, *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"**.

By the end of the project, the *Salvinia molesta* control agent introductions covered approximately 1,870 km² of *Salvinia* infested area. This estimate is based on the final weevil monitoring exercise undertaken in March 2021. This was higher than the target of 1,500km².

Satellite image analysis of the comparative progression of the Lukanga swamp land coverage between 2010 and 2020 was undertaken in 2020. Although its results show an increase in the *Salvinia molesta* coverage, it indicates the lowest rate (0.3%) of increase of *Salvinia* spread was between 2017 and 2020 (Figure 2). This is a clear indication of impact from the current project intervention. At the same time *Salvinia* has been cleared from many sections of the swamp. Unfortunately, GIS image analysis does not always provide enough detail to show changes in *Salvinia* clearance. However, photographs of some of the heavily infested water canals in the swamp, taken at project start and end, show evidence of total *Salvinia* clearance at the end of the project in these canals (Figure 3 above).

3.3 Monitoring of assumptions

Assumption 1: Successful weevil introduction to cover approximately 1,500km² and monitoring of weevil activities on the swamp.

Comments: After a successful initial introduction of weevils in mid-October 2018, quarterly weevil monitoring was carried out and weevil efficacy has been evident from the clearance of *Salvinia molesta* in some sections/canals of the swamps as seen in Figure 3. The weevil efficacy is also evident from the perforations (gunshots) made on *Salvinia molesta* leaves and not in any other plant species around the weevil release sites. It is worth noting that weevils have now been introduced in a total of 76 points in the swamp during the project's life. Currently, it has been estimated that the weevils have covered approximately 1,870km² of the Lukanga swamp. These results were obtained from quarterly site weevil monitoring activities, the latest being March 2021. These activities focused on observing the extent of the weevil spread, *Salvinia molesta* discoloration (browning), number and severity of gunshot wounds within the release and recording any effect of the weevil on associated plants.

In addition, all control points (points at which weevils were not realised but were monitored to compare impacts with weevil realise points) and at least 37 weevil release points merged forming clusters of continuous linked points from weevil activity. This has demonstrated a great extent of weevil spread. The results however showed that *Salvinia molesta* is still a predominant threat to the Lukanga swamp habitat with some areas requiring emergency response in order to prevent re-infestation in already cleared areas. The reinfestation may result from the continuous boat movements from currently infested areas to cleared areas. To mitigate this, safeguarding measures that involve putting in place biosafety checkpoints to prevent *Salvinia molesta* reinfestation in recently cleared areas are recommended.

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

Comments: ZEMA's approval of the EPB to undertake biocontrol activities was received in July 2018; about 6 months after the planned date. This delayed the start of the biocontrol project by well over 5 months as the intervention began in October 2018. However, the project was still able to achieve the outcome from the massive release of the weevils on site.

Assumption 3: Traditional leaders in the project area give their full support and endorsement letters in support of biological control.

Comment: Traditional leaders around the project area gave full consent and support to undertake the project in their areas. The project team worked with chiefs, village headmen and women who actively participated in various project activities such as weevil mass rearing, weevil monitoring and introductions and community mobilisation to facilitate awareness raising amongst their subjects.

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

Comment: Collection of the biocontrol agent *Cyrtobagous salviniae* (*Salvinia* weevil) from Kafue fisheries was unsuccessful. This is because the agent had achieved total control of the weed at the previously infested waterbody and the agent had died afterwards, thus confirming their highly host specific nature. In response, the biocontrol agent was imported from Durban, South Africa and released into the swamp. Mass rearing facilities were established in all three entry points into the project site (Waya, Chilwa and Chiyuni) and at the BWZ office. The weevil procuring costs were covered by CABI as a partner contribution to the project while the project covered courier costs. Conditions in the swamp and in the mass rearing ponds and troughs were favourable for breeding and survival as illustrated by the monitoring data that were collected. At present weevils have multiplied in their various release points in the swamp creating nurseries ready for collection and release onto *Salvinia* infested areas of the swamp.

Assumption 5: Biocontrol agent spreads and mixes well in-situ.

Comments: The biocontrol agent, *Cyrtobagous salviniae* was released into the swamp and has thrived well in-situ, as evidenced by observation of all life cycle stages of the weevils at each release point and in the mass rearing ponds and troughs. At project end weevils had covered approximately 1,870 km².

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

The project's proposed impact was to 'control an invasive alien species from areas under aquaculture in Zambia and increase the resilience of 2,500 fishing households, restore the wetland and conserve its biodiversity'. The project has significantly contributed to this impact in Zambia through engagements that go beyond Lukanga Swamp, as follows:

- Through engagement of BirdWatch Zambia, the project's success and lessons learnt are being contributed to the formulation of a Conservation Plan of the Lukanga swamp and the Upper Kafue Basin. The plan is being developed by the Ministry of Mines in collaboration with the Zambia Environmental Management Agency (ZEMA). The Plan seeks to identify the most significant ecosystem services of this landscape, what the drivers of ecosystem change are, how these impacts can be mitigated as well as sustainable management strategies.
- Due to the input of this project through BirdWatch Zambia, the project was considered as co-finance for the newly launched Ecosystem Based Adaptation (EBA) project led by the Ministry of Lands and Natural Resources (MLNR). The project is titled "Building the resilience of local communities in Zambia through the introduction of Ecosystem-Based Adaptation (EBA) into priority ecosystems, including wetlands and forests" within the Lukanga and Bangweulu Swamps catchment.
- With *Salvinia molesta* now observed in the Kafue River, the project team from BirdWatch Zambia was engaged in a mapping survey of this new infestation. Due to the ongoing biocontrol underway at the Lukanga Swamp under this Darwin project, ZEMA has waived the requirement for the Kafue River work to undertake an Environmental Impact Assessment as they are within the same catchment. A no objection letter to initiate biological control of *Salvinia molesta* along the Kafue River was issued by ZEMA in February 2021 following the September 2020 *Salvinia* mapping survey (KNP ZEMA letter in annex 14). The control will use the same approach as is in the Lukanga swamp.

4 Contribution to Darwin Initiative Programme Objectives

4.1 Contribution to Global Goals for Sustainable Development (SDGs)

The project achieved and contributed to the following SDGs;

1 (No poverty) – As a result of reduction of *Salvinia* from the water canals in the swamp, there is now eased navigation to major fishing points within the swamp thereby reducing time taken by community members between fishing grounds and trading areas. Fishermen confirmed that previously before *Salvinia* control, a distance of about 3 km would take 2 hours to paddle. Now it takes between 30 to 45 minutes to cover the same distance. According to the Department of Fisheries, additional surface area for fishing has been recovered from project efforts. The gillnetting surveys conducted in Jan/Feb 2020 (baseline) and Jan/Feb 2021 showed that Catch Per Unit of Effort (CPUE) for a boat with 12 fishing nets could have increased by over 3 times from approximately 2 kg/boat/night at baseline to approximately 7.2 kg/boat/night at end of project (refer to Output 3). This implies increased income to fishermen.

2 (Zero Hunger) - Output 3 shows an increase in fish Catch per Unit Effort in the project site due to the project intervention. Also, further anecdotal information given during interactions with the community members, including Site Support Group members and the local weevil monitors indicates that they have observed an increase in fish catches from locations recently cleared of the *Salvinia molesta* (see quotes from community members in 3.1 above). This implies more food and reduced hunger for the community.

5 (Gender equality) – The project team trained 20 weevil monitors from the local community; 4 women and 16 men within the project area. We were already aware at the start of the project that there was a barrier in involving women as weevil monitors since according to local traditional beliefs women are not permitted to go into the swamp due to misconceptions and concerns around safety. Therefore, the project proactively made major strides locally in changing this perception and eventually succeeded in engaging the 4 women.

The gender ration for participants of the Project Steering Committee (PSC) was maintained at about 55% women/ 45% men attending every quarterly meeting. On-site and off-site awareness raising meetings endeavoured a balance between male and female participation, refer to section 3.1 on output 2.

17-Partnership for goals - Through engagements with PSC members, the project team has had an opportunity to participate in the formulation of a Conservation Plan for the Lukanga Swamp and the Upper Kafue Basin through ZEMA and another Conservation plan for the Lukanga swamp being formulated by the Ministry of Lands and Natural Resources. Furthermore, the project outcomes and activities have contributed to updating the Ramsar information site through the Ramsar focal point

(<https://rsis.ramsar.org/ris/1580>). 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.

4.2 Project support to the Conventions or Treaties (e.g. CBD, Nagoya Protocol, ITPGRFA, CITES, Ramsar, CMS, UNFCCC)

CBD:

National Biodiversity Strategies and Action Plans (NBSAPs) are the principal instruments for implementing the Convention on Biodiversity (CBD) at the national level. Zambia revised its NBSAP in 2015 to include a strategy aimed at controlling or preventing the spread of key invasive species in support of Aichi Target 9 which states: “By 2020, invasive species and their spreading pathways are identified and prioritized, controlled or eradicated, and measures are in place to manage pathways to prevent their spread and establishment.” The project has directly contributed to this strategy through the biocontrol of *Salvinia molesta* in Lukanga Swamp. Lessons from the project are also going to influence elements regarding control and management of invasive species to be included in the development of the Conservation Plan for the Lukanga Swamp and Kafue Flats.

Target 7 of Strategic Goal B in Zambia NBSAP 2015 states: “By 2025, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.” *Salvinia molesta* is one of the key invasive species threatening at least three of Zambia’s major wetland ecosystems including the Lukanga Swamp. Control of *Salvinia molesta* on the Lukanga Swamps has reduced threats the aquaculture industry as the Lukanga is one of Zambia’s major fisheries supplying protein to at least four large cities in the country.

Kariba weed reduces water quality increasing the prevalence of diseases such as cholera and forms suitable breeding grounds for mosquitoes, the insect vector responsible for the transmission of malaria. By clearing this weed from the Lukanga Swamp, this project has made strides in achieving Sustainable Development Goals number 3 (Good health and well-being) and 6 (clean water and sanitation).

AICHI targets: The project has built capacity in 20 community members on Invasive species management through training on weevil (biocontrol agent) management techniques. Four fisheries officers and four community members were trained on gillnetting survey techniques during the project. The above contribute to goals B, C and D, whose aims are; reducing the direct pressure on biodiversity and promoting sustainable use, improving the status of biodiversity by safeguarding ecosystems, species and genetic diversity and enhancement of benefits to all from biodiversity and ecosystem services respectively. The project contributions were in line with Aichi Targets 1, 5, 6, 8, 9, 11, 12, 14, 17, 18 and 19 on biodiversity.

Both the NBSAP and Aichi targets are principal instruments for implementing CBD obligations at national level.

Ramsar: The project also contributed and is still contributing to the Ramsar Information Site which provides online information on wetlands of international importance. Lessons learnt and monitoring data has been inputted into the Ramsar factsheets onto the online open access platform. This has subsequently provided the current status of the Ramsar site.

4.3 Project support to poverty alleviation

Output 3 of this project (“*Salvinia molesta* control in Lukanga Swamp improves habitat for wetland biodiversity including increased fish stock leading to increased food security for fishing community households”) is the one that mainly dealt with poverty alleviation, through increased food security for fishing community households. This was achieved mainly through increased fish stocks following reduced cover of *Salvinia* cover in the swamp. This can be demonstrated by increased fish Catch Per Unit Effort as measured using gill net surveys from a fleet of 12 fishing nets during baseline (2 kg/boat/night in 2020) and end of project (approximately 7.2 kg/boat/night in 2021). Over 2500 households live in the vicinity of Lukanga Swamp, most of them dependent on fishing, and thus are likely to have directly benefited from this fish stock increase. Also 50 fishermen who were interviewed at the end of the project ascertained that they already were seeing an increase in the fish catches, which reflected a slight increase in their income. Interviewed fish traders also confirmed that they have started buying more fish from fishermen now (March

2021) compared to two years ago. Given that the Lukanga Swamp is one of Zambia's major fisheries, supplying protein to at least four large cities and contributing about 20% to Zambia's fish, the noted increase in fish stocks also have wider positive implications for poverty alleviation at the national level.

Before this project, most canals in the Lukanga Swamp were blocked by *Salvinia molesta* making it difficult for fishermen to navigate the swamp and increasing time required to move within the swamp. These delays negatively affected fish catch and resulted in some fishermen using improper fishing gear. Within the life of the project, fishermen, traders and transporters have enjoyed cleared canals with eased navigation and opened up fishing grounds. According to the fishermen spoken to, fish catches have slightly improved.

The project saw significant contributions to both the social and economic well-being of the local community who are beneficiaries of its ecosystem services. Social activities such as swimming that were abandoned as a result of the infestation have resumed in recently cleared canals.

4.4 Gender equality

Throughout its lifetime, the project worked closely with both men and women from the local Site Support Groups (SSGs) and other members of the local community. The SSG at Waya (one of the entry points to Lukanga Swamp) is composed of 30 members: 12 women (40%) and 18 men (60%). The project supported the establishment of a new SSG in Chilwa which is composed of 12 members: 7 women (57%) and 5 men (43%). The SSGs have particularly set up management structures that have women in leadership roles giving them an opportunity to stand out as decision makers. As a result of gender equality, the project continued to attract participation from men and women throughout the project without bias and discrimination.

Weevil monitors comprised a total of 20 trained individuals: 4 women (20%) and 16 men (80%). Initially only one woman was participating, but this increased to four by the end of the project as other women admired her work and were encouraged to participate. They played major roles in all project activities such as weevil nurturing at the ponds and troughs, and monitoring activities on the swamp, and awareness raising sessions. Weevil introduction and monitoring on the swamp was mostly done by men, because women are traditionally forbidden from going into the Swamp. However, women were highly involved in weevil mass rearing activities (water refilling and monitoring in weevil mass rearing avenues). Their inclusion increased the sense of ownership and attention given to the weevil mass rearing process.

Of the 15 Project Steering Committee members, 9 were men (60%) and 6 women (40%). The women's voices and opinions were heard based on experience and expertise. They provided sound input that contributed to project progress.

Public awareness was open to men and women and this reached 2421 (58%) men and 1682 (41%) women. The women were open in asking questions and seeking clarification due to the open atmosphere created by the project team.

4.5 Programme indicators

- **Did the project lead to greater representation of local poor people in management structures of biodiversity?**

The project did not discriminate against anyone from the community being involved. The project maintained open access for participation at all project levels and within the local SSG structures. An example is the collective approach on selection of weevil monitors was that it had a combination of fishermen, a headman, fish traders, small business owners as well fisheries officers included to ensure fair representation of different groups. The newly formed SSG incorporated both genders as regular members and in the executive.

- **Were any management plans for biodiversity developed and were these formally accepted?**

Lessons learnt from the project have been incorporated and mainstreamed into:

1) The Lukanga Swamp and upper Kafue Basin Conservation Plan currently under development by Zambia Environmental Management Agency (ZEMA) through the Ministry of Mines. Its focus is

to deal with all the impending risks and tackle all the impacts occurring now or in the future, over this ecologically relevant wetland. This Plan is expected to be completed in July 2021.

2) The Lukanga Swamps Conservation Plan under development by the Ministry of Lands and Natural Resources (MLNR). This Lukanga Conservation Plan (LCP) seeks to restore the integrity of the swamp to make it more ecologically functional and for the ecosystem to contribute to livelihoods and sustainable development. The management area for this plan will be the whole Lukanga Swamp and parts of the Ramsar Site Boundary where there are environmentally sensitive areas or potential impacts and threats such as sedimentation. This Plan is expected to be completed by the end of 2021.

- **Were they participatory in nature or were they ‘top-down’? How well represented are the local poor, including women, in any proposed management structures?**

The management structures were all inclusive and participatory. The project was open access to all community members regardless of their gender. However, some awareness raising meetings were restricted to top leadership such as the initial project consent, inception, courtesy visits and end of project meetings. After full consent was obtained from the local leadership, inception meetings were held with the fisheries officers, SSG members and general populace. This followed unrestricted random village meetings to the general community membership open for all. As explained in Q4.4. above special attention was taken to engage women in the project, to ensure that they were able to fully participate and have a voice in all project activities and meetings.

- **How did the project positively influence household (HH) income and how many HHs saw an increase?**

Measuring of the influence of the project on HH income was not anticipated in the project activities, and thus wasn't undertaken. However, the measured increase in fish CPUE and the increase in opened up areas for fishing, and reduced time now taken to get to fishing areas (thanks to many canals being cleared as a result of the biocontrol agent) is expected to have increased income for the 2,500 HHs, who are dependent on fishing from Lukanga Swamp.

- **How much did their HH income increase (e.g. x% above baseline, x% above national average)? How was this measured?**

This was not measured as the project did not do any socio-economic surveys. This is the first time Birdwatch Zambia has undertaken such a project, and many lessons have been learnt and a greater understanding and awareness of how to improve project monitoring for similar projects in the future.

4.6 4.6 Transfer of knowledge

From the efforts on this project, BWZ has been invited to sit on the Zambian National Invasive Species Committee composed of multi sectoral Government and Non-governmental organisations whose mandate is to coordinate the management of invasive species countrywide. Additionally, knowledge was transferred via multi media platforms such as monthly newsletters, social media, print media and through the project's Steering committee.

BWZ was also invited to attend an expert panel on invasive species at an invasive species symposium in Botswana. Other engagements were through panel discussions during commemorations such as wetlands day.

Through the National Steering Committee for Biodiversity on which BWZ sits, a Policy Advisory Note to parliament to gazette the Lukanga as a protected Areas was submitted within project year 4.

Although by the end of the project no formal qualifications had been achieved, the project engagements stimulated interest of a lecturer at Zambia's second Highest learning Institution (Copperbelt University) who assigned a female Masters' student to research on the impact of biologically controlling the weed on water quality - the effect of the rotten weed that sinks to the bottom of the water body. This is still ongoing.

4.7 4.7 Capacity building

As a result of the technical and financial capacity training provided by BirdLife International to BirdWatch Zambia (BWZ), the national implementing partner, the organisation and respective staff now have greater

confidence, abilities and experience in project and financial management of complex projects and large grants.

Within BWZ, the project's former project officer was promoted to overall Project Coordinator and is currently Acting Programme Manager overseeing office management from the expertise and skills she acquired from her engagement on the project.

One female BWZ staff member was selected, trained and certified as having completed a Leadership course through BirdLife Partnership Leadership Programme conducted virtually by Common Purpose - a global leadership organization devoted to developing leaders who can cross boundaries.

5 Sustainability and Legacy

We expect to see the further reduction of the aquatic invasive weed *Salvinia molesta* in Lukanga Swamp as a result of the continued and further spread of the biocontrol agent across the Swamp as a result of the biocontrol agent now being well established now across Lukanga Swamp. With the long term aim the removal of all the *Salvinia molesta*.

The positive biodiversity and socio-economic impacts of this control are expected to endure beyond the project duration.

The project influence on the design and content of the Conservation Plans that are currently in development will endure beyond the project period, especially in regard to the control of invasive species, giving confidence of further invasive control beyond the project period.

An original element of the project's exit strategy, i.e. capacity building of the local community members and fisheries officers will have enduring impacts beyond the project duration: Five Fisheries Officers and three local community members were trained in the Gillnet survey (GNS) techniques by research experts from within the Department of Fisheries; 20 community members were trained in biocontrol agent (*Salvinia* weevil) nurturing and monitoring by BWZ staff; and the Fisheries Department has now mainstreamed monitoring of *Salvinia* weevil into their scheduled patrols on the swamp.

With the training and skills acquired in weevil mass rearing, introduction and monitoring, the trained monitors on site have committed to continue the procedure and identify other individuals to collaborate with to sustain the project efforts. This is highly motivated by the benefits and/or impacts currently being experienced.

The Zambia Environmental Management Agency (ZEMA) and the Ministry of Lands and Natural Resources (MLNR) are currently conducting projects on the Lukanga Swamp and the upper Kafue that will ensure the formulation of a conservation plan for the two sites. 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 lessons learnt.

Additionally, a Policy Advisory note was also submitted by BWZ to Zambia parliament to propose the designation of the Lukanga as a Protected Area.

BWZ has currently retained all equipment and project staff.

6 Lessons learned

Throughout the project, stakeholder participation was consistent and resulted in several positive results that will have a long-term impact on the project site beyond the scope of the project. Through engagement with the steering committee members, the project team had an opportunity to participate in the formulation of Conservation Plans for the Lukanga swamp, and the Lukanga Swamps and Upper Kafue Basin developed by the Ministry of Lands and Natural Resources and ZEMA respectively.

It is through stakeholder engagements that a PSC member from the Department of Fisheries (DoF) recommended the use of Gillnet surveys to measure fish Catch Per Unit Effort (CPUE) for rapidly assessing fish stocks. From lessons learnt during this exercise, BWZ and DoF 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 requires coverage of more sample sites, analysis and measurement of individual fishermen's actual catch and involves a much larger team.

The mass rearing techniques for *Salvinia* weevils was scaled up and adapted from methods learnt from experts from the Northern Territory Government of Palestine during the 29th International Congress for Conservation Biology (ICCB) in Kuala Lumpur, Malaysia in project year 3 (July 2019). The new techniques

learnt involved keeping the mass rearing avenues at the optimum temperature (25.5-33°C) by using a heating pad, application of a Nitrogen rich fertilizer to improve nutrient quality, thus improving weevil growth through all stages of the life cycle and promoting growth of *Salvinia molesta* in mass rearing avenues thereby sustaining the weevils. Additionally, the team learnt a technique for counting weevils from mass rearing avenues, thus providing an indication of the number of weevils at a particular time. Unfortunately, the use of the Nitrogen rich fertilizer (Nutrifeed) was discontinued due to an increase in algae in the mass rearing avenues.

While mass rearing on site was a success, the project recorded a loss of about 400 weevils in one location. This was as a result of negligence on the part of the five weevil monitors in Chiyuni entry point and miscommunication with the BWZ project team. This was however mitigated by a refresher training emphasizing the mass rearing methodology for the weevil success as well as enhanced communication with all monitors in all sites every fortnight.

The project eventually recognised the need for more detailed baselines to be set for monitoring, particularly in relation to *Salvinia* clearance e.g., measurement of canal clearance, poverty alleviation (HH household income) and increased fish catch per night per head or (something similar) as a way of checking in with the fishing community what improvements have been seen since the start of the project. Also, the need to conduct a household survey of the beneficiaries, as there may be other benefits that the project was not aware of as a result of *Salvinia* clearance e.g., effects weed clearance on mosquitoes and implication on malaria.

6.1 Monitoring and evaluation

At the start of the project, a monitoring and evaluation framework for the project was developed, and it assisted both the project team and the Project Steering Committee in keeping track of the project progress. The reviewers of the annual reports also referred to this M&E framework and gave the project team very valuable comments that guided the project. M & E Framework in annex 16.

There was no internal or external evaluation of the work, but the PSC acted as an external eye to keep the project team on track, closely referring back to the project logical framework, and conducting field visits to the project site.

In the course of the project, due to change in circumstances (e.g., late approval by ZEMA, need to import biocontrol agent and in small quantities) and upon observation on the rate of spread of biocontrol agent, the team's reflections and recommendations by reviewers of annual reports, the ambition of the project was revised. The outcome indicators were therefore revised and approved through a change request, as explained in 3.2 above.

6.2 Actions taken in response to annual report reviews

No.	Comment	Response
1	It would be good to see more information about capacity building for the SSG	The SSG's capacity was built in weevil introduction and mass rearing. They were also involved in weevil monitoring activities. During the life of the project, the project team shared a proposal which the SSG (in Waya), wrote and submitted to the Enterprise Zambia Challenge Fund with funding from the European Union. The proposal is envisaged to support conservation friendly livelihood activities - feedback is still awaited
2	From experience at other sites in Zambia, how resilient is the weevil in the face of a declining food source? If 100% elimination	The weevils entirely depend on the weed (<i>Salvinia molesta</i>) as a means to

	of the salvinia is not achieved, could the weevil population increase in step with the rate of weed reinfestation?	feeding and breeding survival. When <i>Salvinia molesta</i> gets depleted, the weevil population starves to death. In the case of 100% elimination of the weed, there are no alternative means of supporting the weevil population.
3	How does a mat of decaying <i>Salvinia</i> weed on the floor of the swamp affect dissolved oxygen levels? (ie might this affect fish numbers?)	Dissolved oxygen was not used as a measure of water quality. However, zooplankton and phytoplankton were used as indicators of aquatic health for the swamp as they respond to oxygen, nutrient levels, contaminants among other factors. These were assessed during the gillnetting surveys. Results from the baseline and end of project gillnetting surveys show 30 and 26 phytoplankton species, 14 and 19 zooplankton species respectively. The plankton species' richness indicate abundance of food for fish which then may become food for people. The results indicate a healthy waterbody and balanced food web.

7 Darwin identity

The Darwin logo was used on all project correspondence. The materials designed within the project were targeted to and circulated within the organisation, project partners, stakeholders, external BirdLife partners, scholars as well as media houses.

All awareness raising and publicity materials developed during the project included the Darwin Logo. Including booklets, posters, stickers, maps, project reports, presentations, articles, online media publicity, t-shirts, documentary (*An Insect of Life - A Tale of Lukanga Swamps*) as well as personal protective equipment (PPE). Awareness raising materials attached in annex.

Project efforts were recognised as co-financing for the Ecosystem Based Adaptation Project which was launched by the Ministry of Lands and Natural Resources (MLNR) for the Lukanga Swamp. This Darwin Initiative project was identified as a critical pilot for *Salvinia molesta* control in Zambia, and its impact include BWZ's involvement in the Kafue National Park proposed biological control as well as a waiver from ZEMA from conducting Environmental Impact Assessment processes prior to the staff of biocontrol activities.

The Darwin Initiative funded biocontrol project falls within BirdLife International's Invasive Alien Species Conservation Programme and BirdWatch Zambia's Sites and Habitat Restoration Program, 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 were mostly involved with research and livelihood initiatives such as the Biocontrol project and general environmental conservation.

The Darwin Initiative was recognised as a distinct project sponsor with a clear identity. The project has been profiled on the BWZ website showcasing results and lessons learnt. This link is attached to the current organisational website. Apart from this BWZ also uses social media platforms like the BirdWatch Zambia’s official Facebook Account to post about the Biocontrol project and project updates that are linked to the Darwin Initiative social media channels.

8 Impact of COVID-19 on project delivery

The COVID-19 pandemic mainly affected the awareness raising component of the project. Within the last one and half year of the project, the team was unable to meet the targets of at least 250 individuals per quarter. To deal with this situation, more awareness was raised on social media, using print media as well as smaller target group meetings with strict adherence to the health guidelines of masking up, sanitizing and social distancing. Additionally, BWZ staff, who are based far from the project site, made the best of the field-based community field weevil monitors by engaging with them virtually to provide their bi-weekly reports. This is an excellent way to keep the project activities moving forward without the scheduled trips by the project staff. This communication has proved sustainable and has since continued.

9 Finance and administration

9.1 Project expenditure

Project spend (indicative) since last annual report	2020/21 Grant (£)	2020/21 Total actual 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)				
Others (see below)				
TOTAL				

Staff employed. (Name and position)	Cost (£)
Mary Malasa, Project Assistant, Birdwatch Zambia	
Frank Jan Willems, Technical Advisor, BirdWatch Zambia	
Chaona Getrude Phiri, Project Coordinator, BirdWatch Zambia	
Chinga Lufwino, Research Assistant, BirdWatch Zambia	
Christelle Makonga, Project Assistant, BirdWatch Zambia	
Clara Nanja, Project Officer, BirdWatch Zambia	
George Chanda, Finance officer, BirdWatch Zambia.	

Kelvin Mkandawire, Research Assistant, BirdWatch Zambia	
Dalphine Adre, Finance unit Co-ordinator, BirdLife International	
Paul Kariuki Ndang'ang'a, Head of Conservation - Africa, BirdLife International (Project Leader)	
Evans Siaw, Finance Business partner, BirdLife International	
TOTAL	

Capital items – description	Capital items – cost (£)
Purchase of T-Bolt inverter	
TOTAL	

Other items – description	Other items – cost (£)
Bank charges	
Sundries	
Monitoring and Evaluation	
TOTAL	

9.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
BWZ and the Department of Fisheries - Five concrete ponds for mass rearing of weevils as in-kind contribution	
CABI - in-kind contribution for procurement of biocontrol agent from South Africa	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
TOTAL	

9.3 Value for Money

At every opportunity, the project provided good value for money, as can be demonstrated by the following examples:

- For mass rearing of the biocontrol agent, the project team eventually resolved to mostly use the plastic/fibreglass troughs instead of only using the initially planned concrete ponds. This significantly fast-tracked and eased operations as well as reducing costs. While a 5m*8m concrete pond cost approximately £, a 2m*3m fibreglass troughs cost £ and a 1m*2m plastic troughs cost £ each. The project had a total 20 mass rearing avenues composed of six concrete ponds, seven fibreglass troughs and seven plastic troughs. This led to increased mass rearing effort at a much lower cost. This was also highly advantageous in areas that experienced high floods where concrete ponds could not be built much closer to the swamp within the project site.
- With mass rearing on site, the team engaged with the local community members instead of employing three site-based staff. This saved the project approximately £ per month. The trained community members engaged in onsite weevil mass rearing on a voluntary basis. This also had the advantage of building capacity within the community and ensuring greater sustainability as these community members plan to continue their efforts rearing and releasing weevils beyond this project's lifetime.

10 OPTIONAL: Outstanding achievements of your project during the (300-400 words maximum). This section may be used for publicity purposes

I agree for the Darwin Secretariat to publish the content of this section.

This project, started in 2017, undertook biological control of the invasive aquatic weed *Salvinia molesta* from the 3300 km² Lukanga Swamp, a Ramsar site, a Key Biodiversity area and a major source of fish for Zambia. The site had been infested by the weed in 2009 leading to declines in bird and fish numbers, as well as negatively affecting livelihoods of the fish-dependent communities. Biological control is through a host-specific weevil, *Cyrtobagous salviniae*. Mass rearing of the weevils was done in concrete as well as in fibreglass and plastic ponds, and the project developed innovative methods of keeping weevils in the ponds reproducing through all seasons. It trained 20 community volunteers who sustained the weevil rearing and introduction into weed infested areas during the Covid 19 pandemic and have continued after project closed in March 2021. The weevils have already spread to cover approximately 1900 km² of the 2200 km² infested area, and some sections had been cleared of the weed, giving fishermen better access to the swamp and already increasing numbers of some of the open water dependent bird species – see documentary at <https://youtu.be/hjxSX-Sh7WU>. Fish Capture per Unit Effort in the Swamp has also increased, thereby having positive implications for the 2500 fishing dependent households. The project engaged widely with stakeholders and also reached approximately 4,103 individuals through awareness raising. Within Zambia, this is the largest scale of *Salvinia* control, and has contributed to ongoing development of conservation plans for Lukanga Swamp and the Upper Kafue Basin by the Zambia Environmental Management Agency and the Ministry of Lands and Natural Resources.

Annex 1:

Project's original (or most recently approved) logframe, including indicators, means of verification and assumptions.

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 <i>Salvinia molesta</i> in Lukanga Swamp enhances livelihoods and food security for 2500 fishing households, and restores 2000km ² 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 1.2 By end of project weevil (<i>Salvinia molesta</i> control agent) introductions covering at least 1500km ² of <i>Salvinia</i> infested area, and <i>Salvinia</i> cover shows at least 25% reduction with increased (from 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)	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 <i>Salvinia molesta</i> .	1.1 Approval by Zambia Environment Management Authority (ZEMA) for <i>Salvinia</i> 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 Fishing community members have increased the capacity and interest to participate in <i>Salvinia</i> control.	2.1 By end of Year 1 >100 community members sensitised and trained in the biocontrol process.	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

	2.2 By end of Year 3 at least 50% of sensitized fishing community members voluntarily participating in monitoring of <i>Salvinia molesta</i> , fish stocks and birds		
Output 3 <i>Salvinia molesta</i> 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 (<i>Salvinia molesta</i> control agent) introductions covering at least 1500km ² of <i>Salvinia</i> infested area, and <i>Salvinia</i> 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 IBA status and trends reports which are all publicly 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 consultant 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 on 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 2 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements
<p>Impact:</p> <p>Control of invasive alien species from areas under aquaculture in Zambia increases the resilience of 2500 fishing households and conserve wetland biodiversity</p>		<p>Control of the invasive aquatic weed <i>Salvinia molesta</i> in Lukanga Swamp, Zambia, was initiated through introduction of the biocontrol agent <i>Cyrtobagous salviniae</i> (Salvinia weevil). By the end of the project, the Salvinia weevil had spread to cover 1870km² of the 3300 km² area of the swamp, exceeding the anticipated 1500km² project target. This also led to clearance of the invasive weed in some sections of the swamp, including some water canals used by fishermen to access the swamp, and decreased rate of spread of the weed compared to years before the project. As a result, fishing community households resilience was increased through Improved fish stocks as demonstrated from the Catch per Unit (CPUE) of 2kg/boat night obtained from 12 nets at baseline (2020) and 1.8 kg/boat/night obtained from 3 nets (which translates to approximately 7.2 kg/boat night if 12 nets were to be used as in baseline) at the end of the project (2021) and easier navigation by fishermen through the opened up canals for fishing have increased the habitat's resilience to supporting ecosystem services. Habitat was also improved for open-water dependent biodiversity including waterbirds as a result of opened up canals.</p> <p>Lessons learnt from the project influenced and will continue to influence the ongoing development of the Conservation Plans for the Lukanga Swamp and the upper Kafue Basin led by ZEMA and Ministry of Lands and Natural Resources. The project also influenced mapping and ongoing plans for controlling <i>Salvinia molesta</i> in the Kafue River, leading to a waiver from undertaking an EIA.</p> <p>The project team has been invited to various national forums in Zambia regarding invasive alien species control and had a major influence by sharing lessons from the project.</p> <p>The project has enhanced community participation from their involvement in weevil mass rearing, formation of an additional Site Support Group (SSG) and a Nature club on Chilwa island.</p>
<p>Outcome</p> <p>Biological control of <i>Salvinia molesta</i> in Lukanga Swamp enhances</p>	<p>2 Fish catch per unit effort (CPUE) baseline established using a gillnet survey in 2020, and shows</p>	<p>Gillnetting survey results indicate fish Catch Per Unit of Effort (CPUE) of 2kg/boat night obtained from 12 nets at baseline (2020) and 1.8 kg/boat/night obtained from 3 nets (which translates to approximately 7.2 kg/boat night if</p>

<p>livelihoods and food security for 2500 fishing households, and restores 2000km² of suitable habitat for biodiversity and provision of ecosystems services</p>	<p>at least a 10% increase by the end of project</p> <p>2.1 By end of project weevil (<i>Salvinia molesta</i> control agent) introductions covering at least 1500km² of <i>Salvinia</i> infested area, and <i>Salvinia</i> cover shows at least 25% reduction with increased (from baseline) numbers of Wattled Crane and other water birds</p> <p>2.2 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)</p>	<p>12 nets were to be used as in baseline) at the end of the project (2021). This is more than 10% increase.</p> <p>The weevils were introduced in a total 76 release points across the swamp and estimated to cover approximately 1870 km², exceeding the target 1500 km² by 360 km². This extent of spread increased from 662 km² in 2019, to 1575 km² in 2020 and 1870 km² in 2021. Satellite image analysis (2020) indicated that while <i>Salvinia molesta</i> is still on the increase, its rate of spread has been suppressed to about 0.3% between 2017 and 2020, much lower than the 1.98% increase between 2014 and 2016 (3 years before the start of the project).</p> <p>The long-standing local Site Support Group (SSG) was involved in weevil monitoring activities. The SSG's capacity was built in weevil introduction, training and mass rearing. They were involved in weevil monitoring activities. During the life of the project, they were able to submit a proposal to the Enterprise Zambia Challenge Fund supported by the European Union. The proposal is envisaged to support conservation friendly livelihood activities - feedback is still awaited. The team set up an additional SSG and a school nature club within the project site. This enhanced community participation in the project through weevil mass rearing and monitoring activities as well as awareness raising. The project team trained 20 weevil monitors from the local community; 4 women and 16 men were trained in weevil nurturing and monitoring within the project area. Trained members actively participated in weevil mass rearing in the ponds and troughs as well as taking part in quarterly weevil monitoring exercises on the Swamp. All weevil monitors have been incorporated into the SSG for collaboration and continuity of the project work.</p>
<p>Output 1. Environmental Impact and Risk Assessment guiding mitigation measures for biologically controlling <i>Salvinia molesta</i>.</p>	<p>1.1 Approval by Zambia Environment Management Authority (ZEMA) for <i>Salvinia molesta</i> control work to start by mid of year 1</p>	<p>Following a series of meetings and consultations with ZEMA, the initially proposed Environmental Impact Assessment (EIA) was downscaled to an Environmental Project Brief (EPB) just providing justification that the <i>Salvinia</i> biocontrol intervention had previously been successful in Zambia. ZEMA issued an approval to biological control activities in project Year 2.</p>
<p>Activity 1.1 Hire a consult to conduct EIA</p>		<p>A consultant (Masterteck Enterprises) was hired to undertake assessments leading to the approval of the project activities. This was in accordance with national regulations on biological control projects. This activity was completed in project year 1.</p>

Activity 1.2. Conduct EIA		The Environmental Impact Assessment (EIA) was downscaled to an Environmental Project Brief (EPB). A process that was much shorter and cheaper. It was an independent assignment that was completed by the consultant mentioned in Activity 1.1
Activity 1.3. Consult submits draft EIA report to BWZ for review		Prior to submission of the EPB reports to ZEMA, the consultant put them forward to BWZ for review. This was the case with both the first and second draft reports.
Activity 1.4. Final revised EIA report submitted to ZEMA		The final revised EPB report was submitted to ZEMA and was approved in year 2. The delayed feedback (approval) from ZEMA directly impacted the delay in commencement of biocontrol activities on site.
Output 2. Fishing community members have increased the capacity and interest to participate in <i>Salvinia</i> control.	2.1 By end of Year 1 >100 community members sensitised and trained in the biocontrol process.	Approximately 4103 individuals were reached via awareness raising activities, both onsite and offsite. Target groups for awareness raising included but were not limited to fishermen, traders, traditional leaders, pupils, universities, scholars and the general public. Awareness was raised through print and online media, conferences, workshops, community meetings and a documentary. The awareness raising was focused on disseminating information on the management of invasives, the 'Dos and Don'ts' to a successful biocontrol of <i>Salvinia molesta</i> and providing project progress. However, this was disrupted in the final year of the project due to the restrictions on gatherings as a result of the COVID-19 pandemic.
	2.2 By end of Year 3 at least 50% of sensitized fishing community members voluntarily participating in monitoring of <i>Salvinia molesta</i> , fish stocks and birds	Community participation on site was a key requirement for enhanced and successful weevil management. This was adapted through training sessions on weevil management conducted with selected community members to enhance their participation and build their capacity. These training sessions were conducted at all 3 entry points of the project area (Waya, Chilwa and Chiyuni). Refresher courses were also conducted on the weevil monitors to review and revise the weevil management strategies during the life of the project. A total of 20 weevil monitors were trained (4 women and 16 men). A smaller number of people (than 50% of the 4103 sensitised) was more appropriate for weevil monitoring since this exercise required specialised attention and fewer people on the boats. Their role was to replenish <i>Salvinia molesta</i> and fresh water, clean and clear mass rearing avenues as well as take part in awareness raising, weevil introduction and monitoring.
Activity 2.1. Conduct awareness talks on site, discussing the control program and methods		Approximately 4,103 individuals [1682 (41%) females and 2421 (58%)] were reached through awareness raising sessions during the lifetime of the project both on and offsite.

	<p>Multiple awareness raising meetings conducted within the project site targeted traditional leaders, fishermen, school pupils and the general public. These meetings highlighted the biocontrol intervention and the role each one needed to play for a successful habitat restoration. A plastic campaign was also launched in schools within the project site to mitigate plastic pollution which was potentially identified as a threat to the survival and success rate of the weevils.</p> <p>Additional awareness was raised off site at 2 Universities (LIUTEBM and Rusangu) providing general knowledge, tips and tricks to invasive species management. This targeted natural resources and environmental education students and lecturers in the two institutions.</p> <p>Awareness was raised through posters, banners, articles, reports, stickers and PowerPoint presentations.</p>
<p>Activity 2.2. Community mobilisation of participants, time table development, etc.</p>	<p>The 20 trained local weevil monitors based on-site were providing phone feedback to the BWZ project team every fortnight throughout the project when staff were not on site. They also took part in quarterly weevil monitoring activities with the BWZ staff. Weevil monitors were composed of fisheries officers, traders, traditional leaders and local community members.</p>
<p>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.</p>	<p>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</p> <p>3.2 By end of project weevil (<i>Salvinia molesta</i> control agent) introductions covering at least 1500 km² of <i>Salvinia</i> infested area, and <i>Salvinia</i> cover shows at least 25% reduction with increased (from baseline) numbers of Wattled Crane and other waterbirds</p> <p>In partnership with the Department of Fisheries, two gillnetting surveys were conducted in 2020 (baseline) and at the end of the project. The fish CPUE results for the two surveys were of 2kg/boat night obtained from 12 nets at baseline (2020) and 1.8 kg/boat/night obtained from 3 nets (which translates to approximately 7.2 kg/boat night if 12 nets were to be used as in baseline) at the end of the project (2021).The CPUE was obtained using unmodified standard fishing gear.</p> <p>During the latest monitoring survey conducted in March 2021, weevils were approximated to cover about 1870km² of <i>Salvinia molesta</i> infested area of the swamp. Satellite image analysis indicates that the period between 2017 and 2020 was the lowest in terms of <i>Salvinia</i> increase, by 0.3%, compared to previous increase rate between 2010 and 2017. This is evidence that the intervention has suppressed <i>Salvinia</i> proliferation.</p>
<p>Activity 3.1 Training of participants; first institutional partners then community members</p>	<p>Five Fisheries Officers' capacity was built in gillnetting survey techniques. This was obtained from a training conducted by seasoned surveyors from within the Fisheries Department. This training was also extended to 8 community members who participated in the surveys and related activities.</p>

	20 community members were trained on weevil nurturing and monitoring. They practiced their skills with weevil mass rearing in the ponds and troughs as well as took part in quarterly weevil monitoring exercises.
Activity 3.2 Establishment of on-site weevil breeding ponds	A total of 20 weevil mass rearing avenues were established during the project implementation period both on and offsite. These were composed of 6 concrete ponds (approximately 5m*8m), 7 fiberglass troughs (2m*3m) and 7 plastic troughs (1m*2m).
Activity 3.3 Weevil collection and release into on-site ponds	Weevils were periodically collected from mass rearing avenues (ponds and troughs) and introduced in <i>Salvinia molesta</i> infested areas in the swamp. After the initial importation of the initial 2200 weevils from South Africa, all weevils for release into the swamp were collected from the established mass rearing avenues (ponds and troughs) in-country in Zambia, demonstrating our success in mass rearing of the biocontrol agent locally.
Activity 3.4 Rearing of weevils by community members supervised by BWZ staff	The total weevil mass rearing avenues (ponds and troughs) were 20; 11 onsite and 9 off-site. 20 trained community members participated in weevil mass rearing activities. They provided biweekly feedback to BWZ staff.
Activity 3.5 Releasing the weevil into trial points within the swamps	A total of 11 trial points were set up in year 2. The weevils became well adapted and their foraging activities led to cleared <i>Salvinia</i> on water canals, swimming activities resumed, eased navigation and active fishing activities in previously <i>Salvinia</i> infested areas.
Activity 3.6 Monitoring of released weevil	Weevil monitoring was conducted quarterly to ascertain progress from weevil release as well as identify potential sites for further weevil release. These assessments further evaluated the impact of weevil activities including extent of spread, cleared canals, social activities like swimming. Additionally, monitoring assessed the threats to the weevils which included fire, use of poison for fishing as well as plastic pollution within the Swamp.
Activity 3.7 Release weevil into additional points	Weevils were initially introduced into 11 points at the start of weevil introduction exercise in 2018 (Year 2). An additional 14 points were later added in Year 3 and 51 more points in Year 4. This brought a cumulative total of 76 weevil release points on the swamp since project inception.
Activity 3.8 Maintain on-site breeding ponds	Weevil rearing avenues were composed of fibreglass troughs, plastic troughs as well as concrete ponds. All plastic and fibreglass troughs required

	<p>constant cleaning, replenishing of water and providing fresh supply of <i>Salvinia molesta</i> while the concrete ponds were further maintained by filling up cracks and clearing of vegetation around the concrete pond sites.</p>
<p>Activity 3.9 Documentation, including video footage of weevil and non-weevil released points</p>	<p>Weevil monitoring reports were developed to document the results from the quarterly monitoring surveys. These reports highlighted the parameters used, threats to the weevils and the importance of these surveys in measuring the impact of the biological agent/intervention. These reports were shared with project stakeholders, collaborating institutions and to Darwin via interim and annual reports.</p> <p>Additionally, the team conducted a survey to assess the impact of awareness raising work done within a 15km radius around the project area. The results revealed that the more people were closer to the swamp, the more aware they were, and the opposite was true with 65% aware while 35% unaware of the project.</p> <p>The project team produced a documentary as part of the awareness raising program, highlighting the importance of the project and its impact on the Lukanga swamp and the livelihoods of the people around the swamp (see https://youtu.be/hjxSX-Sh7WU)</p>
<p>Output 4</p> <p>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.</p>	<p>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</p> <p>We raised awareness at two National institutions (LIUTEBM and Rusangu University) discussing invasive species and their management in Zambia. This platform was relevant for knowledge sharing as well as highlighting the project's current status and lessons learnt. It targeted Natural resources and environmental education students and lecturers.</p> <p>Awareness was extended to the National Steering Committee for Biodiversity. This has led to mainstreaming lessons into the development of Conservation plans for the lukanga swamp and upper Kafue Basin. It also influenced ongoing plans for the control of salvinia molesta on the Kafue River which has been waived of the EIA process from this project's success. The Kafue and Lukanga fall within the safe landscape.</p>
<p>Activity 4.1 Meeting with key stakeholders to share progress, successes, failures and lessons</p>	<p>We conducted a total of ten steering committee meetings during the time of the project. These were attended by representatives from 12 organisations;; Department of Fisheries (DoF), Centre for Agriculture and Bioscience International (CABI), Zambia Agriculture Research Institute (ZARI), World Wide Fund for Nature (WWF), International Crane Foundation (ICF), Zambia Environmental Management Agency (ZEMA), Department of National Parks and Wildlife (DNPW) and the Ministry of Lands and Natural resources (MLNR). Other relevant stakeholders were representatives from; the British</p>

	<p>High Commission (BHC), Zambia Governance Foundation (ZGF), National Heritage Conservation Commission (NHCC), Wildlife and Environmental Conservation Society of Zambia (WECSZ) and Mizu Eco-Care.</p> <p>These quarterly meetings were a platform to share progress, successes, failures and lessons learnt as well as receive feedback and backstopping, as well as share plans ahead to ensure sustainability of the project. Minutes of these meetings were shared with all the PSC members.</p> <p>Furthermore, project progress was provided to the local traditional leaders, local communities members, weevil monitors and the local Site support Groups during multiple onsite meetings at every site visit.</p> <p>Multiple meetings were set up between the lead and implementing organisation to catch on project activities, for backstopping and lesson sharing.</p>
Activity 4.2 Newspaper article on overall project activity	<p>BWZ published a magazine article in the e-Nkwazi inflight magazine, Zambia’s leading consumer lifestyle publication that aims to inspire a mix of business, travel, arts and culture. This is in addition to multiple newsletter articles shared and circulated through BWZ’s monthly “Wattled Crane” newsletter.</p> <p>News articles about the project were also published on the BirdLife website in 2018 and 2020, and in the September 2020 Darwin Initiative Newsletter.</p>
Activity 4.3 TV interview sharing on-site video footage	<p>A documentary titled <i>An Insect of Life - A Tale of Lukanga Swamps</i> was produced by BirdWatch Zambia (BWZ) in conjunction with the National Broadcaster, Zambia National Broadcasting Corporation (ZNBC) and the local community. It was produced in English and local language and has aired on National Television as well as radio multiple times. This has also been shared on various social media platforms and is on Youtube.</p>

<p>Output 5</p> <p>Project management, impact monitoring and evaluation structures and processes ensure that the project objectives are achieved on schedule and within budget</p>	<p>5.1 Partners and staff with project contractual agreements and full understanding of project requirements, including reporting.</p> <p>5.2 Biodiversity and socio-economic baselines, with follow-up monitoring & evaluation system in place</p> <p>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</p>	<p>At project inception, a financial and technical training was conducted on the project team by the lead organisation (BirdLife International). This was executed to provide a full understanding of the project and its requirements including reporting. This was concluded by a familiarisation visit onto the project site.</p> <p>The project partners set up biodiversity baselines at the start of the project. However, fish CPUE baselines were established in Year 3 (2020) after project staff became aware that baseline figures given at proposal were unreliable, and thus a change request was made to allow resetting of baselines. Additionally, a monitoring and evaluation framework was developed as a guide for assigning tasks and tracking deliverables.</p> <p>A total of 4 annual biodiversity assessment surveys were conducted and accompanying reports were developed throughout the project. These reported on the site's flora and fauna as an indicator of the biological control intervention. Additionally, weevil monitoring was conducted quarterly assessing weevil activities and its impact on the weed and other biodiversity. These reports have been used to feed into the open access Ramsar factsheets and the World Bird Database. A summary state of the wetlands report is planned for publication by mid-2021.</p>
<p>Activity 5.1 Contract project partners and staff</p>		<p>BirdWatch Zambia (BWZ, the main project partner in Zambia) was contracted by BirdLife International early in Year 1. All project staff within BWZ were also contracted early in project Year 1.</p>
<p>Activity 5.2 Undertake project induction/inception and quarterly meetings</p>		<p>We conducted inception meetings in project Year 1. Ten quarterly project steering committee meetings and two stakeholder site visits were conducted during the project.</p>
<p>Activity 5.3 Set/confirm biodiversity and socio-economic baselines</p>		<p>We set baselines at project inception from preliminary surveys. However, the Catch Per Unit of Effort (CPUE) baseline was obtained much later as initial figures provided by the fisheries Department were through extrapolation from a much larger fishery within the country, and were thus unreliable.</p>
<p>Activity 5.4 Undertake project monitoring and reporting involving partners</p>		<p>The project developed a Monitoring and Evaluation framework in project year 2. This was reviewed against progress in some steering committee meetings.</p>

Annex 3 Standard Measures

Code	Description	Total	Nationality	Gender	Title or Focus	Language	Comments
Training Measures							
1a	Number of people to submit PhD thesis	0					
1b	Number of PhD qualifications obtained	0					
2	Number of Masters qualifications obtained	0					
3	Number of other qualifications obtained	0					
4a	Number of undergraduate students receiving training	0					
4b	Number of training weeks provided to undergraduate students	0					
4c	Number of postgraduate students receiving training (not 1-3 above)	1	Zambian		The effect of <i>Salvinia molesta</i> on the physical chemical parameters of water on the Lukanga swamp.	English	Master of Science to be obtained from Zambia's Copperbelt University
4d	Number of training weeks for postgraduate students	0					
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification (e.g., not categories 1-4 above)	0					
6a	Number of people receiving other forms of short-term education/training (e.g., not categories 1-5 above)	0					

6b	Number of training weeks not leading to formal qualification	11	Zambian	M/F	Weevil mass rearing. Gillnetting survey techniques.	English, Tonga, Bemba, Lenje	20 community members trained as weevil monitors. 8 community members trained in gillnetting surveys
7	Number of types of training materials produced for use by host country(s) (describe training materials)						
Research Measures		Total	Nationality	Gender	Title	Language	Comments/ Weblink if available
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (ies)	0	Zambian	F	Conservation Plan of the Lukanga Swamps. The Lukanga Swamp and upper Kafue Basin Conservation Plan	English	Yes (Both documents still underway)
10	Number of formal documents produced to assist work related to species identification, classification and recording.	2	Zambian	F	1 invasive species identification guide, Weevil monitoring data recording sheet	English	
11a	Number of papers published or accepted for publication in peer reviewed journals	0					

11b	Number of papers published or accepted for publication elsewhere	0					Location?
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	1	Zambian	F	1 GIS and satellite imagine analytics	English	
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	0					
13a	Number of species reference collections established and handed over to host country(s)	0					
13b	Number of species reference collections enhanced and handed over to host country(s)	0					

Dissemination Measures		Total	Nationality	Gender	Theme	Language	Comments
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	10	Zambian	F	Project Steering Committee workshops	English	These were organised by BWZ quarterly for the project team to present on project progress and seek backstopping from committee members.

14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	6	Zambian	F	Invasive species summit, BirdLife Africa partnership regional workshop, 29th International Congress for Conservation Biology, BirdLife Council of African Partners EBA project Launch, COP 2021, NBSAP review 2021	English	The EBA project was launched in April 2021. Workshops were both National and international
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Physical Measures		Total	Comments
20	Estimated value (£s) of physical assets handed over to host country(s)		2 laptops, camping tents, mattresses, 1 desktop computer, 300kg mechanical scale, troughs
21	Number of permanent educational, training, research facilities or organisation established	2	1 Site Support Group and 1 Nature club established on Chilwa island.
22	Number of permanent field plots established	2	Weevil mass rearing concrete ponds established at the project site

Financial Measures		Total	Nationality	Gender	Theme	Language	Comments
23	Value of additional resources raised from other sources (e.g., in addition to Darwin funding) for project work <i>(please note that the figure provided here should align with financial information provided in section 9.2)</i>	GBP		M	FIC	English	Funds have been secured as part of the support BWZ is offering during the local environmental assessment for the proposed Chenguang agriculture project around the Lukanga swamp.

Annex 4 Aichi Targets

	Aichi Target	Tick if applicable to your project
1	People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	√
2	Biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	
3	Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	
4	Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	
5	The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	√
6	All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	√
7	Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	
8	Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	√
9	Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	√
10	The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	
11	At least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	√
12	The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	√
13	The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	
14	Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded,	√

	taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	
15	Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 percent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	
16	The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	
17	Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	√
18	The traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	√
19	Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	√
20	The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	

Annex 5 Publications

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	Available from (e.g. web link, contact address etc)
Report	Monitoring of <i>Cyrtobagous Salviniae</i> . Clara Nanja and Francis Ng'ona, 2019	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Report	Extent/ Impact of Awareness Raising Campaigns on the Lukanga Swamp. Francis Ng'ona, 2019	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	
Report	Assessing the Abundance and richness of the Flora and Fauna of the Lukanga Swamp. Francis Ng'ona, 2019	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	
Newsletter Article	An in depth view into Chilwa - Lukanga Swamp.	Zambian	Zambian	Female,	BirdWatch Zambia, Lusaka	

	Clara Nanja and Francis Ng'ona, 2019					
Newsletter Article	29th International Congress for Conservation Biology Clara Nanja, 2019	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Newsletter Article	The State of Water Birds in the Lukanga Swamp IBA Chaona Phiri and Mary Malasa, 2019	Zambian	Zambian	Female,	BirdWatch Zambia, Lusaka	
Newsletter Article	2019 BirdLife Southern African Partnership workshop in Victoria Falls,Zimbabwe. Clara Nanja, 2019	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Newsletter Article	Mass Rearing of <i>Cyrtobagous salviniae</i> . Chaona Phiri and Clara Nanja, 2019	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Newsletter Article	Two years on the Invasive Species Management project in the Lukanga Swamp IBA.	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	

	Chaona Phiri, 2019					
Article	The Lukanga Swamp Restoration Project Chaona Phiri, 2019	Zambian	Zambian	Female	Nkwazi Magazine	
Newsletter Article	Lukanga swamp site visit Swithin Kashulwe and Mary Malasa , 2020	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	
Newsletter Article	Weevil Monitoring and Project Documentary Shooting on the Lukanga Swamp Swithin Kashulwe, 2020	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	
*Video	An Insect of Life - A Tale of Lukanga Swamps. 2020	Zambian	Zambian	Female	Zambia National Broadcasting Corporation (ZNBC)	
Report	Assessing the Abundance of Flora and Fauna in and Around the Lukanga Swamps, 2017	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Report	Monitoring of <i>Cyrtobagous salviniae</i> in the Lukanga Swamp –	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	

	Year 3, 2nd Quarter, 2019					
Report	The Fauna and flora of the Lukanga Swamp, 2018	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Report	The introduction of <i>Cyrtobagous Salviniae</i> , a host specific weevil for controlling the invasive <i>Salvinia molesta</i> in the Lukanga swamp IBA, Zambia, 2018	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Report	Monitoring of <i>Cyrtobagous salviniae</i> in the Lukanga Swamp, Nov/Dec, 2018	Zambian	Zambian	Female	BirdWatch Zambia, Lusaka	
Report	Monitoring of <i>Cyrtobagous salviniae</i> in the Lukanga Swamp, 2nd Quarter, 2020	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	
Report	Monitoring of <i>Cyrtobagous salviniae</i> activities in the Lukanga Swamp, 3rd Quarter, 2020 Swithin Kasulwe	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	

Report	Monitoring of <i>Cyrtobagous salviniae</i> activities in the Lukanga Swamp IBA, 4th Quarter, 2021 Swithin Kashulwe	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	
Newsletter article	Weevil Monitoring and Project Documentary Shooting in the Lukanga Swamp, 2020 Swithin Kashulwe	Zambian	Zambian	Male	BirdWatch Zambia, Lusaka	

Annex 6 Darwin Contacts

Ref No	24030
Project Title	Controlling an invasive aquatic plant for improved biodiversity and livelihoods
Project Leader Details	
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Annex 7 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@itsi.co.uk putting the project number in the Subject line.	YES
Is your report more than 10MB? If so, please discuss with Darwin-Projects@itsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	NO
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see section 10)?	N/A
Have you included means of verification? You should 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 need 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.	