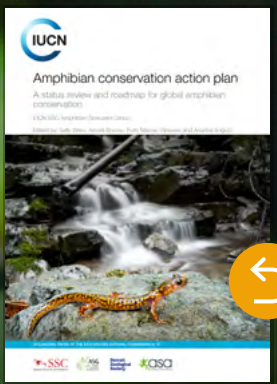
Chapter 9



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The Montevideo treefrog (*Boana pulchella*), photographed near La Plata, Argentina. Although classified as Least Concern, and relatively widespread through parts of South America, in Argentina this species is covered by the country-wide action plan Plan de Acción para la Conservación de los Anfibios de la República Argentina (Vaira, Akmentins & Lavilla, 2018). © Debbie Bishop

Chapter 9

Strategic planning: a basis for effective action

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Abstract

Comprehensive conservation planning is the second, essential step in the Assess-Plan-Act cycle necessary for effective conservation efforts. Planning sets a long-term vision, clarifies the goals and expected outcomes, evaluates threats to species, identifies missing scientific information, identifies and prioritises the actions that are needed to achieve objectives, establishes a timeline, identifies necessary resources including funding, personnel, and partnerships, and creates a monitoring plan to assess conservation impact and adaptive management needs. Because effective conservation is a long-term process, and evaluation must be evidence-based, the impact of planning is often difficult to assess. However, evidence is emerging that shows improved species status as a result of comprehensive conservation planning. In this chapter we identify the various levels at which planning occurs, discuss tools and processes available to assist with conservation planning, including some specific to amphibians, outline some of the major challenges to planning and plan implementation, and provide key recommendations to facilitate successful amphibian conservation planning.

Introduction

The importance of species conservation planning is recognised by the IUCN Species Survival Commission (SSC) as one of the essential elements of species conservation in the Assess-Plan-Act Cycle (Figure 9.1). Key components of conservation planning are discussed in this document.

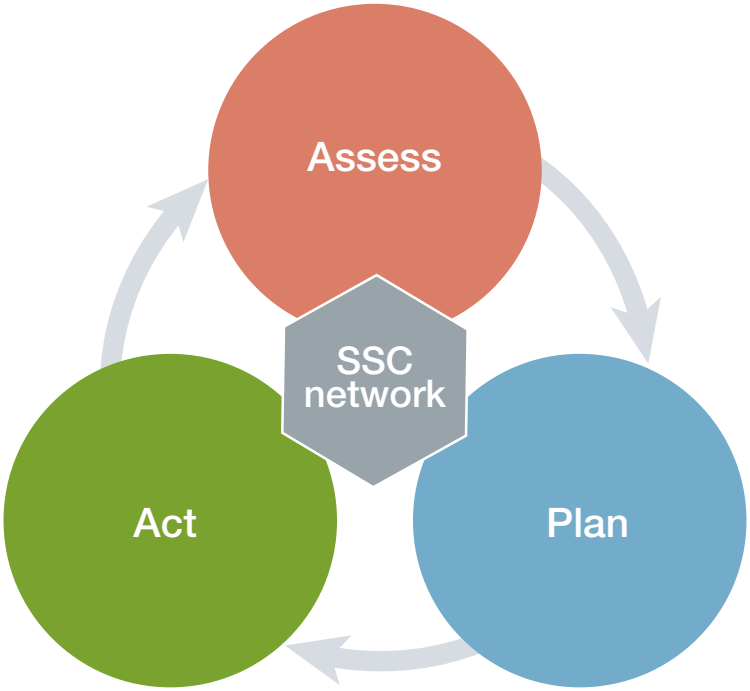


Figure 9.1: The IUCN SSC Assess-Plan-Act Cycle. Source: IUCN SSC.

Strategic species conservation planning increases the potential for effective conservation actions that result in positive outcomes for the species (*see* Box 9.1). Such a positive outcome depends on several aspects: **i)** the inclusion of all affected stakeholders in the planning process; **ii)** consensus around well-defined and achievable goals, objectives, and actions; **iii)** the best available scientific information to inform management and policy decisions; **iv)** check points over time that enable adaptive management; **v)** periodic reporting to stakeholders for transparency and accountability; and **vi)** clear identification of the measure(s) of success. In addition to these elements, clarification of the regulatory authority over species for conservation actions (including its legal enforcement capability), matching actions with available resources such as funding and personnel that may limit the capacity of the conservation programme, and an understanding of how stakeholders consider risk and uncertainty relative to conservation planning, implementation of actions, and results are needed to maximise the success of programmes (Olson, 2007).

Comprehensive conservation planning can occur at global, national, and local levels. The IUCN *Amphibian Conservation Action Plan* (ACAP; Gascon et al., 2007; Wren et al., 2015) has identified cross-cutting needs across broad geographic and jurisdictional scales for amphibian conservation and has provided direction for addressing those needs relative to key risk factors. National and regional plans (e.g. Vaira, Akmentins & Lavilla, 2018) often have established priorities regarding which species are most in need of conservation action at those spatial scales and what type(s) of action are most urgent. In contrast, species action plans identify specific measures needed to implement the plans, as well as who would be responsible for which actions, over what timeframes, and the metrics of success. In addition to ensuring efficient use of resources, conservation action plans at all levels may be leveraged to increase funding opportunities and partnerships, and overall can improve the probability of success of grant applications as they ensure accountability with periodic reports and adaptive management, when needed.

Conservation is a truly multi-disciplinary subject, requiring a wide range of expertise. Traditionally, biologists have moved into the conservation sphere as their research highlighted the decline of threatened species, but as the discipline of conservation

Box 9.1: Recovery of the El Rincon-stream frog

Plan development

In 2012 faculty and graduate students at La Plata Museum in Argentina started a planning project with a clear vision, ensuring the long-lasting viability of one of the most threatened amphibians in Argentina, the El Rincon-stream Frog, *Pleurodema somuncurense*. This frog was listed as Critically Endangered in the Red List and among the Top 100 EDGE amphibians worldwide due to its restricted range, declining population (including local extinctions), and the existence of several threats. However, as with many threatened amphibians, there was a lack of information to clearly identify and set management actions. Consequently, a stakeholder workshop was organised aimed at developing a Logical Framework for this species. Workshop participants first helped build a tree of threats and then, turned it into a tree of objectives to guide management activities (*see* Box Figure 9.1). However, because the real impact of threats was not fully known, it was decided to apply adaptive management to both measure the conservation impact of actions and, at the same time gather scientific data to allow assessment of the real effect of these threats on the frogs.

Plan implementation

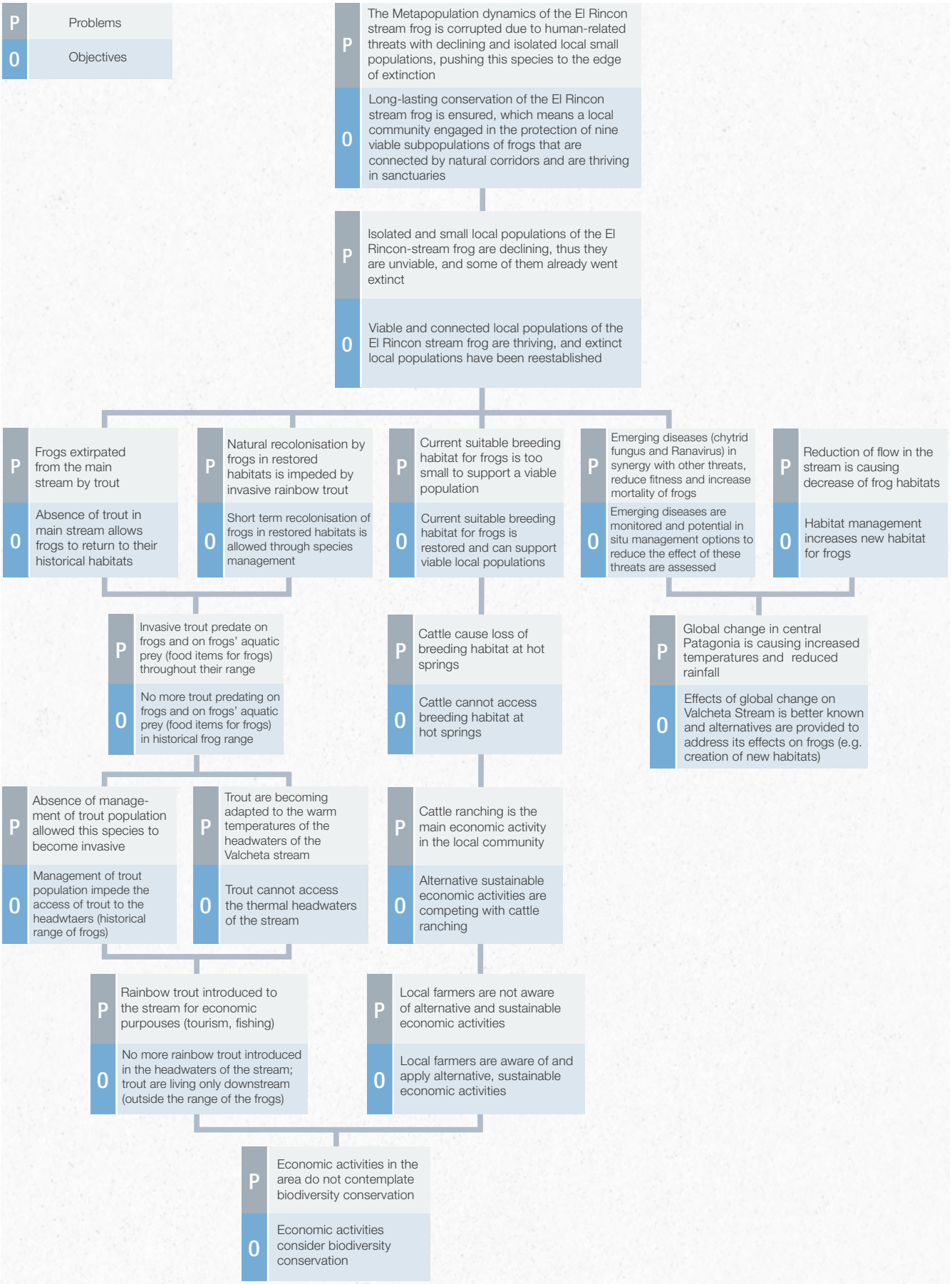
Initially, the team focused on alleviating the main threats, invasive trout, which restricted frogs to a few remnants of trout-free habitat, and livestock, which promoted loss and fragmentation of these remnants through grazing and trampling. Removal of these threats was identified as crucial to enhance connectivity and natural movement of individuals to restored habitats, which would help the natural recovery of extinct sub-populations. However, there was a delay in obtaining permits to remove invasive trout, making natural recolonisation impossible. To address this, the team decided to add an ex situ component and a translocation programme to help re-establishment of extinct sub-populations until permits to manage trout were approved.

While waiting for the permit to remove invasive trout, progress was made on the next step in the plan; working to exclude livestock from some sites, allowing rapid habitat regeneration of suitable frog habitat. Successful breeding in the ex situ colony of this species, allowed for translocations from ex situ facilities to the restored habitats, achieving the re-establishment of extinct sub-populations. Five years later, the permit to remove invasive trout was approved, which allowed the work of enhancing corridors to connect isolated sub-populations to begin, thus starting the recovery of the meta-population dynamics of the El Rincon-stream Frog.

Process evaluation

The Logical Framework represents a powerful tool for planning successful projects. This planning tool consists of a matrix which provides an overview of a project's goal, activities and anticipated results. It provides a structure to help specify the components of a project and its activities and for relating them to one another. It also identifies the measures by which the project's anticipated results will be monitored. Within this framework action plans resulting from a planning process should be flexible enough to address uncertainties. In this case, the re-establishment of extinct sub-populations by natural recolonisation of frogs could have failed due to a delay in permits. This problem was solved by developing an ex situ population and adding a translocation component to the original action plan. Additionally, adaptive management proves to be helpful to face both the lack of information about the real impact of some potential threats and the effectiveness of planned management actions.

Source: Planning and execution by Federico Kacorilis



Box Figure 9.1: A tree of problems and threats that was developed during a conservation planning workshop for the El Rincon-stream Frog, *Pleurodema somuncurense* to guide management decisions. Source: Adapted from the El Rincon stream frog action plan.

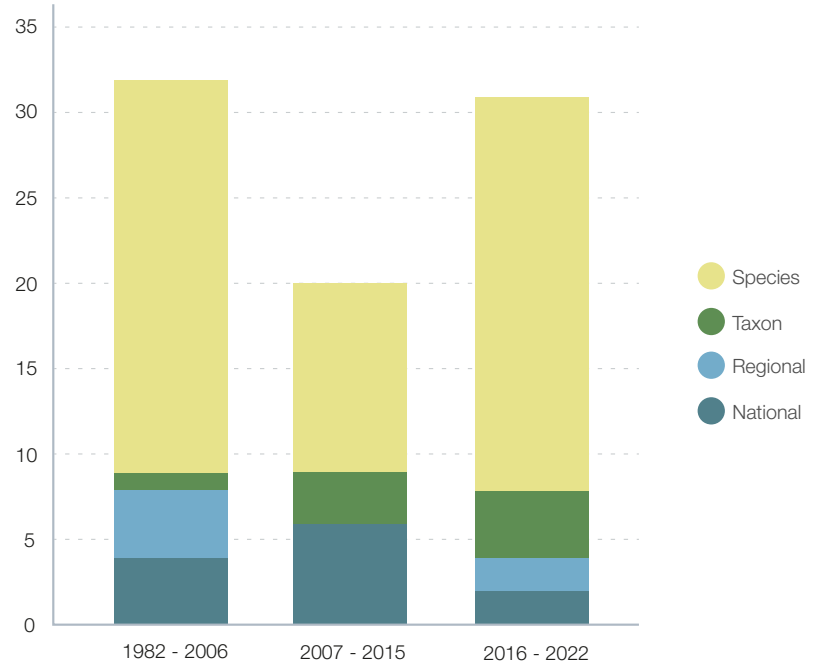


Figure 9.2: Number of amphibian conservation action plans produced globally since 1982, split by pre-ACAP (before 2007; mean = 1.4 plans/yr), first ACAP (2007-2015; mean = 2.9 plans/yr), and second ACAP (2016-October 2022; mean = 5.2 plans/yr). National Action Plans (NAPs) cover an entire country; Taxon Action Plans cover all species in a particular taxonomic group; Regional Action Plans (RAPs) cover a region within a country; and Species Action Plans (SAPs) are usually developed for a single or small group of species. All plans for which references could be found, either on the ASG website, the CPSG website, the USFWS website and through internet search engines were included. This probably underestimates the actual number of plans as some countries were reported to have plans for all nationally endangered species, which were not available. Plans are recorded based on the year they were first produced. Some were updated in subsequent years, but these were not recorded as separate plans. Source: Data compiled by Anne Baker.

planning has evolved, conservation biologists have recognised the need to engage diverse professions to improve the success of conservation initiatives. It might be beneficial, for example, to include experts in social marketing, human demographics, resource economics, or the Population, Health and Environment (PHE) approach (CHASE Africa, 2021) in amphibian conservation decision-making. Undertaking a planning exercise is one of the best opportunities to bring that expertise together, strengthening stakeholder networks and increasing coordination and collaboration for, ultimately, better outcomes for the species, group of species, or site(s) in question.

The history of amphibian conservation planning

The first conservation plans for amphibians (e.g. USFWS, 1983, 1984) were developed in the 1980s in response to the United States Endangered Species Act of 1973 (*The Endangered Species Act as Amended by Public Law 97-304 (the Endangered Species Act Amendments of 1982)*, 1983). These and other early plans brought together important ecological information about a threatened species, highlighted knowledge gaps, and sometimes prioritised actions required for species recovery, but often failed to provide recovery criteria, thus making it difficult to know when a species had been recovered successfully. Whereas the first edition of the ACAP (Gascon et al., 2007) did not include a chapter on conservation planning, it was included in the 2015 ACAP revision (Wren et al., 2015). The average number of plans produced per year has been steadily increasing over this time (Figure 9.2) but is still low given the number of threatened amphibian species.

During the 1982-2006 period an average of 1.3 plans were produced per year. In the subsequent 2008-2015 period, 2.5 plans per year were completed, while post-2015 an average of 4.4 plans were produced annually.

A full accounting of species conservation plans has been difficult to compile, hence inadequate reporting may contribute to some differences among timeframes.

The number of plans produced between 1982 and 2022 varies starkly with geographic region (Figure 9.3). The variation in number of plans among regions does not reflect species richness, relative number of threatened species within a region, or spatial extent of regions. Multiple complex interacting factors may explain variation in conservation plan initiation over time among geographic areas. Some of these are discussed further below. Many tie to low priority for amphibian conservation, resulting in limited resources and capacity to assess amphibian species status and to develop and implement conservation plans.

Assessing the effectiveness of conservation action plans is difficult for a number of reasons, not the least of which is identifying what measures will be used to evaluate success. At one end of the spectrum, success may be measured by activity, such as the number of prioritised actions completed, or by slowing declines in populations as is the case in a review of the Sahonagasy Action Plan (Andreone et al., 2012) published four years following the plan's completion. Alternatively, success may be measured by outcomes, such as the long-term viability of a species in the wild, for example, via changes in conservation status on The IUCN Red List of Threatened Species™ (Red List; Young et al., 2014). It is difficult to quantify how many amphibian conservation plans have been implemented, and there is no standard review process of the effectiveness of amphibian conservation action plans in terms of achieving positive outcomes. This is not surprising, as the literature suggests that there is little evidence for the conservation outcomes of any conservation action planning (McIntosh et al.,

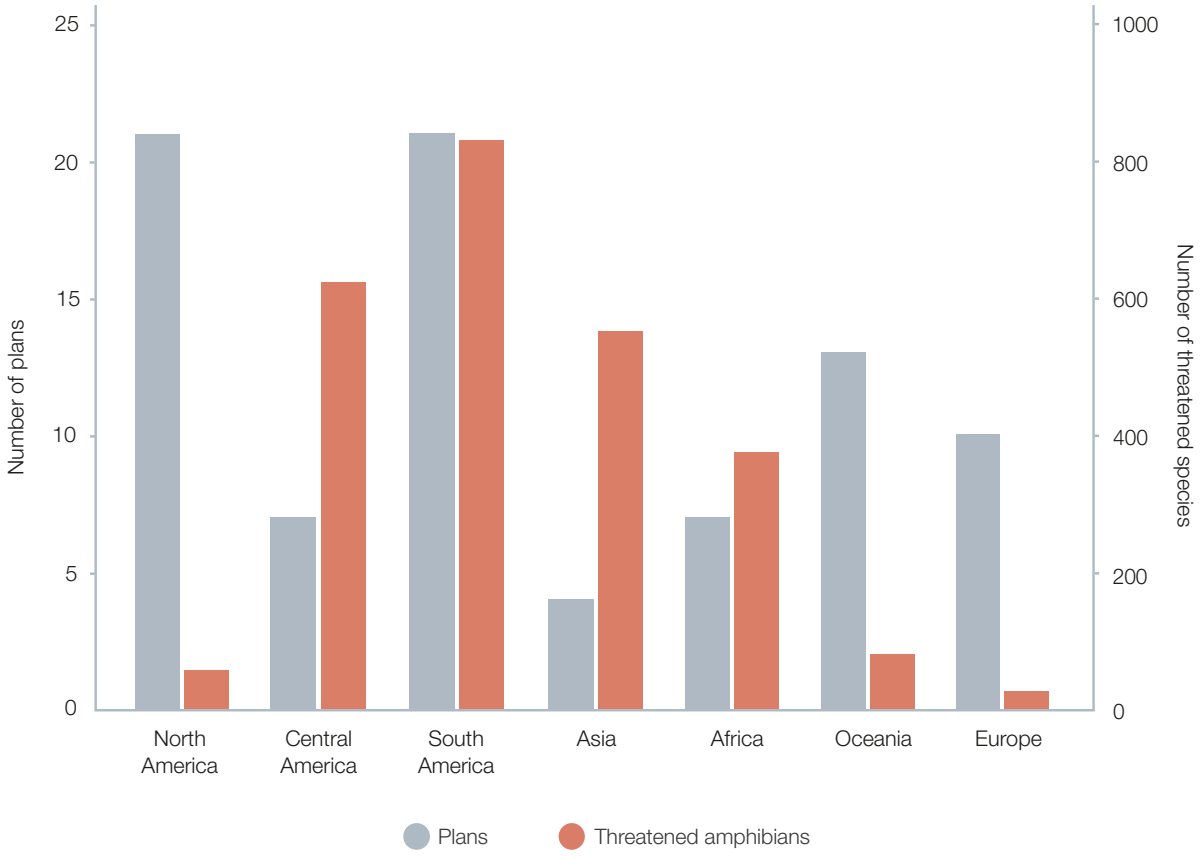


Figure 9.3: The total number of amphibian species conservation action plans (National, Regional and Species combined) by Geographic Region. There may be additional amphibian conservation plans that we did not find when assembling these data. Source: Plan data compiled by Anne Baker (*see* Figure 9.2 legend for how plan data were gathered), threatened species data downloaded from Red List website 13 October 2022.

2018), although individual actions are quite diverse and many have had support for positive effects (Smith, Meredith & Sutherland, 2020). Assessing the impact of conservation planning for a species can take years as the effects of various efforts may not occur immediately. Lees et al. (2021), in an analysis of 35 species conservation plans completed in 23 countries over 13 years for a wide variety of species have documented positive outcomes (either increased or stable populations) for 26 species after periods of 15 years. Although the remaining species continued to decline over the same period, the decline slowed, and no species went extinct. As this analysis documented, measuring the impact of conservation planning is difficult and complex. It can take several decades for the effect of conservation actions to be seen, so it is unlikely that results will be seen immediately for more recently developed plans.

Assessment – a critical first step in planning

Good planning depends on good information about the current status of species. Several tools are available to assist in providing this information. The amphibian database assembled for the Red List provides collated information on species status across multiple standardised criteria, including some recommended conservation steps. The Conservation Needs Assessment (CNA; Johnson et al., 2020) developed by the Amphibian Ark (AArk) is a transparent, logical and objective method which prioritises those species with the most pressing conservation needs. The CNA complements the Red List extinction risk assessments and together they provide a foundation for the development of holistic conservation action plans that combine in situ and ex situ actions as appropriate. Where they exist, National Red Lists or equivalent classification schemes also provide similar status information for species. Although to date amphibian conservation planning has tended to be species based, in some instances site-based plans may be more appropriate (Butchart et al., 2012). Alliance for Zero Extinction (AZE) identifies key sites that are the last refuges for Endangered or Critically Endangered species (Luther et al., 2021; Parr et al., 2009) and their website (zeroextinction.org) can be searched by taxonomic group. In a similar vein the Key Biodiversity Areas (KBA) initiative (keybiodiversityareas.org) provides a world database of areas of importance for conserving biodiversity (Eken et al., 2004). *See* Chapters 2 and 10 for a deeper discussion on types of data required to make assessments, the issue of insufficient data, and methods that can be used for surveillance and monitoring to inform extinction risk assessments and planning. These assessment and prioritisation processes provide guidance for maximising the impact of limited conservation resources by identifying which measures could best serve those species requiring help.

Planning tools

Guidelines

As experience with conservation planning has increased, methods for species conservation planning have evolved, incorporating knowledge and decision-making tools from other disciplines. Published conservation planning guidelines reflect this improved knowledge.

IUCN SSC groups have produced a number of guidelines aimed at assisting those undertaking a conservation planning process (CPSG, 2020; IUCN/SSC, 2008; IUCN – SSC Species Conservation Planning Sub-Committee, 2017). The IUCN – SSC Species Conservation Planning Sub-Committee *Guidelines for Species Conservation Planning* (IUCN – SSC Species Conservation Planning Sub-Committee, 2017), and the IUCN SSC Conservation Planning Specialist Group (CPSG) publication *Species Conservation Planning Principles & Steps*, Ver. 1.0 (CPSG, 2020; www.CPSG.org) both provide guiding principles for conservation planning and systematically describe the steps essential for effective conservation planning (http://www.cbsg.org/species-conservation-planning-cycle; Byers et al., 2022). The Open Standards for the Practice of Conservation (or 'Conservation Standards'; Conservation Measures Partnership, 2020) is an adaptive planning framework utilised to collaboratively and systematically conserve flora and fauna. It was created by the Conservation Measures Partnership

(CMP). A full description of the Conservation Standards can be found at www.conservationmeasures.org. A number of similarities exist between the Conservation Standards and IUCN/CPSG planning methods. These include inclusion of stakeholders (all persons or groups who impact and/or are impacted by conservation decisions), assessment of the current situation, clear articulation of issues, identification of a vision, goals, objectives and actions, and evaluation of impact (feeding back into the cycle to inform future decisions). They also differ in some respects. One key difference between the Open Standards and the IUCN/CPSG process is that the latter focuses more heavily on identifying the key threats to the species as an initial step in the planning process. AArk has developed templates for formatting both national and species action plans which can be found in the AArk website's husbandry section (www.amphibianark.org).

Although there are guideline documents for the different approaches described above, they share some key components, which enable development of an effective conservation plan, and facilitate the implementation of that plan. All the methods help a group come together and work through complicated challenges, which may include conflicting stakeholder priorities and lack of data or evidence, to agree on a conservation solution. A skilled facilitator is key to ensuring an inclusive process. These methods also rely on making clear objectives (often following the SMART model: Specific, Measurable, Achievable, Realistic, and Time-bound). Furthermore, all these techniques are 'living methods' with a cyclical nature, which involve regularly re-evaluating decisions based on new information, changing environments, and unforeseeable events, and encourage assessment of past decisions to ensure the best possible outcomes.

Analytical tools

There are several analytical tools that can be used during a conservation planning exercise to assist with informed decision-making and testing alternate scenarios. Structured Decision Making (Gregory et al., 2012) is an approach for organised analysis of natural resource management decisions that can help address risk and uncertainty in the conservation planning process. In particular, Structured Decision Making is designed for use when there is substantial uncertainty regarding the effectiveness of possible conservation actions, whether because of inadequate understanding of factors such as fundamental ecological requirements of a species, or the probable impact of proposed actions.

In cases where sufficient demographic information is known, Population Viability Analysis (PVA; Lacy, 2000b, 2000a) is an analytical tool that can project the future of threatened species' populations under various scenarios describing current and future conditions. This method is used in the management of threatened species to evaluate the relative impacts of threats, develop plans of action, judge outcomes of proposed management options, evaluate population recovery efforts and assess possible impacts of habitat modification or loss. It considers the interacting factors that could drive populations to extinction. PVA is used to estimate the likelihood of a population becoming extinct and to point out the need for conservation efforts, identifying key life stages or processes that should be the target of such conservation. One key value of a PVA is that it points out where data and expert opinion or intuition often led to quite different results. While the predictive accuracies of PVAs have been criticised for lack of applied validation, they are objective and repeatable (Chaudhary & Oli, 2020; Doak et al., 2015) and the benefits of their use has been demonstrated in amphibians (Auffarth et al., 2017; Pickett et al., 2016).

Unfortunately, these simulation models (examples of software given in Table 9.1) require solid data on population sizes and demographic parameters, information often not available for many threatened amphibian species. To date, only eight of the 60 amphibian species conservation action plans included PVA modelling. In all eight plans information on demographic parameters came mostly from captive populations or a single, small wild population.

Multi-species planning

With increasing recognition of the need to plan for threatened species across taxonomic groups, we are

Table 9.1: Software that may be useful in making objective decisions when conservation planning

	VORTEX	RAMAS	HexSim	PMX	Outbreak
Author	Lacy, 2000b; Lacy & Pollak, 2021	Akçakaya & Root, 2005	Schumaker, 2016	Lacy, Ballou, & Pollak, 2012	Lacy et al., 2014
Location	www.scti.tools/vortex	www.ramas.com/software	www.hexsim.net	www.scti.tools	www.scti.tools
Cost	Free	US$ 1K - US$ 5K	Free	Free	Free
Description	Monte Carlo simulation, models population dynamics as discrete, sequential events (e.g. births, deaths, catastrophes, etc.) that occur according to defined probabilities. Probabilities of events are modelled as constants or as random variables that follow specified distributions.	Models population dynamics as discrete, sequential events (e.g. births, deaths, catastrophes, etc.) that occur according to defined probabilities. Probabilities of events are modelled as constants or as random variables that follow specified distributions, allows for species that live in multiple patches	Versatile, multi-species, life history simulator used for building spatially explicit and individual-based models of animal and plant population viability, interactions, and responses to disturbance.	Software for managing captive populations	Software for modelling dynamics of infectious diseases

faced with the issue of limited capacity to plan for all the species that need these conservation efforts. As of October 2022, 2,515 amphibian species are listed as threatened on the Red List (classified as either Critically Endangered, Endangered, or Vulnerable; IUCN, 2022), and from a global perspective it would not be feasible to undertake conservation planning for these species one-by-one. Therefore, efforts have been made to develop and carry out multi-species planning, to address the needs of several species in one process. This might be through the development of country-wide plans, for example the Action Plan for the Conservation of Amphibians of the Republic of Argentina (Vaira, Akmentins & Lavilla, 2018), which was developed following a nation-wide Conservation Needs Assessment; the Sahonagasy Action Plans developed by ASG Madagascar (Andreone et al., 2016; Andreone & Randriamahazo, 2008; and *see* Box 9.2) and the China Herpetological Conservation Action Plan I: Amphibians (Li, 2010). Conservation plans may also cover a region within a country, for example the Action Plan for the Conservation of the Amphibians of the Valle del Cauca Region (Corredor Londoño et al., 2010).

Another option is taxon-based multi-species planning, suitable where there are taxonomic groups of amphibians with high numbers, or a high proportion, of threatened species and where the same actions are likely to have a positive impact on the whole group. For example, harlequin toads (*Atelopus* spp.) are among the most threatened amphibian genera; 82 of the 94 species that have been assessed by the Red List are categorised as

Threatened or Extinct. In response, a partnership of organisations formed the Atelopus Survival Initiative, a collaborative network which aims to coordinate conservation responses for *Atelopus* species through a single comprehensive conservation action plan – HarleCAP – for the genus (Valencia & Fonte, 2021).

Multi-species plans do not need to be taxon-specific, covering only amphibians; it may be that we can increase the number of threatened amphibian species covered by conservation plans by explicitly including these species in site-based plans, for example plans for protected areas (e.g. Pulgar Vidal et al., 2015), wetlands where waterfowl protections are implemented, or forests where stream-riparian protections are implemented to meet water quality standards or sensitive fish (e.g. Olson & Ares, 2022). These approaches may be especially effective for species where a significant proportion of their range falls within a protected area.

Another approach, which remains to be tested for amphibians, is the Assess to Plan (or A2P) approach, developed by the Conservation Planning Specialist Group (Byers et al., 2022; Gibson et al., 2020; Lees et al., 2020). A2P aims to move species more quickly through the Assess-Plan-Act Cycle (Figure 9.1) by using the Red List database to develop "bundles" of species that are sensible for multi-species conservation planning. Good bundles would comprise species anticipated to respond positively to the same set of conservation actions and whose conservation can be addressed by the same conservation actors or agencies. Typical planning categories expected from the A2P process might include: habitat-directed planning, for species dependent on the same habitat type which is subject to a common threat or set of threats; site-directed planning, for bundles of species inhabiting a defined area and subject to multiple localised threats linked to that site; threat-directed planning, for groups of species targeted by a common threat that is not anchored to a site, for example disease, overharvesting, or climate change; ex situ conservation feasibility assessment/planning, for species for which in situ conservation alone is considered unlikely to prevent extinction within the time available; and individual species recovery planning, for outlier species whose conservation needs do not overlap significantly with those of other species.

While single-species planning will remain key for some species, increasing efficiencies through multi-species planning approaches will be necessary; with such a large number of threatened amphibian species currently on the Red List, and a further 1177 listed as Data Deficient (IUCN 2022), as well as the continued discovery of new species (Tapley et al., 2018), planning and conservation efforts need to be scaled up significantly if we are to address the

Box 9.2: The endemic amphibians of Madagascar and the development of a country-wide conservation strategy

Background

Madagascar is well known for its astonishing biodiversity and high endemicity rate. Amphibians are one of the most prominent vertebrate groups living there: current estimates indicate around 380 described species and many others still await formal description. The increasing deforestation rate of the natural habitats of Madagascar justifies priority attention be given to the conservation of this peculiar fauna and their habitats. This was highlighted by the Global Amphibian Assessment and the first *Amphibian Conservation Action Plan* (Gascon et al., 2007).

Plan development

A meeting was held in 2006 in Antananarivo to develop "A Conservation Strategy for the Amphibians of Madagascar" (ACSAM). During this meeting participants exchanged information, identified issues, and

developed proposals for amphibian conservation in Madagascar. These discussions led to the formalisation of the Sahonagasy Action Plan (SAP), "sahonagasy" being a Malagasy neologism, with "sahona" meaning "frog" and "gasy" an equivalent adjective to "Malagasy". The SAP was the first initiative to implement the ACAP at a national level and one of the first plans in a high endemism country. In the plan the meeting discussions were translated into eight themes addressing the major needs of Madagascan amphibians, including coordination of research and conservation activities, managing threats such as emerging disease, harvesting, and climate change, and monitoring species, accompanied by active safeguard and awareness initiatives.

Plan implementation and revision

The Sahonagasy Action Plan prompted research on iconic species and important amphibian communities. Workshops focusing on aspects of the plan were held, including one dedicated to chytrid fungus (*Bd*) and its prevention. This eventually led to the activation of a Chytrid Emergency Cell and regular monitoring after screening found *Bd* positive individuals. Another workshop provided training on captive breeding and husbandry science for Malagasy amphibians. Conservation actions included a collaboration with Madagascar Fauna and Flora Group to organise a festival dedicated to the tomato frog (*Dyscophus antongilii*).

At an ACSAM2 workshop held in Ranomafana National Park in 2012, participants assessed the results and process of the first SAP. A review of progress had been published prior to the workshop (Andreone et al., 2012), then at the meeting talks were followed by a brainstorm analysis and revision of the many tasks and objectives. Outcomes of the revised plan included a collaboration between ASG Madagascar, ASA and Durrell Wildlife Conservation Trust, who received funding from the Critical Ecosystem Partnership Fund to implement the new plan, including capacity building of local people, and the recruitment of two dedicated personnel. Further outcomes included scientific research training to support the understanding of the Ministry staff on how research is undertaken, with the goal of facilitating the delivery of scientific permits; a workshop sharing knowledge on the different amphibian-oriented protocols used in the field; a conference dedicated to the amphibians at Toamasina University; and an amphibian festival in the Ivoloina Park to increase public awareness of amphibian conservation. Furthermore, a new species action plan, the McAP *Mantella cowanii* Action Plan, was finalised in 2021.

Process evaluation

The activity of ASG Madagascar and the workshops dedicated to amphibians highlighted these vertebrates as an important component of Madagascar's biodiversity; after being involved in the ACSAM the Malagasy Government is more aware of the importance of amphibians, which are now always considered in biodiversity strategies. Getting an amphibian action plan formally accepted by the Madagascar Government is a success in itself, and while there have been successful outcomes of the action plan, a lack of funding and insufficient coordination limited implementation of the original plan (see Andreone et al., 2012 for a full evaluation). While engaging the government has produced positive outcomes, implementation of long-term activities in a national strategy is possible only when there are stakeholders ready to support the actions with long-term funds. For this project it is compulsory that an NGO dedicated to amphibians is active in Madagascar to promote and sustain conservation actions. This is a great opportunity but also a great challenge for the Madagascar scientific community.

Source: Franco Andreone & Andolalao Rakotoarison IUCN SSC Amphibian Specialist Group - Madagascar

conservation needs of all amphibian species currently listed as threatened, and efficiencies can be gained with multi-species planning approaches.

Virtual planning

Traditionally, one of the key stages in a quality conservation planning process has been to bring together stakeholders in a multi-participatory planning workshop. There are several benefits to this method, including building stronger relationships and encouraging participants to focus on the task to hand. However, in 2020-21, in the face of the global Covid-19 pandemic, where international travel came to a halt, it was necessary to adapt and develop methods for continuing conservation planning work virtually.

There are significant challenges to effective virtual planning, not least ensuring that all participants have access to the relevant technology – both in terms of having reliable access to internet, as well an acceptable level of familiarity with the programmes used. It can be more challenging in a virtual process to ensure that there is equal engagement of all participants, and it may take additional capacity on the facilitation team to ensure that all avenues of communication – such as video, chat bar, and polls – are monitored sufficiently well, and that there is always somebody available to fix participants' technical issues.
Scheduling virtual meetings may present additional difficulties; first, timing meetings to be during working hours in all relevant time zones is not always possible, so some participants will be working at unusual hours. Online sessions can often be more mentally draining for participants, so a virtual workshop may not be able to include day-long sessions, as is traditionally the practice for in-person workshops. Rather, it may be necessary to schedule workshops over a series of shorter sessions, which will extend the process, but allow participants to remain fully engaged within each session. However, sessions should not be scheduled too far apart, otherwise much time will be required to re-cap. Further guidance on setting up and facilitating a virtual workshop can be found in CPSG's document *A Guide to Facilitating Virtual Workshops* (IUCN SSC CPSG, 2020).Despite these challenges to implementing effective workshops online, there are also benefits to this approach including significant reductions in cost and carbon emissions, and often the ability to invite more participants due to the lack of travel costs. As such, even though international travel is increasing again, it is likely that virtual workshops will remain a part of the future of conservation planning.

Challenges to planning

Key challenges to conservation planning in this section come from members of the ASG Conservation Planning Working Group who contributed their experiences in a brainstorm process. The factors listed *below* can be frequent and substantial challenges; some ways in which these challenges might be addressed are suggested.

- **Knowledge gaps:** Although the ASG has tried to collate past and existing plans on the ASG's website (https://www.iucn-amphibians.org/resources/publications/action-plans/action-plans-by-regions), this is not a comprehensive list, and it is difficult to track development and implementation of conservation plans. There may be species-specific plans that have been missed (e.g. those not appearing in an online literature search due to language differences), or species could be included in protected-area or habitat-management plans but are not specifically mentioned in the plan's title or keywords. It is important that efforts are made to better track and monitor the existence and implementation of plans for amphibian species to help decision-making for future planning efforts.

- For individual conservation plans, actual or perceived **lack of data** is a further obstacle to undertaking planning for amphibians; decision-making can become more difficult where data are poorly available. Some evidence suggests that there may be a lower incentive for academic research on amphibians, due to the relatively low impact factor of herpetology compared with other

biological sciences (Urbina-Cardona, 2008). The competitive academic system in many countries rewards research that can be completed and published quickly as opposed to the collection of data that, while not novel or cutting edge, would be useful to inform conservation decision-making, such as long-term monitoring of amphibian populations. Traditionally, much amphibian research has focused on taxonomy and systematics, with little or no attention paid to ecological research addressing life history parameters, population trends, or environmental threats, although this is gradually changing in a number of countries and publications. Specific impacts to amphibians may be overlooked even in research on relevant subjects; climate change, for example, is a threat to many amphibian species, but most studies modelling the impact of climate change focus on temperature rather than more difficult to model hydrological changes that are more likely to impact amphibians. It will be an ongoing challenge to ensure that sufficient, current data are available for decision-making in amphibian conservation planning. In cases where data are poor, an adaptive management approach may be used to test proposed actions (e.g. Canessa et al., 2019).

- **Amphibians are not valued**: Many participants felt that amphibians are often overlooked, not perceived as important as some other taxonomic groups (*see* more detailed discussion in Chapter 2), and therefore end up not being priorities for conservation planning (Olson & Pilliod, 2022). Addressing this may take education (*see* Chapter 8) to improve understanding of the importance of amphibians in the ecosystem. This reflects the importance of environmental education programmes to improve the direct experiences and interactions of people with amphibians beginning in childhood, that can develop more positive feelings and perceptions (Brom et al., 2020). In this sense, education programmes at zoos are key for urban children while participatory sampling with rural people could be the most efficient strategy (Vergara-Ríos et al., 2021). One strategy potentially useful with adults is to pinpoint the beneficial effects that amphibians have as controllers of disease vectors and pests, and to encourage the development of citizen science initiatives to bring understanding, interest, and care to the global public. Once such programme is the Global Amphibian BioBlitz organised by and supported by the ASG (https://www.inaturalist.org/projects/global-amphibian-bioblitz). Additionally, multispectral partnership approaches to biodiversity conservation, including the Population, Health and Environment approach, which are developed inclusively and equitably in response to local situations, can provide additional entry points for conservation practitioners to share conservation messages within communities local to areas where amphibian conservation is undertaken (CHASE Africa, 2021).

- **Planning is not valued**: Another major challenge to undertaking conservation planning for amphibians is a lack of appreciation for the benefits of planning. It is true that it has been difficult to show the impact of developing a conservation plan empirically, partly due to the long time-period necessary to see outcomes. However, evidence is now starting to show the positive impact of developing species-based conservation plans (IUCN SSC CBSG, 2017; Lees et al., 2021). Further, individuals that have participated in a conservation planning process often note the benefits of going through the steps of examining the evidence, developing a joint vision and goals, and critically thinking in a group setting with a variety of expertise present, about how best to achieve those objectives.

- **Conservation planning is perceived as difficult**: Individuals may be daunted by the process of undertaking conservation planning, but as shown *above*, several guidelines are available to help support those undertaking planning for the first time (Byers et al., 2022; Conservation Measures Partnership, 2020; Copsey, Lees & Miller, 2020; CPSG, 2020; Gregory et al., 2012; *see* Box 9.3 for a list of useful documents), as well as support offered from groups such as CPSG.

- **Lack of planning capacity** can be another obstacle to developing conservation plans. Managing multi-stakeholder participation in the planning process requires facilitators with

Box 9.3: Useful resources for those undertaking conservation planning

Breitenmoser, U., Lanz, T., Vogt, K., & Breitenmoser-Würsten, C. (2015). How to save the cat - Cat Conservation Compendium, a practical guideline for strategic and project planning in cat conservation. *Cat News Special Issue*, 9, 1–36). www.catsg.org/index.php?id=293

CHASE Africa. (2021). *Supporting Community & Ecosystem Health: A Guide On Why, And How, To Include Community Health And Rights Based Family Planning In Conservation Programmes.* Community Health & Sustainable Environment, Sommerset, UK. Pp. 21. www.chaseafrica.org.uk

Conservation Measures Partnership. (2020). *Open standards for the practice of conservation. Version 4.0.* https://conservationstandards.org/download-cs/

Copsey, J., Lees, C. & Miller, P. (2020). *A Facilitator's Guide to Species Conservation Planning.* IUCN SSC Conservation Planning Specialist Group: Apple Valley, MN. www.cpsg.org/content/facilitators-guide-species-conservation-planning

CPSG. (2020). *Species Conservation Planning Principles & Steps, Ver. 1.0.* IUCN SSC Conservation Planning Specialist Group: Apple Valley, MN. www.cpsg.org/sites/cbsg.org/files/documents/CPSG Principles %26 Steps_English.pdf

Foden, E. W. B. & Young, B. E. (2016). *IUCN SSC Guidelines For Assessing Species' Vulnerability To Climate Change.* Version 1.0. Occasional Paper of the IUCN Species Survival Commission No. 59. Cambridge, UK and Gland, Switzerland. https://doi.org/10.2305/iucn.ch.2016.ssc-op.59.en

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T., & Ohlson, D. (2012). *Structured Decision Making: A Practical Guide to Environmental Management Choices.* Wiley-Blackwell.

IUCN/SSC. (2008). *Strategic Planning for Species Conservation: A Handbook. Version 1.0.* Gland, Switzerland. https://portals.iucn.org/library/node/9289

IUCN/SSC. (2013). *Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0.* Gland, Switzerland: IUCN Species Survival Commission. https://portals.iucn.org/library/node/10386

IUCN/SSC. (2014). *Guidelines on the Use of Ex Situ Management for Species Conservation. Version 2.0.* Gland, Switzerland. https://portals.iucn.org/library/node/44952

IUCN SSC CPSG. (2020). *A guide to Facilitating Virtual Workshops.* Apple Valley, MN, USA. https://www.cpsg.org/content/guide-facilitating-virtual-workshops

IUCN – SSC Species Conservation Planning Sub-Committee. (2017). *Guidelines for Species Conservation Planning. Version 1.0.* https://doi.org/10.2305/IUCN.CH.2017.18.en

Linhoff, L. J., Soorae, P. S., Harding, G., Donnelly, M. A., Germano, J. M., Hunter, D. A., … Eckstut, M. E. (2021). *IUCN Guidelines for amphibian reintroductions and other conservation translocations.* Gland, Switzerland. https://portals.iucn.org/library/node/49485

World Organisation for Animal Health (OIE) & International Union for Conservation of Nature (IUCN). (2014). *Guidelines for wildlife disease risk analysis.* OIE, Paris. https://portals.iucn.org/library/node/43385

knowledge of planning processes and skill in facilitating both the interpersonal interactions within the stakeholder group and complex decision-making processes. A facilitator who can speak the major languages represented in the stakeholder group is also highly beneficial.

- **Limited funding**: Funding for conservation planning is often limited and difficult to obtain. Bringing multiple stakeholders together, often including individuals from several different countries, requires significant financial resources; it is often perceived that such resources are better spent on action rather than planning. Some savings may be made with a virtual planning process, although virtual planning presents its own difficulties (*see* above). The use of virtual workshops for planning is a way to reduce the costs of planning, while allowing for even broader stakeholder participation.

- **Scientists and conservationists are disconnected**: Finally, a lack of connection between research scientists and those implementing conservation actions was mentioned as a problem in undertaking planning. Scientists may follow a research cycle for knowledge discovery, focused on attainment of grants, research project implementation, and reporting in the scientific literature where information may not be freely available to conservation decision-makers and implementers. This highlights one of the specific benefits of bringing together diverse experts in a multi-participatory planning process – here information exchange is encouraged, and participants may benefit from networking with individuals who have both different expertise and knowledge. It is this diversity of participants that helps build quality decision-making at a planning workshop, and ensures that proposed actions are based on the best possible evidence.

Challenges to implementing plans

Plans, once developed, must be implemented. Far too often plans are developed, made into a glossy document and then sit on shelves only to be referred to in funding proposals. The most successful conservation plans include an implementation component which identifies who is going to implement each action, by when, how that will be funded, etc.
The same brainstorm of Working Group members identified the following factors that may impede plan implementation.

- **Lack of resources**: Implementing conservation plans requires resources – both human capacity and funding – over extended periods. This need for **sustained resources** may be a hurdle to implementing conservation plans, especially when funding for amphibians can be more difficult to obtain than for other taxa (*see* Chapter 2). The development of a conservation plan can assist with fundraising for the actions within the plan; some funders now request that applications are backed up by a conservation plan, and even for those that don't there are benefits to showing that a project is part of a larger, coordinated, and collaborative conservation strategy. This shift from funders may indicate that the benefits of planning are increasingly understood by funders, potentially increasing the availability of funds for planning itself.

- **Ineffective coordination** or a breakdown in trust between partners can hinder implementation of a conservation plan; however, having a dedicated programme coordinator can help alleviate this issue. Someone who can review progress on specific actions, keep up communication with groups or individuals who had agreed to support or lead an action, identify new project partners, and report back to the wider stakeholder group

on progress, helping to maintain the network that was instigated at the initial planning workshop and ensuring regular communication between relevant parties (Olson & Van Horne, 2017). Enhancing communication of conservation plan efficacy, such as through annual reports, can improve conservation plan accountability and engagement with complex stakeholder communities, including donors.

- **Lack of government support** can be a major impediment to implementing a conservation plan, and this was also a common response in a more general survey of ASG members, when asked for impediments to conservation success (ASG Membership forms, 2013-2016 quadrennium and 2017-2020 quadrennium). There is often a disconnect between conservationists who identify problems and propose solutions, and the political actors necessary to ensure their execution. Conservation initiatives do not often transcend the scientific field and are rarely established as national policies that receive sustained state funding. Linked to a lack of government support, is the potential conflict (either real, or perceived) between economic development and species conservation. This problem may be alleviated when appropriate officials from relevant government agencies are afforded time-on-the-job to participate in or lead the development of a conservation action plan. As such, we recommend proactively including relevant government agencies as identified stakeholders when undertaking conservation planning.

- **Lack of public support** among local communities can be a hurdle to conservation plan implementation, especially where there are negative public perceptions towards amphibians, or lower social values than other conservation priorities (Olson & Pilliod, 2022). These values may be related to negative experiences, oral traditions and superstitions, or negative media coverage of herpetofauna (Ceríaco, 2012; Iosif et al., 2019; Prokop & Fančovičová, 2012; Tomažic & Šorgo, 2017). However, there is evidence that undertaking amphibian conservation actions can promote more positive media coverage (Unger & Hickman, 2020). Urban dwellers may also show apathy towards amphibians, reducing support for implementation of conservation strategies. Engaging local communities as stakeholders and including project actions that provide social benefits, can lead to increased community engagement and goodwill in relation to conservation actions.

Conclusions and approaches

Good conservation planning accrues a number of benefits. In addition to creating a roadmap for mitigating threats, it engages stakeholders in the conservation process, and increases funding opportunities. Evidence is beginning to emerge that directly links positive outcomes for species to conservation planning. Implementation of the following steps will increase effective amphibian conservation planning:

- *Strive to include all Critically Endangered amphibians in a conservation plan* that identifies threats and appropriate threat mitigation strategies, along with specific goals, objectives, actions, a timeline and budget, monitoring, adaptive management, and expected positive outcomes.

- *Proceed with planning despite imperfect data and knowledge gaps*; identify imperfect data and knowledge gaps, risks, and uncertainty in development of a plan.

- *Address all relevant areas* identified in the ACAP (e.g. disease mitigation, education, genome banking) in plan development.

- *Identify trained facilitators and technical advisors* to assist with conservation planning.

- *Include all relevant stakeholders* in planning workshops.

- *Identify amphibian species of concern* in all protected area (reserve) and habitat (e.g. forest,

wetland) management plans that are not species conservation plans per se.

- *Establish a central database* in which all amphibian conservation plans and plan updates are recorded, with capacity to include adaptive management, lessons learned, and implementation progress.

- *Ensure public access* to plans and reports (e.g. via proposed database in point, above).

- *Promote planning* as valuable to amphibian conservation efforts.

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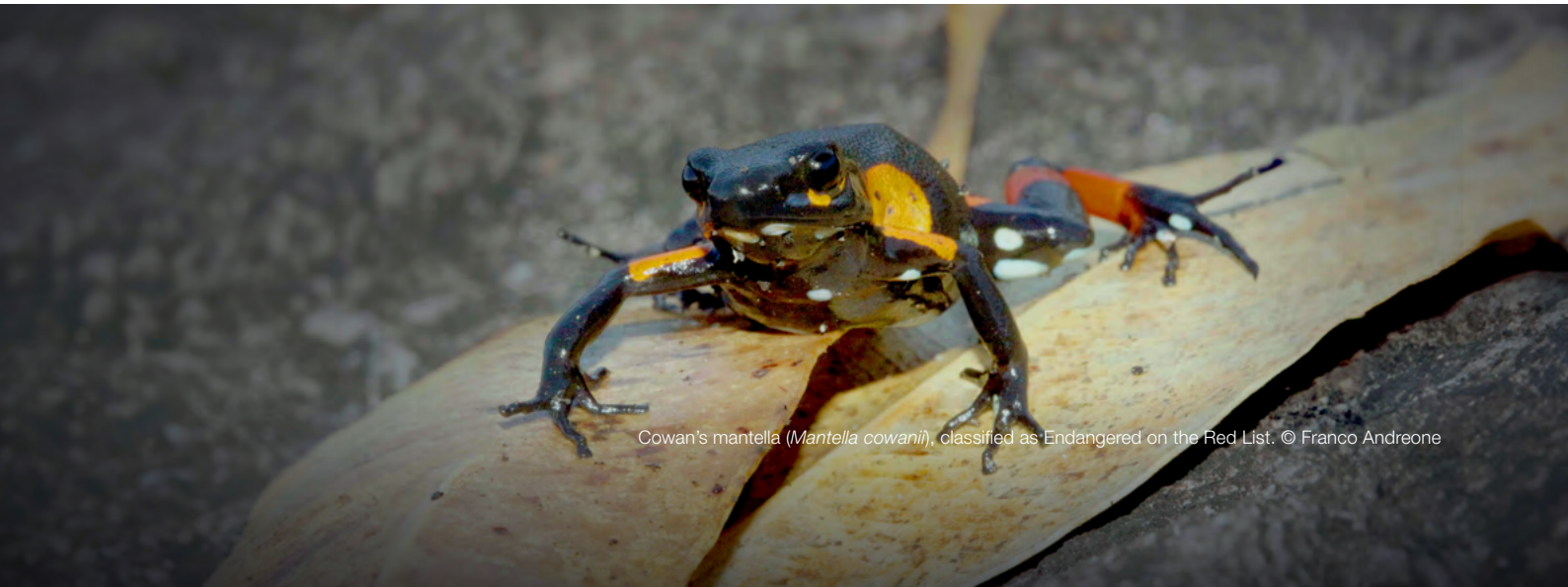

Cowan's mantella (*Mantella cowanii*), classified as Endangered on the Red List. © Franco Andreone

Searching for the Endangered harlequin mantella (*Mantella cowanii*) within the McAP (*Mantella cowanii* Action Plan). Devin Edmonds, Samina Sam Edmonds, Association Mitsinjo members Frederic Razafimahefa and Georges Ramarolahy, and a local guide during a break in the astonishing landscape of the Betafo area, central Madagascar. © Franco Andreone