

Troubled Times for the Radiated Tortoise (*Astrochelys radiata*)

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ABSTRACT. – Wild populations of the Radiated Tortoise are under increasing pressure from poachers to supply local food markets (adults) and the international pet trade (juveniles). The species is declining rapidly and significant range contraction has been documented. The situation is compounded by severe environmental degradation and a lack of capacity for enforcement and protection at the local level. The importance of maintaining core source populations and protected areas is underscored, as well as the role of local community involvement. A comprehensive strategy to transition tortoises seized from the illegal trade back into areas of former abundance is outlined.

KEY WORDS. – Reptilia, Testudines, Testudinidae, *Astrochelys radiata*, conservation, illegal trade, Madagascar

Borrowing a quote from the late John Behler, these are indeed “troubled times for turtles.” This rings especially true for Madagascar’s Radiated Tortoise, *Astrochelys radiata*, widely considered as the world’s most strikingly beautiful tortoise. One of four endemic tortoises on the island, *A. radiata* occupies a narrow band of xeric spiny forest along the southwestern coastline. Traditionally avoided by indigenous tribes because they were considered to be taboo (*fady*), these tortoises are now routinely and relentlessly harvested for food.

When John Behler and I first visited southern Madagascar over 20 years ago, Radiated Tortoises were abundant and one could hardly fathom as to why they were ever classified as an Endangered species. We drove to the coastal fishing village of Beheloka, and at approximately 1600 hrs, it was in John’s words, “like someone threw the switch.” Tortoises suddenly began to emerge in numbers, and it felt like we were stopping the vehicle every 50 yards to photograph one. As we gazed down the long, straight, red dirt road, we could see tortoise after tortoise in the distance. Upon arriving in Beheloka several hours later, shortly before dusk, we again found Radiated Tortoises in abundance, as well as numerous Spider Tortoises, *Pyxis arachnoides arachnoides*, in the coastal dunes around the village. We even encountered both species side by side, hunkered under the same *Euphorbia* bush. This day was truly one of those special moments in life that one never forgets.

But those halcyon days are long gone, with populations of Radiated Tortoises having been decimated in this area during the late 1990s for human consumption, which was followed some years later by the mass collection of Spider Tortoises for the international pet trade. Today, only a few scattered individuals of the Spider Tortoise can be found around Beheloka, mere remnants of a once thriving population. Unfortunately, this scenario is now being played out throughout southern Madagascar, and the Radiated Tortoise, once a commonly seen denizen of the spiny forest landscape, has disappeared from vast tracts of its former range. Formerly

considered one of the world’s most abundant tortoises, with populations conservatively estimated at 12 million (Leuteritz 2005), it is now assessed as Critically Endangered on the IUCN Red List, and unless drastic protective measures are taken, functional extinction in the wild within the next 20 years is a distinct possibility. Biologist Ryan Walker, who has been documenting range contraction in both Radiated and Spider Tortoises for the past seven years, stated in March 2011 that this prediction “may be a bit generous.” According to Walker “we are witnessing the systematic extermination of these species across their range.”

Extinction within 20 Years

We predicted extinction for the Radiated Tortoise in the wild within the next two decades after a visit to Madagascar in March of 2010; this projection was reported in a widely distributed press release by the Wildlife Conservation Society (WCS). The purpose of our joint Turtle Survival Alliance/WCS expedition was to conduct health assessments on both wild and captive Radiated Tortoises, in preparation for an upcoming release of animals that had been confiscated from the illegal wildlife trade. On the second day of our trip, Brian D. Horne stumbled upon a disturbing site at the garbage dump in the village of Faux Cap. The area was littered with Radiated Tortoise shells (minimally estimated at 200 adults and subadults) from animals that were recently slaughtered for food, a grim harbinger of the carnage that we were to discover over the next two weeks (Fig. 1).

We also discovered that poaching had heavily impacted populations of the tortoise in areas that just a few years ago supported scores of individuals; we found only a handful of juveniles in these areas, and encountered adults only in close proximity to protected lands. We likened this rate of hunting to what the American Bison faced during the early 19th century, when it was nearly hunted to extinction after numbering in the 10s of millions (Dary 1974). Although a



Figure 1. The village of Faux Cap was littered with Radiated Tortoise shells (minimally estimated at 200 adults and subadults) from animals that were recently slaughtered for food. Photo by Rick Hudson.

limited level of subsistence hunting of Radiated Tortoises has existed for decades, generally for holiday celebrations in the cities of Tuléar and Ft. Dauphin, the current rate of poaching is unsustainable. With this scale of poaching and the rate of decline in this species, which is unlike anything witnessed in modern times, functional extinction of natural populations in 20 years is not an unlikely scenario (Fig. 2). To illustrate this impact, Rafelarisoa et al. (2013, this volume) estimate that the range of the Radiated Tortoise has contracted by approximately 65% over the past 150 years. However the numbers have decreased by roughly 47% in the past 12 years, from an estimated 12 million tortoises in the late 1990s, to around 6.3 million today. The rate of decline—the primary reason for their elevation to IUCN Critically Endangered status—is both shocking and troubling, and demands swift conservation action.

Tortoise extinctions are not new to islands, and certainly not islands in the Indian Ocean. According to the Turtle Taxonomy Working Group (2012) checklist, at least 10 species of giant tortoises have been driven to extinction by the actions of humans in relatively recent times. Those in Madagascar were the first to go, as two species were lost approximately 750 to 1050 years ago, shortly after humans arrived. Five

species disappeared in the 1700s from Réunion, Mauritius, and Rodrigues, and in more recent times three went extinct in the Galapagos Islands in the eastern Pacific Ocean.

To date, the work of Sue O'Brien and colleagues (2003) had provided the most scholarly review of the current level of overexploitation of the Radiated Tortoise. These authors presented some startling conclusions, though not all were totally unexpected. They estimated that the annual take of Radiated Tortoises exceeded 50,000 animals per year, an amount they considered unsustainable based on the following salient points:

1. The geographic range of the Radiated Tortoise had contracted by ca. 20% over the previous 25 years, tortoise abundance had significantly declined close to centers of high demand, and commercial hunters were traveling increasingly farther to find sufficient densities of tortoises.

2. Tortoise density was three times lower and the size of adult tortoises was smaller in harvested populations, compared to an unharvested population.

3. Based on several important life-history characteristics (i.e., differential survival rates between adults and juveniles and the limited reproductive output of the female) and the harvest rate at that time, their population modeling predicted extinction within 2–15 yrs when starting with a hypothetical population of 10,000 tortoises.

4. The harvest at the time was at least 25 times greater than a predicted sustainable harvest. In addition, the authors detailed that the removal of juvenile tortoises rather than the adults would be much more sustainable.

Unfortunately, the Radiated Tortoise continues to be impacted by indiscriminate collection at two critical stages of its life history, with both juveniles and adults being heavily collected. Aside from the slaughter of adults for food, we have received reports of thousands of small Radiated Tortoises leaving the Antananarivo airport on direct flights to Bangkok, Thailand, from where they are distributed to markets in Asia, most notably China, Indonesia, Japan, Malaysia, Singapore, and the former Soviet Union. Recent work by TRAFFIC indicates that Radiated Tortoises are being smuggled into Southeast Asia at an alarming rate, through Thailand, and that they are now the most commonly observed chelonian in the trade (Nijman and Shepherd 2007). This “one-two harvesting punch” will almost certainly render the recovery of Radiated Tortoise populations nearly impossible without significant hands-on efforts aimed at reducing the off-take of both adults and juveniles. Additionally, programs for restocking areas of suitable habitat with tortoises seized from the illegal trade will become increasingly necessary.

Yet, the Radiated Tortoise appears to defy logic in that it has managed to sustain remarkable population numbers prior to these modern times, when other similar species have long since undergone catastrophic population declines (e.g., African Spur-thighed Tortoise and Burmese Star Tortoise). The answer to this puzzle may lie within the traditional belief known as *fady* (taboo). The dominant tribe in southwestern Madagascar, the Antandroy, do not eat tortoises and hold on to



Figure 2. The current rate of poaching is unsustainable. A poacher from Beloha is shown here in front of a large pile of tortoise shells. Photo by Aaron Gekoski.

a long-held belief that harming them is taboo. Unfortunately, these local customs that protected tortoises for centuries are being lost to the rapid westernization of traditional societies. In addition, this particular tradition of *fady* is not being respected by outside tribes, particularly the Antanosy from the north and east and the Vezo in the far west. Members of these tribes often target areas to specifically collect tortoises for sale in major cities and to meet the demand for bushmeat that is being fuelled, in part, by large-scale international mining operations in southern Madagascar. For instance, tortoise populations have been extirpated in areas surrounding large urban centers in the south (Tulear and Ft. Dauphin). Even more disturbing, recent evidence indicates that poachers are searching for tortoises in distant and remote areas that are often extremely difficult to reach, as evidenced by poaching camps discovered with the remains of hundreds of tortoises (Castellano et al. 2013, this volume). Local informants are also reporting that trucks loaded with Radiated Tortoises and/or dried tortoise meat have been recently spotted on their way to Antananarivo. Groups of tortoise hunters are reportedly dropped off in tortoise-rich areas and are able to thoroughly



Figure 3. Fresh tortoise meat is being sold openly without fear of prosecution. Herilala Randriamahazo, TSA's Malagasy Tortoise Conservation Coordinator, is shown here purchasing tortoise meat at a restaurant in Tsiombe. Photo by Rick Hudson.

extract large numbers of tortoises, often taking only the dried meat, which makes concealment easier. Furthermore, in towns such as Beloha and Tsiombe, fresh tortoise meat is being sold openly without fear of prosecution (Fig. 3). Tortoise meat is offered in some restaurants daily as the “special” and the remains of discarded tortoise shells can be easily seen in these cities, piled along the roads or in vacant lots, a testament to this growing trade. Sadly, poverty-stricken and protein-starved people are not consuming tortoises; rather it is people that can afford to eat in restaurants, who simply prefer to eat something other than chicken or beef, that are consuming the majority of the tortoises. This situation is exacerbated by the following factors:

- Several years of extreme drought have led to diminished rice and agricultural production, and poverty, leading people to collect the tortoises for cash so they can purchase rice and corn.
- An arcane law dictating that wildlife laws must be enforced from afar (Antananarivo, or a regional office), and thus local officials have no legal capacity to apprehend poachers. Enforcement action is often days or weeks away, making the system easy to circumvent.
- Severe habitat degradation of the xeric spiny forest has greatly limited the amount of remaining habitat for the tortoises. This forest type is now regarded as the most endangered forest type in Madagascar (<2% remains), primarily in a limited number of protected areas. Following the burning and clearing of forests for agriculture (slash and burn) invasive plant species outcompete native species. Two species in particular, *Opuntia* sp. (prickly pear) and *Agave* sp. (sisal), dominate these altered areas. The problem is exacerbated by an overabundance of Zebu cattle that sustain themselves on *Opuntia*, which facilitates the plant's dispersal through the spread of seeds in the dung. Large numbers of goats also share the habitat, and charcoal production consumes any large trees left standing after burning. Amazingly, in this highly disturbed and human-altered habitat, the Radiated Tortoise is still able to continue finding enough resources to survive and reproduce. And it is uncertain to what degree the tortoises are also utilizing *Opuntia* (particularly the fruits) as a substitute food source in these highly altered habitats. Yet it is obvious that the chances for long-term survival of the Radiated Tortoise are grim in light of both habitat destruction and degradation and the elevated levels of collection for human consumption.

• The recent collapse of the central government and political instability makes conservation efforts logistically difficult. In short, the government is effectively non-operational, international tourism is at a modern low, and any and all natural resources are apparently for sale in marginal efforts to keep the government solvent.

Perhaps the most troubling trend is that poachers are now entering protected areas (Special Reserves, National Parks, and World Heritage Sites) to collect tortoises. One of the largest remaining populations of Radiated Tortoises is in the Cap Ste. Marie (CSM) Special Reserve (Fig. 4), a small (17 km²) protected area with one of the highest densities of

tortoises in the world (once estimated from 1905 to 2105 individuals/km²; Leuteritz 2005). But, with only a handful of guards to protect the reserve and no means of making daily patrols to deter poaching, this near pristine site remains vulnerable. The guards lack motorcycles or all-terrain vehicles to patrol the reserve; rather, they occasionally hitch a ride on an ox-cart. The only real protection the reserve has is due to the fact that the park is isolated and difficult to reach. This protection is fleeting, however, as once the population of tortoises outside the park is diminished, the poachers will eventually make their way into the park. This situation was confirmed through conversations with the CSM staff, who admit that they are aware of the looming crisis, but they are poorly prepared to deal with the impending threat. To illustrate this, in October 2011 a poaching camp was raided in the village of Tragnavaho, and the remains of 1982 slaughtered adult tortoises were uncovered. Sixty people—including women and children—were rounded up, mainly from the town of Fotadrevo in the north, where many of the poaching gangs currently hail from. Tragnavaho lies between Beloha, a major trade nexus for tortoises coming from the south and a well-known tortoise eating center, and CSM, a foreboding indication of how close to the Reserve poachers are operating. We heard similar stories from the staff at Lac Tsimanampetsotsa, Madagascar's newest National Park, where poaching has already heavily impacted tortoise populations, largely due to the park's close proximity to the city of Tulear.

Our sense of urgency is now heightened because it appears that the situation may have finally reached a tipping point. After *holding their own* despite years of harvesting for food, though on a more limited basis, the beautiful Radiated Tortoise may be on its *final legs*. Our challenge is to determine a strategy that will at least preserve *some* healthy populations; that solution will almost certainly lie at the local community level. Southern Madagascar is a vast rural region where there is little capacity for enforcement of tortoise poaching activity. Enforcement is constrained by a poor communications network, lack of transportation by officials, and a lack of knowledge of the laws.

Given the urgent nature of the present crisis, what can we do to help? How can we engender support for protecting tortoises in the face of such grinding poverty? The solutions will not be easy, because of the number of people and domestic livestock trying to eke out an existence in this harsh, desert environment. Moreover, this situation can only become worse because Madagascar has one of the fastest-growing human populations in the world, with the majority of people under the age of 12.

Vital Protected Areas

We believe that at least one solution begins with Madagascar National Parks (MNP), a private association that manages the protected areas network and operates under the Ministry of the Environment and Forests (MEF). With only two protected areas that support robust populations



Figure 4. Radiated tortoises with the iconic light house at the Cap Ste. Marie Special Reserve in the background. This Reserve supports the densest and most important tortoise population for protection in Madagascar. Photo by Aaron Gekoski.

of Radiated Tortoises, we must find ways to empower and strengthen them to meet this challenge. Given the importance of the CSM Special Reserve as a major source population of tortoises, this has to become our *line in the sand* and we must devote all possible resources to protecting this critical area. Will we be able to find the means of providing greater financial support to more effectively manage this important population, given that high dollar items such as vehicles are so desperately needed? Perhaps more importantly, do we really have a choice? If we cannot find the means to adequately defend these protected areas from poachers, it appears there may be little hope for the survival of this species in the wild.

A second but equally important solution involves the development of community-based protection programs, whereby local villagers assist the MNP staff in patrolling and monitoring tortoise populations within and around the protected areas. In order to encourage such cooperation, we need to find ways for improving the socioeconomic lives of the local people as an incentive to support protective measures. In 2011, Christina Castellano and the TSA presented a comprehensive and multifaceted plan to the World Bank for protecting the tortoise population at CSM that involved a range of actions, most of them community-based. Actions included improving capacity



Figure 5. The completed “signed” agreement (village leaders traced their hands) committing the community to tortoise protection is displayed for the ceremony in which TSA pledged to build a new school for Antsakoamasy. Photo by Rick Hudson.

for surveillance and enforcement, both within and outside the Reserve, establishing a communications network, biological monitoring and research, increasing capacity to properly care for confiscated tortoises, engaging the local community in Reserve management, and building a research/interpretive center, as well as a tortoise rescue center, and a public relations and marketing campaign. The three-year program totaled \$647,745, with the World Bank agreeing to provide \$485,245 in support. However, despite this approval of the proposal nearly three years ago, we have been unsuccessful in having the funds allocated as a result of the MNP bureaucracy.

In 2010 the TSA found an enthusiastic group of villagers at Antsakoamasy, a small village located on the outskirts of CSM, who are doing an admirable job of protecting tortoises. We engaged them to find out why, and what they hoped to gain by protecting the tortoises and challenging the poachers. We learned that the protective taboo or *fady*



Figure 6. Over 1200 people showed up to witness the dedication ceremony for the region’s newest primary school, many having walked for days to reach Antsakoamasy. Photo by Rick Hudson.

is very strong in this village, and the tortoises are seen as the embodiment of their ancestors. We hypothesized that Antsakoamasy could become a model for community protection of a local Radiated Tortoise population. But how should TSA reward what they do, and provide incentive for continuing this custom? We asked the village elders what they wanted most for their community and they indicated a primary school. Therefore, the TSA agreed to fund the construction of a school and began raising \$15,000 toward this cause (Fig. 5). In March 2011 we formalized this agreement with a traditional zebu festival at Antsakoamasy. The festival was attended by at least 1200 people (Fig. 6), including the mayor from the nearby town of Maravato, who extolled the crowd to regard tortoises as a means of improving their lifestyle and community.

Our hope was that word of this relationship would spread rapidly throughout the rural villages of the south, and that Antsakoamasy would become a catalyst, motivat-



Figure 7. This new school house was presented by the TSA to the village of Antsakoamasy in recognition of their exceptional protection of Radiated Tortoises. Photo by Herilala Randriamahazo.

ing other villages to provide greater protection for their tortoises. In March 2012, after five months of planning and construction, that hope was realized as a huge crowd gathered to dance and celebrate, eat and drink, and cut the ribbon on their new school (Fig. 7). From all over the Androy Region they came: politicians, local officials, teachers, and of course the children—over 1000 of them. All wanted to be there to participate in the dedication ceremony for the region’s newest primary school. A host of local political officials in attendance spoke enthusiastically on the irony of how one village protecting tortoises could have such a powerful impact, bringing people together to celebrate and refresh their cultural traditions and taboos, while building a partnership that resulted in a new school as a basis for the future for their children. One education official committed to provide a full-time teacher for the school, which has since happened. Clearly something special was happening at Antsakoamasy, and this community has since become a regional model that establishes a strong link between protecting tortoises and long-term benefits for the community.

To place the effectiveness of this relatively small sum of \$15,000 into a greater conservation perspective—knowing that the sale of surplus offspring from Radiated Tortoise captive breeding programs in the United States alone could easily generate these funds on a regular sustained basis—we must find a way to challenge the Radiated Tortoise captive care community to help with this cause, thus linking *ex-situ* breeding programs with the survival of wild populations of tortoises.

The important role that Antsakoamasy plays in the greater tortoise conservation strategy for the region cannot be understated. This community not only protects the vital eastern flank of CSM, but now shines as a beacon in the south, providing inspiration to communities that are willing to come to terms with tortoise poachers. The message must

be clear: tolerance for poaching has no rewards and there is value in protecting tortoises.

Keystone Species

If the spiny forest habitat has a keystone species, it is almost certainly the Radiated Tortoise. This species has become an icon for southern Madagascar, one that every tourist expects to see (second only to the sighting of lemurs), and if conservation groups need a landscape species to rally around, then the Radiated Tortoise is a clear choice. Surviving in both disturbed and “undisturbed” habitats, Radiated Tortoises are one of the most highly visible components of this tortured ecosystem, and losing this species to extinction due to an indulgent need for tortoise meat and pets would be a travesty.

The ongoing crisis with the Radiated Tortoise should be a call to action for all of us—a rallying cry if you will—because if we lose this durable symbol of longevity and survivorship from the spiny forest, what will be left to save? Conservation groups today often state that “we don’t do single species conservation,” but if we ignore the plight of the Radiated Tortoise then the question becomes, “at the end of the day, what have we really achieved in southern Madagascar?” We believe this species must become our barometer for success in this ecosystem. *If we lose the tortoise, then everything else will not be far behind.*

The TSA’s goal is to develop partnerships with groups already working at the community level in the south, such as WWF Madagascar, which has an extensive education network and is able to impact conservation on a broad scale. Nearby, personnel from Henry Doorly Zoo’s Madagascar Biodiversity Partnership (MBP) are working in the Lavavolo Classified Forest to find an alternative fuel source to charcoal, thereby protecting tortoise habitat from burning and agricultural conversion. In 2011, the TSA, working closely with Christina



Figure 8. Movie nights were the highlight of a local media campaign designed to highlight the growing poaching crisis of Radiated Tortoises. The film *Tortoises in Trouble* was shown to nine communities in March 2012. Photo by Christina Castellano.

Castellano (then with the Orianne Society, now with Utah's Hogle Zoo), launched a partnership designed to identify and protect important source populations, focusing on those with a supportive community nearby, and that practice a strong protective *fady*. Overall we aim to increase surveillance of key tortoise populations, reduce poaching, increase the number of confiscations, expand educational opportunities, and engage the communities in the management of protected areas.

Protect the Sokake

In 2011 the TSA launched a major media campaign designed to draw attention to the Radiated Tortoise crisis internationally and to increase pressure on the government to respond with stricter penalties and enforcement. We also wanted to “raise the awareness level” locally, particularly in areas of high tortoise consumption where a tolerance for poachers has developed. In September, noted South Africa-based wildlife film makers Moz Images traveled to Madagascar to capture this story. The film, entitled *Tortoises in Trouble*, was released in 2012 and tracks a group of 140 confiscated tortoises from the capital of Antananarivo to their homeland in the south. Along the way the film exposes ample evidence of massive tortoise poaching, and explores the root causes through interviews with poachers, gendarmes, and local judiciary. The film became the centerpiece of our campaign to take this message to the rural communities in key tortoise poaching areas in the south, as well as those that traditionally do not harm tortoises. During a two-week trip *Team Sokake* (local for tortoise), including our Malagasy colleagues Riana Rakotondrainy (University of Antananarivo), Herilala Randriamahazo (TSA), Sylvain Mahazotahy (TSA), Soary Tahafe (University of Tulear), and colleagues from Madagascar National Parks (MNP), presented the film in nine villages and communities (Fig. 8). *Movie nights* turned out to be wildly popular, especially with children, as we handed out thousands of arm bands and stickers with the simple message *Protect the Sokake*. These materials were also distributed to participants in the husbandry workshops who returned to their hometowns and began dutifully displaying the materials in prominent store locations and public places. I recall arriving in Beloha and feeling a sense of pride as we saw our materials plastered everywhere, and hundreds of kids wearing our brightly colored armbands as a symbol of solidarity. Likewise when we left the fishing village of Lavanono the morning following movie night, literally every house and shop displayed a tortoise poster.

We believe the value of the media campaign is that it helps reinforce the protective traditions among certain tribes in the south that traditionally have not harmed tortoises. This *fady* is breaking down in some areas, with poachers descending from outside regions, from tribes that do not share the local protective custom. As is becoming far too commonplace, local people are becoming complacent with tortoise killing and eating though it violates their cultural traditions. The

Protect the Sokake message is becoming widespread and obvious now, and lets local people know that the *fady* still exists, and that people around the world care about what is happening to Madagascar's tortoises.

In response to the 2012 media blitz in the south, a tortoise council emerged in the town of Ambovombe and pushed through a community based pact or *Dina*, which binds villages to honor their *fady* and not tolerate poachers on their land. This historic agreement is now being applied throughout the south, and TSA is providing support to gendarmes to reach areas where poachers are working or have been apprehended. *Dinas* are an effective form of local law, and usually transcend national law in rural areas that are disconnected from national policy. A significant outcome of this *Dina* has been the dramatic increase in both tortoise confiscations and arrests, both in the south and at the airport in the capital city, a sign that the tide may finally be turning. For the first seven months of 2013, TSA's Madagascar office was called on to handle tortoise confiscations. As the number of tortoises requiring captive sanctuary grew, it became obvious that we needed to develop increasing capacity to handle them.

Confiscation to Reintroduction Strategy

With it becoming apparent that MNP was unlikely to release the World Bank funds, and the number of tortoises requiring sanctuary increasing, the TSA began seeking funding to develop a comprehensive strategy for responsibly transitioning tortoises caught up in the trade, back into the wild. Often, these confiscations end poorly for the tortoises involved, and we continue to see appalling levels of mortality due to improper care and inadequate holding facilities. Radiated Tortoises are increasingly becoming akin to *refugees* in need of safe sanctuary, and with populations crashing rapidly, there is an overwhelming need to ensure that as many as possible survive.

In March 2012, together with Christina Castellano and Michael Ogle (Knoxville Zoo), we conducted two tortoise husbandry workshops in Madagascar aimed at improving care and survival. The first was held in the newly dedicated school house at Antsakoamasy, the second at SOPTOM's Village des Tortues in Ifaty. The curriculum was directed at frontline personnel that were likely to handle seized tortoises; fifty people participated, representing MNP, the Forestry Department, local Gendarmes, and community leaders. Lectures and presentations covered all facets of tortoise management, and were enhanced with a printed color husbandry manual. Perhaps most encouraging were lively discussions that took place as participants exchanged views and attempted to work through the various obstacles to tortoise conservation in their regions. Primary among them are the lack of financial resources available locally to effectively deal with tortoise protection, enforcement, and the resulting confiscations. We believe that these workshops will prove catalytic because we now have organized groups of empowered and inspired advocates who, at the very least,

are monitoring the illegal tortoise trade. The TSA's challenge will be to identify the resources that will now allow them have an impact on tortoise conservation.

The first step in this process is to build temporary rescue facilities where confiscated tortoises can be unpacked and immediately cared for. With grants from the Boise Zoo Conservation Fund and the Mohamed bin Zayed Species Conservation Fund, the TSA began planning a series of five such centers in the south, to be located in Ambovombe, Ampanihy, Betioky, Beloha, and Tsiombe—all well-known tortoise trafficking areas. The Center at Ambovombe was built in August 2013 and the Ampanihy facility is currently under construction. These five centers are designed for short-term holding, where tortoises can be cared for, stabilized, and returned to health before being moved. The *crown jewel* in this strategy is a proposed Regional Rescue Center where tortoises will remain for longer periods of time, for processing, health and genetic screening, and preparation for release into the wild. This Center will be located east of the Menarandra River, closer to the core of the remaining Radiated Tortoise range, and will be the counterpart to SOPTOM's Village des Tortues at Ifaty (near Tuléar) in the western part of their range. In recent time the Ifaty facility has been the recipient of numerous tortoise confiscations and overcrowding could soon become an issue. This second regional tortoise Center is currently being planned for the town of Maravato where the mayor is extremely supportive of our work and has offered to host the new facility. Plans are now underway to identify financial backers that will fund this Center's construction in 2014. This is an ambitious and multi-step process, but is essential if we are to properly handle the vast numbers of tortoises that we anticipate in the future as enforcement efforts improve. The TSA now has two fulltime staff members in the south that are working to make this vision a reality.

Returning confiscated tortoises to areas of former abundance, in safe and protected habitat, is the ultimate goal of this recovery program. Over the next few years the TSA will be working to identify potential release sites that have supportive communities nearby that can be mobilized as tortoise guards. One such example is the village of Ampotoka where the TSA is working to restore a depleted tortoise population in their sacred forest. Though preliminary releases occurred with limited success in 2011–2012, a TSA-sponsored research project will begin in December 2013 that will test various techniques to determine the best strategy for releasing tortoises. With a goal of improving site fidelity—the propensity of a tortoise to remain in the area where it was released—we will build enclosures of 1 ha each, where tortoises will be held for periods of six months and one year prior to a *soft release*. From previous experience we know that Radiated

Tortoises that are hard-released, without first acclimating and orienting to a novel environment, generally move away from the area where they are released. Our goal is to instill site fidelity so that tortoises remain close to the release site, which may be a limited protected area such as a sacred forest where they are safe from poaching.

Such progress provides some measure of hope and optimism, despite the grim scenario that is being played out through so much of the rural south. Radiated Tortoises will not survive unless we can encourage community support for their protection, and we are challenged to find innovative solutions that will benefit local villages. We believe that building and sustaining these relationships will be essential if we are to have a fighting chance to save this beleaguered icon of the southern spiny desert.

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