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THE BROWN TREESNAKE RAPID RESPONSE TEAM

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Abstract: In the 1940s the brown treesnake (*Boiga irregularis*) was accidentally transported to Guam and became established. Brown treesnakes have caused and continue to cause major problems for the ecology, economy, and quality of life on Guam. As Guam's snake densities increased in the late 1970s, extralimital encounters began to be reported on islands with transportation links to Guam. In 1993, a major effort was initiated to reduce the potential for brown treesnakes to accidentally enter Guam's transportation system. In 2002, a multi-agency Rapid Response Team (RRT) was established to assist in detection and capture of brown treesnakes on recipient islands after being accidentally transported from Guam. Since its creation, the RRT has conducted 2-5 training courses annually on Guam and 16 off-Guam field operations. As of 2006, the RRT consisted of 66 members located throughout the Pacific region and the United States mainland. The RRT has incorporated research results from affiliated agencies, such as means to improve snake detectability at low densities, effectiveness of control tools in rodent-rich environments, and predicting movements of snakes accidentally translocated. The RRT continues to work with regional island groups, improving communication networks, elevating public awareness, and developing response capabilities.

Key Words: *Boiga irregularis*, brown treesnake, extralimital populations, Guam, Hawaii, invasive species, management, Micronesia, rapid response.

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INTRODUCTION

Invasive species are a global concern, with numerous species causing significant damage or potential damage to countless systems (Campbell 1991, Wilcove et al. 1998, Pimentel et al. 2005). As global trade continues to increase, so does the potential for accidental transportation and colonization by invasive species (Jenkins 1996, Christy et al. 2007). Once established, invasives are costly to economies, damaging to natural resources, and often uncontrollable or exceedingly expensive to control (Pimentel et al. 2005, Burnett et al. 2006). Therefore, preventing the spread of invasive species is preferable to control or eradication after establishment (Simberloff et al. 2005). In cases of a suspected introduction, reacting quickly and effectively to minimize or eliminate new populations is preferable to taking no, or ineffective, action. An economic analysis of brown treesnake (*Boiga irregularis*, Colubridae, BTS) management on Oahu indicated that much greater effort should be expended on eliminating or containing incipient populations on recipient islands (Burnett 2007).

The brown treesnake is a slender snake native to the area extending east of Wallace's Line to the Solomon Islands as well as the humid northern and eastern Australian coasts (Rodda et al. 1999b). BTS are nocturnal and oviparous. In their native range, BTS appear to be relatively common (Rodda et al. 1999b), and are not known to cause any major conflicts with the environment or humans as they are presumably in equilibrium within the natural system. The central component of this equilibrium is thought to be low prey availability (Rodda et al. 1999c). BTS are good climbers, seek refuge during daytime heat and light, and search at night for prey items such as birds, lizards, and rodents (Rodda et al. 1999b).

Brown treesnakes were accidentally transported to Guam (Savidge 1987, Fritts 1988, Rodda and Fritts 1992), most likely arriving on Guam as accidental stowaways in the late 1940s, when salvaged military equipment was shipped from the Admiralty Islands (Fritts and Rodda 1998). The population on Guam is the only confirmed breeding population outside of its native range. In the decades since its arrival, the BTS has severely impacted the economy and ecology of Guam, as well as having direct impacts on human health (Savidge 1987, Fritts et al. 1990, Fritts and McCoid 1991, Perry and Morton 1999, Fritts 2002).

Lacking geographical or ecological barriers, the BTS spread throughout the island, by the mid-1980s had reached unprecedented densities of 50-100 snakes per ha in some localities (Rodda et al. 1999b, Fritts 2002). Population densities have since dropped, but overall densities remain substantial (Rodda and Fritts 1992, Rodda et al. 1999b). In 1990, the BTS was declared an Injurious Wildlife species (Federal Register 55(80):17439-17441, McCoid et al. 1994), prohibiting its intentional importation into the United States (US) for most commercial purposes. However, intentional importation may be a relatively minor pathway for BTS dispersal as it makes a poor pet, being drab, secretive and prone to biting.

Guam is a hub for commercial and military shipments in the tropical western Pacific. High levels of transportation with regional and external locations greatly increases the threat of BTS being transported from Guam to new locations. In 1993, the US Department of Agriculture, Wildlife Services (WS), in conjunction with other agencies, including Guam Department of Agriculture, Division of Aquatic and Wildlife Resources (GDAWR), began a concerted interdiction program to reduce the potential for snakes to accidentally enter Guam's transportation system (Vice et al. 2005). WS has taken the primary role in this effort through trapping, oral toxicants, fence line searches and the use of BTS detection dog teams. The protection of port facilities and the examination of outbound cargo and planes require an extensive but highly cost-effective effort. This effort has minimized the probability of snakes being transported from Guam to new locations. While these efforts have dramatically reduced the likelihood of such an event (Vice et al. 1999, Engeman and Vice 2002, Vice and Vice 2004), no inspection program can be 100% effective, as all control tools experience occasional failures and some shippers actively evade the voluntary inspection program.

To further reduce the probability of BTS becoming established on islands receiving goods from Guam, the highest risk islands (Saipan, Oahu, and Tinian) have established inbound interdiction protocols, emphasizing dog-aided inspections of cargo coming from Guam. Sentinel traps have been placed within port areas in the Northern Mariana Islands to assist detection and capture of arriving BTS. However, snakes may be unmotivated or unable to exit cargo at the port of entry, only to escape at the cargo's final destination or other interior localities. It is not economically feasible to maintain permanent interdiction measures at all potential cargo destinations on a given island. This limitation, interdiction failures, and post-interdiction dispersal are presumably responsible for the 123 credible BTS encounters recorded to date at recipient locations.

EXTRALIMITAL SIGHTINGS

Apart from encounters on Guam and one on Wake Island (1949), reports of BTS outside of their native range began in the late 1970s and continue to the present (Figure 1). Numerous recipient island BTS encounters are associated with cargo from Guam, and it is generally accepted that BTS encounters in non-native range locations are likely snakes transported from Guam. The probability of snake transport from Guam is much higher than from its native range, due to Guam's high snake densities and the high frequency of ship and plane traffic departing Guam. In this paper, sightings of BTS outside of Guam and the snake's native range will be termed extralimital or recipient-island encounters.

The increase in reported extralimital encounters from 1978 to 1992 (Figure 1) was presumably due to a combination of high snake densities on Guam, increased cargo traffic from Guam, and improved reporting of encounters in recipient locations. Since the mid-1980s, the public was encouraged to report extralimital BTS sightings to authorities, with greatly improved public outreach efforts since 2000 (Hawley 2007, Martin 2007). As a result, the percentage of sightings reported to officials has probably increased, with actual sightings more numerous than suggested by Figure 1. The under-reporting bias appears most severe in earlier years, when awareness levels were substantially lower.

In the most recent 5-year time period (2003-2007) there were fewer extralimital BTS encounters than in comparable periods of the preceding decade. It is unknown whether this decrease in encounter reports represents a long-term trend or merely a fluctuation. We believe that a reduction of snake transport events has occurred, given the greatly-increased BTS interdiction effort on Guam after 1994. Some encounters reported after 1994 may reflect snakes (or their progeny) transported prior to 1994, but discovered later. All recent sightings, however, are not due to pre-1994 transport in cargo.

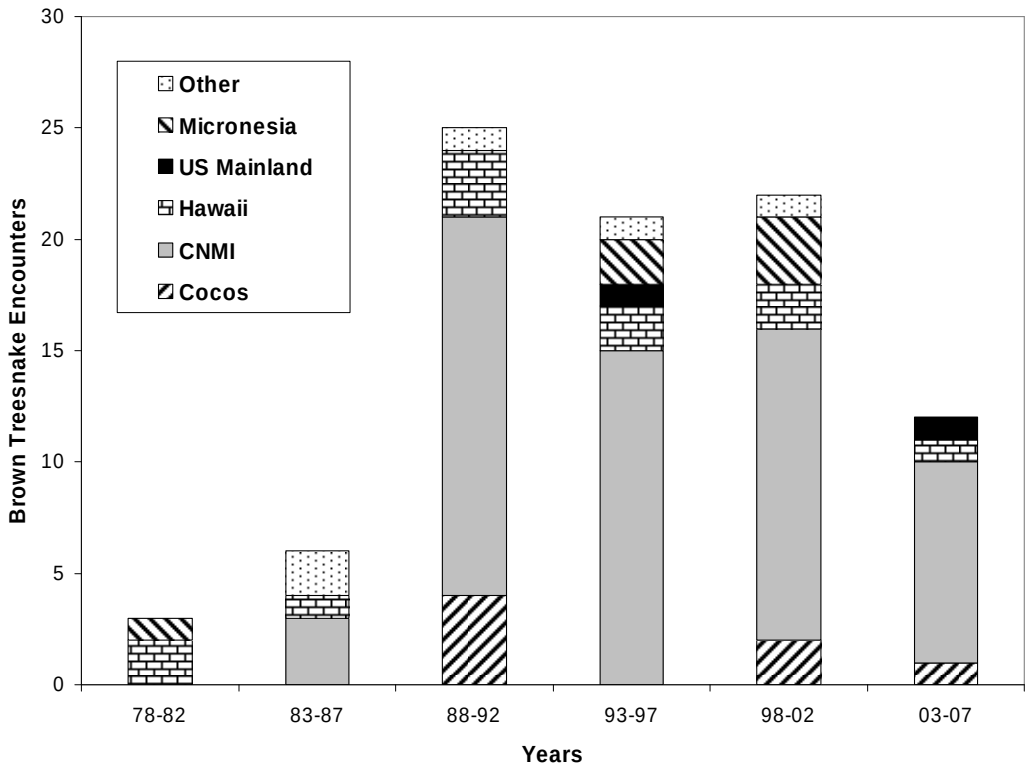

Figure 1. Brown treesnake encounter reports. Additional encounters not shown include Wake Island (1949), 1 each for Alaska and Taiwan (dates unknown), and 31 reports from the Northern Mariana Islands with unknown dates.

While encounters have occurred in numerous locations (Figure 2), they tend to be concentrated on a few high-risk islands such as Saipan, Tinian,and Oahu (Fritts 1987, Fritts 1988, McCoid and Stinson 1991, McCoid et al. 1994, Fritts et al. 1999). Of the 76 reports from Saipan, 13 are captures and 63 are credible sightings (many additional reports are insufficiently documented to warrant characterization as "credible"). The large number of encounters on Saipan has led to speculation that a breeding population may already be established (Colvin et al. 2005).

Aside from the high frequency of BTS encounters on Saipan, the island is of special concern because it receives much cargo from Guam, and the other Mariana Islands receive most of their cargo from Saipan. Thus, infestation of Saipan is both possible and consequential. Saipan is the largest snake-free island in the Marianas, and it is the primary refuge for many bird species (or sister taxa) that have been extirpated on Guam. Saipan and surrounding islands are the sole remaining refuge for the Marianas rufous fantail (*Rhipidura rufifrons saipanensis*), Mariana fruit-dove (*Ptilinopus roseicapilla*), Saipan bridled white-eye (*Zosterops saypani*), Saipan nightingale reed-warbler (*Acrocephalus luscinia nijoi*), Tinian monarch (*Monarcha takatsukasae*), and the golden white-eye (*Cleptornis marchei*).

The island with the second-largest number of encounters is Oahu (Figure 2). It shares with Saipan the attribute that should the island become infested, the large amount of local inter-island cargo traffic would render it very problematic to keep an infestation from spreading to adjacent islands (in Oahu's case, the remainder of the Hawaiian Islands).

POST-DISPERSAL CONTROL OF BROWN TREESNAKES ON RECIPIENT ISLANDS

As previously mentioned, permanent interdiction facilities at each possible cargo destination from Guam are impractical. In many states, the response to such a situation is often to abandon further control efforts as being too costly.

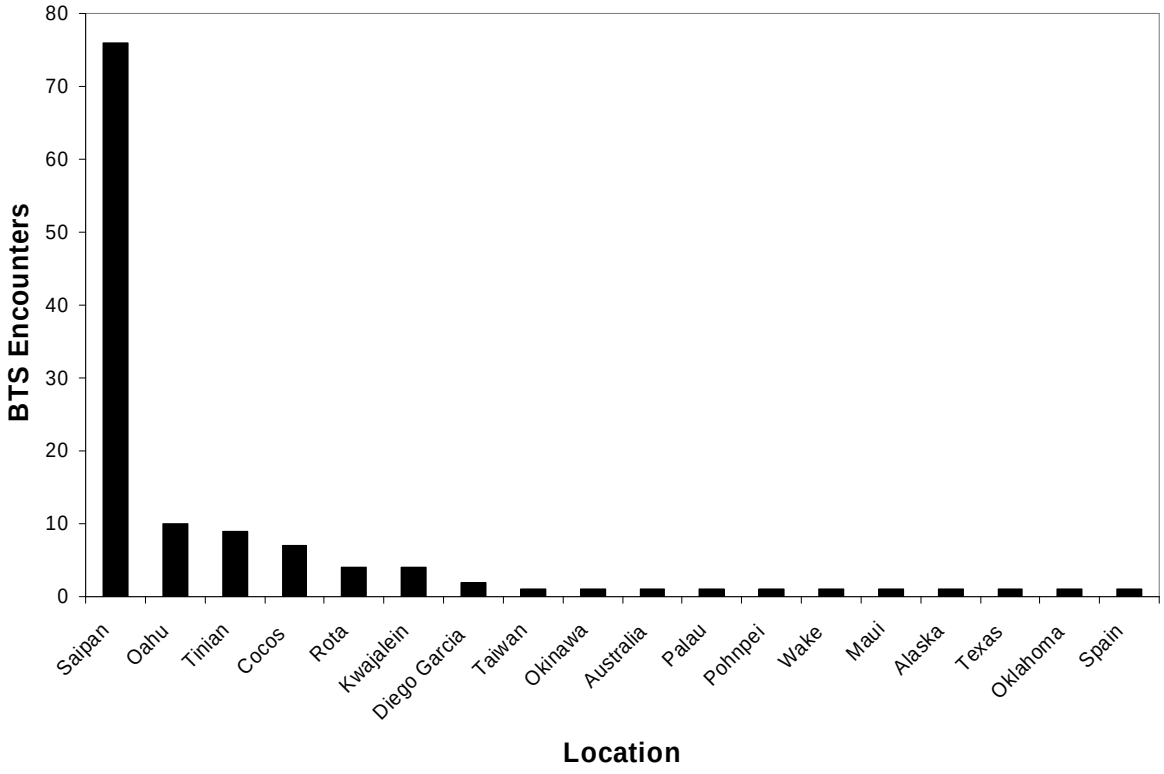

Figure 2. Encounter reports by location for brown treesnakes thought to have originated from Guam (excluding the single Wake Island report).

However, control tools for BTS are better developed than for almost any other reptile, and the ecological and economic costs of inaction are great. From 1990 to 2002, recipient island responses ranged from inaction to temporarily deploying a small number of snake traps in the vicinity of encounters, coupled with a few night-time visual searches in the area conducted by local wildlife personnel.

Research activities on Guam gradually revealed a number of key weaknesses with this approach: (1) dispersing snakes are mostly small, and the snake traps currently available fail to catch small snakes, (2) snake traps baited with live mice are not effective in environments with high rodent densities which we expect to find on most recipient islands, and (3) visual searcher abilities are highly variable.

Vice and Vice (2004) showed that BTS removed from the transportation network were relatively small: 83% were smaller than 900 mm SVL (snout-vent length). Rodda et al. (2007) demonstrated that conventional BTS traps are largely ineffective for snakes smaller than 900 mm SVL with over 25% of BTS in large-scale trapping less than 800 mm SVL (WS, unpublished data). Thus, we would not expect traps used on recipient islands to be effective, and in fact, extralimital BTS trapping efforts to date have captured no snakes, nor have visual searches observed any snakes.

Rodda et al. (2001) looked at the relationship between rodent abundance and snake trap capture success, and found a seven-fold decrease in trap effectiveness in areas of high rodent abundance on Guam. However, many recipient islands are suspected of having even higher rodent abundances, implying that trap success might be further reduced on recipient islands. Wiewel et al. (2006) demonstrated that many recipient island sites had higher rat (*Rattus* spp.) densities than eight comparable Guam sites. Gragg et al. (In Press) demonstrated experimentally that rodent reduction on Guam elicited a rapid (~ one week delay) 38-65% increase in trap capture success following rodenticide application. Thus, traps

would have relatively poor prospects of success for snakes of any size on high rodent density islands such as Saipan, unless rodent contral is integrated into response protocols.

Researchers have long been aware that some searchers are more effective than others when searching for snakes in the forest. Brown treesnakes are vine-like in appearance and their behavior does not facilitate visual detection (Rodda and Fritts 1992). These authors found a 10-fold range in effectiveness of trained searchers, and a 24-fold difference in a later study (1995-99, unpublished data) based on at least 25 hours of search time. We assume that inexperienced searchers are less effective than trained searchers, but it is difficult to get an adequate sample of inexperienced searcher effectiveness. As searchers develop experience over the time needed for quantification they become experienced before the "inexperienced" sample is completed. The specific challenge for searchers on recipient islands (except Palau) is that there are no native snakes on which to practice searching. Locally-trained searchers on recipient islands, therefore, may not be as effective as they would be if trained on Guam.

If traps and locally-trained searchers are not effective responses to dispersed snakes on recipient islands, what is a wildlife manager to do? Validation of searchers trained on Guam provides a partial answer. Rodda et al. (2007) demonstrated that searchers trained on Guam were able to find both large and small snakes, and all snakes in a geographically closed 5-ha population could be detected given sufficient effort (59 searches, 826 search-hr). All resident small snakes were found in the first 12 searches. Snake trapping in areas where rodent densities have been suppressed by rodenticide is another tool that can be used on recipient islands. Investigations into the effectiveness of specially-trained dogs for detection of snakes at low densities are ongoing.

US GEOLOGICAL SURVEY BROWN TREESNAKE RAPID RESPONSE TEAM

The US Geological Survey's (USGS) Brown Treesnake Rapid Response Team (RRT) was established in 2002 at the request of the US Department of Interior's Office of Insular Affairs. The RRT was established to: (1) train searchers on Guam, (2) provide experienced searchers for extralimital searches, (3) assist in communicating new developments in BTS science to recipient islands, and (4) provide guidance in the conduct of responses to BTS sightings. Placement of these tasks within USGS, a research agency, was justified by the absence of trained visual searchers in other agencies. The RRT is administered by the USGS RRT Coordinator (RRTC), and membership includes US federal, state, and territorial agency personnel, as well as personnel from several foreign governments. Active members are those that have been trained and undergone subsequent refresher training as needed. Current team members include staff from the following agencies: USGS, WS, GDAWR, US Fish and Wildlife Service, Northern Mariana Island's Division of Fish and Wildlife, Federated States of Micronesia's Division of Agriculture, Marshall Islands' Ministry of Resources and Development, Palau Division of Agriculture, Hawaii Department of Agriculture, Hawaii Department of Land and Natural Resources, Coordinating Group on Alien Pest Species, Maui Invasive Species Committee, and Colorado State University.

Team membership and training (e.g., the number of islands with trained team members) continue to increase (Figure 3), with 66 members from 15 locations at the end of 2006 (Figure 4). These personnel are made available by their agencies for response actions. The majority of team members are stationed within the Marianas (12) and Hawaiian (25) archipelagos. We expect that an additional 10 team members will be trained in 2007, mainly from Hawaii and the Marshall Islands.

Since its inception in 2002, the brown treesnake RRT has provided Guam-based searchers for 16 BTS responses (Table 1). Most of these responses have been to the Northern Mariana Islands (14), specifically Saipan (8). Responses have also occurred on Maui and Pohnpei. The most active year was 2003, with 7 responses occurring in the Northern Mariana Islands.

Proactive coordination among the various recipient islands and a consistent interview process are necessary for optimal response to a snake sighting. Prior to the development of a coordinated RRT effort, each island had its own approach to responding to a sighting. Spurious sightings, incomplete interviews of the person reporting the sighting, and ad hoc responses made it difficult to assess the credibility of sightings and evaluate the effectiveness of the response. The first step towards addressing this inter-island inconsistency was to develop a standard snake sighting interview protocol (Appendix A), which uses props and illustrations to avoid leading the witness.

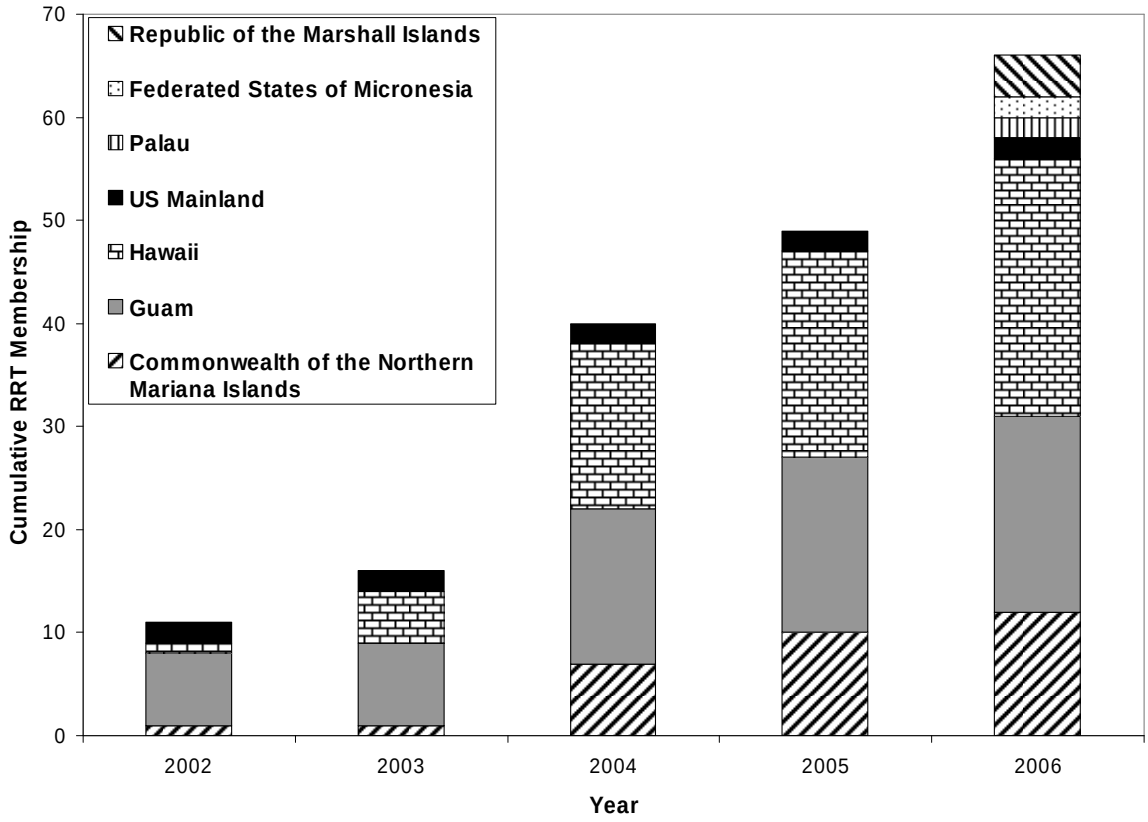

Figure 3. Rapid Response Team cumulative membership from its inception in 2002-2006.

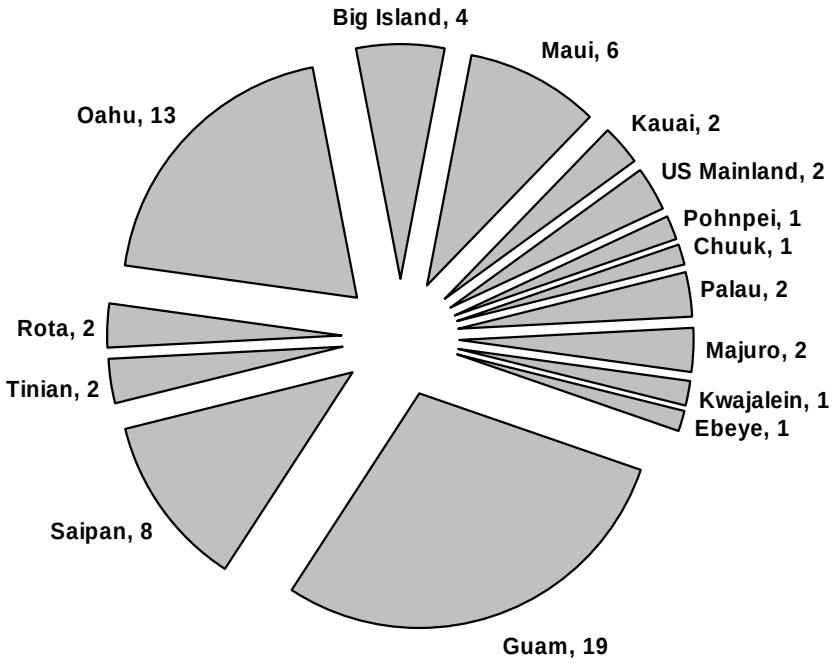

Figure 4. Rapid Response Team membership by island for 2006.

Table 1. US Geological Survey Rapid Response Team response actions to date.

Date	Location	Agencies Involved	Reason for Response
29-May-02	Rota	CNMI DFW, USGS	BTS sighting report
18-Dec-02	Rota	CNMI DFW, USGS	Typhoon damage/ transportation concern
24-Feb-03	Saipan	CNMI DFW, USGS	Search for incipient BTS population
20-Apr-03	Saipan	CNMI DFW, USGS, HIDOA, HIDLNR	BTS sighting report
31-Jul-03	Saipan	CNMI DFW, USGS	BTS sighting report
10-Aug-03	Tinian	CNMI DFW, USGS	BTS sighting report
20-Sep-03	Tinian	CNMI DFW, USGS	BTS sighting report
8-Nov-03	Tinian	CNMI DFW, USGS	BTS sighting report
9-Nov-03	Tinian	CNMI DFW, USGS	BTS sighting report
10-Aug-04	Maui	HIDOA, HIDLNR, MISC, HIDOH, USGS, CNMI DFW	BTS sighting report
22-Sep-04	Saipan	CNMI DFW, USGS	BTS sighting report
28-Sep-04	Saipan	CNMI DFW, USGS	BTS sighting report
20-Mar-05	Saipan	CNMI DFW, USGS	BTS sighting report
21-May-06	Pohnpei	FSM Agr, USGS	BTS sighting report (later determined to be a blind snake)
3-Jan-07	Saipan	CNMI DFW, USGS	BTS sighting report
20-Feb-07	Saipan	CNMI DFW, USGS, GDAWR, USFWS	Search for incipient BTS population

CNMI DFW = Commonwealth of the Northern Mariana Island Division of Fish and Wildlife, HIDOA = Hawaii Department of Agriculture, HIDLNR = Hawaii Department of Land and Natural Resources, MISC = Maui Invasive Species Committee, HIDOH = Hawaii Department of Health, FSM Agr = Federated Sates of Micronesia Division of Agriculture, GDAWR = Guam Department of Agriculture, USFWS = United States Fish and Wildlife Service.

Witnesses may be intimidated by questions from government officials, and may provide the answer that they think the official wants. When possible, the interview is administered by a local person using the witness's first language. Yes/no questions are avoided (as "yes" answers tend to be given disproportionately) and distances or sizes are given with reference to physical models rather than measured units. For example, the witness may be asked to match the thickness of the snake to the closest match from a series of ropes of different thicknesses; they are not asked for measurements. In the western Pacific, the taxonomic target of each interview is the BTS, so a variety of BTS photos are used as interview props. However, in Hawaii the taxonomic range of likely snake species is broad, calling for a greater diversity of photographic props. The interview questions are invariant across the Pacific. Each witness is given the opportunity to request confidentiality for individual answers. For example, the exact sighting location can be withheld from the public, as might the witness's identifying information (name, phone, address, etc.).

The USGS is in the process of posting the full snake sighting database (with appropriate limitations for confidentiality) on a public internet site. The site will have mapping capability such that anyone can point to a spot on a map and see locations, dates, and data for nearby snake sightings. This is useful for discerning whether a cluster of sightings has occurred in any particular venue.

A cluster of sightings is of special interest in that it suggests that an incipient snake population has a higher probability of existing in that area. Single credible sightings generally evoke a search effort involving approximately twelve searchers for two weeks. This is the most rapid action the RRT implements. Less credible sightings rarely involve deployments of searchers from Guam, but may justify a smaller search effort by local searchers (credibility is rarely clear-cut, and one can rarely be confident that a snake population does not exist if

one has not looked). A cluster of sightings evokes a much stronger response, but with less urgency, as the cluster is not based on any single stimulus. Response to a cluster is critical, as it reflects growing evidence that a snake population may be present. To date, there has been only one putative cluster identified (west of Saipan airport, searched intensively in February 2007). Response to the airport cluster comprised participation by 49 visual searchers over 21 nights, as well as hundreds of traps and four dog teams. Thus, a response is variable and is calibrated to address the perceived snake colonization risk.

A possible misinterpretation of the RRT concerns the objective of response actions. Responses are usually timed to follow immediately after a snake sighting is reported, but that misleads some into assuming that the sole purpose of a response is to locate the reported snake. While capture of the snake that was sighted would be desirable (though it has yet to occur), the more important objective is to determine whether a snake population exists in the area where the sighting or cluster was discovered. Single snake sightings constitute an indication that a population may have developed, but it is the population rather than the individual that is of most concern.

Estimating the geographic extent and population size of an incipient population (both geographic and numeric) is crucial. Current technology suffices to eradicate BTS from small areas at reasonable cost (Rodda et al. 1998, 1999a), but it is unclear whether BTS can be eradicated from large areas, and such an accomplishment may be prohibitively expensive with currently available technology. Thus, identifying a population before it has grown beyond a small area is critical.

Fortunately, a population is much easier to detect than is a single individual. Capture probability results from marked populations on Guam indicate that a single snake might not be found during the brief period of a response. Unlike most BTS research sites, many sighting locations are extremely difficult to inspect (e.g., debris piles, dense vine tangles, habitations and structures), and a snake may leave the sighting vicinity either by chance or in response to some stimuli. The RRT has only a qualified expectation that the reported snake will be recovered during the brief period of a response. However, rigorous estimates of capture probability on Guam indicate a very strong likelihood that a snake will be seen if there is a population of snakes in the area searched. The exact probability depends on the number of snakes in the population, the difficulty of searching a specific site, the amount of effort applied to the search, and the level of snake activity as a function of resource availability. Under conditions tested on Guam, even a single snake that remains in the search area would likely be detected by the effort associated with an ordinary RRT response.

Our main concern is the establishment of an incipient population, but the RRT is also interested in capturing any reported snake. The best odds of encountering a particular snake are achieved by responding rapidly to sighting reports. In addition to increasing the potential for encountering a reported snake, rapid reaction to a public sighting highlights the crisis aspect of BTS sightings and increases public appreciation and understanding of the threat posed by these snakes.

Public awareness and reporting is critical to the functionality of the response team. While a RRT response may put dozens of eyes in the field at the right time and place, the public constitutes thousands of observers that spend their lives in that area. The value of the public in spotting and reporting snakes cannot be overstated. Without sighting reports, wildlife managers would likely be unaware of incipient populations until they have grown too large to eradicate. The probability of finding and capturing a single snake is greatly reduced with the passing of time, as the potential search area grows exponentially. In locations where educational outreach is minimal or non-existent, sightings are often unreported. If they are reported, reports are frequently submitted days or weeks after the sighting. Outreach to the public is critical in high risk areas but is currently lacking or minimal on islands other than Hawaii and the Northern Marianas The RRTC is currently working with several island groups to increase their outreach capacities.

The RRTC also has a role to play in assisting responsible local authorities with developing institutional mechanisms for preventing and addressing the BTS invasion threat. For example, many remote island officials may not be fully aware of what BTS have done on Guam, and may not have a 24/7 phone number for the public to report sightings. They may not have a set protocol for evaluating sighting reports and developing a response. There may also be jurisdictional uncertainty about whether a forestry, wildlife, agriculture, or quarantine agency has lead responsibility. While the RRTC does not purport to have the definitive answer to these sorts of questions, he/she has witnessed similar discussions

on many islands and can convey which solutions have been tried elsewhere, and how successful they were. Network building and preparation of first responders is a key step and the RRTC assists with training when requested by local authorities.

A core responsibility of the RRTC is the training on Guam of recipient island personnel. Generally, initial training for response team members entails an intensive 18-day program. These trainings are held 1-3 times a year depending on the needs of cooperators. Training focuses on development of appropriate BTS search images and acquiring a basic skill set which increases each team member's ability to respond appropriately to a sighting. Suitable methods for the capture and containment of venomous and non-venomous snakes, proper use of resources, interviewing a sighting reporter, navigation in remote locations, setting up preliminary search areas, search strategies, and response documentation are some of the topics covered during a typical training course.

Refresher training courses are also held yearly. These courses are designed for previously trained response members (it is strongly urged that all team members receive updated training every two years) and focus on maintaining an appropriate BTS search image. Refresher courses also cover topics as requested by cooperators and update team members on the most current theories and resources used during a response.

BROWN TREESNAKE RESPONSE MANAGEMENT

The response to a BTS sighting is up to local authorities. Communication with the RRTC is strongly encouraged, but strictly voluntary. Local authorities may request consultation, the direct involvement of off-island searchers, or full participation by the RRT. The availability of RRT resources is dependent on conflicting demands and funding availability, but we endeavor to provide as much assistance as funding and local interest warrants.

There is no one correct way to respond to a sighting report; however, there are certain commonalities. If an initial report is suggestive of a BTS sighting, and trained or competent searchers are locally available, we suggest that such searchers travel immediately to the sighting location to begin visual searches. Immediate response heightens the prospects for capturing the reported snake, and in at least one case on Oahu the snake (not a brown treesnake) was retrieved by timely arrival of searchers.

A second priority is to comprehensively evaluate the probability that the sighting constitutes evidence of a BTS population or individual. This is accomplished through a detailed interview of the reporting person, preferably documented by a trained team member at the sighting location, although other formats such as telephone interviews are also acceptable (see appendix A for the standard interview form). The interview should be conducted as soon as possible, preferably within a few hours of the sighting. Rapid interviews benefit from fresher memories, additional context, and may preempt inappropriate responses based on premature judgments (e.g., prematurely flying in off-island searchers).

The interviewer will be asked for his/her evaluation of the probability that the sighted object was a BTS, but in a situation in which the local interviewer has relatively little personal experience with BTS, the obtained information should also be vetted by experts familiar with BTS appearance and behavior. Additional assessments can also be obtained by email from experts identified by the RRTC. In many cases, interview results are relatively unequivocal, indicating that the sighted organism was a blind snake (*Ramphotyphlops braminus*) or monitor lizard (*Varanus indicus*). In many cases deemed "credible", the evidence supports the likelihood that the sighting object was a BTS.

The brown treesnake RRT is funded primarily for response to BTS sightings, but if credible information regarding a non-BTS sighting is received and the host agency requests RRT assistance, it will be provided dependent on expertise that can be offered and availability of resources. When the species of snake is questionable, it is best to cautiously treat the report as a BTS sighting. However, for safety, when capturing an unknown species of snake, we assume it is venomous and handle it as such. If off-island RRT searchers are requested, warranted, and available, a response team will depart from Guam for the sighting location on the next available flight (usually within a day of the assistance request). In general, 3-6 trained members from Guam, including the RRTC, are available to travel to the sighting location. The RRT may also supply resources such as traps and dog teams depending on requests and availability. It is expected that the local host agency will supply additional field personnel. If warranted, more trained team

members may be requested from either Guam or other locations to assist with a response.

INCIDENT COMMAND STRUCTURE

Opportunities for chaos abound during a typical response action making pre-planning critical in order to avoid potential pitfalls. Some of the challenges during a response include: (1) the need for rapid action which generally involves personnel from multiple agencies and locations, (2) addressing landowner/property rights as needed in the sighting location, (3) coordinating field crews and response tools including visual searchers who are in the field after sunset, (4) participation from both print and video media, (5) tracking what has and has not been searched/cleared/prepped, and (6) mapping the response area and associated efforts.

To minimize frustration and overtime costs, maximize volunteer enthusiasm, assure searcher safety, and optimize educational outreach through the inevitable media attention, it is imperative that a response be well organized. In general, the solution to all of these problems is to develop an appropriate chain of command and record-keeping procedures before the incident, and convince the participants of the importance of disciplined adherence to the plan when incidents arise. Lines of responsibility and communication need to be clearly drawn and rigorously adhered to. Media requests should be channeled through a single local authority (who may choose to involve others).

The standard method for organizing events of this nature is called "incident command structure," which is the organizing protocol used for forest fires or oil spills (Bigley and Roberts 2001, Burkle and Hayden 2001). A full fledged incident command structure is very bureaucratic and formal; we recommend only as much formality as is necessary for the size and complexity of the response. Figure 5 shows one possible structure for organizing a response, with representative lines of responsibility and communication. The responsible host agency must decide the extent to which this model is to be followed and the degree to which it

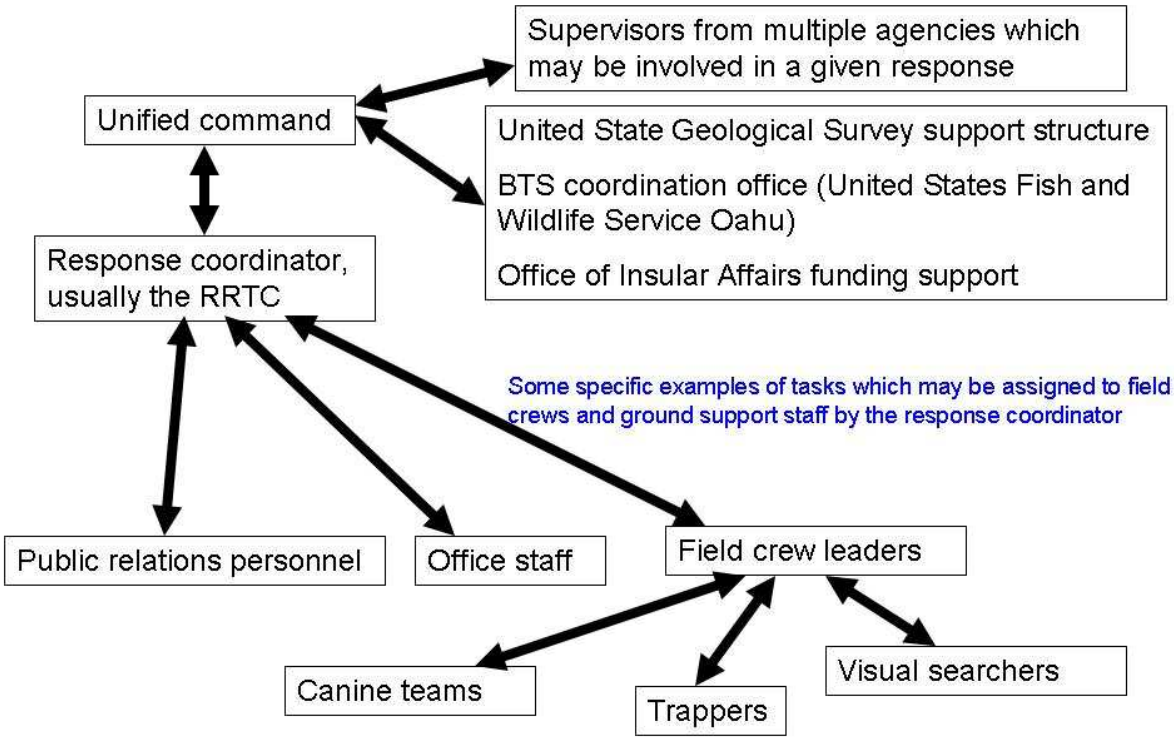

Figure 5. A basic brown treesnake Rapid Response Team command structure.

response, but procedures should be in place to notify everyone when roles are changed (distinctive hats are one literal way to do that). The RRTC is versed in the complexities of incident command needs to be simplified or elaborated. It may be efficient to have people change roles during the procedures and computer-aided mapping (GIS), and can assist local officials with developing a plan appropriate to the size and intricacies of likely responses on their island. Appendix B provides an outline of what such a plan might entail.

One plan element that should be addressed is the procedure for transferring personnel from their day-to-day supervision to supervision during the snake response. Who will they answer to during the response? Under what conditions/times of day/dates do they get transferred? What overtime/hazardous duty rules apply to their use in snake searching? Does anyone have a medical condition or other restriction on their duties that should be conveyed to their temporary snake search supervisor? If they have concerns, to whom do they complain? Are there issues of vehicle use by temporary detailees (who can drive/ride in which vehicles)? Do volunteer forms need to be completed? Who will keep track of their restrictions/duties/hours during a snake search? To whom is information owed? For example, if a crew leader has completed a search of a specified sector, does he/she notify his/her regular supervisor, temporary search supervisor, the RRTC, or all of the above? Parallel or optional lines of responsibility are best avoided, though communication redundancy can be useful for assuring that essential knowledge is successfully transferred. For responses involving the RRT, we recommend the establishment of a unified command between the host agency and the response team as an available avenue for ensuring appropriate supervision (Figure 5).

Even with a unified command, we believe it is best to have a single overall coordinator at any one time at the field site. This eliminates the potential for individuals to receive conflicting orders or information from multiple sources. Given that response personnel are often from multiple agencies and offices within agencies, the likelihood of conflicting direction is high if the established structure is not adhered to. During a response, high motivation, a sense of urgency and a genuine desire to get the job done can cause both inexperienced and experienced personnel and managers to take unnecessary risks or to step outside of established protocols. But in the end, following established command lines will increase accountability, improve information flow, help coordination, increase operational safety, and optimize use of resources.

For small searches, it may be practical for the response coordinator to know each searcher individually and keep each person's work rules in mind. Large searches may generate a need for written records and easily-viewed credentials such as distinctive clothing or name badges. While it is simplest if each searcher is responsible for their own equipment and vehicles, a need for expensive equipment such as GPS and high-output headlamps (Lardner et al. 2007) may justify a tracking system for high-value equipment as well as all personnel.

Another central element of a snake search incident plan is geographic tracking of areas searched, areas for which entry permission has been granted, time/date searched, personnel arrivals and departures, and so forth. The incident command literature is well developed with regard to forms for tracking activities; examples are given in Appendix C.

Media coverage is valuable during a response. The media thrive on immediacy, and a snake on the loose is a hook that opens readers' minds to new information. If off-island personnel are part of the response, that fact alone will communicate to local residents the importance of reporting snake sightings. Rapid response to a snake sighting report increases the potential for media coverage through the demonstration of the urgency with which this threat is addressed. It is also wise during a response action to ask local residents to provide assistance by reporting any additional snake sightings quickly and allowing searchers to search on their properties.

A response plan should also outline the range of activities that are anticipated, the triggers for invoking that activity, and the mechanisms for ensuring their completion. Examples include night visual searches of the response area, canine team searches (night or day), barrier erection, use of ejectants and rodenticides, trapping, spotlighting, mapping, etc. Naturally, the priority assigned to any given task will be reevaluated daily during a response, but it is much easier to set in motion planned activities than to generate an organized execution spontaneously. Daily briefing can be used to verify that assignments are being completed, to assign new tasks or re-assign tasks as needed, and to provide a general update to the response personnel.

CONCLUSION

We see four lines of defense protecting a recipient island from BTS: (1) reduction of populations on Guam, the source island, (2) interdiction efforts at Guam ports of exit, (3) interdiction efforts at recipient island ports of entry, and (4) off-port eradication of incipient populations. The latter two activities are the responsibility of the recipient island government, and for those jurisdictions that have the wherewithal, local efforts may suffice. For example, Hawaii agencies conduct virtually all of their own off-port eradication efforts, relying on the federal government primarily for assistance in training their staff on Guam. The Northern Mariana Islands have made great strides in that direction, though as a financially-strained territory they are eligible for considerable financial aid as well as support from the RRT for training and periodic direct assistance. Other island governments in the Pacific are unlikely to be able to maintain large staff of trained personnel for off-port eradication (Figure 4). Thus, we anticipate that as WS's already tight interdiction net is improved and Guam's snake population is suppressed or eradicated, the RRT will have a progressively reduced need for deploying Guam-based searchers, but will have a continued role in outreach, technology transfer, and training recipient island personnel on Guam.

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Appendix A

USGS Snake Sighting Interview Form

2004 Edition

Haldre S. Rogers

Interview instructions

How to perform the interview

Location

- The interview should be conducted at the sighting location shortly after the sighting. If it is not possible to conduct the interview at the site, the interview should be conducted elsewhere and the location noted on Form B. In any case where the interview does not occur at the site, the interviewer should schedule a visit to the site with the observer as soon as possible.

Observer

- The interviewer should interview in person with the observer. However, if the interviewer cannot speak directly with the observer for language or availability reasons, the interview should occur using a third party or over the phone.

- If more than one person saw the snake, each person must be interviewed separately.

Form

- This packet consists of 2 forms: Form A, which is to be used during the interview with the observer and Form B, which is to be filled out by the interviewer after the interview is complete.
- Begin by entering the date of the interview on the top of each page of Form A and Form B, because this date will be the identifying number linking the pages. If more than interview is performed in one day, please enter a letter of the alphabet beginning with "a" after the date to distinguish the two sightings.
- During the interview with the observer (Form A), read the instructions for each question written in italics, then ask each question as written in bold.

- Faithfully record the observer's answers. If the observer volunteers any extra information for a question, make a note of that in the margin or on the back of the interview form

- Enter N/A for questions that are not applicable or not available.
- Some questions refer to props such as rope or cards. These are part of a prop packet. If you obtained a hard copy of this form, you should have received the prop packet with the form. If you downloaded the form from the internet, please read the additional instructions on creating a prop packet on the website.

Interview tactics

The interview of the observer is one of the most important steps in the sighting response process. Through the interview, we are able to judge the validity of a sighting and respond accordingly. Here are some guidelines for a successful interview:

Make your interview…

- Timely: It is important to interview as soon after the sighting as possible, because memories of an event change over time and retelling of the event. We must get the information from the observer when it is still fresh in his/her head.
- Relaxed: People tend to share information more freely when they are comfortable, so anything you can do to make the interview a relaxed and welcoming occasion will improve the quality of the interview.
- Smooth: Before you perform an interview, familiarize yourself with the questions on the forms.

Killing and Preserving Live Specimens

If the snake is alive, please kill it by freezing (preferable method) or severing the head. The specimen should be preserved as a reference or for future research. If it is impractical to store the specimen in a freezer, try to preserve the remains in a preserving fluid such as 10% formalin, 70% grain alcohol, denatured alcohol, rubbing alcohol, or rum or other high proof (> 80 proof) spirits (in order of preference). If none of these is available, the head may be dried in a slightly warmed oven, or packed in desiccating powder (such as “dri-rite”). Arrange for identification by proper authorities through the rapid response team coordinator.

A

Snake Sighting Interview Form

Interviewer name: _____

Interview location: _____

Introduction

	Question	Answer
1	**As you probably know, I'd like to talk to you about the snake you saw recently. First of all, thank you for reporting it. Information about this sighting may be very important to the welfare of our island. Do you have half an hour so that I could ask you some questions about this sighting?**	☐ yes ☐ no

If the answer is "yes", continue on to question 2; if it is "no", reschedule the interview with the observer.

Name

2	**Please spell your first name, your middle name and then your last name out loud.**	

Observer Contact information:

3	**I would like to get your contact information so that we can get in touch with you if any questions come up in the future regarding this sighting. I will not use your contact information for other purposes, without your permission. May I continue?**	☐ yes ☐ no
If the answer to question 3 is "yes", continue on to question 4; if it is "no", skip to question 7.		
4	**What is your address?**	Address:
5	**What are your daytime and evening phone numbers?**	Daytime: Evening:
6	**What is your email address, if you have one?**	☐ My email address is: _____ ☐ I do not have an email address

Observer's story

Please describe to me how you saw the snake. Tell me as many details as you can remember. (write details on back on sheet)

Present location of snake:

Now, I will ask you a series of questions, some of which may be repetitive. Please bear with me if I ask you a question for which you have already given an answer because we must ask the same set of questions to each person who reports a snake. If at any point, you do not know an answer to a question, please say "I don't know".		
7	**Was the snake killed, captured or did it get away?**	☐ Killed ☐ Captured ☐ It got away ☐ Other_____
If the answer to question 7 is "a-killed", "b-captured" or "d-other", continue on to question 8; if it is "c-it got away", skip to question 10.		
8	**Where is the snake now?**	
If the snake is in the observer's custody, collect the snake and continue to question 9. If it is not in the observer's custody, skip to question 10, complete the interview, then make every effort to obtain the specimen.		
9	*Interviewer: What species is the snake?*	
If the snake is a blind snake, discontinue the interview. If it is another species or unknown, continue the interview, disregarding the 'sighting information', 'snake description' and 'snake lineup' sections. Read the instructions on how to kill and/or preserve the snake on page 1.		

Time and Location of Sighting

10	**What day did you see the snake?**	_____ _____/_____/____ Day of Week Day Month Year
11	**What time did you see the snake?**	Use a 24-hour clock. __ __:__ __
12	*If necessary, ask the observer:* **In which state or on which island did you see the snake?**	
13	**What is the name of the town or region where you saw the snake?**	
14	*Detach the last page of this form (blank) and provide it to the observer with a pen.* **Please draw a map showing where you saw the snake on this piece of paper. Include all major roads and obvious landmarks in the area, so that someone who is not familiar with this island could find the place where you saw the snake. Put a star on your map at the sighting location.**	

Sighting Information

15	**How far away was the snake when you initially spotted it? Was it within arm's reach, closer than the length of a standard sedan, such as a Nissan Sentra, further than a sedan's length, but closer than a bus's length or further than a bus's length?**	☐ Within arm's reach (<1m) ☐ Closer than the length of a standard sedan, e.g. Nissan Sentra (1m - 4m) ☐ Further than a sedan's length, but closer than a bus's length (4m - 10m) ☐ Further than a bus's length (>10 m) How far? _____ ☐ I don't know
16	**Did you get any closer to the snake?**	☐ yes ☐ no ☐ I don't know
If the answer to question 16 is "yes", continue on to question 17; if it is "no" or "I don't know", skip to question 18.		
17	**How close did you get to the snake? Did you get within arm's reach, closer than the length of a standard sedan, such as a Nissan Sentra, further than a sedan's length, but closer than a bus's length or further than a bus's length?**	☐ Within arm's reach (<1m) ☐ Closer than the length of a standard sedan, e.g. Nissan Sentra (1m - 4m) ☐ Further than a sedan's length, but closer than a bus's length (4m - 10m) ☐ Further than a bus's length (>10 m) How far? _____ ☐ I don't know
18	**How long did you have the snake in view?**	☐ A few seconds ☐ More than a few seconds but less a minute ☐ More than one minute but less than five minutes ☐ More than 5 min (how long? _____) ☐ I don't know
19	**On a scale of 0 to 10, with 0 being "it definitely was not a snake" and 10 being "it definitely was a snake", how confident are you that what you saw was a snake?**	

Snake Description

In this section, I am going to ask you a number of questions about the specific snake that you saw. Please try to remember as many details as you can. This is probably the most crucial section of this interview, because your answers will help us to identify the animal that you saw.		
20	**Before I start on the specific questions about the description I'd like to ask you about your overall impression of the snake. Was there anything about this snake that stood out in your mind as being remarkable?**	
21	**If a snake is divided into three parts, the head, the body and the tail, what segment or segments did you see?**	☐ Head ☐ Body ☐ Tail ☐ I don't know
22	*Hand the selection of ropes and PVC pipes to the observer.* **Which of these is the same thickness as the snake you saw?**	☐ <1/4-inch ☐ 1/4-inch (small rope) ☐ 1/2-inch (medium rope) ☐ 3/4-inch (large rope)
22	**Can I measure the circumference of your** _____ *(fill in body part chosen in question 21)**?*** *If the observer answers "a"to this question, measure the body part using calipers (if available) or a tape measure (in metric units, if possible). If he/she answers "b" or "c", continue on to question 23.*	☐ Yes: _____mm ☐ No ☐ I don't know
23	*Use the rope selected in Question 22. If the observer chose '<1/4-inch' or anything larger than 3/4-inch, use the rope with the closest diameter.* **Now we will use this rope to determine the length of the snake you saw. The black tape on the end represents the head of the snake. Feel free to manipulate the rope into the position of the snake if that will help you to determine the length.** *If the observer chooses a length that is between two colors of tape, mark the longer value in the answer column.*	☐ Red (<0.5 m) ☐ Orange (0.8m) ☐ Black (1.0m) ☐ Green (1.5m) ☐ Blue (2.0m) ☐ White (2.5m or above)

24	*Spread the markings cards in front of the observer.* **Choose the card with a pattern that most closely matches the markings on the snake you saw.**	☐ Solid pattern ☐ Colored head ☐ Linear multicolor ☐ Spotted ☐ Banded ☐ Striped ☐ Blotched ☐ Speckled ☐ I don't know
25	*Hand the observer a color wheel. Record the numbers associated with the color chosen by the observer.* **Please choose the color that most closely resembles the main color of the snake. You may use either side of the color wheel.**	
26	**What part of the snake was that color?**	
27	**Did you see any other colors on the snake?**	☐ yes ☐ no ☐ I don't know
If the answer to question 27 is "yes", continue on to question 28; if it is "no" or "I don't know", skip to question 29.		
28	**What other colors did you see on the snake? Please tell me where on the snake these colors were.**	Color _____ Location _____ Color _____ Location _____
29	**What was the sheen of the snake? Was it glossy like patent-leather shoes, semi-glossy like ordinary cowhide leather or flat like suede leather?**	☐ Glossy (like patent-leather shoes) ☐ Semi-glossy (like ordinary cowhide leather) ☐ Flat (like suede leather) ☐ I don't know
30	*Spread all head shape cards on the table in front of observer.* **Please select the head shape that most closely resembles the head of the snake you saw.**	☐ Broad head ☐ Medium head ☐ Narrow head ☐ I don't know
31	*Use pupil cards. Omit this question if observer did not see the head of the snake (refer to question 21).* **Were the snake's pupils elliptical or round**?	☐ Elliptical ☐ Round ☐ I don't know

Snake Behavior

32	**Was the snake moving or still when you first saw it?**	☐ Still ☐ Moving (where? _____) ☐ Other _____
If the answer to question 32 is "a- still", skip to question 34. If it is "b- moving" or "c- other', continue on to question 33.		
33	**At what speed was the snake traveling when you first saw it? Was it the speed of a slow walk, a normal walk, a fast walk or a run?**	☐ Slow walk ☐ Normal walk ☐ Fast walk ☐ Run
34	*Show the posture cards to the observer one by one.* **Which picture best illustrates the snake's posture when you first saw it?**	☐ Coiled ☐ Looped ☐ Sinuous ☐ Defensive "S" ☐ Cobra ☐ I don't know
35	**Did you see the snake exhibit any of these other postures? Choose all that apply.**	☐ Coiled ☐ Looped ☐ Sinuous ☐ Defensive "S" ☐ Cobra ☐ No ☐ I don't know

Snake Line-up

36	*Ask the question written below, then, one by one, in numerical order, show the pictures of snakes. If the observer chooses a picture, record the number on the back of the card along with any remarks about the picture (i.e. "the head looked like this one"). Go through pictures a second time if requested by the observer.* **Please select any picture that looks like the snake you saw. You may choose more than one picture. The snake you saw may not be in this assortment of pictures, so I will go through these once, during which time you may choose pictures of snakes that look similar to the one you saw. If you have not chosen any pictures once I have finished showing all of the options, I will go through the options a second time. If the snake does not resemble any of these options, do not choose any** *(interviewer: mark "none" in that case)***.**	Card Number Comments
		I don't know None

Sighting Location Details

37	**Was the snake in a tree, on the ground or in water?**	☐ Tree ☐ Ground ☐ Water ☐ Other _____
38	**Was the snake on the road, on the roadside, in the jungle, in a grassy area, amongst buildings or somewhere else?**	☐ Road ☐ Roadside ☐ Jungle ☐ Grassy area ☐ Residential area ☐ Other
39	**How high was the vegetation at the exact spot of the snake sighting? Was it bare ground, mowed grass, ankle high, mid-calf, knee-high, waist-high, head-high, as high as you can reach or tall jungle?**	☐ Bare ground (0 mm) ☐ Mowed grass (1-80 mm) ☐ Ankle high (81-190 mm) ☐ Mid-calf (191-400 mm) ☐ Knee-high (401-600 mm) ☐ Waist-high (601mm-1.3m) ☐ Head-high (1.4m-2.0m) ☐ As high as one can reach (2.1m-2.6m) ☐ Tall jungle (>2.6m) ☐ I don't know
40	**What was in the 3 meters around where you saw the snake? I am going to read out some options. Say yes or no to each option. Were there buildings, vehicles, yard vegetation, farm vegetation, jungle, grassy area or pavement?**	☐ Buildings ☐ Vehicles ☐ Yard vegetation ☐ Farm vegetation ☐ Jungle ☐ Grassy area ☐ Pavement ☐ Other _____

Weather

41	**To the best of your knowledge, did it rain in the 6 hours prior to the sighting?**	☐ yes ☐ no ☐ I don't know
42	**Was it raining at the time of the sighting?**	☐ yes ☐ no ☐ I don't know
If the answer to question 42 is "yes", continue on to question 43. If it is "no" or "I don't know", skip to question 44.		
43	**How hard was it raining? Was it a misty fog, drizzle, light rain, heavy rain or torrential rain?**	☐ Mist fog ☐ Drizzle ☐ Light rain ☐ Heavy rain ☐ Torrential rain
44	**What was the amount of natural light on the snake at the time of the sighting? Was it direct sunlight, during the day without direct sunlight, at dawn or dusk where natural lighting was low but sufficient to see color, under a full moon or on a dark night?**	☐ direct sunlight ☐ during the day, but without direct sunlight ☐ at dawn or dusk where natural lighting was low but sufficient to see color ☐ full moon ☐ dark night
If the answer to question 44 is "a- direct sunlight" or "b- during the day, but without direct sunlight", continue on to question 45. If it is "c- at dawn or dusk", "d- full moon" or "e- dark night", skip to question 46.		
45	*Ask this question only if the observer saw the snake during the day (use your local knowledge of lighting conditions for the time answered in question 6 to determine if it was during the day or night).* **Was it sunny, partly cloudy or overcast when you saw the snake?**	☐ Sunny ☐ Partly cloudy ☐ Overcast ☐ I don't know
46	**Was there an artificial source of light, such as streetlights, car headlights or a flashlight, when you saw the snake?**	☐ yes ☐ no
If the answer to question 46 is "yes", continue on to question 47; if it is "no", skip to question 48.		
47	**What was this light source?**	

Local information

48	**What is the approximate distance between where you saw the snake and the nearest airport or seaport?** *Have the observer estimate the distance. Accept any answer given. Be sure to record the units given by observer.*	_____ _____ Port Name Distance
49	**How far is it between where you saw the snake and the ocean?** *Have the observer estimate the distance. Accept any answer given. Be sure to record the units given by observer.*	
50	**Is there any construction or cargo that has recently arrived on island near the sighting location?**	☐ yes ☐ no ☐ I don't know
If the answer to question 50 is "yes", continue on to question 51; if it is "no" or "I don't know", skip to question 53.		
51	**What type of construction/cargo is near the sighting location?**	
52	**Exactly where is this construction/cargo located?**	
53	**Do you know the name and phone number of the person who owns or manages the land where you saw the snake?**	Name: Phone Number:

Other observers

54	**Did anyone else see this snake?**	☐ yes ☐ no ☐ I don't know
If the answer to question 54 is "yes", continue on to question 55; if it is "no" or "I don't know", skip to question 56		
55	**Could you give me their name, address and phone number, if you know it?** *Please gather as much and as accurate contact information as possible because often addresses in remote locations are vague or unavailable, making future contact with the observer difficult. Each observer must be interviewed separately.*	

Prior experience with snakes

I'm going to finish up with a few questions about your previous experience with snakes.		
56	**Which of the following choices best describes your experience with snakes: None; in photographs, books, TV and videos; as pets or live exhibits at zoos; seeing wild snakes caught by others; or personally capturing wild snakes?**	☐ None ☐ Photographs, books, TV and videos ☐ As pets or live exhibits at zoos ☐ Seeing wild snakes caught by others ☐ Personally capturing wild snakes
57	**Roughly how many live snakes have you handled?**	☐ 0 ☐ 1-5 ☐ 5-25 ☐ >25
58	**What kind of snakes have you handled?**	

Other comments

59	*Record every detail mentioned by the observer because each detail could be important at a later date.* **Please tell me anything I have missed that you think could be important.**	
60	**Do you have any other comments?** *Record any other comments made by observer exactly as they are stated.*	
61	**Thank you for sharing this information with us. Can we share the details of your sighting with other researchers or managers?**	☐ yes ☐ no
62	**May we include the information from this interview in a database that will be available to the general public? Your name and contact information, however, will NOT be available to the public.**	☐ yes ☐ no

On-site examination

Ask the observer to tell his/her story of the sighting. Mark the place where the observer was when he/she first saw the snake and where the snake was when the observer first spotted it.

Your interview with the observer is now complete. Please fill out form B now.

B

Questions for Interviewer

This form is to be filled out by the interviewer.

Interviewer contact information

1	Name of interviewer	
2	Interviewer Address	
3	Interviewer Phone Number	daytime: evening:
4	Interviewer Email	

Observer information

5	Name of Observer:	
6	Estimated age of observer:	

Chronology of Events

7	Date and time sighting was reported to officials	_____/_____/_____ __ __:__ Day Month Year Time
8	Date and time of initial contact with observer	_____/_____/_____ __ __:__ Day Month Year Time
9	Date and time of interview	_____/_____/_____ __ __:__ Day Month Year Time

Method of interview:

10	Was the interview conducted with the observer or through a third party?	☐ With the observer ☐ Through a third party
11	Was the interview conducted person-to-person or over the phone?	☐ Person-to-person ☐ Over the phone
12	Was the interview conducted at the location of the sighting, at the observer's home or elsewhere?	☐ At the location of the sighting ☐ At the observer's home ☐ Elsewhere_____

Location

13	What country was the sighting in?	
14	On which island or in which state was the sighting?	
15	Did you visit the sighting location?	☐ yes ☐ no
16	Please describe where the sighting was located, using specific landmarks and road names.	
17	Do you foresee any difficulties getting permission from the landowner to search the area?	☐ yes ☐ no Comments:

Interviewer's opinion of sighting

18	On a scale of 0 to 10, with 0 being "the observer definitely did not see a snake" and 10 being "the observer definitely saw a snake", how confident are you that what the observer saw was a snake?	0 1 2 3 4 5 6 7 8 9 10 Not a snake Definitely a snake

Interviewer background

19	Prior to this sighting, what was your primary experience with snakes?	☐ none ☐ photographs, books, TV and videos ☐ as pets or live exhibits at zoos ☐ seeing wild snakes caught by others ☐ personally capturing wild snakes ☐ Other: _____
20	Roughly how many live snakes have you handled?	☐ 0 ☐ 1-5 ☐ 5-25 ☐ >25
21	What kind of snakes have you handled?	

On-site examination- to be completed at the location of the sighting.

22	Measure the distance between observer and snake at time of initial sighting using a metric tape measure.	
23	If snake was off the ground, measure vertical distance from ground using metric tape measure.	
24	Record the UTM coordinates for the sighting location using a GPS and the WGS-84 datum.	
25	What are the dominant vegetation types in the 1 ha area around the sighting? Please be as specific as possible, using Latin species names if known.	
26	What potential non-snake candidates for the sighting are present in the area (i.e., rats, water hoses, monitor lizards etc.)?	
27	Is there any recent construction or cargo in the area? If yes, please describe it.	Yes _____ No

Appendix B

USGS Snake Sighting Overall Search Plan

2007 edition

Haldre S. Rogers and James W. Stanford

Overall search plan

Response code: _____ Response Command: _____
Sighting date: _____ Sighting location:_____
Search plan created by: _____

Circle all tools that will be used in this response:

Trapping Rodenticide Night searches Daytime searches Ejectants

Canine Team Night Searches Canine Team Day Searches

Acetaminophen Temporary Barrier

Agencies and their staff involved during the response action:

Trapping **Yes** **No**

Person in charge: _____

Total number of traps available: _____

Total number of bait available: Live mice: _____ Dead mice: _____

Other (please describe): _____

Potatoes? Yes No Feed blocks? Yes No

Date traps will be activated: _____

Date traps will be deactivated: _____

Traps will be checked @ _____ by: _____

Segment	Number of Traps	Location of traps

Rodenticide Yes No

Person in charge: _____

Total number of bait stations available: _____

Total amount of rodenticide available: _____

Date bait stations will be activated: _____

Date stations will be deactivated: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Segment ___ Number of bait stations: _____ Location of bait stations: _____

Bait stations will be checked by: _____

Bait stations will be checked: daily every 2 days

Night Searching **Yes** **No**

Person in charge: _____

Total number of searchers available and initials of each:

RRT _____

Local _____

Segments to cover: _____

Date night searching will begin: RRT _____ Local _____

Date night searching will end: RRT _____ Local _____

Hours spent conducting searches each night: RRT _____

Local _____

Maximum search area: _____

Day 1 (date _____): Inner 50 meters = Segments _____

Day 2 (date _____): To 100 meters = Segments _____

Day 3 (date _____): To 150 meters = Segments _____

Day 4 (date _____): To 200 meters = Segments _____

Day 5 (date _____): To 250 meters = Segments _____

Day 6 (date _____): To 300 meters = Segments _____

Day 7 (date _____): To 300 meters = Segments _____

Day 8 (date _____): To 300 meters = Segments _____

Day 9 (date _____): To 300 meters = Segments _____

Day 10 (date _____): To 300 meters = Segments _____

Day 11 (date _____): To 300 meters = Segments _____

Day 12 (date _____): To 300 meters = Segments _____

Day 13 (date _____): To 300 meters = Segments _____

Day 14 (date _____): To 300 meters = Segments _____

Day 15 (date _____): To 300 meters = Segments _____

Day 16 (date _____): To 300 meters = Segments _____

Day 17 (date _____): To 300 meters = Segments _____

Day 18 (date _____): To 300 meters = Segments _____

Daytime searches **Yes** **No**

Person in charge: _____

Total number of searchers available and initials:

RRT _____

Local _____

Segments to cover: _____

Date daytime searching will begin: RRT _____ Local _____

Date daytime searching will end: RRT _____ Local _____

Hours spent conducting search each day: _____

Targets: Pandanus ground burrows other (list): _____

Ejectants **Yes** **No**

Person in charge: _____

Chemical available: CloveCinnamon Hair Spray Other: _____

Total number of people available and initials:

RRT _____

Local _____

Segments to cover: _____

Date repellent use will begin: _____

Date repellent use will end: _____

Hours spent using repellents each day: _____

Targets: Cliff holes Rodent Burrows Pipes Other: _____

Canine teams **Yes** **No**

Person in charge: _____

Canine teams used (list dog, handler, affiliations, and whether forest or cargo trained):

_____

_____

_____

Segments to cover: _____

Date dog searches will begin: _____

Date dog searches will end: _____

Hours spent performing dog searches each day: _____

Targets: _____

Day 1 (date _____): Segments (by team) _____

Day 2 (date _____): Segments _____

Day 3 (date _____): Segments _____

Day 4 (date _____): Segments _____

Day 5 (date _____): Segments _____

Day 6 (date _____): Segments _____

Day 7 (date _____): Segments _____

Day 8 (date _____): Segments _____

Day 9 (date _____): Segments _____

Day 10 (date _____): Segments _____

Day 11 (date _____): Segments _____

Day 12 (date _____): Segments _____

Day 13 (date _____): Segments _____

Day 14 (date _____): Segments _____

Acetaminophen **Yes** **No**

Person in charge: _____

Total number of bait tubes available: _____

Total number of dead mice available: _____

Total amount of acetaminophen available: _____

Segments to cover: _____

Date bait tubes will be baited:_____

Date tubes will be deactivated: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Segment ___ Number of bait tubes: _____ Location of bait tubes: _____

Bait tubes will be checked by: _____

Bait tubes will be checked: daily every 2 days weekly

Temporary Barrier **Yes** **No**

Person in charge: _____

Available on island? Yes No

Circumference of area to be enclosed by barrier: _____ meters

Number of people available to set up: RRT _____

Local_____

Length of shade cloth available: _____

Sand to be collected from: _____

Date to be erected: _____

Date to be removed: _____

Landowner permission to clear branches/trees? Yes N

Other Tools **Yes** **No**

Person in charge: _____

Describe Tool and Use:

Appendix C

USGS Snake Sighting Response Data Sheets

2007 edition

Saipan Search Data

Primary Searcher			
Other Searchers			
Date			
Page		of	
Location			
Arrival time			
Clouds (%)			
Rain Past (y/n)			
Rain Now (y/n)			
Wind (Beaufort #)			
Gust (Beaufort #)			
Wind Direction			
Moon			
Light Source			

Search Type	Dist (M)	Segment	Start	Stop

Non-Snake Perch Data

Time	Species	Vert (M)	Perch Dia (mm)	Perchtax

Snake Data (Capture snake before collecting this info!)

Time Captured	Location	Vert (M)	Perch Dia (mm)	Perchtax	ABS	Mov	Notes

General Notes

Data Entered By:____________ Date Entered:____________ Data Proofed By:______________ Date Proofed:___________ Record #:_______

Trapper **Date**

Trap	Checked? (Y/N)	Replace food/potato?	Bait deceased (Y/N)?	Functional (Y/N)?	Catch	Notes