



Monitoring Terrestrial Reptiles and Amphibians in the Mediterranean Coast Network

Cabrillo National Monument 2011 Annual Report

Natural Resource Data Series NPS/MEDN/NRDS—2014/714



ON THE COVER

Adult female *Sceloporus occidentalis* captured at array LOMA-18 during June 2011 herpetofauna surveys
Photograph by: Kaye London, Cabrillo National Monument

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Abstract

The use of pitfall traps and drift fencing has been an effective method for monitoring many species of herptiles. This method has been used at Cabrillo National Monument in San Diego, California since 1995 to monitor trends in reptile and amphibian species within the park. These methods were first used by USGS and then continued as part of the National Park Service Mediterranean Coast Network Inventory and Monitoring Program. The park is located at the southern tip of the Point Loma peninsula near downtown San Diego and is surrounded by water and developed land essentially creating an island of native Coastal Sage Scrub habitat. There are 12 species of herptiles that are currently found within the 163 acre park and species diversity has declined according to historical records. Of the 12 herptile species, 11 were captured in 2011. *Diadophis punctatus* was the only herptile not detected this year, and *Cnemidophorus hyperythrus beldingi*, a state species of concern, was absent in some locations where this species was previously found. Continuous inventory and monitoring efforts are important to detect any significant changes in the herptile populations within this urban “island” park and to manage our parks for future generations to enjoy.

Acknowledgments

We would like to acknowledge all volunteers and NPS staff who have helped with this project. Special thanks go out to U. Guerrero, J. Christian, J. Skoglund, M. Hamilton, A. Cheshire, D. Palmer, E. Morgan, T. Kibler, S. Topham, N. Cates, B. Sharp and M. Powers for their long hours dedicated as volunteers during the 2011 herpetofauna survey season. We would also like to thank J. Buccowich for her hard work and contributions to the project as an NPS Intern.

List of Terms

CABR: Cabrillo National Monument, 163 acres managed by the National Park Service

CSS: Coastal Sage Scrub vegetation type

DIS: Disturbed habitat

MSS: Maritime succulent scrub vegetation type

NPS: National Park Service, U.S.

PLECA: Point Loma Ecological Conservation Area, 650 acres of land on the Point Loma Peninsula with multi-agency management designated for conservation of native species.

SMC: Southern maritime chaparral vegetation

USGS: U.S. Geological Survey

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Introduction

Cabrillo National Monument (CABR) is located at the tip of the Point Loma peninsula in San Diego, California USA (Fig. 1). The National Park Service (NPS) manages 163 acres of land that is dominated by the coastal sage scrub vegetation community. The park is surrounded by a US Navy base, City of San Diego wastewater treatment plant and residential housing. The surrounding development and habitat fragmentation can negatively affect wildlife and the biodiversity of native reptile species by restricting natural movements of individuals as well as gene flow with adjacent populations (Busteed 2003, Delaney et al, 2010). The herpetofauna monitoring program was initiated in 1995 to inventory and monitor herptile species within and around the park including some areas on US Navy property. Cabrillo National Monument is part of the Point Loma Ecological Conservation Area (PLECA) which is made up of 650 acres of land on Point Loma that is owned and managed by federal and local agencies. The PLECA was designed to protect the cultural and biological resources that can be found on the Point Loma peninsula.

There are currently twelve species of herptiles found within Cabrillo National Monument that are monitored regularly using these methods. Several species of snakes and lizards are thought to be extirpated from the peninsula according to historical records possibly due to landscape changes and habitat fragmentation on and around the Point Loma peninsula. The monitoring efforts are important for detecting changes in the herptile population dynamics and species composition.

The herpetofauna monitoring program on Point Loma was initiated using pitfall traps. There were originally 17 arrays, which included seven pitfall traps and three funnel traps at each array, constructed on Point Loma that were operated by USGS July 1995 until December 2001 for sampling periods of 11 days/10 nights every other month. After Dec 2001, NPS took over the management of the herpetofauna surveys and at this time, herpetofauna was designated as a “vital sign” for the Mediterranean Coast Network (MEDN) Inventory and Monitoring Program (I&M). The vital signs are ecological parameters that are monitored to provide the park natural resource managers and the greater scientific community with scientific information to assist with natural resource management. Beginning in 2002, NPS conducted surveys on a five-day/four-night sampling period once a month for 11 months of the year. Atkinson et al. (2003) determined that a minimum of 40 trap nights per year are needed to detect changes in species richness and abundance of certain target herptile species. In July 2005 and March 2006, arrays six and seven were permanently closed respectively.



Figure 1. Map of the location of the herpetofauna arrays within the study area including Point Loma Ecological Conservation Area and Cabrillo National Monument management areas.

Methods

The approved monitoring protocol (Busteed et al. 2006) was followed during 2011. This protocol was based on the initial monitoring and methods used by Fisher and Case (Fisher and Case 2000, Fisher et al. 2008).

Sixteen arrays were operated during the herpetofauna surveys in 2011. Nine arrays are within Cabrillo National Monument property and the remaining seven arrays are on US Navy property north of CABR. Each array consists of seven pitfall traps and three funnel traps in a “Y” configuration. The pitfall traps are five gallon buckets that are recessed so the tops of the buckets are flush with the surrounding ground. The funnel traps are cylinders made from hardware fabric with plastic funnels attached at each end. Fifteen meters of drift fencing along each arm of the array with 7.5 meters between each pitfall trap are utilized to direct the animals along the fencing and into the traps. A 24”x48”x2” (61cmx 122cmx 5.1cm) plywood coverboard was placed at each array to increase detection rates of cryptic or fossorial animals that are difficult to observe near the arrays and not easily captured in the pitfall or funnel traps.

Within each pitfall trap, there were two plastic PVC pipes of different sizes to serve as hide-tubes for captured animals. A nine-ounce plastic cup containing cotton or polyester stuffing was placed in the traps to provide cover and bedding material for small mammals. One to two mealworms were placed at the bottom of the cup under the stuffing in order to provide food for shrew captures. Moist sponges were also placed in the bottom of each trap to reduce desiccation of salamander captures. Sponges and polyester stuffing were used throughout the year. The plastic cups were first placed in the traps 22 March 2011.

From January to November 2011, the arrays were scheduled to be opened every month for a four-night sampling period (Table 1). Traps were closed or never opened if heavy precipitation was in the forecast in order to reduce mortality of captured animals. Traps were also closed if there was a heavy infestation of Argentine ants, *Linepithema humile*, in order to reduce the chance of mortality of captures because ants may attack animals trapped in the pitfall traps. There is a negative correlation with the density of *L. humile* and lizard capture rates (Atkinson et al, 2003). Traps were also not opened if there was flooding in the bottom of the trap or if the ground was saturated with water, which caused flooding from the drainage holes in the bottom of the trap. This usually occurred after heavy rains for only some of the traps.

Data collected from all lizard captures included weight, snout/vent length (SVL), age (adult or juvenile), and gender if possible. SVL measurement cut-off lengths were utilized to categorize lizards by age class (Table 1). Body condition was also noted if any abnormalities were observed. Each individual lizard was marked using toe clip numbers to assign it a unique number. The toe clips along with a small clip of the tail were preserved in 95% ethanol for future genetic studies.

Non-venomous snakes were weighed and measured and some were marked using scale clips in order to assign a unique number to the individual snake. This procedure was not used consistently due to difficulty in applying this technique on smaller snakes. Venomous snakes were neither handled nor weighed for personnel safety. When captured, the total length of the

rattlesnake was estimated and the number of rattles was noted. All herptiles were released in the area of capture after processing.

Table 1. Minimum measurement cut-off lengths for adult age class determination.

Species	Minimum SVL for adult classification, in millimeters
<i>Sceloporus occidentalis</i>	50
<i>Uta stansburiana</i>	40
<i>Cnemidophorus hyperythrus beldingi</i>	50
<i>Elgaria multicarinata</i>	Determined by collector
<i>Anniella pulchra</i>	Determined by collector

Notiosorex crawfordi captures were processed as quickly as possible in order to reduce stress and facilitate quick release. Measurements including mass, tail length and body length were recorded. Captures were noted as adult and were not sexed. The shrews were also offered a mealworm during processing.

Other small mammals such as rodents were identified to species. Gender, age estimation, tail length, body length, hind foot length, and ear length were also recorded. Any dead or escaped animal was noted along with all other notes in a PalmOne PDA.

The data were transferred from PDA to an Access database and then exported to Excel for analysis. The capture rate of each species was calculated by the number of captures per trapping session. The number of captures per trap type (pitfall vs. funnel trap) was also determined for the species that were captured in both trap types. Captures of each species per array was also determined. The recapture rate (number of individuals recaptured to number of individuals captured for the first time) was calculated for each of the marked species. When age could be determined for *Sceloporus occidentalis*, *Uta stansburiana*, *Elgaria multicarinata*, *Cnemidophorus hyperythrus* (*Aspidoscelis hyperythra*), the number of juveniles and adults were calculated. Recruitment for these species was calculated by dividing the number of unique juveniles of a species captured in 2011 by the number of unique adults of that species captured in 2011.

Weather data were also recorded for the surveys. Weather conditions including temperature, humidity, wind speed, wind direction and gust speed were recorded at the start and end of each survey day from the CABR Visitor's Center weather station located at -117.239493, 32.674827 decimal degrees. HOBO temperature loggers that were placed at Arrays 5, 8 and 15 on the first day of surveys and collected on the last day of the surveys (Appendix A). All weather data from the HOBOS were downloaded using Boxcar software. Monthly total precipitation data were obtained from the Western Regional Climate Center from the San Diego Airport station (located about 6 km from CABR) (Appendix B).

Results

The 2011 herpetofauna monitoring results yielded captures of 32 species including herptiles ($n=11$), small mammals ($n=10$), birds ($n=2$) and invertebrates ($n=9$). Captures were either in the pitfall traps or funnel traps of the 16 arrays. The capture data do not include observations or animals under the coverboards. Those data were included separately as incidental sightings at or near arrays. There were a total of 43 trapping nights throughout the year with 12 trapping sessions (Table 2). The traps were closed early in February, March and April due to expected rain in the forecast. There was only one sampling night in March.

The traps were consistently checked in the same order except February in which the traps were checked in a different order due to trainings on the Navy base (9, 8, 10, 11, 12, 14, 13, 15, 16, 17, and 5). The survey start-times changed throughout the year depending on the sunrise (Table 2). Several traps at Array 10 were closed much of the year due to *L. humile*. Array 18 was only opened seasonally due to the federally endangered plant *Corizantha orcuttiana* which has been detected at the array. The array was operational June to November 2011. *C. orcuttiana* was detected at array 18 on 16 November 2011 beginning to sprout so the array was closed immediately on that day.

The capture rate of each lizard and amphibian species was calculated as the number of captures per trapping night per month (Fig. 3).

Lizards

Five species of lizards were captured during the 2011 herpetofauna surveys: *Sceloporus occidentalis* (SCOC), *Uta stansburiana* (UTST), *Elgaria multicarinata* (ELMU), *Cnemidophorus hyperythrus beldingi* (CNHY), and *Anniella pulchra* (ANPU). *S. occidentalis* accounted for the majority of captures with 54% (Fig. 2).

March had the greatest capture rate of lizards in 2011 (Fig. 3). There was a sudden increase in *S. occidentalis* and *U. stansburiana* followed by a decline in both species in April.

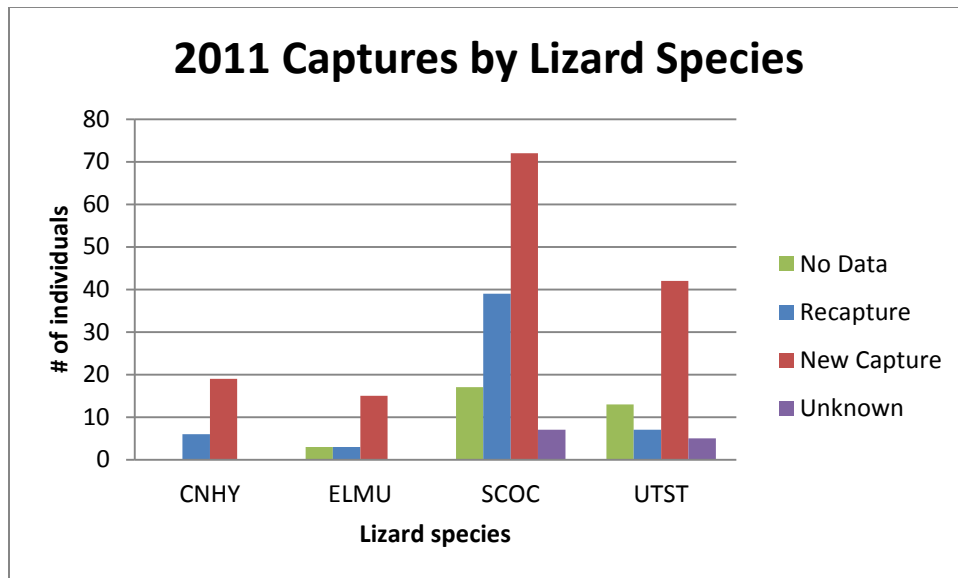


Figure 2. Number of individuals of 4 lizard species captured during 43 trap nights in 2011 at Cabrillo National Monument.

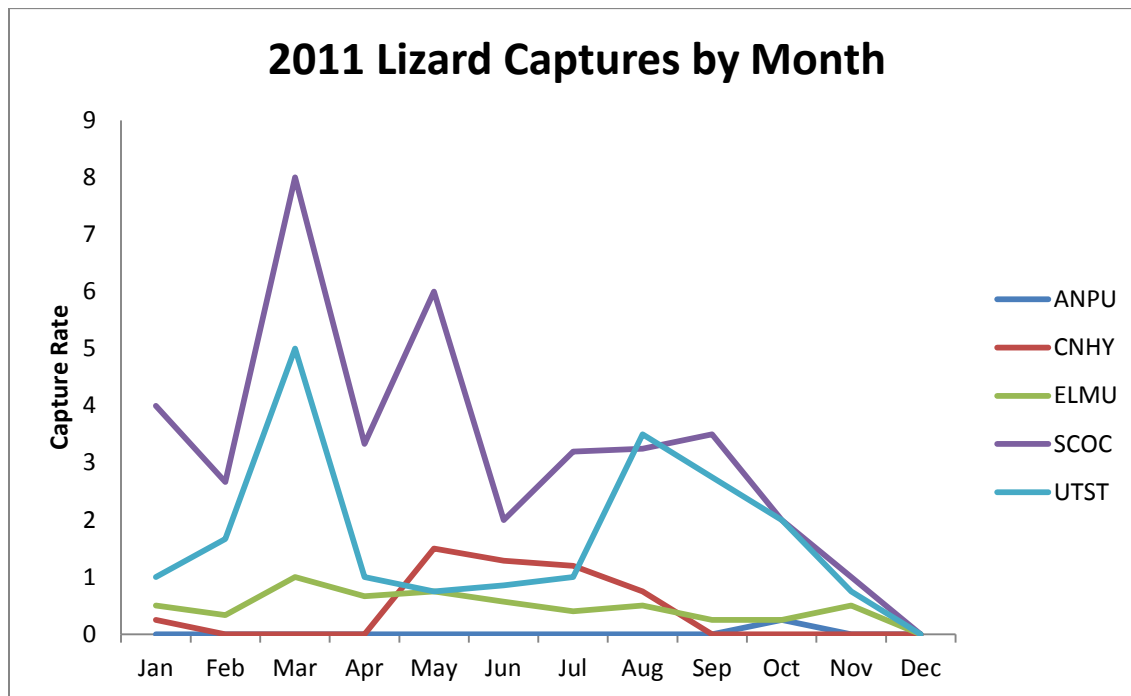


Figure 3. Capture rates of lizard species by month in 2011.

***S. occidentalis* (SCOC):** There were 135 SCOC captures in 2011, of which 72 (53.3%) were new captures and 39 (28.9%) had been previously captured and marked. The peak capture rate occurred in February. SCOC were widespread and were captured at each array in 2011 (78 in pitfall traps and in funnel traps).

In all, there were 7 SCOC were recorded as an “unknown” when small lizards were captured that were too small to mark. Records with unknown capture status were excluded from further analysis.

There were 50 (37%) juvenile captures and 82 (60.7%) adult captures in 2011. We identified 30 unique individual adult SCOC. Of the 50 juveniles that were captured, only 37 unique individuals were of sufficient size to be marked and identified. Eight of the 37 marked juveniles were recaptured throughout the year.

The 2011 recruitment index for SCOC was 1.23 (the number of unique juveniles captured in 2011/number of unique adults captured in 2011).

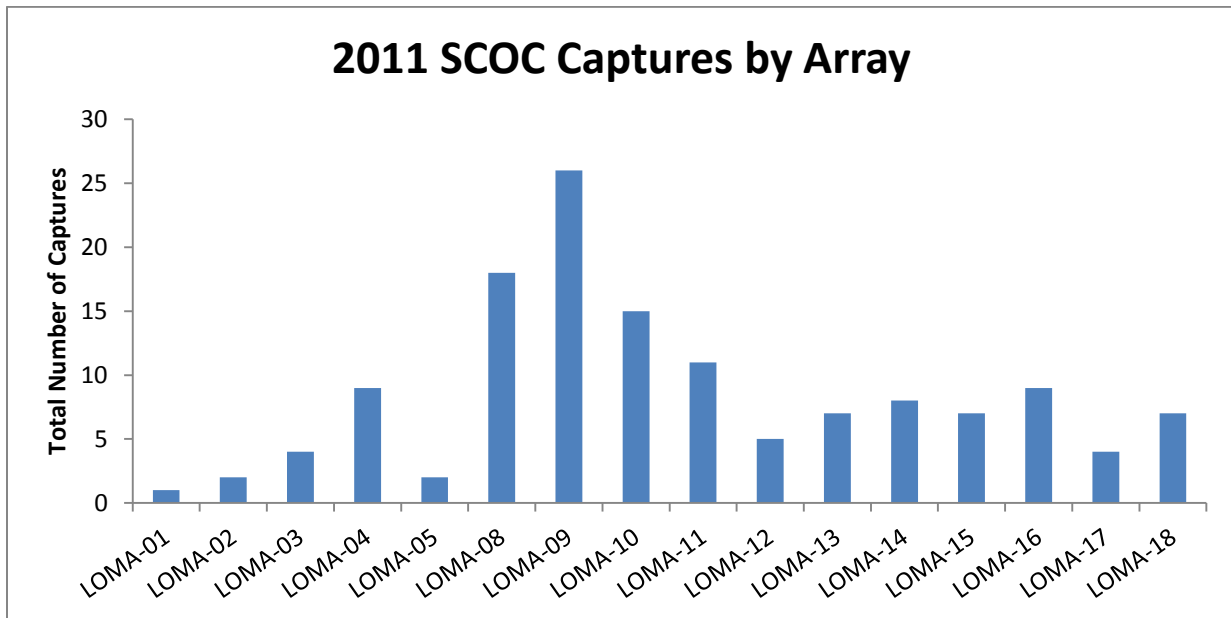


Figure 4. *S. occidentalis* captures by array in 2011.

The greatest number of SCOC captured in 2011 was in late spring, April to June. The greatest number of female captures occurred in May with 11. For adult males, the greatest number of captures occurred in June with 10 captures (Fig. 5).

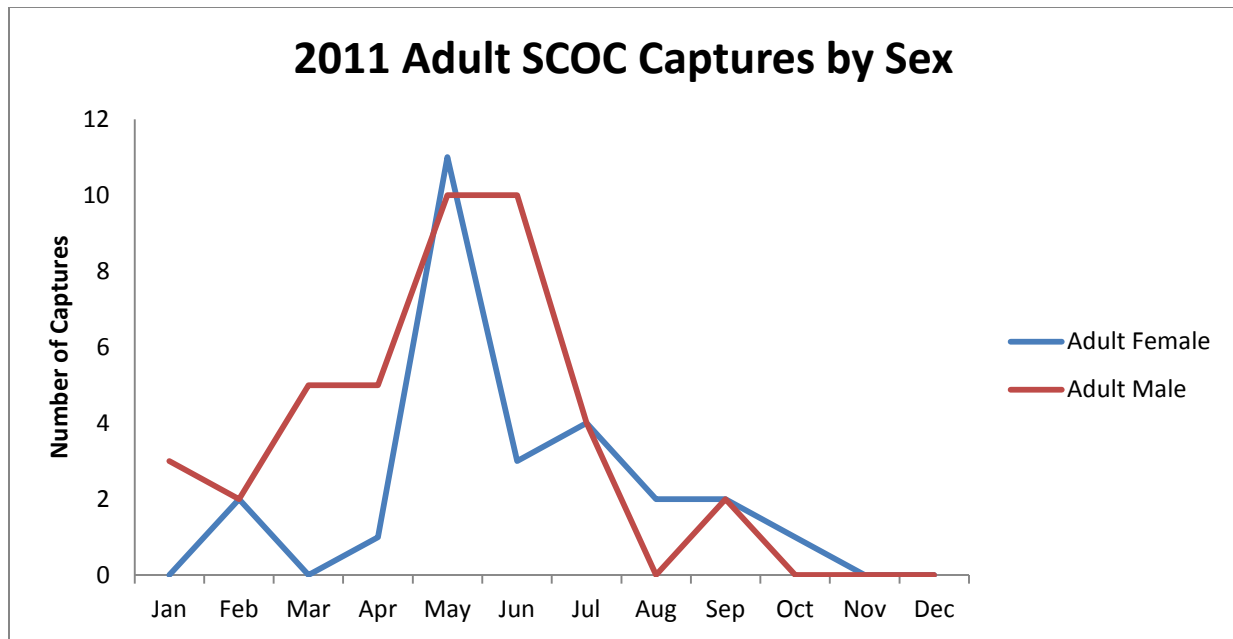


Figure 5. Captures for adult male and female *S. occidentalis* in 2011.

Capture rates for adult and juvenile SCOC are shown in Fig.6. Juvenile captures were greatest in September, with 8 individuals captured (Fig. 6)

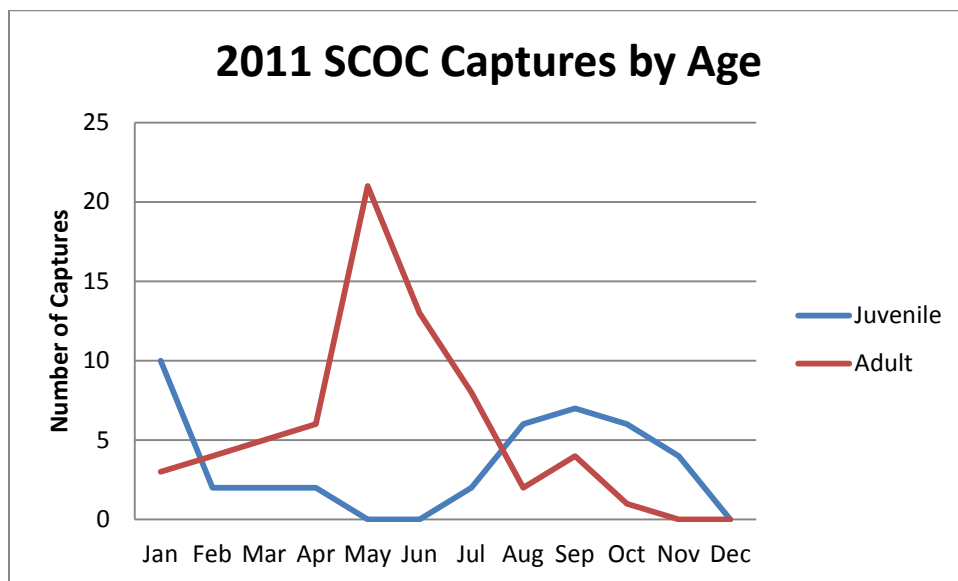


Figure 6. *S. occidentalis* monthly captures of adults and juveniles for 2011.

***Uta stansburiana* (UTST):** In total, there were 67 UTST captures in 2011. Capture rate was greatest in March 2011 at 5.0 UTST per trap night. UTST was captured at 13 of the arrays and were not detected at Array 8, 9, and 12 (Fig 7). The greatest number of captures was at Array 05 with 15 captures. Of the 67 captures, 42 (62.69%) were new captures, 7 were recaptures (10.45%) and 5 had an unknown capture status. The age of UTST was determined using the

length measurements of 40 mm or greater in length for adults; juveniles were determined by having a length less than 40 mm.

In 2011, there were 37 (55.2%) juvenile captures and 29 (43.3%) adult UTST captures. Of the 37 juveniles, 20 were unique individuals with 4 having been recaptured throughout the year. Of the 29 adults, 8 had been captured and marked in previous years and 17 were new captures.

Recruitment was estimated as 1.17 juveniles per adult in 2011 for UTST.

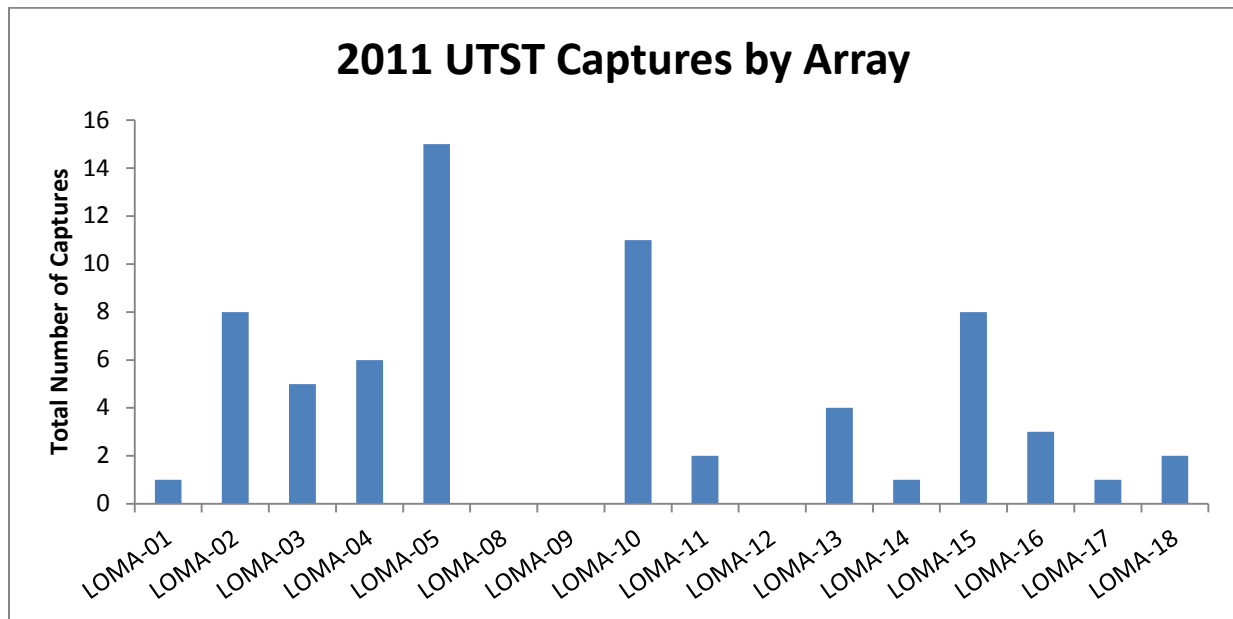


Figure 7. *U. stansburiana* captures by array during CABR 2011 herpetofauna surveys.

Adult UTST captures varied by sex with the greatest number of males captured in March and females in June (Fig. 8).

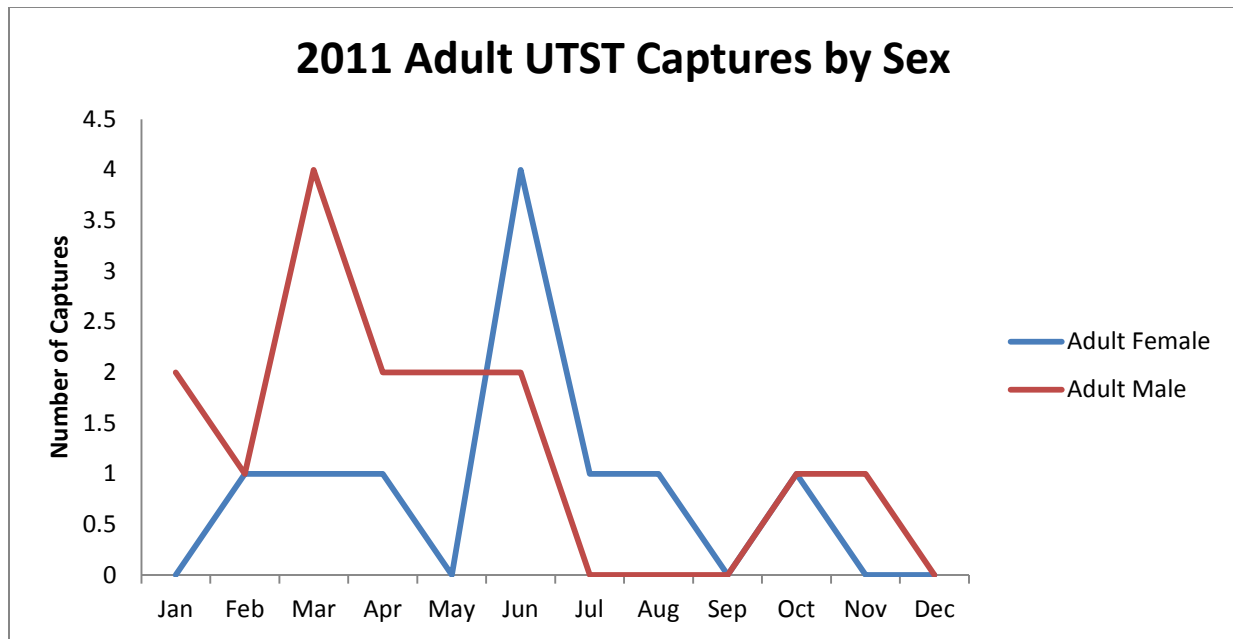


Figure 8. *Uta stansburiana* monthly adult captures for 2011 at CABR.

The number of juvenile UTST compared to adult UTST captured increased in September. There were no juveniles captured February to June 2011. There were 3 captured in September 2011 (Fig. 10).

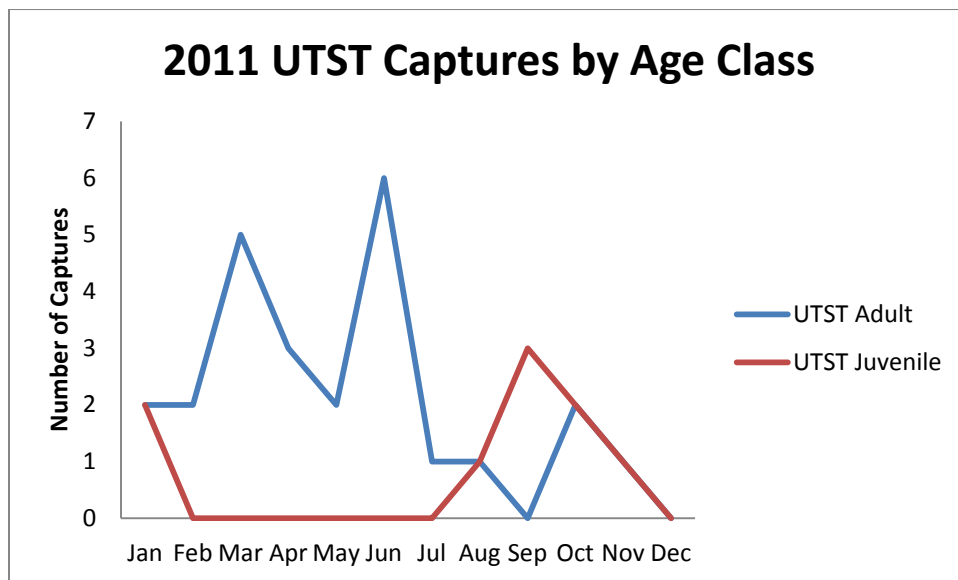


Figure 10. *Uta stansburiana* monthly capture rates by age class for 2011 at CABR.

***Cnemidophorus (Aspidoscelis) hyperythrus* (CNHY):** There were 25 CNHY captured in 2011. There was a sudden increase in captures in May 2011. CNHY were not detected at any of the arrays located on SPAWAR property just north of the wastewater treatment plant, and was also not detected at Array 15 (Fig. 11).

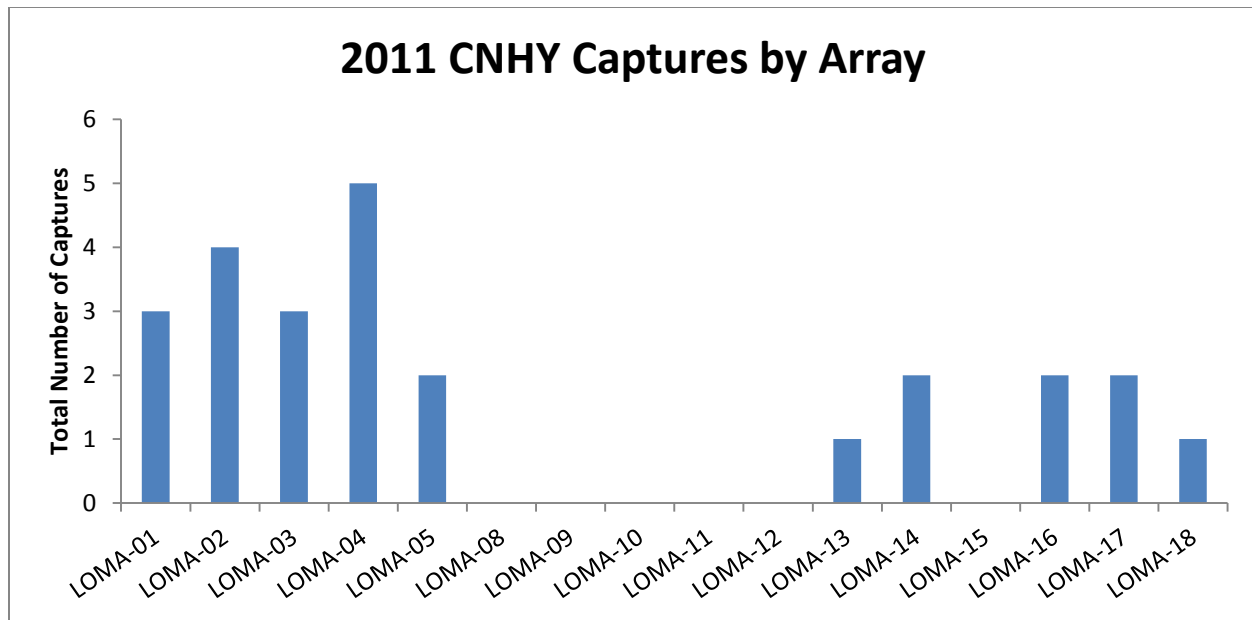


Figure 11. *A. hyperythrus* captures by array in 2011.

Of the CNHY captured in 2011, 76% were new captures and 24% had previously been captured and marked. There were no juvenile CNHY captured in the traps in 2011. All were recorded as adults using 50 mm length as the cut-off for juvenile/adult determination.

One CNHY captured had enlarged, hardened, and possibly keratinized areas on the distal portion of the left front toes. This lizard was marked as CNHY4201. Photographs were taken for documentation (Appendix C). A tissue sample was sent to NPS veterinarians and University of Colorado Veterinary School Pathology Department for analysis. Results were negative of any findings (Appendix D).

***E. multicarinata* (ELMU):** In total, there were 21 ELMU captures in 2011, and all were classified as adult. This species was present at 11 arrays and absent from arrays 5, 11, 17 and 18 (Fig. 12). Of the 21 adults captured, 15 of them were unique individuals. One ELMU was marked in 2011 and captured a second time in 2011. Of the 15 unique adults, three had been captured and marked in previous years and 13 were captured for the first time in 2011.

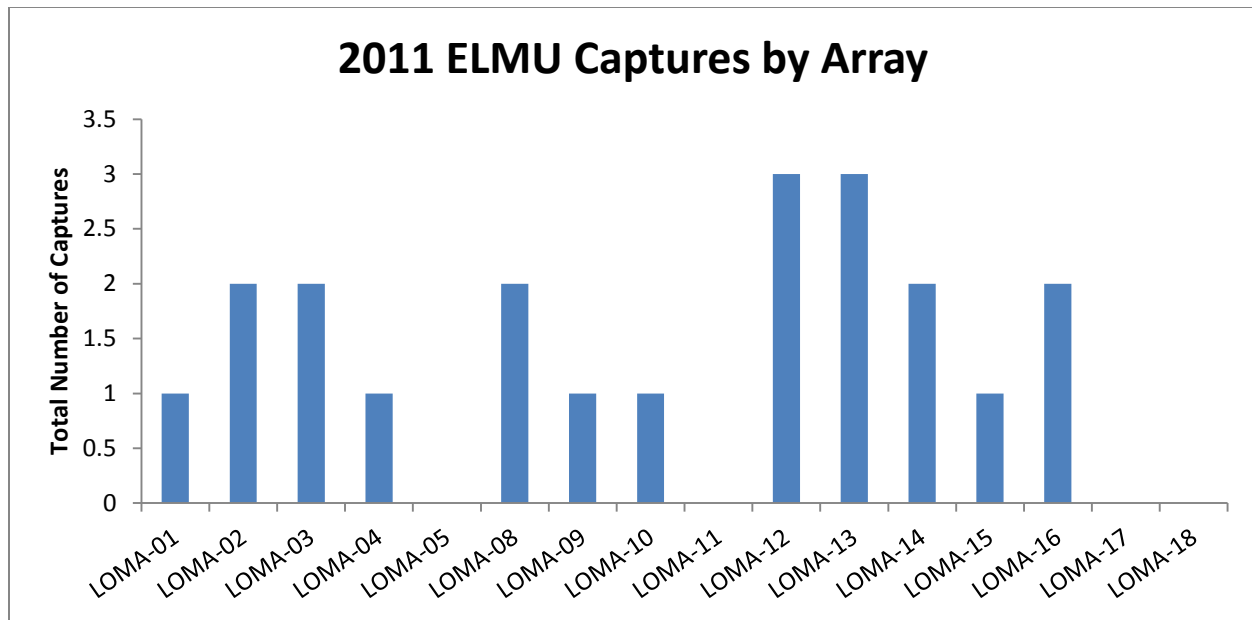


Figure 12. *E. multicarinata* captures by array in 2011.

***A. pulchra* (ANPU):** We captured one ANPU in 2011 in trap 03-1B on 18 October 2011. It measured 125 millimeters SVL and weighed 2.3 grams. Photos were taken for documentation (Appendix C).

Snakes

There were ten snakes comprised of five species captured in 2011. Three snakes were captured in the pitfall traps and seven were in funnel traps (Fig. 13). The snakes were captured at arrays 2, 3, 8, 9, 13, 15, and 16 (Fig. 14). The captures consisted of: *Lampropeltus getula* ($n=3$), *M. lateralis* ($n=3$), *P. melanoleucas* ($n=1$), *C. viridis* ($n=2$) and *H. torquata* ($n=1$) captured in 2011. The only species that was not captured in the traps in 2011 was *D. punctatus* which was detected during the 2010 surveys. Three *M. lateralis* were observed under coverboards in 2011, but these snakes were not captured.

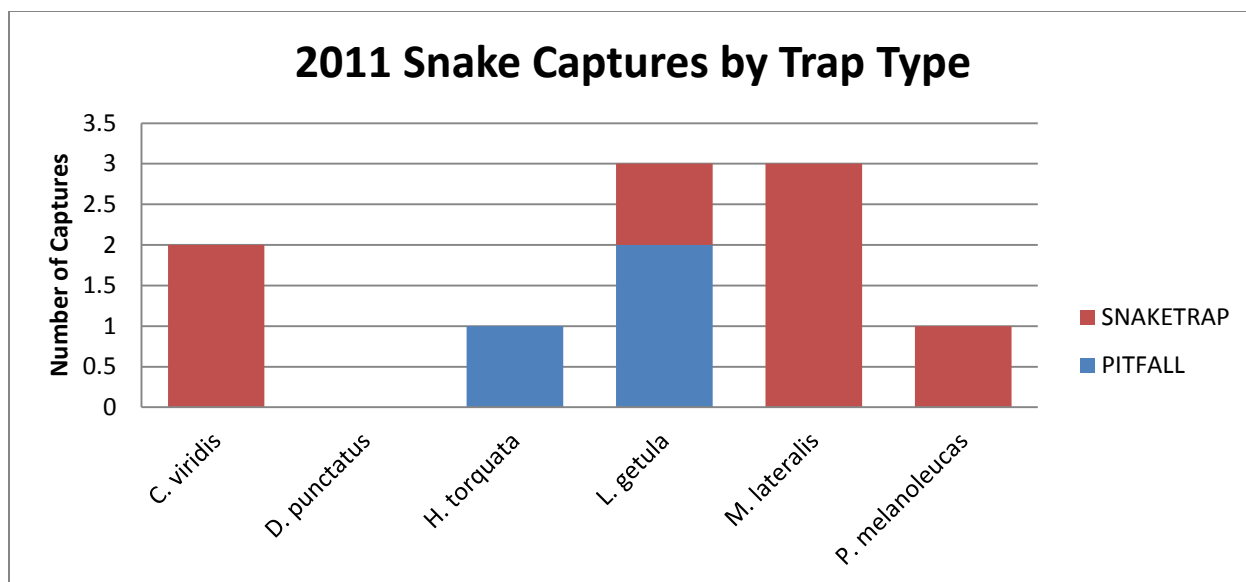


Figure 13. Snake captures and trap type in 2011.

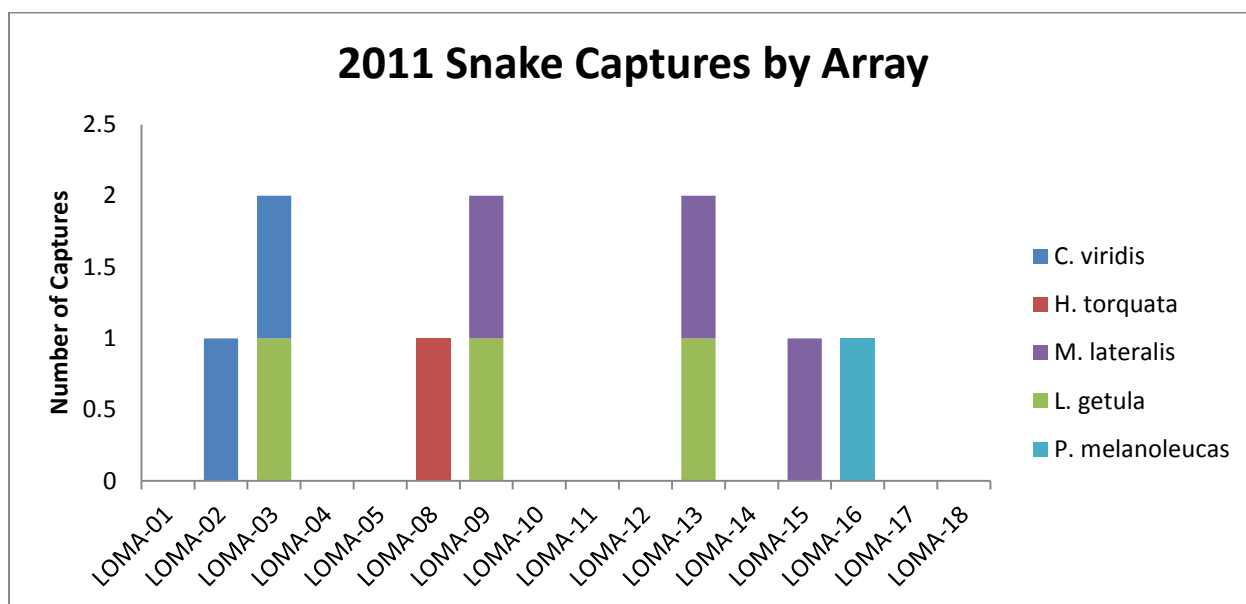


Figure 14. Snake captures by array in 2011.

Amphibians

***B. major (pacificus)* (BAPA):** The salamander captures are seasonal with the winter months having the greatest captures (October-February), however, there were BAPA captures in April (Fig. 15). The location of the arrays including the surrounding vegetation and soils may play a role in salamander captures by array. In all, 90% of the salamander captures were at arrays associated with maritime succulent scrub while the remaining 10% were in southern maritime chaparral (Table 4). BAPA was captured at arrays 1, 2, 5, 9, 11, 12, and 16 (Fig. 16).

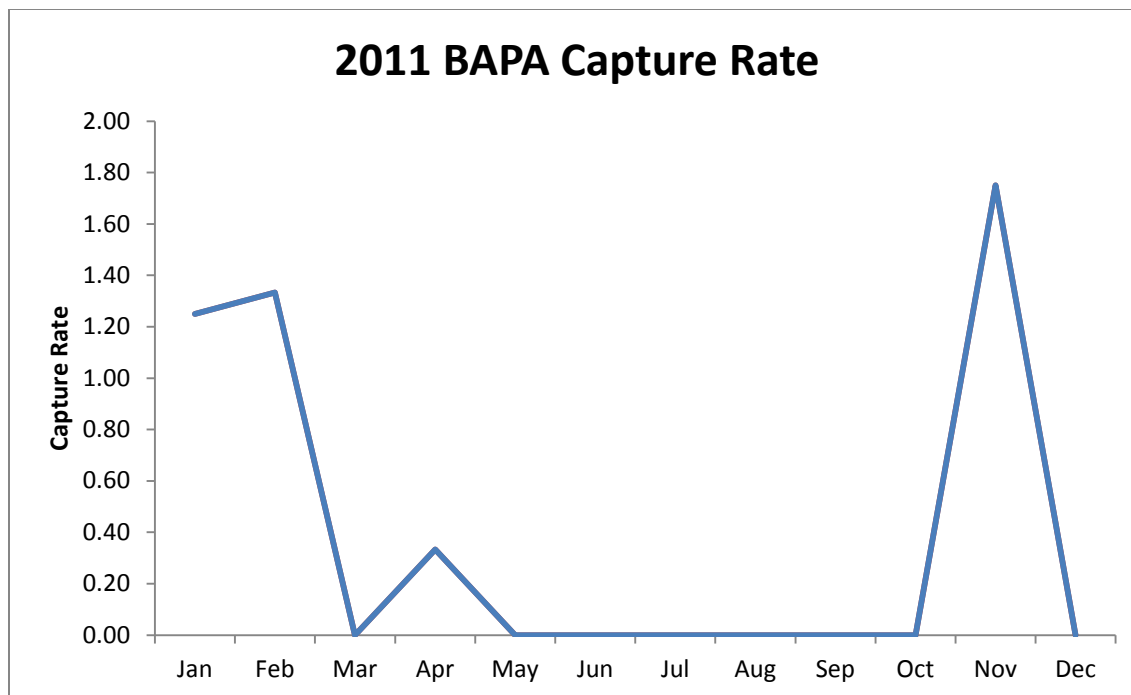


Figure 15. *B. major* capture rates in 2011.

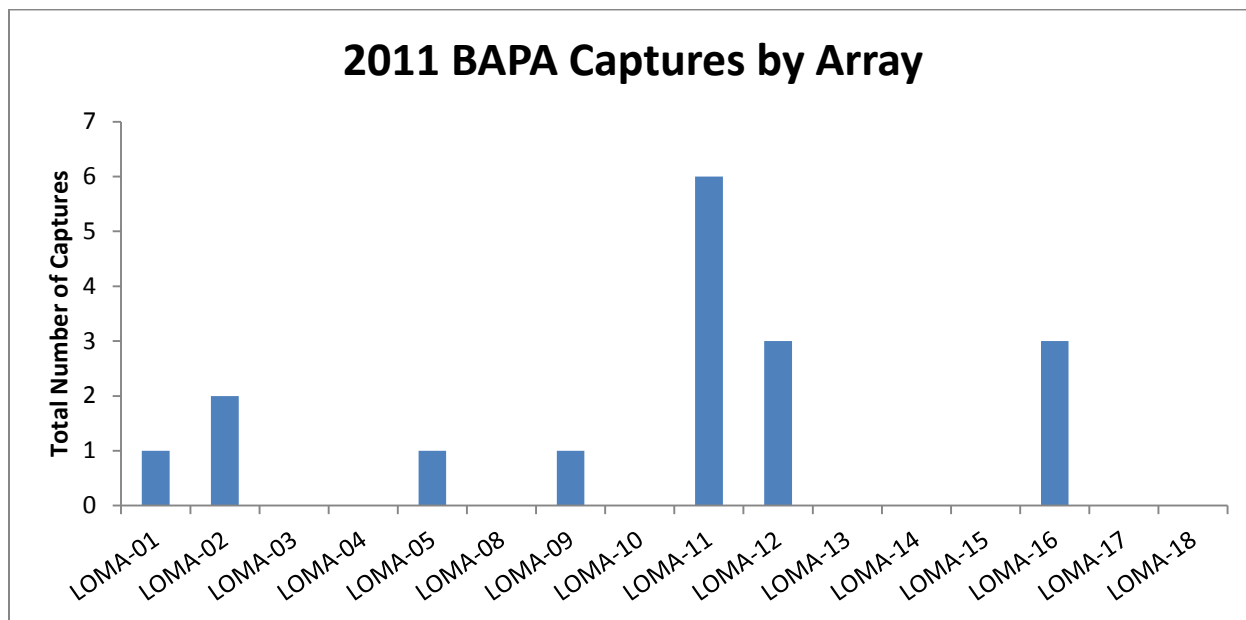


Figure 16. Arrays where *B. major* were captured in 2011.

Small Mammals

***N. crawfordi* (NOCR):** There were 192 NOCR captured in the traps in 2011. Two of the captures were in funnel traps while the remaining 190 were captured in the pitfall traps. NOCR were captured during every trapping session with the highest capture rate in June (7.71 NOCR captured per trap night). The cooler months of January and November had the lowest capture rates of the year; Fig. 17). NOCR was detected at every array in 2011 (Fig. 18). The mortality rate was very high this year with 42.2% ($n=81$). There was no information regarding condition of 7 individuals. Mealworms were placed in the traps beginning in June in order to reduce mortality. There was also a higher survival rate in June possibly due to the addition of mealworms (Fig.19 and 20). Shrew mortality increased throughout the survey day according to the order in which the traps were checked (Fig. 21). There was a higher survival for those that were in traps checked early in the morning.

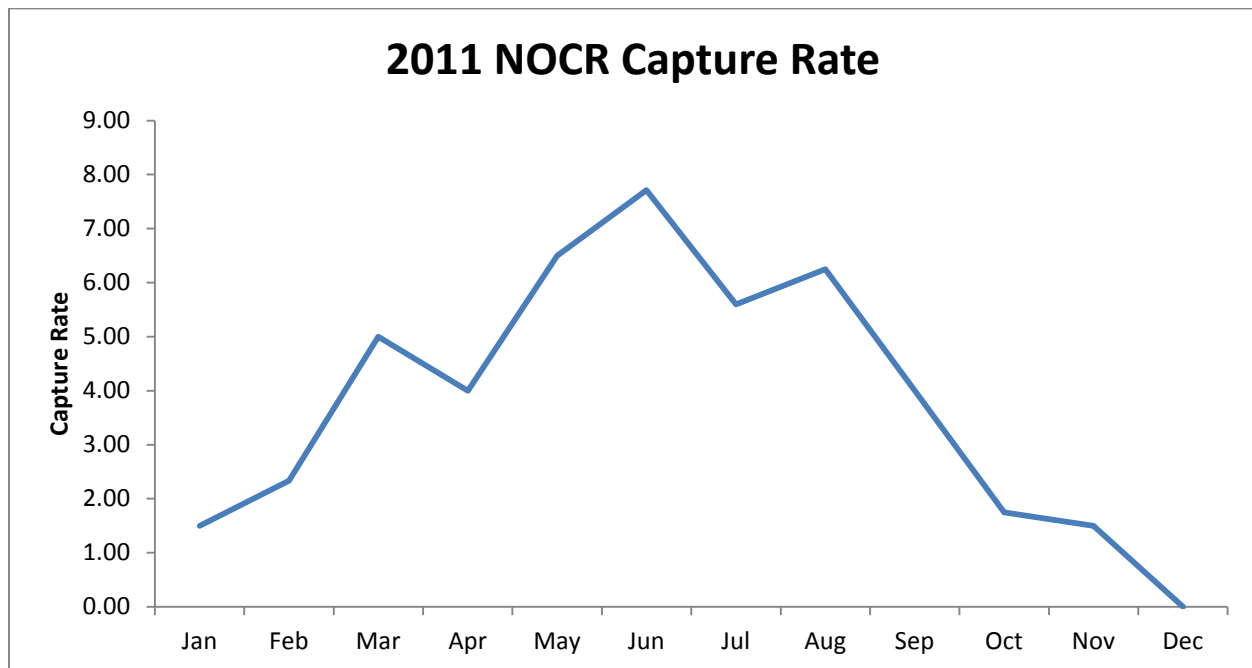


Figure 17. *N. crawfordi* capture rate by month in 2011.

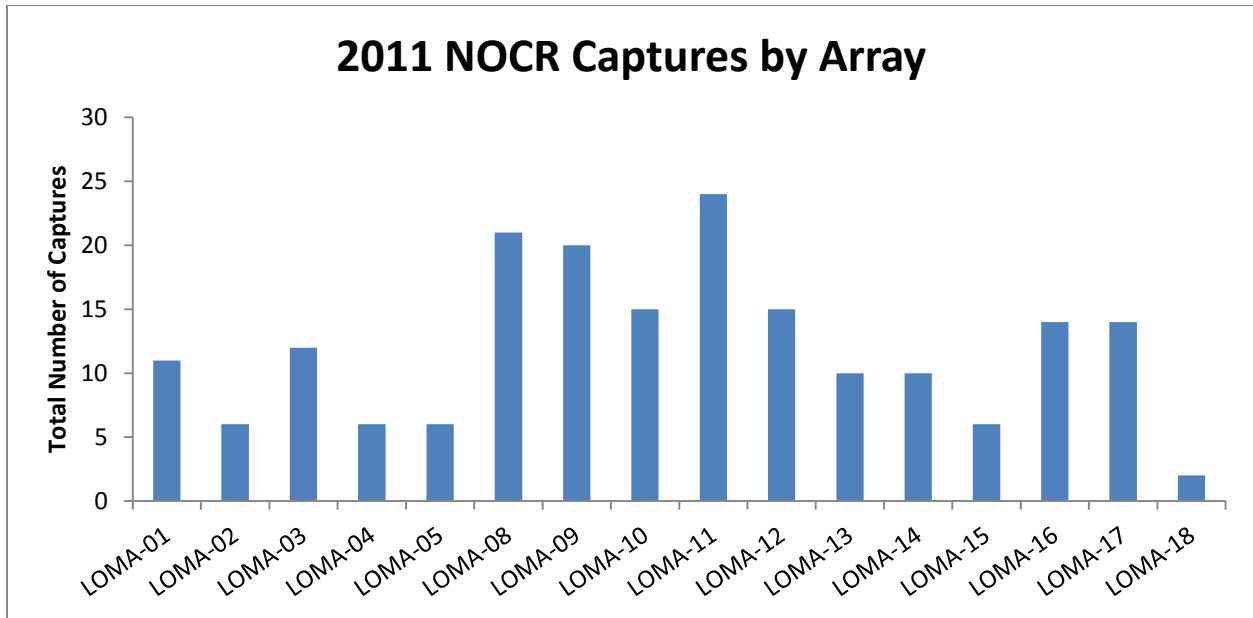


Figure 18. *N. crawfordi* captures per array in 2011.

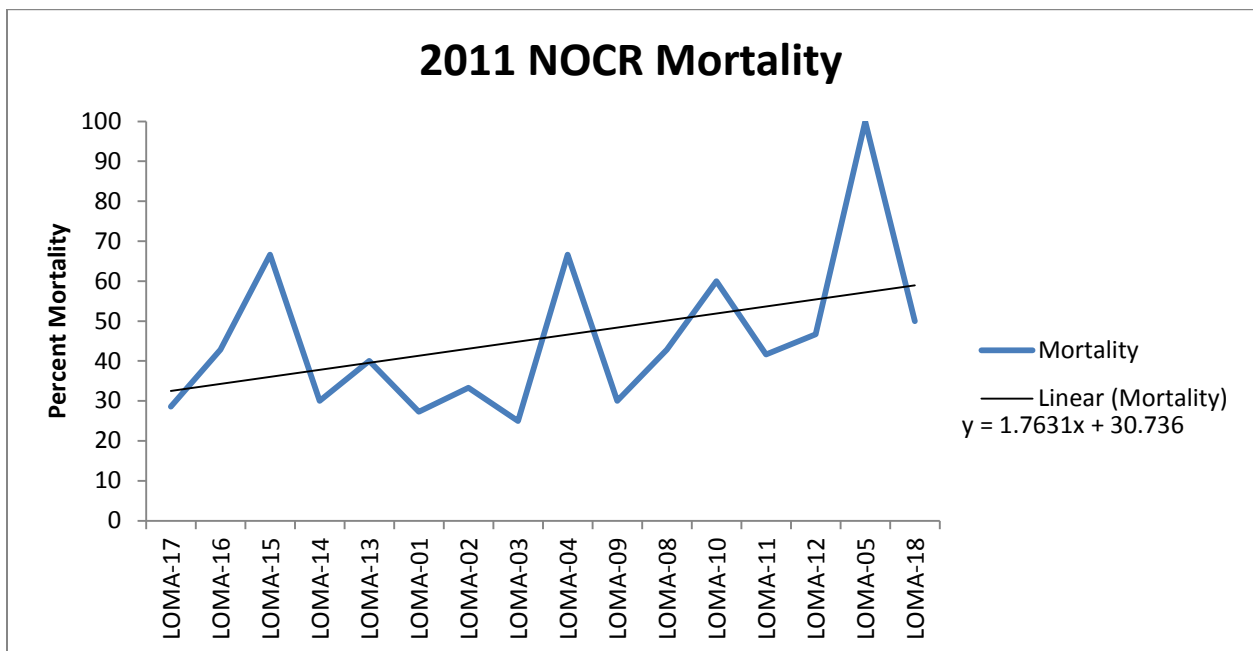


Figure 19. *N. crawfordi* mortality rate through the survey day in 2011.

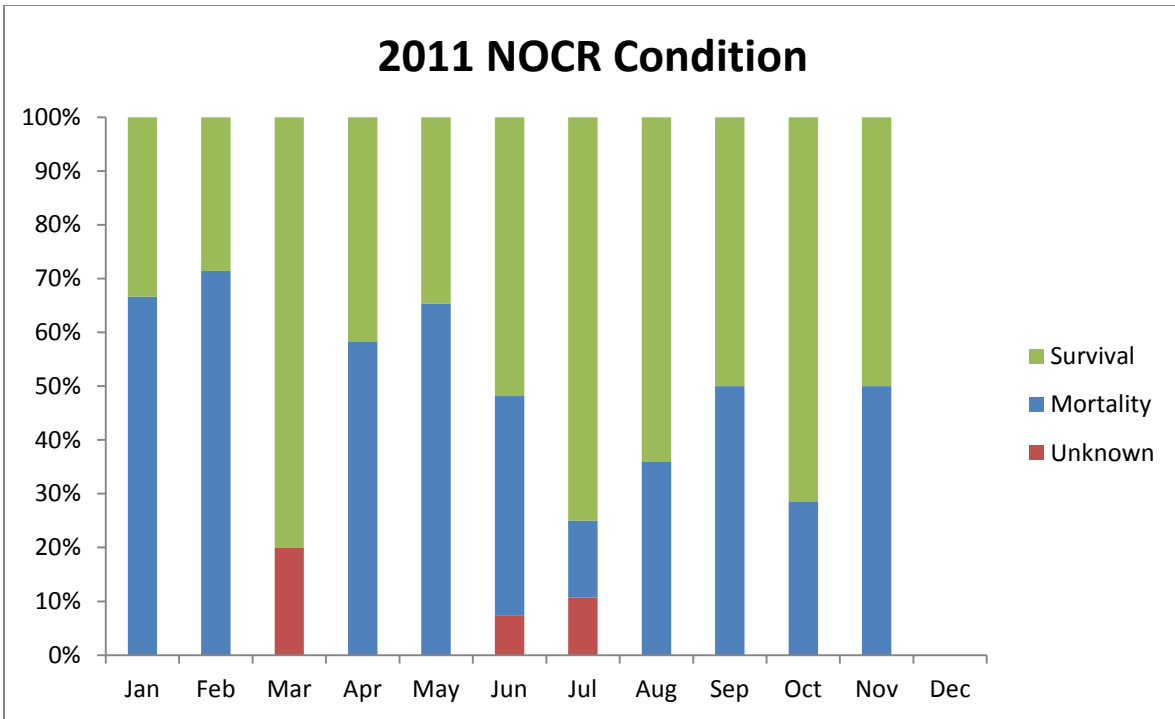


Figure 20. *N. crawfordi* condition in 2011.

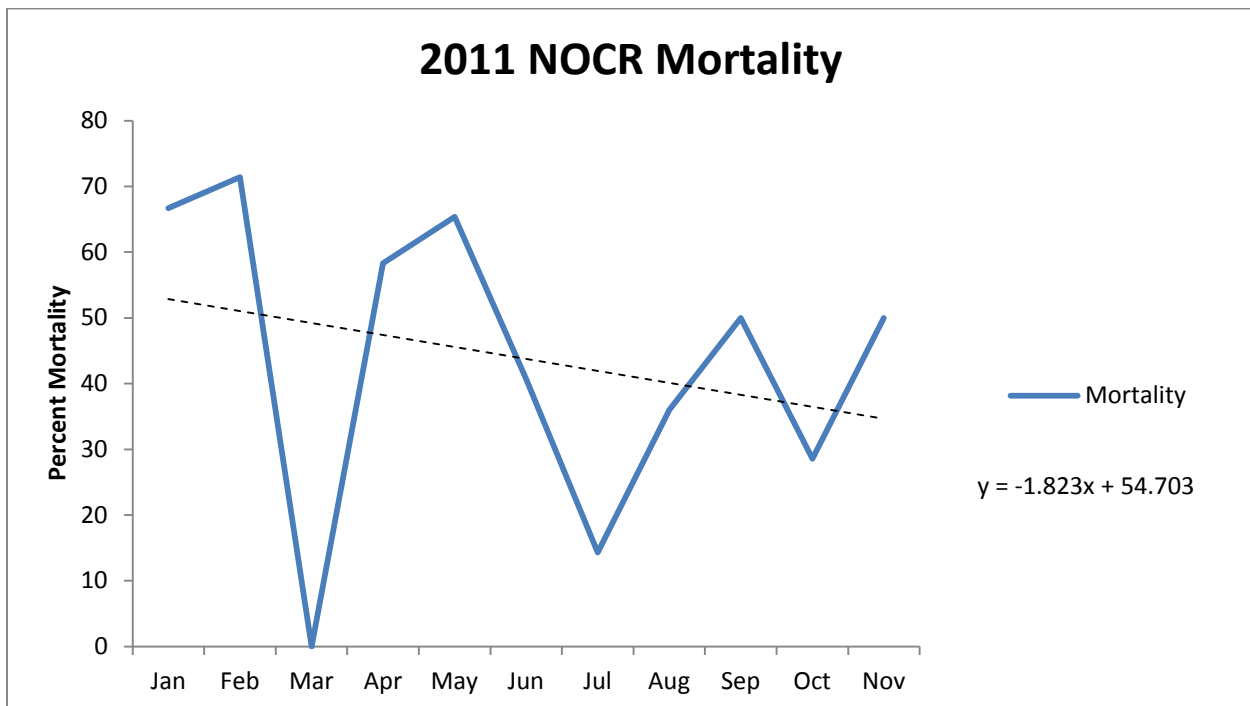


Figure 21. *N. crawfordi* mortality decreases throughout the year in 2011.

Rodents: Rodents that were captured in the traps included *Reithrodontomys megalotis* (n=54), *Peromyscus eremicus* (n=9), *P. maniculatus* (n=1), 1 *Chaetodipus fallax*, 1 unknown *Chaetodopus* sp., unknown *Peromyscus* sp. (n=4), and *Neotoma lepida* (n=3). The mice that were identified to species but to genus (*Peromyscus* or *Chaetodipus*) were noted as such because the animals escaped before processing. None of the rodents were marked and recaptures were not identified, therefore recapture rate could not be determined. *Neotoma fuscipes* and *Microtus californicus* were not captured in 2011.

For the *N. lepida* captures, one was dead in the trap due to cold temperatures that trap night, one escaped while removing it from a funnel trap and the last one was a juvenile captured in a pitfall trap.

Other captures: Other animals captured in the traps included California quail chicks, Bewick's wren, tarantulas, trapdoor spiders, sunspiders, scorpions, Jerusalem crickets, millipedes, centipedes, grubs, and caterpillars.

The trapdoor spiders of genus *Aptostichus* were documented as *Aptostichus* spp. in the notes beginning in August 2011. This genus had been captured previously in the year but not identified until July 2011. From Aug-Nov, this species was documented as trapdoor spider in the PDA with a side-note regarding the genus.

Array 18 was only operated June to Nov 2011 due to the presence of *Corizanthus oregonensis*. This federally endangered plant was detected on the third day of sampling in November and closure immediately followed that same day. Array 10 had a high infestation of Argentine ants (*Linepithema humile*) which forced closure of many of the traps at that array throughout the year. These traps typically experience the greatest ant infestation during summer months.

Temperature: The temperature varied with the maximum and minimum temperatures between 3.74°C and 36.13°C, both at Array 5, which were the temperature extremes and an average of 17.38°C at all 3 arrays (Arrays 5, 8 and 15). In January 2011, there were two readings which were extremely high from the norm with readings of 43.32 and 44.89 at Array 5. These extreme temperatures were anomalies in the data so were removed from the max and average temperatures. In April and June (1), the HOBO at 8 malfunctioned and did not record data. In July and August, the HOBO at Array 5 did not record data.

Precipitation: The annual rainfall as reported from the Western Regional Climate Center was 9.08 inches of rain for 2011. Zero precipitation was recorded for July and August 2011 with November having the greatest amount of precipitation at 3.12 inches of rain.

Table 2. Herptile and small mammal species list and 2011 captures.

Scientific Name	Species Code	Common Name	Number of Captures
Amphibian			
<i>Batrachoseps major</i>	BAPA	Pacific Garden slender salamander	20
Reptiles			
<i>Anniella pulchra</i>	ANPU	Legless lizard	1
<i>Cnemidophorus hyperythrus</i>	CNHY	Orange-throated whiptail	25
<i>Elgaria multicarinata</i>	ELMU	Southern alligator lizard	18
<i>Sceloporus occidentalis</i>	SCOC	Western fence lizard	113
<i>Uta stansburiana</i>	UTST	Side-blotched lizard	53
<i>Crotalus viridis</i>	CRVI	Southern Pacific rattlesnake	2
<i>Diadophis punctatus</i>	DIPU	Ring-necked snake	0
<i>Hypsiglena torquata</i>	HYTO	Night snake	1
<i>Lampropeltis getula</i>	LAGE	California kingsnake	1
<i>Masticophis lateralis</i>	MALA	Striped racer	3
<i>Pituophis catenifer</i>	PIME	Gopher snake	1
Mammals			
<i>Notiosorex crawfordi</i>	NOCR	Desert shrew	193
<i>Chaetodipus fallax</i>	CHFA	San Diego pocketmouse	1
<i>Microtus californicus</i>	MICA	California vole	0
<i>Peromyscus californicus</i>	PECA	California mouse	0
<i>Peromyscus eremicus</i>	PEER	Cactus mouse	9
<i>Peromyscus maniculatus</i>	PEMA	Deer mouse	8
<i>Peromyscus</i> species	PESP	<i>Peromyscus</i> species	4
<i>Reithrodontomys megalotis</i>	REME	Western harvest mouse	54
<i>Neotoma lepida</i>	NELE	Desert woodrat	3
<i>Neotoma fuscipes</i>	NEFU	Dusky-footed woodrat	0

Table 3. Trapping sessions for 2011 CABR herpetofauna surveys including the dates and start times.

2011 Trapping Session	Date Opened	Date Closed	Survey Start Time	Number of trap nights
1 (Jan)	10 Jan 2011	14 Jan 2011	07:30	4
2 (Feb)	22 Feb 2011	25 Feb 2011	07:30	3
3 (Mar)	22 Mar 2011	23 Mar 2011	07:30	1
4 (Apr)	4 Apr 2011	7 Apr 2011	07:30	3
5 (May)	9 May 2011	13 May 2011	07:30	4
6 (Jun1)	6 Jun 2011	10 Jun 2011	07:30	4
7 (Jun2)	27 Jun 2011	1 Jul 2011	07:30	4
8 (Jul)	25 Jul 2011	29 Jul 2011	06:30	4
9 (Aug)	15 Aug 2011	19 Aug 2011	06:30	4
10 (Sep)	12 Sep 2011	16 Sep 2011	07:00	4
11 (Oct)	17 Oct 2011	21 Oct 2011	07:00	4
12 (Nov)	14 Nov 2011	18 Nov 2011	07:00	4
TOTAL # Trap Nights				43

Table 4. 2011 Cabrillo herpetofauna array information. MSS:maritime succulent scrub, DIS: disturbed, SMC: southern maritime chaparral. (Arrays were checked in a different order in February 2011).

Site Name	Habitat	UTM Easting	UTM Northing	Elevation (m)	Order Checked
LOMA-01	MSS	476784	3616177	26	6 (6)
LOMA-02	MSS	477081	3614952	22	7 (7)
LOMA-03	MSS	477296	3614404	22	8 (8)
LOMA-04	MSS	477280	3614528	33	9 (9)
LOMA-05	SMC	477224	3617604	83	15 (15)
LOMA-06	SMC	477181	3617569	82	CLOSED
LOMA-07	SMC	477169	3617491	90	CLOSED
LOMA-08	MSS	476247	3618441	33	11 (2)
LOMA-09	MSS	477117	3615177	42	10 (1)
LOMA-10	DIS	476221	3618694	35	12 (3)
LOMA-11	MSS	476808	3616292	37	13 (4)
LOMA-12	MSS	476769	3616260	31	14 (5)
LOMA-13	MSS	477389	3614716	109	5 (11)
LOMA-14	MSS	477375	3614750	113	4 (10)
LOMA-15	MSS	477677	3614610	54	3 (12)
LOMA-16	MSS	477682	3614669	55	2 (13)
LOMA-17	MSS	477735	3615295	37	1 (14)
LOMA-18	SMC	477241	3617695	75	16 (16)

Discussion

The results of the 2011 herpetofauna surveys at Cabrillo National Monument yielded captures of 11 out of 12 known herptile species of the Point Loma Peninsula. The only herptile species not detected this year was *Diadophis punctatus*. *D. punctatus* was detected 3 times during the 2010 herpetofauna surveys (two captures and one observed along the trail to Array 05). Of the small mammals, *Microtus californicus*, *Neotoma lepida* and *Peromyscus californicus* were not captured in the traps but had been detected in 2011 or subsequent years. *P. californicus* was observed and recorded in and around the park by park staff during 2011. *M. californicus* has not been detected since 2007 according to park records.

The majority of *B. major* captures were at arrays that are dominated by maritime succulent scrub vegetation, which suggests that it is primary habitat for the species. The MSS vegetation community is already protected in CABR, but should also be protected elsewhere to conserve salamander populations within CABR and PLECA.

The capture rates of the *S. occidentalis* and *U. stansburiana* increased in March; however there was only one sampling night due to weather conditions, and capture rates are usually higher on the first night of trapping. Further investigation could remove the possibility of an error with these results. The variation in captures of the adult SCOC and UTST is important for management of these species to determine movement of the males and females as well as when the juveniles were captured. In *S. occidentalis*, the females seem to be active earlier than the males but conversely with *U. stansburiana*. The phenology of the juvenile captures of each species should be noted to determine if any significant changes are occurring over time, especially when climatic factors are considered.

C. hyperythrus beldingi, a subspecies of whiptail that is found at CABR, is a species of special concern in California. The lack of CNHY captures at some arrays is alarming since the species was not detected in arrays 8-12 in 2011 but had been captured at these arrays in the past. Furthermore, there was no recorded recruitment for this species in 2011. CNHY should be monitored in the future to include species-specific surveys to record presence or absence at these sites. Management of invasive plants and/or Argentine ants may increase the quality of habitat for CNHY in these areas and should be considered if the trend remains negative. Due to the conservation status of this subspecies, attention should be given to monitoring this species for significant changes in capture rates and/or occupancy.

A. pulchra has been captured 9 times from 1995 to 2011. It is not unusual to have a low number of captures ($n=1$) since the species is fossorial and difficult to detect using pitfall traps.

Snake captures were lower this year as compared to previous years. There are several factors that could affect the snake captures including changes in precipitation, which can lead to changes in prey and predator abundance. There were many snake sightings and road mortalities this year especially during May to July. *M. lateralis* had the greatest road mortality of the snakes that were observed dead on the roads in 2011 within the park. This could be a result of an increase in vehicle traffic or an increase in the snakes movement and use of roads.

Mortality of *N. crawfordi* appeared to increase throughout the survey day. It may be useful to change the order of the arrays sampled in order to reduce negative impacts on the shrew community near arrays 5 and 18.

The NOCR mortality decreased during the year, possibly due to the addition of meal worms in the traps beginning June 2011. This trend should be monitored over several years.

Rodent populations fluctuate annually and can be influenced by precipitation. CABR did have a particularly wet season in 2010 and 2011 which could be responsible for the increased rodent captures in 2011.

The number of *Neotoma lepida* captures is low in the pitfall traps and funnel traps. Their size and jumping ability may prevent captures in these traps or allow for easy escape. The trapping methods used in this protocol are not effective for capturing *N. lepida* or other large rodents. Even though the number of captures was low, there is a lot of evidence that they use the areas near many of the arrays and surrounding areas. Scat is often found near the traps as well as other signs such as middens that have been identified as NELE. NELE typically like to live near cacti and are found around Shaw's agave and *Opuntia spp.* both of which can be a source of food and shelter for this species of woodrat.

There have been 75 captures of *Microtus californicus* from 1995 to 2007 but none have been detected in the traps since 2007. This species can fluctuate annually with resource availability but since the species has not been detected since 2007, further surveys should be conducted in the future.

Aptostichus cabrillo, a species of trapdoor spider endemic to Point Loma, was captured during the herpetofauna surveys. Given its unique status, captures of this species should be monitored in the future.

Argentine ants should be managed to protect the plants and animals in the Coastal Sage Scrub habitat. This species is an exotic and invasive species which increase morbidity and mortality among native species. Plans to remove this species would benefit the native flora and fauna.

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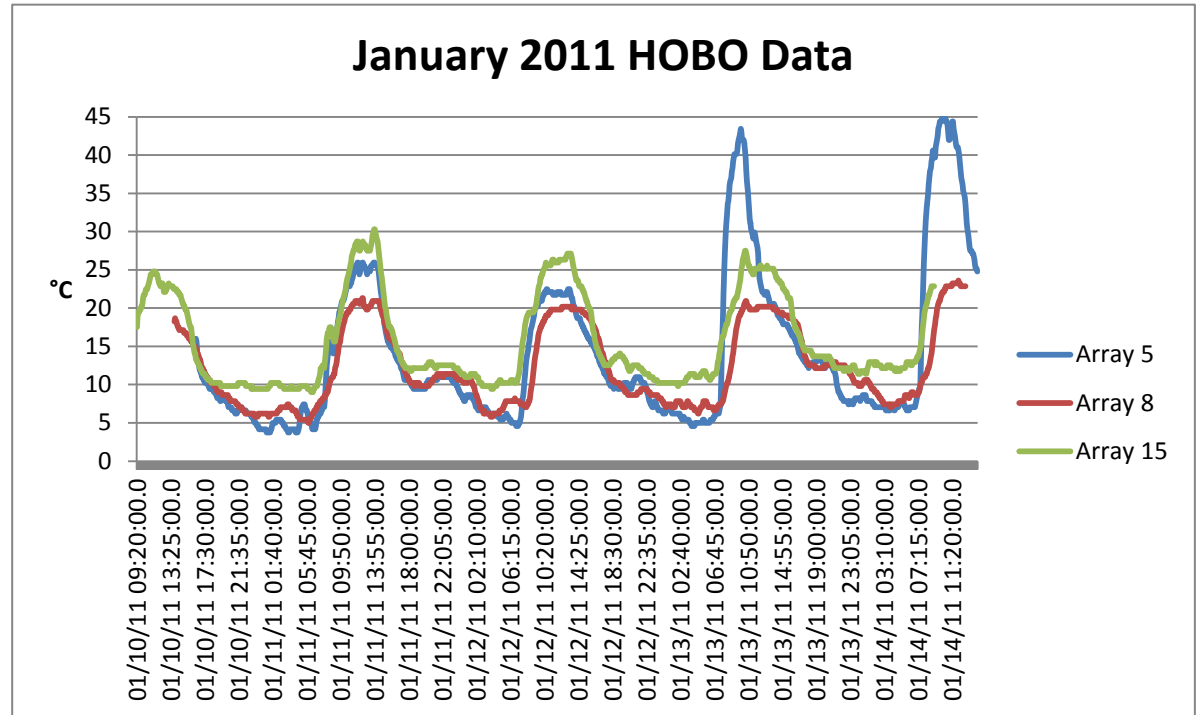
Appendix A: Weather Data from HOBO units

January 2011

HOBO data 10-14 January 2011. The spike in temperature for Array 5 was an anomaly.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	44.89	23.63	30.31
Minimum	3.74	4.99	9.03
Average	14.10	12.26	15.56



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
1/10/2011	16.00	18.66	24.79
1/11/2011	25.95	21.33	30.31
1/12/2011	22.48	20.19	27.12
1/13/2011	43.42	20.95	27.52
1/14/2011	44.89	23.63	22.86

Min	Array 5	Array 8	Array 15
1/10/2011	6.62	5.81	9.42
1/11/2011	3.74	4.99	9.03
1/12/2011	4.57	5.81	9.42
1/13/2011	4.57	6.22	9.82
1/14/2011	6.62	7.03	11.38

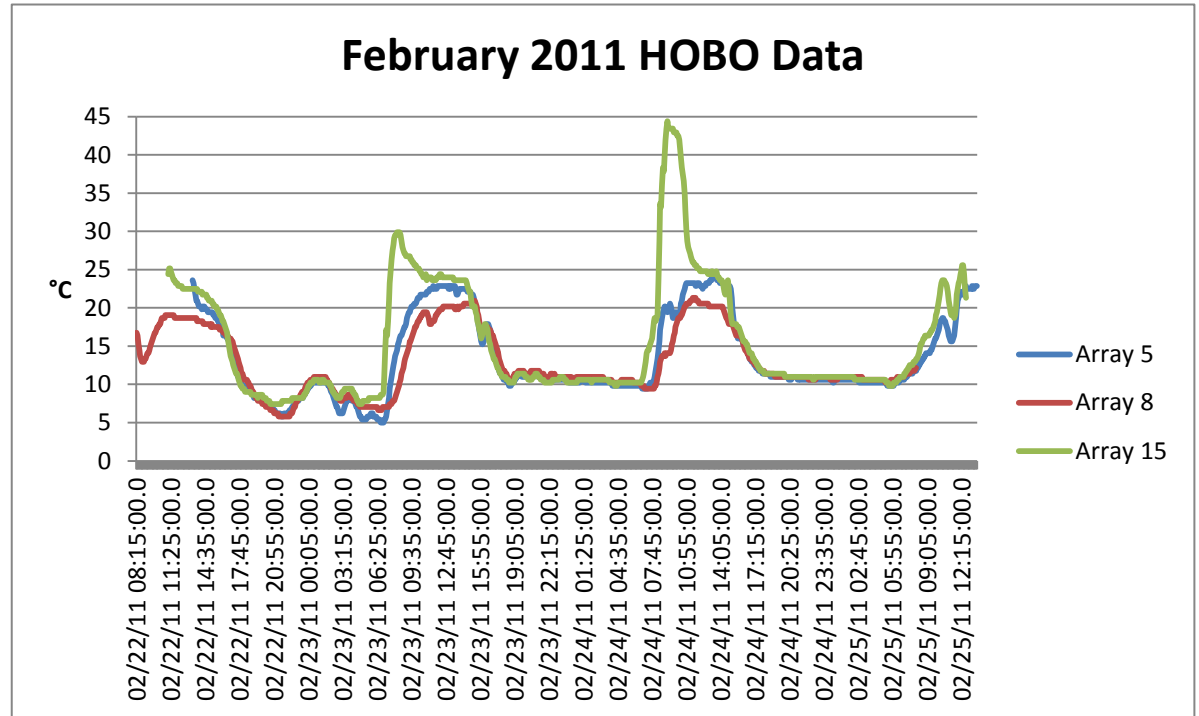
Average	Array 5	Array 8	Array 15
1/10/2011	8.11	10.80	15.70
1/11/2011	12.30	11.84	15.32
1/12/2011	12.28	12.13	15.76
1/13/2011	15.38	12.98	16.17
1/14/2011	21.16	13.08	13.88

February 2011

HOBO data for 22-25 February 2011. The spike in temperature at Array 15 was an anomaly.
The survey ended early due to poor weather conditions.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	24.01	21.33	44.40
Minimum	4.99	5.81	7.43
Average	13.45	12.96	15.55



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
2/22/2011	23.63	19.04	25.17
2/23/2011	22.86	20.95	29.9
2/24/2011	24.01	21.33	44.4
2/25/2011	22.86	12.16	25.56

Min	Array 5	Array 8	Array 15
2/22/2011	5.81	5.81	7.43
2/23/2011	4.99	6.62	7.43
2/24/2011	9.42	9.42	9.82
2/25/2011	9.82	10.21	9.82

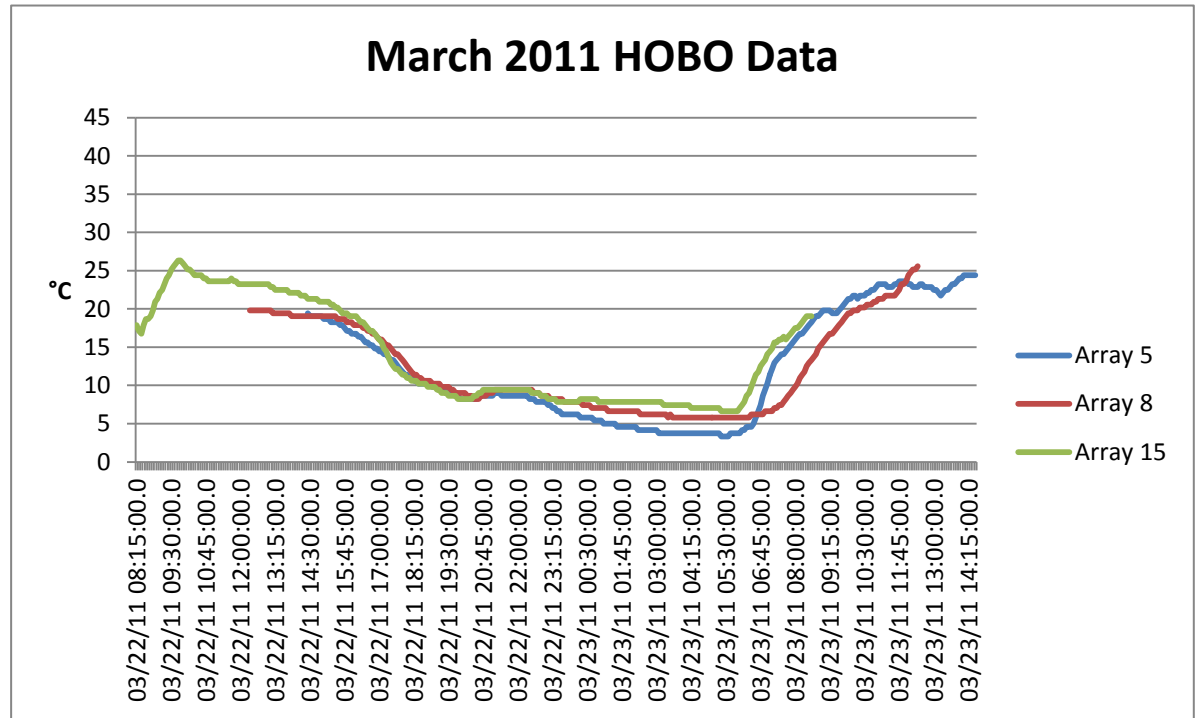
Average	Array 5	Array 8	Array 15
2/22/2011	11.92	13.47	14.41
2/23/2011	13.45	12.93	15.47
2/24/2011	14.13	13.38	17.02
2/25/2011	13.48	10.87	14.06

March 2011

HOBO Data for 22-23 March 2011. The survey ended early due to heavy precipitation.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	24.40	25.56	26.34
Minimum	3.31	5.81	6.62
Average	12.34	12.22	14.04



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
3/22/2011	19.42	19.81	26.34
3/23/2011	24.4	25.56	19.04

Min	Array 5	Array 8	Array 15
3/22/2011	5.81	5.81	7.43
3/23/2011	4.99	6.62	7.43

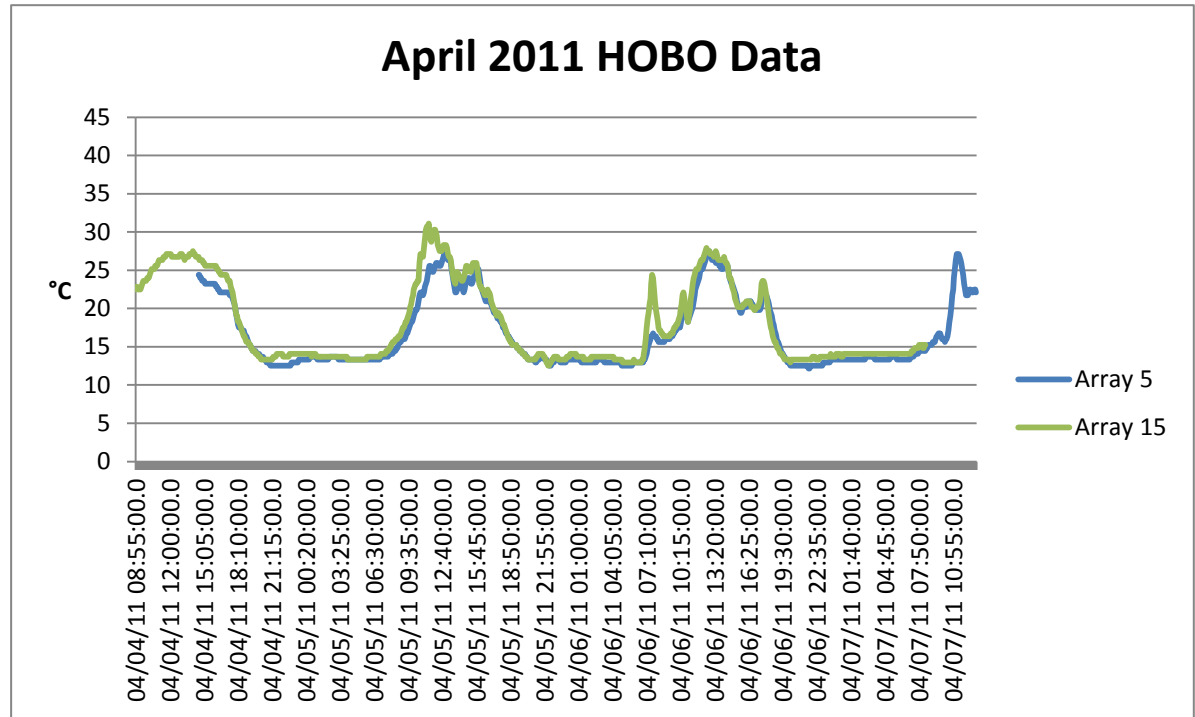
Average	Array 5	Array 8	Array 15
3/22/2011	11.92	13.47	14.41
3/23/2011	13.45	12.93	15.47

April 2011

HOBO data for 4-7 April 2011. The HOBO at Array 8 malfunctioned and did not record data. This survey ended early due to poor weather conditions.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	27.52	no data	31.12
Minimum	12.16	no data	12.55
Average	16.71	no data	18.01



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
4/4/2011	24.40	no data	27.52
4/5/2011	27.12	no data	31.12
4/6/2011	27.52	no data	27.91
4/7/2011	27.12	no data	15.23

Min	Array 5	Array 8	Array 15
4/4/2011	12.55	no data	13.32
4/5/2011	12.55	no data	12.55
4/6/2011	12.16	no data	12.93
4/7/2011	13.32	no data	13.7

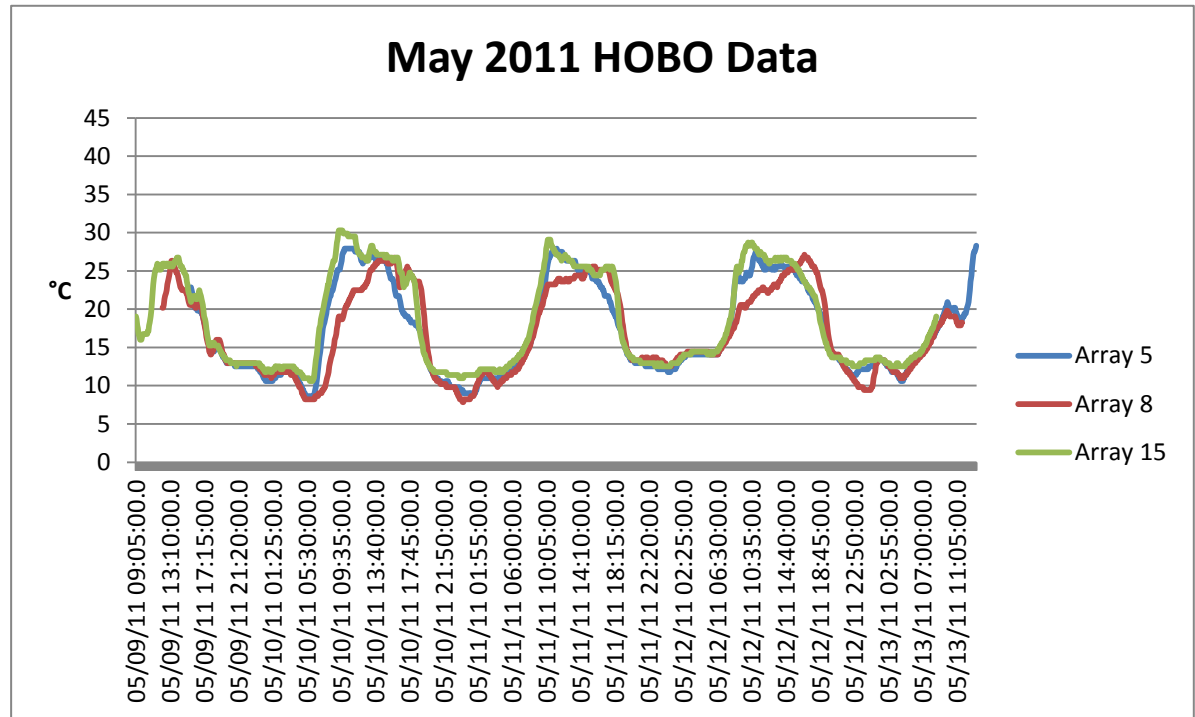
Average	Array 5	Array 8	Array 15
4/4/2011	17.12	no data	21.06
4/5/2011	17.03	no data	17.96
4/6/2011	16.73	no data	17.48
4/7/2011	15.77	no data	14.19

May 2011

HOBO data for 9-13 May 2011.

Temperature max/min for trapping session:

	Array 5	Array 8	Array 15
Max	28.31	27.12	30.31
Min	8.63	7.83	10.60
average	17.16	16.87	18.38



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
5/9/2011	22.86	26.34	26.73
5/10/2011	27.91	26.73	30.31
5/11/2011	27.91	25.56	29.1
5/12/2011	27.52	27.12	28.7
5/13/2011	28.31	19.81	19.04

Min	Array 5	Array 8	Array 15
5/9/2011	10.6	11.38	11.77
5/10/2011	8.63	7.83	10.6
5/11/2011	9.03	8.23	11.38
5/12/2011	11.38	9.42	12.55
5/13/2011	10.6	9.82	12.55

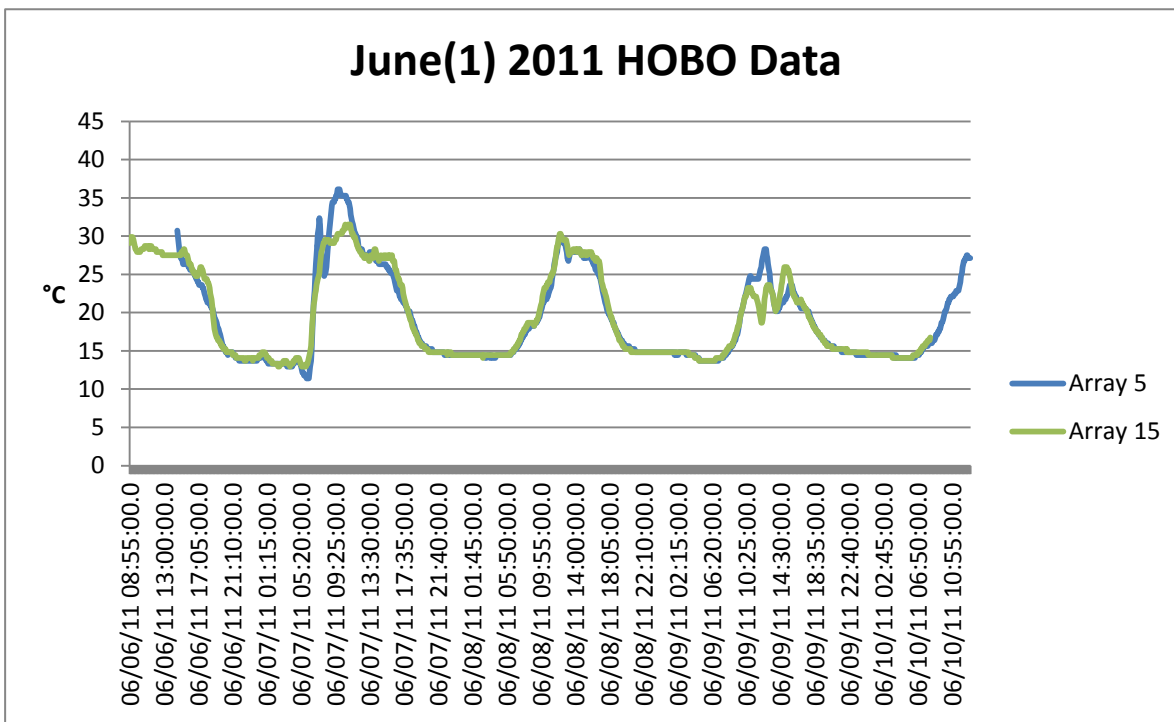
Average	Array 5	Array 8	Array 15
5/9/2011	14.18	16.69	18.09
5/10/2011	17.19	16.21	19.06
5/11/2011	17.47	17.42	18.45
5/12/2011	18.53	17.94	19.19
5/13/2011	16.21	14.86	14.06

June(1) 2011

HOBO data for 6-10 Jun 2011. The HOBO at Array 8 malfunctioned and did not record data.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	36.13	no data	31.52
Minimum	11.38	no data	12.93
Average	18.98	no data	19.40



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
6/6/2011	30.71	no data	29.9
6/7/2011	36.13	no data	31.52
6/8/2011	29.9	no data	30.31
6/9/2011	28.31	no data	25.95
6/10/2011	27.52	no data	16.76

Min	Array 5	Array 8	Array 15
6/6/2011	13.7	no data	13.7
6/7/2011	11.38	no data	12.93
6/8/2011	14.09	no data	14.09
6/9/2011	13.7	no data	13.7
6/10/2011	14.09	no data	14.09

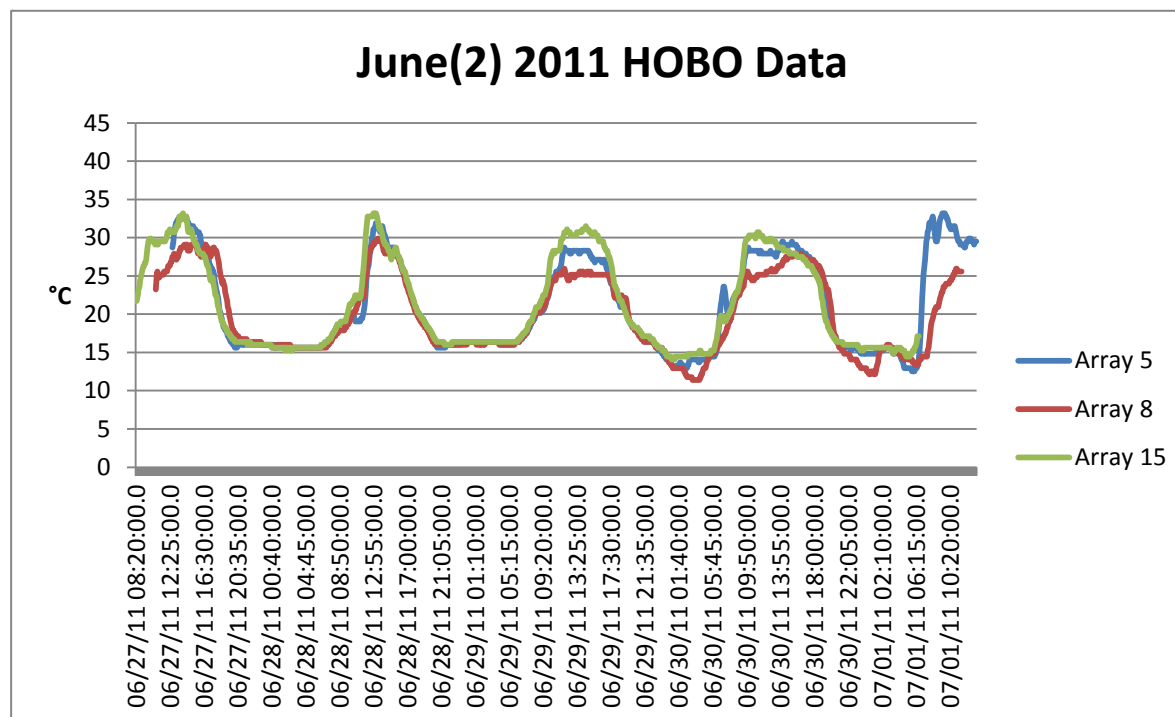
Average	Array 5	Array 8	Array 15
6/6/2011	18.74	no data	21.67
6/7/2011	21.01	no data	20.72
6/8/2011	19.07	no data	19.35
6/9/2011	17.76	no data	17.57
6/10/2011	17.38	no data	14.61

June(2) 2011

HOBO data for 27 June to 01 July 2011.

Temperature max/min for trapping session:

	Array 5	Array 8	Array 15
max	33.17	29.90	33.17
min	12.55	11.38	14.09
average	21.00	20.01	21.22



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
6/27/2011	32.76	29.50	33.17
6/28/2011	31.93	29.90	33.17
6/29/2011	28.7	25.95	31.52
6/30/2011	29.5	27.91	30.71
7/1/2011	33.17	25.95	17.14

min	Array 5	Array 8	Array 15
6/27/2011	15.62	16.00	15.62
6/28/2011	15.62	15.62	15.23
6/29/2011	13.7	13.70	14.47
6/30/2011	12.93	11.38	14.09
7/1/2011	12.55	12.16	14.47

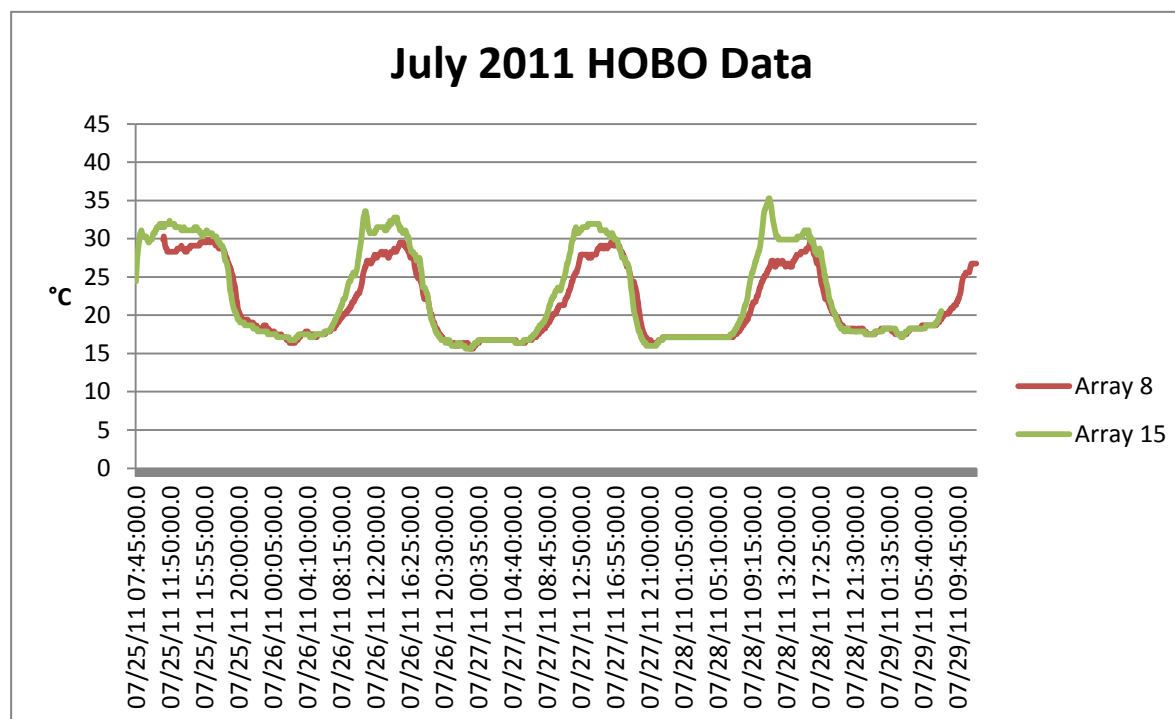
average	Array 5	Array 8	Array 15
6/27/2011	22.30	22.88	23.45
6/28/2011	19.60	19.46	20.19
6/29/2011	20.46	19.92	21.62
6/30/2011	21.18	19.85	21.43
7/1/2011	23.10	17.81	15.44

July 2011

HOBO data for 25-29 July 2011. The HOBO at Array 5 malfunctioned and did not record data.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	no data	30.31	35.27
Minimum	no data	15.62	15.62
Average	no data	21.44	22.72



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
7/25/2011	no data	30.31	32.34
7/26/2011	no data	29.5	33.59
7/27/2011	no data	29.5	31.93
7/28/2011	no data	29.5	35.27
7/29/2011	no data	26.73	20.57

Min	Array 5	Array 8	Array 15
7/25/2011	no data	17.52	17.14
7/26/2011	no data	15.62	15.62
7/27/2011	no data	16.38	16
7/28/2011	no data	17.14	17.14
7/29/2011	no data	17.52	17.14

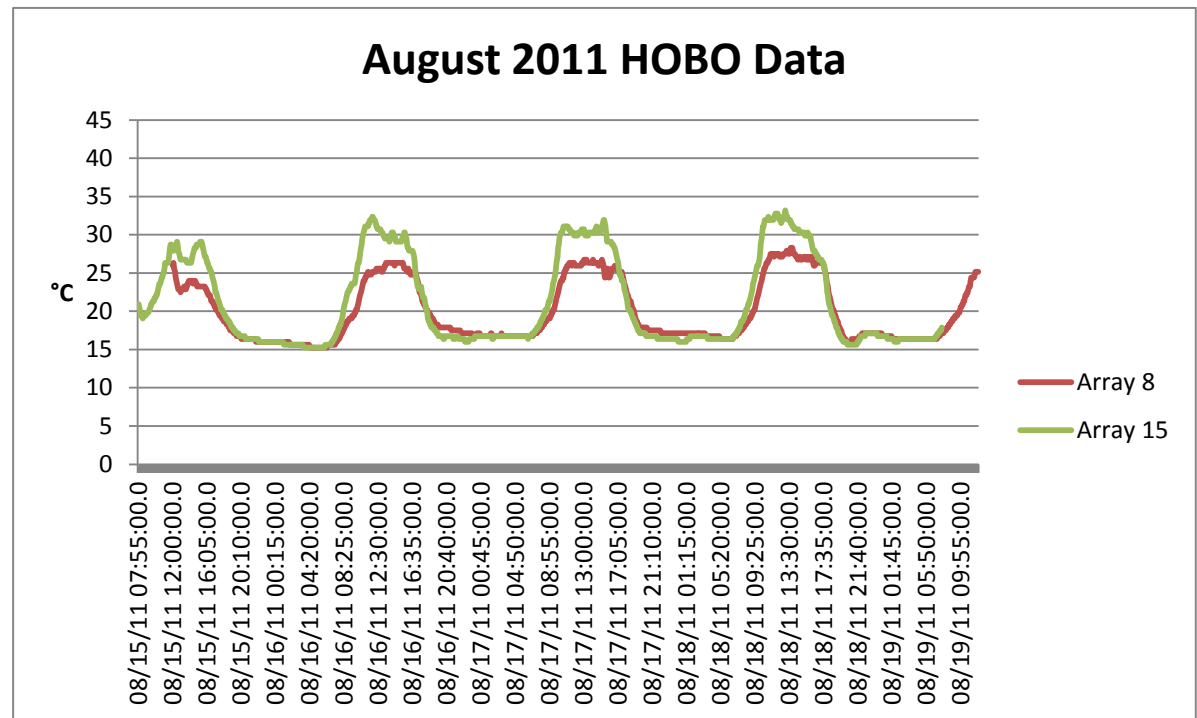
Average	Array 5	Array 8	Array 15
7/25/2011	no data	25.40	26.90
7/26/2011	no data	20.98	22.33
7/27/2011	no data	20.93	21.85
7/28/2011	no data	21.03	22.60
7/29/2011	no data	19.91	18.28

August 2011

HOBO data for 15-19 August 2011. The HOBO at Array 5 malfunctioned and did not record data.

Temperature max/min for trapping session:

°C	Array 5	Array 8	Array 15
Maximum	no data	28.31	33.17
Minimum	no data	15.23	15.23
Average	no data	19.86	21.13



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
8/15/2011	no data	26.34	29.10
8/16/2011	no data	26.34	32.34
8/17/2011	no data	26.73	31.93
8/18/2011	no data	28.31	33.17
8/19/2011	no data	25.17	17.90

Min	Array 5	Array 8	Array 15
8/15/2011	no data	16.00	16.00
8/16/2011	no data	15.23	15.23
8/17/2011	no data	16.76	16.00
8/18/2011	no data	16.00	15.62
8/19/2011	no data	16.38	16.00

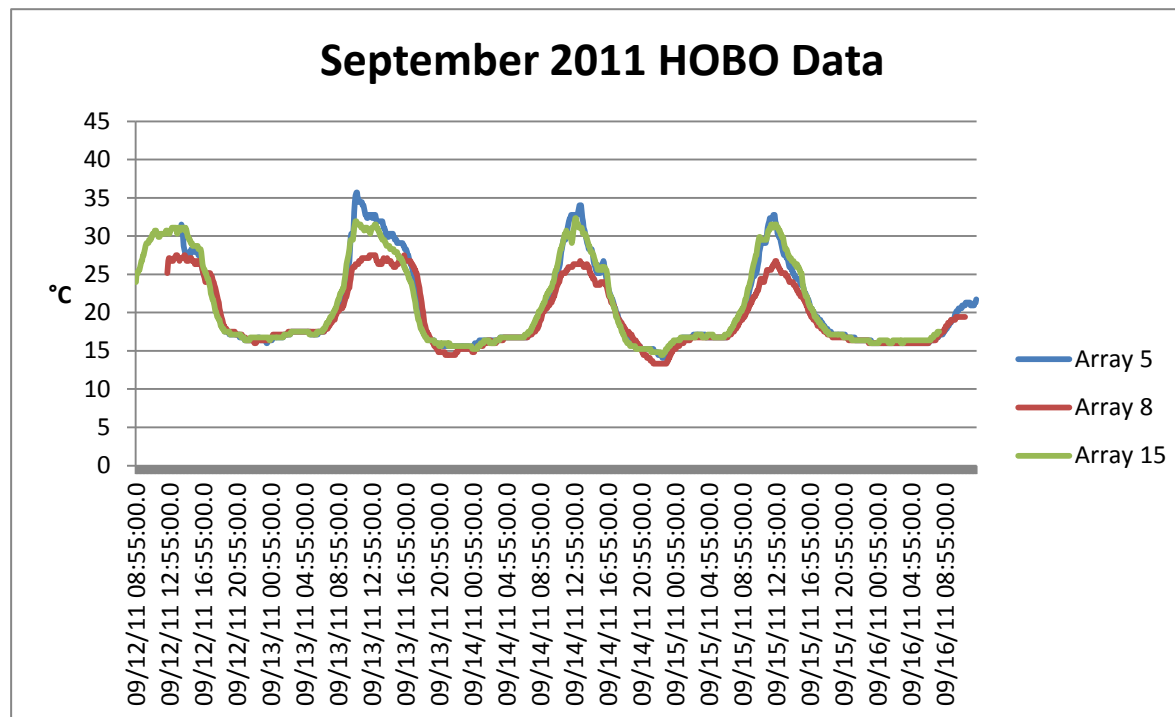
Average	Array 5	Array 8	Array 15
8/15/2011	no data	19.27	21.50
8/16/2011	no data	19.62	21.01
8/17/2011	no data	20.38	21.61
8/18/2011	no data	20.60	21.82
8/19/2011	no data	18.26	16.46

September 2011

HOBO data for 12-16 September 2011.

Temperature max/min for trapping session:

	Array 5	Array 8	Array 15
Max	35.70	27.52	32.34
Min	14.09	13.32	14.47
Average	20.37	19.46	20.88



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
9/12/2011	31.52	27.52	31.12
9/13/2011	35.7	27.52	31.93
9/14/2011	34.01	26.73	32.34
9/15/2011	32.76	26.73	31.52
9/16/2011	21.71	19.42	17.52

Min	Array 5	Array 8	Array 15
9/12/2011	16	16.00	16.38
9/13/2011	15.23	14.47	15.62
9/14/2011	14.09	13.32	14.47
9/15/2011	15.62	15.23	16.00
9/16/2011	16	16.00	16.00

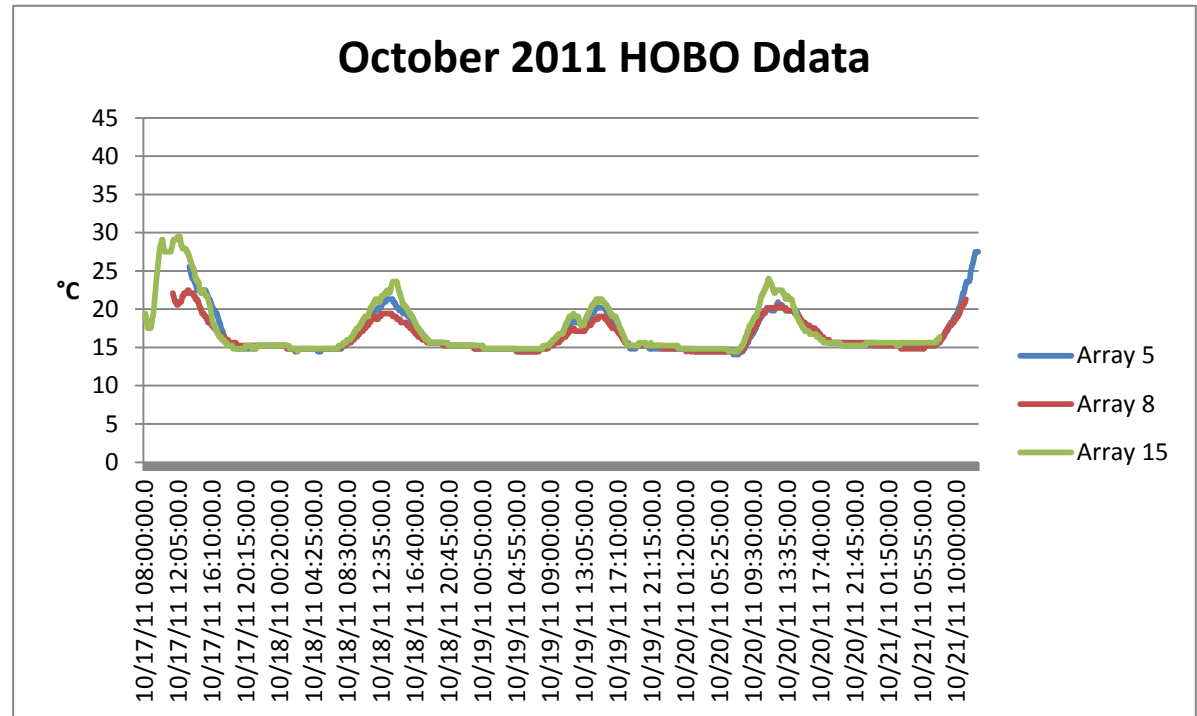
Average	Array 5	Array 8	Array 15
9/12/2011	20.58669	21.35	23.38
9/13/2011	21.85903	20.42	21.27
9/14/2011	20.24399	18.94	20.19
9/15/2011	20.27115	19.09	20.53
9/16/2011	17.51669	16.91	16.44

October 2011

HOBO data for 17-21 October 2011.

Temperature max/min for trapping session:

	Array 5	Array 8	Array 15
Max	27.52	22.48	29.50
Min	14.09	14.47	14.47
Average	16.62	16.32	17.24



Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
10/17/2011	25.56	22.48	29.50
10/18/2011	21.33	19.42	23.63
10/19/2011	20.19	19.04	21.33
10/20/2011	20.95	20.57	24.01
10/21/2011	27.52	21.33	16.38

Min	Array 5	Array 8	Array 15
10/17/2011	14.85	15.23	14.85
10/18/2011	14.47	14.85	14.47
10/19/2011	14.47	14.47	14.85
10/20/2011	14.09	14.47	14.47
10/21/2011	15.23	14.85	15.23

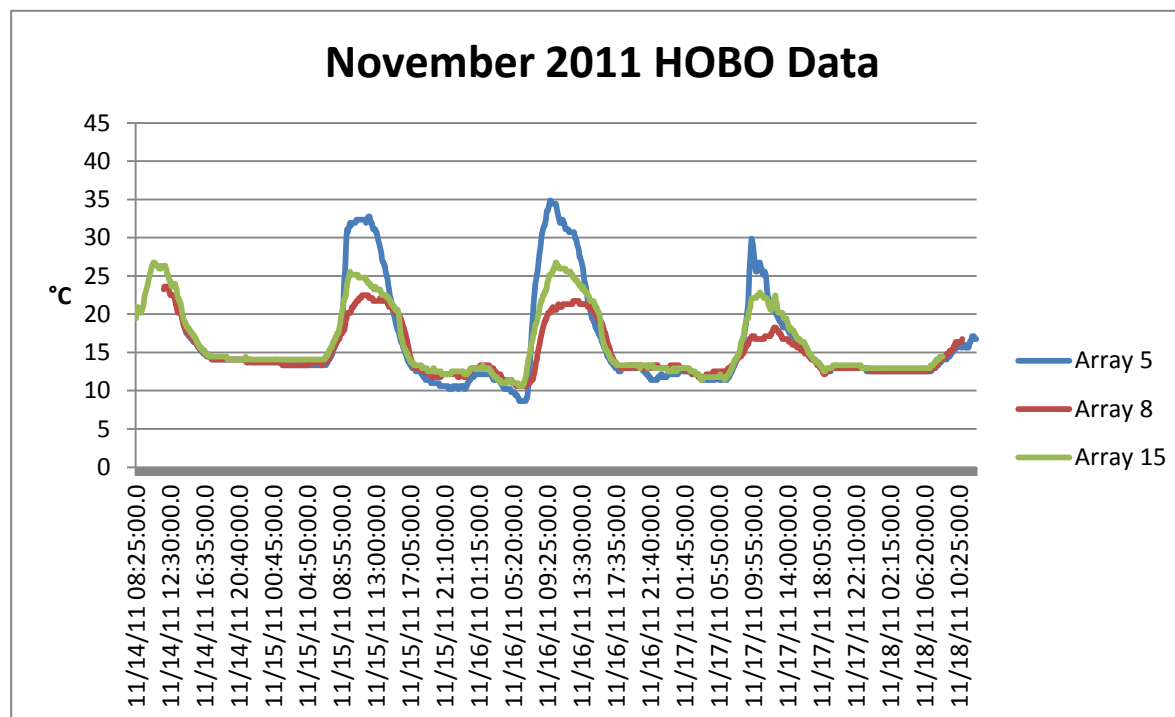
Average	Array 5	Array 8	Array 15
10/17/2011	17.35901	17.37	19.95
10/18/2011	16.53747	16.16	16.95
10/19/2011	16.08951	15.80	16.43
10/20/2011	16.38306	16.47	16.92
10/21/2011	17.62197	16.15	15.63

November 2011

HOBO data for 14-18 November 2011.

Temperature max/min for trapping session:

	Array 5	Array 8	Array 15
Max	34.85	23.63	26.73
Min	8.63	10.60	10.60
Average	15.99	14.96	16.13



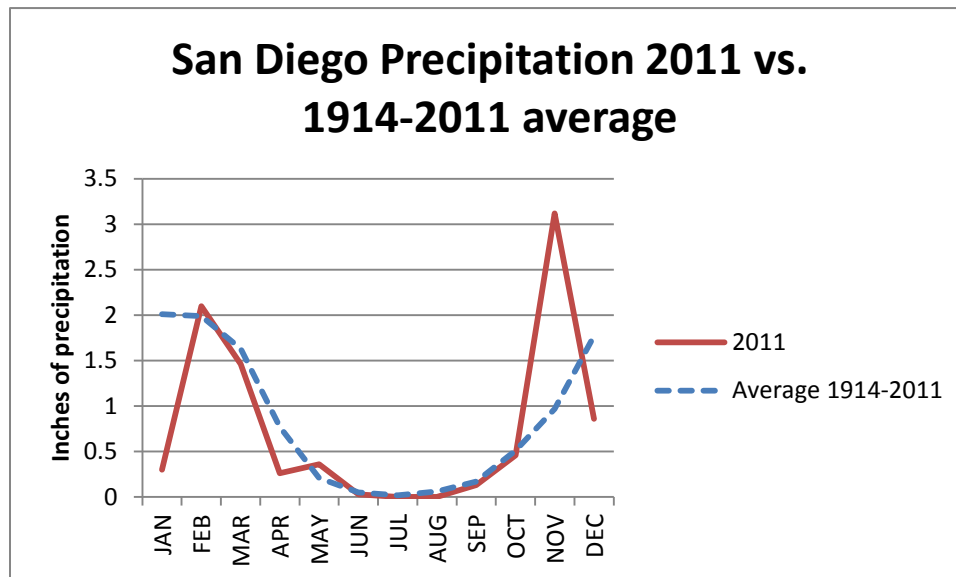
Daily maximum, minimum and average by array:

Max	Array 5	Array 8	Array 15
11/14/2011	19.81	23.63	26.73
11/15/2011	32.76	22.48	25.56
11/16/2011	34.85	21.71	26.73
11/17/2011	29.9	18.28	22.86
11/18/2011	17.14	16.76	14.47

Min	Array 5	Array 8	Array 15
11/14/2011	13.7	13.70	14.09
11/15/2011	10.21	11.77	12.16
11/16/2011	8.63	10.60	10.60
11/17/2011	11.38	11.77	11.38
11/18/2011	12.55	12.55	12.93

Average	Array 5	Array 8	Array 15
11/14/2011	14.58316	15.84	17.59
11/15/2011	17.13087	15.69	16.52
11/16/2011	17.35941	15.27	16.42
11/17/2011	15.20976	14.05	15.15
11/18/2011	13.72563	13.43	13.13

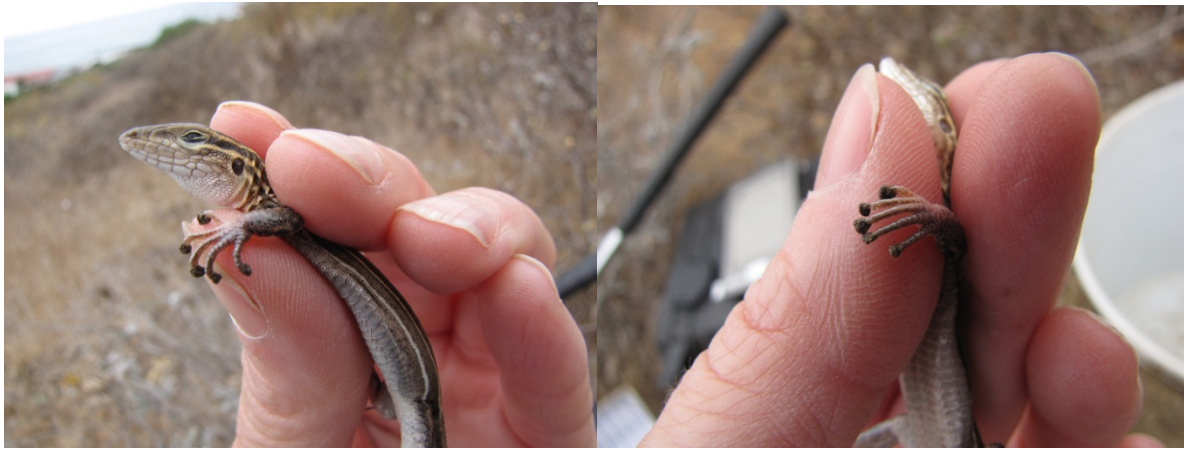
Appendix B: 2011 Precipitation Data



Precipitation data from Western Regional Climate Center (<http://www.wrcc.dri.edu/>).

The weather station used was San Diego WSO Airport located at lat 32°44', long 117°10' at the elevation of 3 feet above sea level.

Appendix C: Photos of Captures



Cnemidophorus hyperythrus captured in trap 03-3A on 27 July 2011. Tissue sample of toe was sent to Colorado State University School of Veterinary Medicine Pathology Lab. Copy of results below.



ANPU captured 18 October 2011 in trap 10-1B.



SCOC 0251 was captured in funnel trap 08-1S on 21 October 2011. It had an injury on the right rear foot where toes 0100 and 0200 were affected. It was already missing toe 0100 but toe 0200 was broken and surrounding tissue appeared necrotic. Toe 0200 was removed to facilitate healing of the injury. This was a juvenile female SCOC at the time of capture.

Appendix D: Pathology Reports for tissue sample from *Cnemidophorus hyperythrus*

Colorado State University
College of Veterinary Medicine and Biomedical Sciences
Veterinary Diagnostic Laboratories
300 West Drake Road
Fort Collins, CO 80523-1644
Phone 970-297-1281 Fax 970-297-0320



DL#: F1170069

Date: 10/7/2011

Vet/Clinic: Dr. Kevin Castle, Technical Assistance for Veterinary Pathology, 1644 Campus Delivery, Attn: Connie Heighes, Fort Collins, CO 80523-1644

Owner: National Park Service

Animal ID: NPS 12-002

Date Specimen Taken: NA

Species: Reptile **Breed:** Whiptail Lizard **Age:** Unknown **Sex:** Unknown

History: Fixed distal toe collected from lizard in Cabrillo National Monument, California. "Deformity" submitted for histopathology.

DIAGNOSIS: None.

REMARKS: The Histopathology Lab was consulted, and only an extremely small section of tissue remains in the block which is fragmenting on processing. As such, it is unlikely to get a full cross section through this digit for examination and all tissue will be gone making it impossible to do other diagnostics if these are desired. Please contact the lab if you would like us to cut the remaining tissue to make slides. Based on the photographs of the digit, if more tissue is available, culture (bacterial and fungal) may be the best use of resources.

HISTOPATHOLOGY:

Slide 1. Present on slide 1 is a section of tissue taken from the very small embedded digit. Much of the section was artifactually chunked during processing, and present on this slide is only an extremely small amount of keratin, approximately 10 cells of epidermis and a small piece of bone with marrow. No significant lesions are identified.

Colleen Duncan, BScH/DVM/MSc/PhD/DACVP/DACVPM

Emailed: 10/21/11 kw

Typed: 10/3/11 kw



United States Department of the Interior

NATIONAL PARK SERVICE

Biological Resource Management Division
1201 Oakridge Drive, Suite 200
Fort Collins, CO 80525

Wildlife Health Program

Final Report

Date: 11/23/2011

Date Submitted: 10/7/2011

NPS Case Number: 12-002

National Park Unit: Cabrillo National Monument

Species: Orange-throated Whiptail (*Aspidoscelis hyperythra*)

FINAL DIAGNOSIS: Undetermined

FINDINGS: The distal phalange of the front foot of a wild Orange-throated Whiptail was submitted by Kaye London of Cabrillo National Monument in San Diego, California. The tissue sample was collected during routine herpetological capture surveys on July 27th, 2011 and stored in 95% ethanol until submission on 10/7/2011. Disfigurement of the distal portion of the left front foot was noted, and the keratinous-like adhesions to the toe tips photographed. Upon receipt, the sample was transferred to 10% neutral-buffered formalin and submitted for histologic evaluation. The extremely small and fragile section of tissue fragmented easily during processing, and only a small amount of keratin with epidermis and bone with marrow could be identified. No significant lesions were observed.

While a diagnosis was not made in this case, please continue to monitor the lizard population for additional morbidity and contact me if you have any questions.

Diagnostician: Kevin T. Castle DVM, MS /s/

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 342/126795, October 2014

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science

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