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THE INFLUENCE OF HURRICANE AND TROPICAL STORM ACTIVITY ON RESIDENT BUTTERFLIES IN THE LOWER FLORIDA KEYS

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ABSTRACT. Butterfly populations were monitored at two coastal locations in the lower Florida Keys to observe and evaluate their response to hurricane and tropical storm activity. Four major hurricanes—Dennis, Katrina, Rita and Wilma—occurred within the vicinity of the Florida Keys during 2005. The ocean-facing exterior portions of both study areas were heavily damaged by hurricane and tropical storm force winds, salt spray and storm surge, resulting in greatly reduced butterfly abundance and species richness. More interior portions of the study areas, while inundated with floodwaters, retained the majority of their vegetation throughout the storm season allowing for an assemblage of butterflies similar in richness, albeit reduced in abundance, to pre-storm conditions. At each study area butterfly recovery time appeared related to availability of appropriate host and nectar plant species. However, the decline, disappearance or slow recovery of certain butterflies suggests that storm activity had a deleterious influence on the natural histories of select butterflies.

Additional key words: adverse weather, population dynamics, *Cyclargus*.

Butterflies of the Florida Keys have adapted over time to the influence of tropical storms and other forms of adverse weather conditions (Covell 1976, Minno and Emmel 1993, Smith *et al*. 1994). However, aside from merely mentioning the threat that hurricanes may pose to localized populations of endangered species in the region (Minno and Emmel 1993, 1994, USFWS 1999, Calhoun *et al*. 2000), there is a scarcity of published data on the effects of tropical storms on butterfly populations and their natural histories. During the active storm season of 2005, we closely monitored butterflies at two locations in the lower Florida Keys to observe and evaluate their response to hurricane and tropical storm activity. Surveys of the study areas conducted by the authors during 2004, in which no substantial storm activity occurred in the lower keys, provided a baseline for comparison.

METHODS

The survey areas and pre-storm butterfly diversity. Cactus Hammock, located on southeastern Big Pine Key within the National Key Deer Refuge (NKDR), contained a variety of plant communities, including coastal scrub, mangroves, salt marsh and tropical hardwood hammocks that allowed for a diversity of butterfly species. *Brephidium isophthalma pseudofea* (Morrison) (Lycaenidae) is prolific in coastal areas within the lower keys, including Cactus Hammock, where the species hostplants, *Salicornia bigelovii* L. (Chenopodiaceae) and *Batis maritima* L. (Bataceae) are abundant (Minno and Emmel 1993, Salvato 1998). Other species frequently encountered within Cactus Hammock historically included *Junonia evarete* (Cramer) (Nymphalidae), *Strymon martialis* (Herrich-Schäffer) (Lycaenidae), *Ascia monuste phileta* Fabricius (Pieridae), *Heliconius charithonia tuckeri* Comstock and Brown (Nymphalidae), and *Panoquina panoquinoides* (Skinner) (Hesperiidae) (Salvato and Salvato, unpublished data). A 5-hectare portion of Cactus Hammock was monitored during this study to observe the possible influence of tropical storm conditions on butterfly species richness and abundance.

Bahia Honda State Park (Bahia Honda), located approximately 8 km (5 miles) east of Big Pine Key, also had a variety of natural habitats, including tropical hammocks, mangroves, coastal scrub and beaches, as well as an old berm that historically served as a railroad bridge. The areas surrounding this berm were heavily vegetated on both the south (Atlantic Ocean) and north (Gulf of Mexico) sides by a variety of native plant species. Our surveys at Bahia Honda were limited to an area approximately 1-hectare in size along the old railroad berm. Vegetation within the study site included *Coccoloba uvifera* L. (Polygonaceae), *Suriana maritima* L. (Surianaceae) and *Caesalpinia bonduc* Roxburgh (Fabaceae), the latter of which is a hostplant of the endangered *Cyclargus thomasi bethunebakeri* Comstock and Huntington (Lycaenidae) (Pyle 1981, Calhoun *et al*. 2000). Other butterfly species occurring on Bahia Honda prior to the survey period included *Phoebus agarithe maxima* (Neumoegen) (Pieridae), *Agraulis vanillae nigrior* Michener (Nymphalidae), *H. c. tuckeri, Hemiargus ceraunus antibubastus* Hübner (Lycaenidae), *Leptotes cassius theonus* (Lucas) (Lycaenidae), *Hylephila phyleus phyleus* (Drury) (Hesperiidae) and *Cymaenes tripunctus tripunctus* (Herrich-Schäffer) (Hesperiidae) (Minno and Emmel 1993, Smith *et al*. 1994, Calhoun *et al*. 2000, Salvato and Salvato, unpublished data).

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The study areas were monitored monthly from June 2005 to February 2006 to determine butterfly abundance and species richness. A standard walking route was established at each location that allowed two researchers to observe and record butterfly activity within the varied environs of each survey location. Both locations were visited on each survey date, except during November 2005, when Cactus Hammock and Bahia Honda were surveyed on 5 November and 11 November, respectively (Bahia Honda was closed to the public due to storm damages on 5 November). Surveys were conducted on warm, clear days under conditions that were considered sufficient for butterflies to be flying. Each sampling date included approximately 6–8 hours of field time (between 8:00–16:00 h). On each sampling date approximately 4 to 5 and 2 to 3 hours was spent monitoring at Cactus Hammock and Bahia Honda, respectively. Butterfly diversity was determined on each sampling date by visually observing and recording the individuals and species encountered. Both researchers traversed the same survey route in unison, with one researcher (MHS) counting (with a hand counter) the most numerous species flying on a given sampling date while HLS tallied the remaining less abundant species.

The storms. Four major hurricanes—Dennis, Katrina, Rita and Wilma—occurred within the vicinity of the Florida Keys during 2005 (Fig. 1 indicates the relative paths for each storm). Storm accounts discuss data gathered and summarized by the National Oceanic and Atmospheric Administration (NOAA) for Key West, Florida (www.nhc.noaa.gov/archive/2005), which was located 48.3–56.3 km (30–35 miles) to the southwest of the study areas on Big Pine and Bahia Honda Keys. Dennis, had been a strong Category 4 hurricane (winds in excess of 241 km [150 mph]) prior to landfall in south-central Cuba, but weakened as it entered the southern Gulf of Mexico. Dennis passed approximately 137 km (85 miles) to the west of Key West on 9 July 2005 generating hurricane and tropical storm force winds in the extreme lower keys and a storm surge of up to 1.8 m (6 feet) above normal high tide levels within our coastal survey areas. Katrina, which crossed southern peninsular Florida and entered the Gulf as a weak hurricane, passed 28 km (45 miles) to the northwest of Key West on 26 August 2005 generating tropical storm force winds and storm surge on the northern side of the keys. Katrina had little influence on our study areas on southern Big Pine and Bahia Honda Keys. Rita passed within 81 km (50 miles) of Key West on 20 September 2005 and rapidly intensified as it traversed the entire stretch of the Straits of Florida. Rita's relatively close proximity generated hurricane and tropical storm force winds of greater duration and intensity than Dennis, with a storm surge up to 2.1 m (7 feet) above normal high tide levels within our study area. Wilma, which passed rapidly to the northeast of the lower keys on 24 October 2005, generated hurricane and tropical storm force winds and a storm surge up to 2.7 m (9 feet) that resulted in extensive damages on the

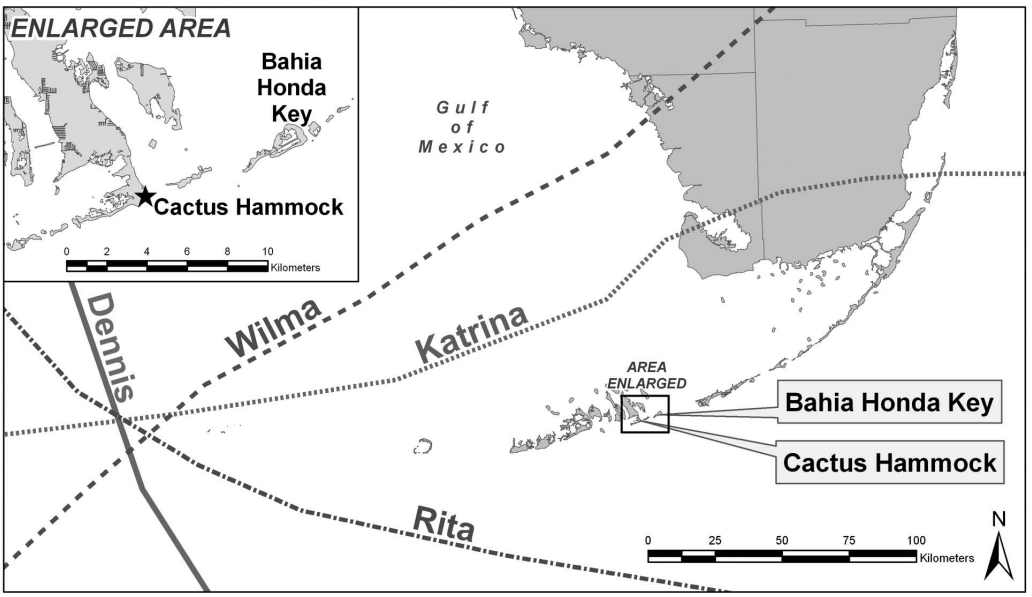

FIG. 1. The paths of Hurricane Dennis, Katrina, Rita and Wilma in relation to south Florida and the study areas in the lower keys.

FIG. 2. Exterior of Cactus Hammock, as shown on 24 September 2005, shortly after Rita, was severely damage from hurricane and tropical storm force winds, salt spray and storm surge (Photo Credit; H.L. Salvato).

FIG. 3. Floodwaters intruded deep into Cactus Hammock following storm activity as a result of coastal dune erosion along the southeastern portion of the study area, covering extensive areas of *Salicornia* (Photo Credit; H.L. Salvato).

northern side of the lower keys. However, as with Katrina, this storm had little direct impact to our survey areas on the southern sides of the islands.

RESULTS

Cactus Hammock-post storms. A survey conducted on 16 July 2005, one week following Dennis, found that the majority of hammock and coastal scrub habitat along the coastal exterior of Cactus Hammock had been either severely damaged or destroyed by tropical storm force winds, salt spray and storm surge. Aside from migratory species such as, *A. m. phileta* and *P. a. maxima*, no other butterfly activity was observed within the heavily damaged exterior portions of Cactus Hammock. The interior of Cactus Hammock, while inundated with floodwaters, was otherwise undamaged. These more inland portions of the survey area maintained a richness of butterfly species similar to what was recorded prior to the storm; however, overall butterfly abundance was greatly reduced, particularly for Lycaenids, such as *B. i. pseudofea*, *L. c. theonus* and *H. c. antibubastus*. *Papilio cresphontes* Cramer (Papilionidae), *P. panoquinoides* and *H. c. tuckeri*, species frequently encountered within Cactus Hammock prior to Dennis, were absent following the storm. Additional post-Dennis surveys of Cactus Hammock indicated that several butterfly species, such as *J. evarete, A. m. phileta* and *Anartia jatrophae guantanamo* Munroe (Nymphalidae), had dispersed within the survey area and were observed ovipositing on available hostplants. However, butterfly abundance and species richness within Cactus Hammock continued to decline post-Dennis, while select species remained absent.

Rita passed directly to the south of the lower keys, generating storm surge, hurricane and tropical storm force winds, further adding to the damages initially caused by Dennis. Although quantitative measures on vegetation were not conducted as part of this study, we visually estimated that 60–80% of the hammock vegetation had been damaged or destroyed during Dennis and Rita (Fig. 2). Floodwaters that had receded during the interim between storms intruded deeper into Cactus Hammock following Rita as a result of coastal dune erosion along the southeastern portion of the study area (Fig. 3). Natural rehabilitation of coastal and hammock vegetation that had begun shortly after Dennis was hindered due to the influence of Rita. The abundance of select butterflies continued to decline,

FIG. 4. Storm surge and salt spray from Dennis and Rita greatly damaged vegetation on the ocean side of the Bahia Honda survey area, such as *Caesalpinia bonduc*, host plant for the endangered *Cyclargus thomasi bethunebakeri* (Photo Credit; H.L. Salvato).

while other species either decreased or remained absent. Overall butterfly richness within the area following Rita and into the fall of 2005 was much lower from what was noted during the previous year. Butterflies that were observed in Cactus Hammock during the late summer and fall months consisted largely of migratory species such as *Phoebus sennae eubule* (L.) (Pieridae), *Urbanus proteus proteus* (L.) (Hesperiidae) and *Danaus plexippus* (L.) (Nymphalidae), which were found nectaring on *Stachytarpheta jamaicensis* (L.) Vahl (Verbenaceae). *Danaus plexippus* was observed roosting on damaged and defoliated hammock trees along the coastal portions of the study site.

Wilma resulted in extensive damage on the Gulf side of the keys. However, a survey of Cactus Hammock on 5 November 2005, two weeks after Wilma, found little indication of major damage from this storm. New foliage that was sprouting on trees and shrubs that had been damaged or defoliated by Hurricanes Dennis and Rita appeared unaffected by Wilma. However, butterfly species richness and abundance continued to decline. In mid-December 2005 and into early 2006, with the exception of *B. i. pseudofea*, which appeared to be returning to seasonal abundance, overall species richness and abundance in Cactus Hammock remained lower from what had been recorded during the previous year and prior to the first storm activity of 2005.

Figures 5 and 6 indicate monthly butterfly species richness and abundance observed in Cactus Hammock from June 2005 to February 2006 during and following an active storm season. Also included is similar data on butterflies in the survey area collected during the same period of the prior year (June 2004 to February 2005), in which no substantial storm activity occurred within in the lower keys. Appendix 1 indicates which species were encountered on each sampling date during the survey periods in 2004–2006 and their abundance.

Bahia Honda-post storms. On Bahia Honda, the ocean side of the old railroad berm was heavily damaged by storm surge and salt spray from Dennis (Fig. 4). One week after Dennis (16 July 2005), with the exception of migrating *A. m. phileta, P. a. maxima* and *Kricogonia lyside* (Godart) (Pieridae), no butterfly activity was observed on the ocean side of the survey area. We visually estimated that as much as 50% of the vegetation on the southern side of the island had been heavily damaged, including large stands of *C. bonduc, S. maritima* and other host and nectar plants of importance to butterflies on Bahia Honda. However,

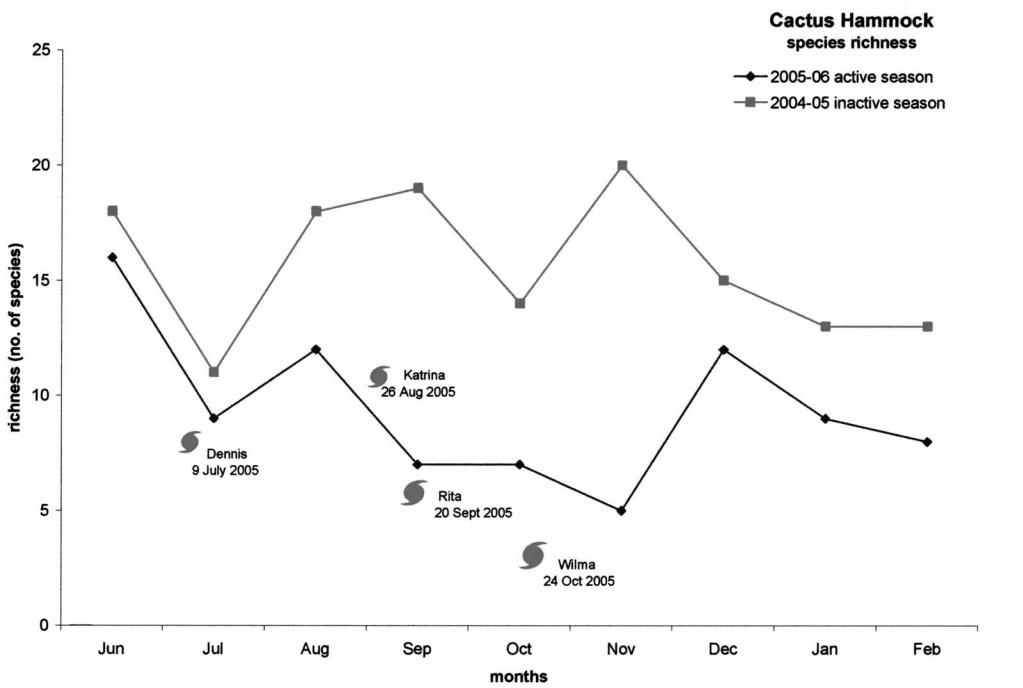

FIG. 5. Indicates monthly butterfly species richness observed in Cactus Hammock from June 2005 to February 2006 during and following an active storm season. Also indicated is similar data on butterflies in Cactus Hammock collected during the same period the prior year (June 2004 to February 2005), in which no substantial storm activity occurred in the lower keys.

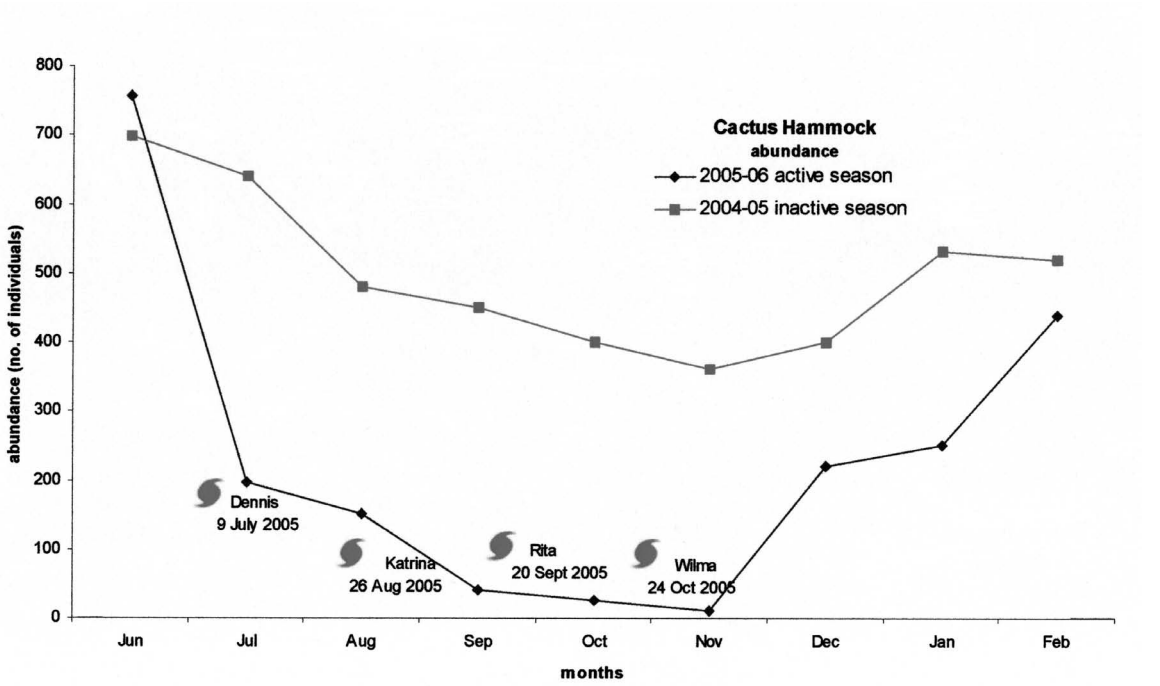

FIG. 6. Indicates monthly butterfly species abundance observed in Cactus Hammock from June 2005 to February 2006 during and following an active storm season. Also indicated is similar data on butterflies in Cactus Hammock collected during the same period the prior year (June 2004 to February 2005), in which no substantial storm activity occurred in the lower keys.

the remaining portions of the survey area, including the areas on top and to the northern side of the old railroad berm itself, appeared relatively undisturbed from storm surge and salt spray. Whereas butterfly activity was largely absent on the ocean side of the survey area, the Gulf side retained its vegetation and numerous plants remained in bloom. *Heliotropium angiospermum* Murray (Boraginaceae), *Bidens alba* L. (Asteraceae) and *Melanthera nivea* Small (Asteraceae), were heavily visited by surviving butterflies.

Unlike Cactus Hammock, where a decline in butterfly abundance was noted following Dennis, the level of butterfly activity increased on Bahia Honda from densities recorded prior to the storm. Similar to Cactus Hammock, however, was increased butterfly activity within areas less impacted from storm activities, which retained ample nectar sources and appropriate hostplants. The increased abundance in the select parts of this study area may have been the result of butterfly dispersal from storm-damaged areas of Bahia Honda and surrounding islands. As a result of natural regeneration and park maintenance, much of the vegetation was observed recovering during continued post-Dennis surveys. However, populations of several butterfly species, such as *C. t. bethunebakeri* and *H. c. tuckeri,* declined steadily. Although both of these species lost large quantities of their respective hostplants on the ocean side of Bahia Honda as a result of Dennis, this reduction did not appear so substantial as to trigger such sharp declines.

As with Cactus Hammock, storm surge and salt spray from Rita greatly damaged vegetation on the ocean side of the old railroad berm. The impacts to the ocean side of the island appeared more severe, perhaps due to the fact that large amounts of coastal vegetation had been damaged or thinned by Dennis. This vegetation may have served as a protective barrier for the study area during the first storm. Overall species richness and abundance in late September and into November decreased following Rita and was reduced from levels observed during the previous year or earlier in the 2005 survey period.

Wilma caused extensive damage to the northeastern side of Bahia Honda; however, we observed little storm impact on our study area on the southwestern portion of the island during a survey on 11 November 2005, about three weeks after the storm. Surveys of Bahia Honda in mid-December 2005 and into early 2006 found butterfly richness and abundance similar to that observed a year prior and earlier in the survey period, indicating that butterflies were returning to relatively normal seasonal densities.

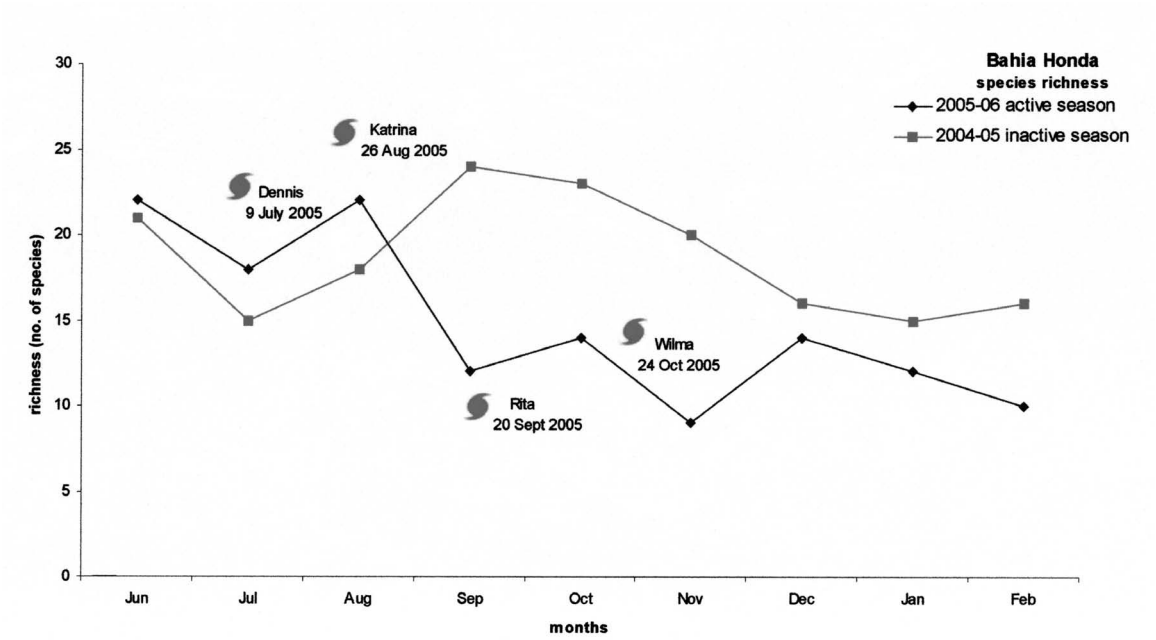

FIG. 7. Indicates monthly butterfly species richness observed on Bahia Honda from June 2005 to February 2006 during and following an active storm season. Also indicated is similar data on butterflies on Bahia Honda collected during the same period the prior year (June 2004 to February 2005), in which no substantial storm activity occurred in the lower keys.

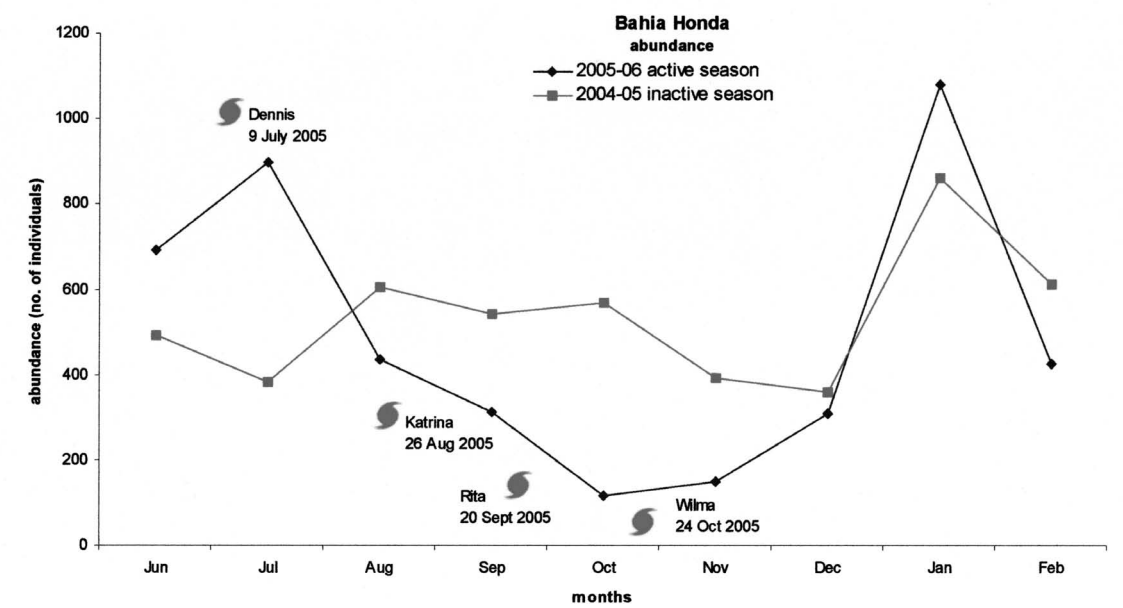

FIG. 8. Indicates monthly butterfly species abundance observed on Bahia Honda from June 2005 to February 2006 during and following an active storm season. Also indicated is similar data on butterflies on Bahia Honda collected during the same period the prior year (June 2004 to February 2005), in which no substantial storm activity occurred in the lower keys.

Figures 7 and 8 indicate monthly butterfly species richness and abundance observed in Bahia Honda from June 2005 to February 2006 during and following an active storm season. Also included is similar data on butterflies in the survey area collected during the same period of the prior year (June 2004 to February 2005), in which no substantial storm activity occurred within in the lower keys. Appendix 2 indicates the species that were encountered on each sampling date during the survey periods in 2004–2006 and their abundance.

DISCUSSION

Butterflies that readily re-established themselves within the survey areas after the storms were those species most closely associated with salt marsh, mangrove and hammock vegetation that had rebounded rapidly after Dennis and Rita. In Cactus Hammock, *A. m. phileta, P. a. maxima, B. i. pseudofea*, *Strymon istapa modestus* Maynard (Lycaenidae), *J. evarete*, *A. j. guantanamo, Phoicides pigmalion okeechobee* (Worthington) (Hesperiidae) and *Polygonus leo savigny* (Latreille) (Hesperiidae) (all dependant on plant species that quickly returned after the storms) were species that were most often re-encountered following the storms. The decline, disappearance or slow recovery of select species within the remainder of Cactus Hammock (such as *H. c. tuckeri*), suggests that storm activity had a deleterious influence on the natural histories of select butterflies. Species that had occurred locally within Cactus Hammock prior to the storms (such as *S. martialis* and *P. panoquinoides*), but not after them, will require ongoing monitoring to determine their status.

Although recovery was rapid for many of the butterfly species within the Bahia Honda survey area following the storms, a number of species remained in decline or absent in post-storm surveys. *Heliconius c. tuckeri* was abundant immediately after the initial storm, but was not recorded again in the Bahia Honda survey area for the remainder of the study. *Leptotes c. theonus* and *S. martialis* disappeared from Cactus Hammock shortly after Dennis, but both quickly re-established themselves on Bahia Honda and elsewhere in the lower keys. This suggests that they may rely on a more storm-impacted host plant within Cactus Hammock, resulting in the differing recovery outcomes. Despite the noted decline of the endangered *C. t. bethunebakeri* throughout the survey period further monitoring by the authors found that the species had returned to pre-storm abundance by the summer months of 2007.

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Please see the next 4 pages for Appendices.

Continued

APPENDIX 1. The butterfly species encountered in Cactus Hammock during each sampling date during the survey periods in 2004-2006 and their abundance.

	2004							2005	
Species	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
Papilio cresphontes	4	0	1	0	1	1	0	0	0
Ascia m. phileta	225	195	36	12	0	6	8	14	10
Phoebus s. eubale	0	0	0	12	2	3	0	0	0
P. a. maxima	22	12	17	13	1	2	0	0	2
Kricogonia lyside	0	0	0	0	0	0	0	0	0
Leptotes c. theonus	87	55	37	23	27	20	25	23	20
Hemiargus c. antibubastus	42	25	22	23	13	15	12	10	6
Brephidium i. pseudofea	245	325	317	313	280	225	267	395	451
Strymon i. modestus	2	0	3	1	0	0	6	4	0
S. martialis	4	0	2	1	0	2	4	3	1
Agraulis v. nigrior	12	15	12	15	25	23	18	25	12
Heliconius c. tuckeri	10	5	12	9	6	14	5	12	14
Junonia genoveva	2	0	1	1	3	2	2	0	0
J. evarete	12	1	2	12	25	22	12	14	3
J. coenia	0	0	0	0	0	0	0	0	0
Anartia j. guantanamo	4	1	2	2	0	2	22	8	2
Danaus plexippus	0	0	0	0	0	12	0	0	0
D. gilippus	0	0	0	0	0	0	0	0	0
Phycoides phaon	0	0	0	0	0	0	0	0	0
Urbanus p. proteus	0	0	0	1	1	2	0	0	0
Phocides p. okeechobee	6	0	2	2	0	2	5	6	3
Polygonus l. savigny	2	0	1	2	2	2	2	8	4
Pyrgus o. oileus	4	0	3	2	1	2	0	0	0
Hylephila p. phyleus	0	0	0	0	0	0	0	0	0
Wallengrenia otho	13	2	8	4	12	3	12	10	2
Panoquina panoquinoides	3	5	2	1	0	1	1	0	0

APPENDIX 1. continued

	2005							2006	
Species	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
Papilio cresphontes	8	2	0	0	0	0	0	0	0
Ascia m. phileta	157	18	15	8	6	1	2	7	2
Phoebus s. eubale	0	0	0	4	0	0	0	0	0
P. a. maxima	28	4	12	6	2	0	1	0	2
Kricogonia lyside	13	4	11	0	0	0	0	0	0
Leptotes c. theonus	125	1	17	0	2	0	0	0	0
Hemiargus c. antibubastus	48	0	4	0	0	0	0	0	0
Brephidium i. pseudofea	312	161	68	12	0	1	157	215	431
Strymon i. modestus	0	0	0	0	0	0	3	2	0
S. martialis	3	0	0	0	0	0	0	0	0
Agraulis v. nigrior	12	3	8	2	3	0	5	12	1
Heliconius c. tuckeri	14	0	0	0	0	0	0	0	0
Junonia genoveva	0	0	0	0	0	0	0	1	0
J. evarete	14	0	7	5	6	0	1	3	2
J. coenia	0	0	0	0	0	0	1	0	0
Anartia j. guantanamo	3	0	4	5	2	0	0	0	0
Danaus plexippus	0	0	0	0	4	6	12	0	0
D. gilippus	0	0	0	0	0	0	8	0	0
Phycoides phaon	0	0	0	0	0	1	0	0	0
Urbanus p. proteus	0	0	0	0	0	0	3	0	0
Phocides p. okeechobee	2	0	1	0	0	0	0	1	1
Polygonus l. savigny	3	2	2	0	0	0	0	5	3
Pyrgus o. oileus	0	0	0	0	0	0	0	0	0
Hylephila p. phyleus	12	2	2	0	0	1	16	5	2
Wallengrenia otho	2	0	0	0	0	0	12	0	0
Panoquina panoquinoides	0	0	0	0	0	0	0	0	0

APPENDIX 2. The butterfly species encountered on Bahia Honda Key during each sampling date during the survey periods in 2004-2006 and their abundance.

	2004							2005	
Species	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
Papilio cresphontes	2	1	0	0	0	0	0	0	0
Ascia m. phileta	197	212	25	15	26	14	5	6	2
Phoebus s. eubale	0	0	12	12	15	3	0	0	0
P. a. maxima	21	13	4	6	10	8	6	2	4
P. p. philea	1	0	2	1	2	0	0	0	0
Nathalis iole	0	15	0	2	5	0	0	0	0
Eurema l. lisa	0	0	0	5	5	0	2	1	0
E. daira	0	0	0	1	3	0	0	0	0
Kricogonia lyside	0	12	5	12	2	2	0	0	0
Leptotes c. theonus	34	27	45	41	25	37	35	142	174
Hemiargus c. antibubastus	18	20	25	15	10	12	18	15	23
Cyclargus t. bethunebakeri	28	35	15	55	75	46	27	53	69
Electrostrymon a. angelia	2	1	0	1	0	0	0	0	0
Strymon i. modestus	7	3	10	12	12	16	12	7	15
S. martialis	6	3	1	1	10	23	13	15	12
Agraulis v. nigrior	73	35	255	202	175	82	95	275	200
Heliconius c. tuckeri	85	5	150	97	105	61	75	110	65
Dryas i. largo	0	0	0	0	0	0	0	0	0
Anartia j. guantanamo	2	0	10	12	12	13	25	209	24
Vanessa cardui	1	0	0	0	0	0	0	0	0
Junonia evarete	0	0	0	0	0	0	0	0	0
J. coenia	0	0	0	0	0	0	0	0	0
Danaus plexippus	0	0	0	0	0	22	0	0	0
D. gilippus	0	0	0	2	8	8	0	0	0
Urbanus p. proteus	0	0	0	1	0	2	4	2	2
Phocides p. okeechobee	2	0	15	13	15	3	2	2	0
Polygonus l. savigny	1	0	0	2	6	7	4	0	2
Pyrgus o. oileus	1	0	1	0	0	0	0	0	2
Hylephila p. phyleus	4	1	10	15	20	16	20	14	15
Polites v. vibex	2	1	10	8	6	6	0	0	2
Wallengrenia otho	3	0	10	12	20	12	15	8	2
Cymaenes t. tripunctus	1	0	0	0	1	0	0	0	0

APPENDIX 2. Continued.

	2005							2006	
Species	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
Papilio cresphontes	0	2	1	0	0	0	0	0	0
Ascia m. phileta	125	116	87	15	5	0	1	0	0
Phoebus s. eubale	0	0	0	12	6	1	0	0	0
P. a. maxima	25	47	32	14	1	0	1	1	2
P. p. philea	2	0	2	0	0	0	0	0	0
Nathalis iole	0	0	0	0	0	0	0	0	0
Eurema l. lisa	2	0	1	1	2	0	1	0	0
E. daira	2	0	1	0	0	0	0	1	0
Kricogonia lyside	28	32	27	7	0	0	0	0	0
Leptotes c. theonus	27	26	29	24	5	25	155	325	152
Hemiargus c. antibubastus	39	38	35	28	23	10	32	10	12
Cyclargus t. bethunebakeri	57	82	30	10	6	17	2	1	0
Electrostrymon a. angelia	6	2	1	0	0	0	0	0	0
Strymon i. modestus	16	62	20	4	1	0	3	2	42
S. martialis	6	12	4	0	1	28	2	5	12
Agraulis v. nigrior	224	268	132	187	60	35	88	371	190
Heliconius c. tuckeri	114	197	18	0	0	0	0	0	0
Dryas i. largo	0	0	0	0	1	0	0	3	0
Anartia j. guantanamo	2	0	5	8	0	1	12	354	5
Vanessa cardui	0	0	2	0	0	0	0	0	0
Junonia evarete	1	0	0	0	0	0	0	0	0
J. coenia	0	0	0	0	2	0	0	0	0
Danaus plexippus	0	0	0	0	0	30	0	0	1
D. gilippus	0	0	0	0	0	0	0	0	0
Urbanus p. proteus	0	1	0	0	0	2	2	0	2
Phocides p. okeechobee	0	0	0	0	0	0	3	0	0
Polygonus l. savigny	1	1	0	0	0	0	0	0	0
Pyrgus o. oileus	1	0	1	0	0	0	0	0	0
Hylephila p. phyleus	7	5	5	2	2	0	4	6	8
Polites v. vibex	2	1	1	0	0	0	0	0	0
Wallengrenia otho	3	3	2	0	1	0	2	1	0
Cymaenes t. tripunctus	3	3	1	0	0	0	0	0	0