

MILWAUKEE PUBLIC MUSEUM

Contributions

in
BIOLOGY
and
GEOLOGY

Number 73

December 1, 1987

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ISBN 0-89326-154-8

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Abstract

Sixty-nine species of butterflies (including skippers) are reported from the Lower Florida Keys. Observations on habitat, behavior, winter-spring abundance, oviposition, and other natural history topics, based on a collection of 1336 specimens and records in the literature, are given. The Upper Keys butterfly fauna consists of sixty-one species, less than that of the Lower Keys. However, when vagrants are taken into account, the Lower Keys harbor 56 resident species and the Upper Keys 44 species. The difference is attributed primarily to the differing geological histories of the two groups of keys.

Introduction

The Florida Keys extend in an arc from Key Biscayne in the northeast to Key West and the Dry Tortugas in the southwest. These keys may be conveniently divided into two major groups: 1) the Upper Keys, from Key Biscayne to Key Vaca and Knight's Key, which are fragments of a fossil coral reef, composed of Key Largo Limestone; and 2) the Lower Keys, from Missouri and Bahia Honda keys to Dry Tortugas, which are composed of Miami Oolite (Cooke, 1945). A glance at any map of this area shows this division clearly, since the Upper Keys lie *along* a northeast-southwest oriented arc, like beads upon a string. The Lower Keys, on the other hand, are oriented basically in a north-south direction, *at right angles* to an imaginary "string." Dry Tortugas lies about 75 mi. (120 km) west of Key West. The Upper and Lower Keys are separated from each other by the Moser and Money Key channels, spanned by the Seven Mile Bridge between Homestead and Key West.

The flora and fauna of the Lower Keys are distinctly different from those of the Upper Keys. Basically, the Upper Keys have a depauperate mainland southern Florida fauna (Duellman and Schwartz, 1958; Schwartz, 1952); the incidence of mainland species in general decreases as one proceeds from Key Largo to Key Vaca. The general original aspect of these Upper Keys was tropical hammock, and even today there still remain stands of this botanical association on many of the Upper Keys, notably northern Key Largo. The Lower Keys, on the other hand, have in some cases extensive stands of pine woods, where the dominant tree is *Pinus elliottii*, with understory plants that occur as well in pine woods on the Florida mainland. Smaller keys in both sections are often composed primarily (or even exclusively in some cases) of mangroves or saline environments (*Batis* and *Salicornia* flats). Some of the Lower Keys likewise have stands of tropical hammock, but these are neither so large nor so common as they are on the Upper Keys. The entire key flora has a distinct Antillean element (Long and Lakela, 1976:15-16), some of which occurs (often sparingly) on the southern Florida mainland (Little, 1978).

The only major work dealing with Florida Lepidoptera is Kimball (1965; hereafter, specific page references to this publication will be made without an accompanying date, for the sake of brevity). Kimball gave an annotated list of both butterflies and moths; the former group occupies only 28 pages of text. Of necessity, Kimball's remarks on distribution are often brief ("statewide," "throughout the state"), and despite the fact that Kimball often (but not always) differentiated between the mainland and the Florida Keys, the reader is unsure whether the two above distributions include the Keys or not. Marginal records (with dates of capture and museum designations) are often given in cases of southern taxa that have their northern limits on the Florida peninsula; for the Keys, there are rarely any details given except for extremely unusual records (at times the only records) for a

particular taxon. Kimball's work is thorough, considering the period in which it was written. The nomenclature of many taxa has of course changed or been modified in the past 20 years, but this does not detract from the usefulness of the work.

The second source of information is Anderson's (1974) paper, which includes records of three new butterflies from the United States and offers information on four others; all data are from specimens taken on the Lower Keys and are the results of a year's collecting (1972-73) in that area.

A third source of Florida Key records has been the annual summary published in the News of the Lepidopterists' Society (hereafter abbreviated as NLS). This publication has, in almost any given year, some "new," noteworthy, or unusual records of Lepidoptera taken or observed on the Keys. I have attempted to garner all such recent records, and many are included herein.

Considering the differences between the flora and fauna of the Upper and Lower keys, at least as far as other (= vertebrate) groups are concerned, and considering their different geological histories, it seemed a possibility that their rhopaloceran fauna might well show some differences as well. I have collected on the Lower Keys between December 1985 and April 1986, and in October and November 1986. This period is perhaps not the most rewarding as far as numbers of individuals are concerned, since in southern Florida the major period of abundance of most species is spring-summer. But the winter-spring of 1985-86 was unusual in that there were few "cold snaps" (the major one in late December 1985); rather, the period in question was unusually warm and relatively dry. Likewise, the winter of 1986 was unusually hot (average 8°F [6°C] above normal) and dry. These facts should be taken into consideration as far as abundances of species reported in this paper are concerned.

We collected on the Keys (primarily but not exclusively the Lower Keys) on 24-25.xii.1985, 29.xii.1985-2.i.1986, 17-20.i.1986, 8-9.ii.1986, 14-17.ii.1986, 15-16.iii.1986, 26-27.iv.1986, 11-12.x.1986, and 27-29.xi.1986. The collections resulting from these trips total 1336 specimens. Although the present report ostensibly covers the Lower Keys, I am aware that there are other keys in this complex which are not reachable by the Overseas Highway; no attempt was made to sample the faunas of these keys which are difficult of access.

At each collection site, the time of day (on the military 24 h system) and the temperature in degrees Celsius were taken, with the exception (unfortunately) of the collections made in December 1985. In addition, information on flowers being used as nectar sources, copulation, oviposition, and other basic natural history data were recorded. All plants noted in the text as food plants are those used by adults, not larvae. Comparisons are made between temporal abundances, as well as abundances on the various Lower Keys, and between that group and the Upper Keys, wherever possible.

I have followed the botanical nomenclature used by Long and Lakela (1976) for the tropical Floridian flora. In the text, whenever I have included records for butterfly taxa that are *not* from the Lower Keys, I have enclosed those records in brackets ([. . .]).

Hesperiidae

1. *Phocides pigmalion okeechobee* Worthington, 1881. Kimball (p. 50) regarded the Mangrove Skipper as "common along the coast" from November to May, as well as June to August in the southern part of its range. We have collected *Ph. p. okeechobee* in every month between xi-iv, with most specimens (17) in i, eight in iii, six in ii, five in xi, three in iv, and four in xii. Temperatures of activity varied between 26°C (29.xii) and 41°C (26.iv). Times of activity were between 0845 and 1630 h.

Although the larval food plant is Red Mangrove (*Rhizophora mangle*), we have only once (Lower Sugarloaf Key; 25.xii) taken this skipper adjacent to that habitat (Fig. 1). Elsewhere, it wanders widely from purely coastal situations and occurs frequently in pine woods (No Name Key, Cudjoe Key) and is often taken in ruderal situations, near habitations (Big Pine Key) or even in open weedy areas (Big Pine Key, Summerland Key), especially if there are flowers as a food source. In xii, when *Pithecellobium keyense* (Fabaceae) was in bloom, we took one individual feeding on the small but clustered flowers of this low tree (Lower Sugarloaf Key) adjacent to a large mangrove stand. On No Name Key (15.ii; 15.iii) the species favored *Pluchea odorata* (Asteraceae), and one specimen was taken on *Bidens pilosa* (Asteraceae) (Cudjoe Key, 14.ii). We have also collected two specimens on *Morinda royoc* (Rubiaceae) on 27.iv (Big Pine Key) on a road through tropical hammock, one on *Solanum blodgettii* (Solanaceae) on Summerland Key (27.xi), and another on *Ipomoea indica* (Convolvulaceae) on Stock Island (29.xi). On one occasion (Upper Matecumbe Key; 8.ii), a single individual was taken while foraging on ornamental *Bougainvillea glabra* (Nyctaginaceae).

But by far the non-native plant most favored by *Ph. p. okeechobee* is *Senecio mexicana* (Asteraceae). This vine, with its large floral heads with red ray flowers and yellow-orange disk flowers, is locally abundant (Big Pine Key [Fig. 3], Marathon). The flowers attract a wide variety of butterflies, from small skippers (*Wallengrenia*) to papilionids (*H. cresphontes*), and, especially in the mid-to-late afternoon (1400-1600 h), are usually (xii-ii) very "busy." On the 15.iii visit to a large stand of *S. mexicana* on Big Pine Key, very few butterflies and only one *Ph. p. okeechobee* were seen (1110 h; 35°C) foraging. However, at Marathon on this same date, three specimens were taken foraging on *S. mexicana* in the business district of the city (1345-1445 h; 37°C).

Specimens: Stock Island, 2; Boca Chica Key, 1; Lower Sugarloaf Key, 2; Summerland Key, 1; Cudjoe Key, 2; No Name Key, 6; Big Pine Key, 18; [Marathon, 10; Upper Matecumbe Key, 1].

2. *Epargyreus zestos zestos* Geyer, 1832. Kimball (p. 50) recorded this Antillean skipper from Key Largo, Upper Matecumbe Key, and Key West. Klots (1951:206) gave i-viii as inclusive dates of capture, and Kimball (p. 50) added ix. *Epargyreus z. zestos* has also been taken in x (NLS, 1981[2]:24) and xi (NLS, 1983[2]:29) on Big Pine Key and Plantation Key, as well as on Key West (NLS, 1976[2]) in v. In the first case, the female was ovipositing on *Galactia spiciformis* (Fabaceae). Howe (1975:Pl. 95, Fig. 2) illustrated a specimen from Key Largo. Riley (1975:157) gave the Antillean distribution as the Bahamas, Virgin Islands, and the Lesser Antilles. He specifically stated that *E. z. zestos* does not occur on any of the Greater Antilles, although there are specimens from Puerto Rico.

We have collected this species on the Lower Keys on two occasions (Big Pine Key, 27.iv, 28.xi). In the hammock on the eastern side of the key, these skippers were

abundant (27.iv) and feeding on *Morinda royoc* and *Lantana involucrata* (Verbenaceae). The specimen from 28.xi was captured in an open field as it fed on *Lantana involucrata*. Specimens from Marathon were taken foraging on *Senecio mexicana*, (one on 2.i, another on 15.iii), and one on *Bidens pilosa* (26.iv). On all occasions, the weather was bright and sunny, with temperatures from 30°C (Marathon, 26.iv) to 37°C (Marathon, 15.iii). Times of collection were between 0845 and 1530 h.

Specimens: Big Pine Key, 10; [Marathon, 3].

3. *Polygonus leo savigny* Latreille, 1824. The Hammock Skipper is moderately abundant on the Lower Keys. Howe (1975:Pl. 95, Figs. 8, 9) has paintings of specimens from Key Largo and Key Vaca, both Upper Keys. We collected specimens in each month between xi and iv, with most specimens in xi (nine) and xii (eight), six each in i and ii, two each in iv and x, and three in iii. Temperatures varied from 22°C (30.xii) to 38°C (15.iii); times of activity varied between 0845 and 1645 h.

Although the common name of *P. l. savigny* suggests that it is found primarily in tropical hammocks, on Big Pine Key this skipper is most often encountered in pine woods. However, two were collected (27.iv) in the Big Pine Key hammock while they fed on *Morinda royoc*, and six in a hammock-park on Stock Island (29.xi). In the extensive hammock on north Key Largo we also collected a specimen within tropical hammock.

Food plants vary with the season. On 30.xii, we took one individual on *Pithecellobium keyense* along a roadside in pine woods (Big Pine Key). On Lower Sugarloaf Key, on 16.ii, one skipper was taken feeding on the white flowers of *Lantana involucrata*, and on No Name Key on 15.iii one was taken from the pink flowers of *Pluchea odorata*. On 28.xi one skipper was taken on *Lantana involucrata* (Big Pine Key). But, as in the case of *Ph. p. okeechobee*, the major plant used as a nectar source is the introduced *Senecio mexicana*. On Big Pine Key we collected one specimen on this plant on 31.xii, two on 1.i, five on 17.i, and four on 14.ii. The same plant was used at Marathon on 1.i (one specimen).

Polygonus l. savigny is most often active on sunny and warm days; occasionally, one collects an individual (Marathon; 18.i; 27°C) under overcast conditions.

Although *P. manueli* Bell and Comstock has been reported (Kimball, p. 50; NLS, 1973[2]:14; NLS, 1975[2/3]:12) from Key Largo and Bonefish Key, none of our keys' material agrees with the criteria for identification of that species given by MacNeill (in Howe, 1975:569-570). The UNHW dark circular costal dot varies in expression in our series from relatively bold and well expressed to absent, but microscopic examination of the white UPFW markings shows that the scales therein are almost vertical to the wing surface and are not iridescent under oblique light.

Specimens: Stock Island, 6; Lower Sugarloaf Key, 2; Cudjoe Key, 2; Summerland Key, 1; No Name Key, 6; Big Pine Key, 21 (1 FLG, 1 GV); [Marathon, 7; north Key Largo, 1].

4. *Urbanus proteus proteus* Linnaeus, 1758. This skipper was unaccountably rare to uncommon during the periods of our collecting. We neither saw nor collected any individuals in xii, but there are eight from i, four from ii, three from iii, two (much battered) from iv, and one each from x and xi. Although we made no special effort to collect individuals, still the abundance of *U. p. proteus* was rather low. This species, as well as the related *U. d. dorantes*, are extremely seasonal on the south Florida mainland, and the same statement seems to apply to *U. p. proteus* on the Keys. Temperatures of activity varied between 27°C (18.i) and 38°C (15.iii), and times

between 0845 and 1630 h. Habitats are usually along roadsides and adjacent to hammocks or within openings in pine woods.

Native nectar sources include *Bidens pilosa* (Big Pine Key, 15.iii) *Pluchea odorata* (No Name Key, 15.iii), and *Lantana involucrata* (Big Pine Key, 11.x). In most cases, only single individuals were collected. More individuals were collected while taking nectar from *Senecio mexicana*, both on Big Pine Key (1.i, 17.i, 15.ii) and at Marathon (1.i, 2.i, 15.ii). But on these six occasions, in each case (with one exception) only one *U. p. proteus* was seen and taken. Two specimens were collected on Big Pine Key on 1.i.

Specimens: No Name Key, 1; Big Pine Key, 10; [Marathon, 6; Upper Matecumbe Key, 1; Plantation Key, 1].

5. *Urbanus dorantes dorantes* Stoll, 1790. This tailed skipper is more common than *U. p. proteus*, but it seems rarely to approach the abundance that it achieves on the Florida mainland. We collected 13 specimens in i, the month of greatest abundance, with four in xi, one in xii, five in ii, one in iii, and none in iv. Temperatures varied between 24°C (20.i) and 35°C (16.ii), and times between 0900 and 1515 h.

On the Lower Keys, *U. d. dorantes* is less common than on the Upper Keys. On the former, this skipper occurs in pine woods (No Name Key) and in open fields (Summerland Key, Big Pine Key), especially when there are flowers. Flowers used as nectar sources include *Bidens pilosa*, *Flaveria linearis* (Asteraceae), and *Stachytarpheta jamaicensis* (Verbenaceae). The last two plants were used in an open field on Summerland Key, where this skipper was modestly abundant (16-17.ii, 15.iii; four specimens, but many more seen). One individual was taken on *B. pilosa* at Marathon (20.i). But *U. d. dorantes*, like other lepidopteran species, is very attracted to *Senecio mexicana* (1.i, 18.i; 10 collected on this plant at Marathon; one [17.i] on Big Pine Key, but many more seen). *Urbanus d. dorantes* is especially seasonal on the south Florida mainland and is multivoltine there. The same situation seems to apply to the Keys' populations.

Specimens: Stock Island, 3; Summerland Key, 4; No Name Key, 2; Big Pine Key, 4; [Marathon, 11].

6. *Ephyriades brunneus floridensis* Bell and Comstock, 1948. This skipper is extremely abundant on the Lower Keys but is apparently accidental (or at least very rare) on the Upper Keys. (The only published records for the Upper Keys are those of the holotype, allotype, and four paratypes, all from Key Largo.

Ephyriades b. floridensis was abundant in xii (19 specimens), i (23), and ii (19), but somewhat less so in iii and iv (six each), and x (three). The iii-iv figures may be somewhat misleading, and the skipper is more common than this low number indicates (although still not so common as in the three preceding months). Very few were seen in x, and many less (about five) in three days in xi (none collected). Temperatures of activity varied from 22°C (30.xii) to 41°C (26.iv), and times of activity between 0845 and 1645 h. Although *E. b. floridensis* is most active on sunny and warm to hot days, on occasion we have taken specimens on cool and overcast days (Big Pine Key; 24.xii; three specimens collected).

On the Lower Keys, *E. b. floridensis* is most abundant in the pine woods of Big Pine Key, somewhat less so on No Name and Cudjoe keys (in disturbed pine woods and mixed pine-hardwoods in each case), and much less so on Lower Sugarloaf Key, Summerland Key, and Stock Island (where there are no pines). The single non-Lower Key individual taken by us is from Lower Matecumbe Key, where it was

taken in an open field on 8.ii between 1430-1515 h at 37°C. There are no pines on Upper Matecumbe Key (nor are there pines on Key Largo, the type-locality), and the area surrounding the field (which had abundant *Flaveria linearis*) was primarily mangroves and scrubby deciduous woods.

In the winter, *E. b. floridensis* feeds avidly on *Pithecellobium keyense* (Big Pine Key, Lower Sugarloaf Key), where often as many as 8-10 individuals were observed feeding on even small (1.5 m high) trees of this species. We have also taken this skipper feeding on *Lantana involucrata* (Big Pine Key, 2.i, 11.x), *Bidens pilosa* (Big Pine Key, 20.i; Stock Island, 14.ii), *Pluchea odorata* (No Name Key, 15.iii), to which these skippers are greatly attracted, often in numbers equivalent to those attracted to *P. keyense* in the winter, and *Flaveria linearis* (No Name Key, 15.ii; Summerland Key, 16-17.ii). *Ephyriades b. floridensis* has also been taken on *Coccoloba uwifera* (Polygonaceae) (Summerland Key, 26.iv) and *Byrsonima lucida* (Malpighiaceae) (Cudjoe Key, 26.iv). Like other skippers, *E. b. floridensis* uses the introduced *Senecio mexicana* (Big Pine Key; 1.i, 17.i, 15.iii). On the last date, there were few butterflies in general on this plant, whereas on the two previous dates, many individuals of a broad spectrum of species were attracted to *S. mexicana*.

Specimens: Stock Island, 1; Lower Sugarloaf Key, 4; Summerland Key, 3; Cudjoe Key, 8; No Name Key, 11; Big Pine Key, 41 (1 GV, 3 FLG); [Lower Matecumbe Key, 1].

7. *Erynnis zarucco* Lucas, 1857. Kimball (p. 53) stated that this skipper was "apparently absent from the Keys," although Skinner had "credited it to Key West." The type-locality is Cuba, and the species occurs there and on Hispaniola, as well as in southeastern North America. Anderson (1974) recorded *E. zarucco* from Key West. I have compared my ten Keys' specimens noted below with a series of 21 Hispaniolan specimens, as well as with Riley's (1975:Pl. 23, Fig. 2) painting of a Cuban specimen. The specimens from the Keys are much darker than all the above, have all UPFW pale markings absent or at least very obscure in both sexes; the UN pale markings are likewise virtually absent, most especially on the UNHW, which is dark unmarked brown. In addition, the HW fringe is white, a phenomenon reported by Anderson (1974) for about twenty percent of his Key West area specimens. In fact, this skipper, as *Erynnis funeralis*, was reported as "rare" on Stock Island on 15.xii (NLS, 1980[2]:22). Even though authors (Riley, 1975:175; Pyle, 1981:755) explicitly stated that *E. zarucco* has brown fringes, and illustrations (Riley, 1975:Pl. 23, Fig. 2; Howe, 1975:Pl. 93, Figs. 39, 40) show this feature, at least Pyle (1981:Fig. 276) and Harris (1972:Pl. 10, Figs. 13, 14) show pale or whitish fringes on fresh specimens. Hispaniolan specimens have the fringes brown.

Burns (1964), the last reviser of the genus, did not examine any specimens of *E. zarucco* (or the related *E. funeralis*) from the Florida Keys (map, p. 168) and elsewhere did not comment on the occurrence of white HW fringes in *E. zarucco*. The situation is anomalous.

This skipper appears to be uncommon on the Lower Keys. Only ten specimens, on two dates on two different keys, have been collected. The specimens from Stock Island (19.i, 28.xi) were taken in a large field of *Bidens pilosa* at the Key West garbage dump. Those taken on 19.i were not feeding, those on 28.xi were so doing. The two Summerland Key specimens (16.ii) were taken near a large field of *Flaveria linearis*; the adjacent areas were tropical hammock and scrubby buttonwoods. One specimen was taken in the latter habitat, the other in the field, where it was not

feeding.

Specimens: Stock Island, 8; Summerland Key, 2.

8. *Pyrgus oileus* Linnaeus, 1767. This small skipper is quite abundant on the south Florida mainland. Yet we have only two specimens from the Lower Keys and one from the Upper Keys. The two Stock Island specimens (28.xi) were feeding on *Bidens pilosa*; several more were seen at this locality. Although *P. oileus* is not extremely abundant in the winter, the very small number seen is puzzling.

Specimens: Stock Island, 2; [Upper Mattecumbe Key, 1].

9. *Pyrgus communis* Grote, 1872. Kimball (p. 52) reported this species from Key West in ix. We did not take it.

10. *Cybaeus tripunctus tripunctus* Herrich-Schäffer, 1865. Kimball (p. 57) reported *C. t. tripunctus* from Key West (vii) and Long Key (viii), suggesting that this hesperiid is poorly known from the Lower (and Upper ?) Keys. It has also been reported from Key West (NLS, 1975[2/3]:12; NLS, 1976[2]) and Key Largo (NLS, 1980[2]:22).

This small and inconspicuous skipper is moderately abundant on the Lower Keys, where it is typically encountered in or adjacent to flowery fields. It also may be taken in open areas in pine woods, where we have collected it feeding on *Pithecellobium keyense* (Big Pine Key). Most of our specimens are from Lower Sugarloaf Key, where *C. t. tripunctus* was collected (27.xi, 25.xii, 16.i) along a road through mangroves; the skippers were feeding on the purple flowers of *Eupatorium coelestinum* (Asteraceae). Elsewhere, *C. t. tripunctus* feeds on *Cirsium horridulum* (Asteraceae) on Big Pine Key (18.i) in the yard of an abandoned home in pine woods and on *Flaveria linearis* (No Name Key, 15.ii; Lower Sugarloaf Key, 16.ii). On Summerland Key, specimen were collected adjacent to a field of the latter plant but were not observed feeding. At Marathon, one specimen was collected on *Bidens pilosa*. The lack of records for this species feeding on *Senecio mexicana* is worthy of note.

Temperatures of activity varied between 22°C (30.xii) and 39°C (27.xi), and times were between 0845 and 1645 h. We have no specimens from iii, but both xii and ii are each represented by nine individuals, xi by five, i and x each by four, and iv by one.

Specimens: Stock Island, 3; Lower Sugarloaf Key, 14; Summerland Key, 6; No Name Key, 2; Big Pine Key, 5; [Marathon, 2; Upper Mattecumbe Key, 1].

11. *Lerema accius* Smith, 1797. We have only one Lower Key specimen of this species and only two from the Upper Keys. Of the latter, one was taken on 9.ii at 1215-1245 h at a temperature of 34°C on a bright and sunny day, feeding on roadside *Bidens pilosa*. The other was taken on 26.iv between 1330 and 1445 h at a temperature of 30 C, again on a bright and sunny day. The Summerland Key specimen was taken on 12.x at 0845-1000 h at a temperature of 32°C in an open field.

Specimens: Summerland Key, 1; [Marathon, 1; Plantation Key, 1.]

12. *Hylephila phylea phylea* Drury, 1773. Kimball (p. 54) noted the occurrence of this species on the Dry Tortugas. It is moderately common, but quite local, on the Lower Keys, most readily encountered in fields and along roadsides. We have 16 specimens from i, 13 from xi, three each from x, xii and ii, and none from iii or iv. The long series (18) from Stock Island (19.i, 28.xi) was taken at the Key West dump site, where the skippers were feeding on *Bidens pilosa* and *Sida hederacea* (Malvaceae), in a rather circumscribed area, perhaps 250 m². On Big Pine Key, four were taken in the morning (0915-1030 h) in a large open field with much *Bidens pilosa*. Most were not feeding but rather were alighting on the bare oolitic slabs to take the sun (T = 28°C).

They were unusually wary and difficult to collect under these circumstances.

Two pairs *in copula* were taken on 28.xi on Stock Island, at 1012 and 1028 h; the temperature was 31°C.

Temperatures of collection varied between 22°C (30.xii) and 37°C (11.x), at times between 0845 and 1615 h.

Food plants elsewhere include *Pithecellobium keyense* (Big Pine Key, 30.xii), *Lantana ovatifolia* (Verbenaceae) (Cudjoe Key, 9.ii), *Melanthera aspera* (Asteraceae) (Stock Island, 14.ii), *Stachytarpheta jamaicensis* (Big Pine Key, 27.xi), and *B. pilosa* (Big Pine Key, 18.i; Plantation Key, 9.ii).

Specimens: Stock Island, 18; Cudjoe Key, 6; Summerland Key, 2; Big Pine Key, 11; [Plantation Key, 1].

13. *Hesperia meskei* Edwards, 1877. Kimball (p. 54) reported this skipper from Big Pine Key (xii). More recently, *H. meskei* has been reported from Big Pine Key (NLS, 1973[2]:14; NLS, 1976[2]; NLS, 1979[2]:12), where it was taken on 3-5.iv and 1-9.v. We have not collected it on either the keys or the southern Florida mainland.

14. *Wallengrenia otho* Smith, 1797. This is by far the most common small skipper on the Lower Keys, where it occurs in open fields, along roadsides through tropical hammock, and in openings and along roads in pine woods. Specimens have been taken in xi (10), x (four), xii (21), i (37), ii (31), iii (five), and iv (four). The small numbers in iii, iv and x are not sample artifacts; the skippers were much less common in those months than they had been previously. Temperatures of collection varied between 22°C (30.xii) and 38°C (15.iii, 27.xi), primarily on sunny or sunny-and-overcast days; even on overcast days, however, a few *W. otho* could be found. Times of collection varied between 0845 and 1630 h.

Food plants are numerous and varied, and depend to some extent on the season (= what flowers are in bloom). In the winter, *Pithecellobium keyense* is a favorite nectar plant (Big Pine Key, 30.xii). Specimens were regularly taken on *Flaveria linearis*: No Name Key (18.i, 15.ii), Big Pine Key (20.i, 15.ii), Lower Sugarloaf Key (16.ii), Summerland Key (15-16.iii); *Bidens pilosa*: Marathon (1.i, 20.i), Plantation Key (9.ii), Cudjoe Key (28.xi). Less commonly used are: *Lantana ovatifolia* (Cudjoe Key, 19.i, 9.ii), *Coreopsis leavenworthi* (Asteraceae) (Big Pine Key, 11.x), *Jacquemontia* sp. (Convolvulaceae) (Big Pine Key, 15.ii), *Eupatorium coelestinum* (Lower Sugarloaf Key, 16.ii), and *Schinus terebinthifolius* (Anacardiaceae) (Big Pine Key, 11.x). As with most other skippers, *W. otho* is attracted to *Senecio mexicana*; specimens were collected on Big Pine Key on this vine on 31.xii, 1.i, 15.ii, and 15.iii. The last date yielded very few specimens of any lepidopterans attracted to *S. mexicana*.

Specimens: Lower Sugarloaf Key, 5; Cudjoe Key, 9; Summerland Key, 6; No Name Key, 5; Big Pine Key, 71 (2 GV, 4 FLG); [Marathon, 10; Lower Matecumbe Key, 4; Plantation Key, 1; Key Largo, north end, 1].

15. *Atalopedes campestris* Boisduval, 1852. *Atalopedes campestris* is abundant on the Lower Keys. There are 16 specimens from x, 18 from xi, 10 from xii, 15 from i, 20 from ii, nine from iv, and eight from iii; the lesser numbers in iii and iv are not an artifact, since these skippers were not so abundant then as previously. They are most readily encountered in open areas, such as fields, open pine woods, hammock margins, and roadsides, most especially on sunny and bright days. On Geiger Key (29.xi), a single individual was taken flying over an extensive stand of *Batis maritima* (Batidaeae), an unusual habitat for this skipper. Temperatures varied between 22°C (30.xii) and 38°C (15.iii), and times between 0845 and 1615 h.

A pair *in copula* was taken on 28.xi (Stock Island, 0930-1040 h, 31°C) on an open lawn with *Sida hederacea*.

Plants used as nectar sources include: *Bidens pilosa* (Marathon, 1.i; Big Pine Key, 18.i, 20.i, Cudjoe Key, xi), *Melanthera aspera* (Stock Island, 14.ii), *Lantana ovatifolia* (Cudjoe Key, 9.ii; Plantation Key, 9.ii), *Flaveria linearis* (No Name Key, 15.ii; Lower Sugarloaf Key, 16.ii; Summerland Key, 16.ii, 15.iii), *Sida hederacea* (Cudjoe Key, 28.xi), and the introduced *Senecio mexicana* (Big Pine Key, 31.xii, 17.i, 15.ii; Marathon, 15.iii).

Specimens: Stock Island, 10; Boca Chica Key, 4; Geiger Key, 1; Lower Sugarloaf Key, 3; Summerland Key, 31; Cudjoe Key, 10; No Name Key, 2; Big Pine Key, 30 (1 FLG); [Marathon, 4; Plantation Key, 1].

16. *Euphyes pilatka klotsi* L. D. Miller, D. J. Harvey, and J. Y. Miller, 1985. Kimball (p. 55) commented on a specimen of this species from Sugarloaf Key that Klots thought might represent a distinct subspecies, since it was "very dark." Kimball (p. 56) further pointed out that comparison of a series from Big Pine Key was "typical," and thus resembled the mainland population. Miller, Harvey, and Miller (1985) named *E. p. klotsi* from the Lower Keys (Stock Island, Sugarloaf Key, Big Pine Key).

This skipper is uncommon on the Lower Keys. We have three specimens each from xii, i, and ii, and one from iv, but none from iii or x-xi. Times of activity varied between 1030 and 1545 h, and temperatures from 22°C (30.xii) to 41°C (26.iv).

Euphyes p. klotsi is most often encountered in large open areas such as flowery fields or clearings in pine woods. Miller, Harvey, and Miller (1985) noted its occurrence in small patches of sawgrass in low areas in pine woods. Weather conditions for our material were invariably bright and sunny. Flowers used as nectar sources include *Pithecellobium keyense* (Big Pine Key, 30.xii), *Flaveria linearis* (No Name Key, 15.ii [Fig. 2]), *Bidens pilosa* (Big Pine Key, 26.iv), and *Senecio mexicana* (Big Pine Key, 15.ii). It is interesting that all our specimens come from keys where pines are a prominent feature of the vegetation. However, Miller *et al.*'s records from Stock Island and Sugarloaf Key suggest that *E. p. klotsi* is not limited to islands that are pine-clad.

Euphyes arpa Boisduval and Leconte, 1834, was listed by Kimball (p. 55) from Big Pine Key collected in iii and xii. The species was again reported from Big Pine Key on 26.iii (NLS, 1977[2]:14), 15-16.iv (NLS 1973[2]:14), 9-11.iv (NLS, 1976[2]), and Sugarloaf Key on 11.iv (NLS, 1976[2]). These records apparently all apply to *E. p. klotsi*, and *E. arpa* does not occur on the Lower Keys.

Specimens: No Name Key, 2; Big Pine Key, 8 (1 FLG).

17. *Asbolis capucinus* Lucas, 1857. This skipper is rather uncommon on the Lower Keys, where it inhabits open and weedy fields, especially those with flowers, openings in pine woods, and occasionally roadsides. It has been reported from Key West on 23.vi and Big Pine Key on 9-11.iv (NLS, 1976[2]). We collected eight specimens in x, nine in xi, four each in xii, i, and iii, seven in ii, and three in iv. Temperatures varied between 24°C (20.i) and 38°C (15.iii), and times between 0845 and 1645 h.

Plants used for nectar include *Bidens pilosa* (Stock Island, 14.ii), *Flaveria linearis* (No Name Key, 15.ii), *Pluchea odorata* (No Name Key, 15.iii), *Allamanda cathartica* (Apocynaceae) (Summerland Key, 11.x), *Ipomoea indica* (Summerland Key, 11.x), and *Senecio mexicana* (Big Pine Key, 31.xii, 17.i; Marathon, 1.i). When feeding on the large flowers of *A. cathartica* and *I. indica* I observed *A. capucinus* completely

entering the flowers to secure nectar; this skipper, by this behavior, is able to use these large blossoms as a food source, a behavior that we have not observed any other comparably sized skippers to perform.

On Lower Matecumbe Key, these skippers were modestly abundant (three taken) in a large weedy field with much *Flaveria linearis*, *Bidens pilosa*, and *Sida hederacea*. In the residential area of Marathon, an *A. capucinus* was taken from a Cabbage Palm (*Sabal palmetto*) planted as an ornamental in the yard of an occupied home. One was secured on exposed oceanside *Bidens pilosa* (not feeding) on Boca Chica Key.

The seven specimens from the Upper Keys, in contrast to 32 from the Lower Keys suggest that *A. capucinus* is more common on the latter than on the former.

Specimens: Stock Island, 8; Boca Chica Key, 1; Summerland Key, 10; Cudjoe Key, 1; No Name Key, 4; Big Pine Key, 8; [Marathon, 4; Lower Matecumbe Key, 3].

18. *Lerodea eufala* Edwards, 1869. This small drab skipper is uncommon on both the Lower and Upper keys. We collected three specimens each in xii, ii, and iii, two each in i and iv, and one in xi. All are from rather open areas such as fields (Stock Island, Summerland Key, Big Pine Key), or roadsides, primarily through mixed pine-hardwoods (Cudjoe Key). Temperatures of activity varied between 25°C (29.xii) and 36°C (8.ii), and times between 0900 and 1700 h.

Plants used as nectar sources include *Bidens pilosa* (Marathon, 1.i) and *Flaveria linearis* (Summerland Key, 16.ii, 15.iii); most specimens (four) came from the latter locality. On three occasions (Big Pine Key, 24.xii; Marathon, 18.i, Stock Island, 28.xi), we took specimens of *L. eufala* under overcast and cool conditions.

Specimens: Stock Island, 1; Summerland Key, 4; Cudjoe Key, 1; Big Pine Key, 4; [Marathon, 3; Upper Matecumbe Key, 1].

19. *Oligoria maculata* Edwards, 1865. We have not collected this skipper on the Upper Keys, but it is modestly common on the Lower Keys, although rather local there, having been recorded from Big Pine Key on 9-11.iv and Sugarloaf Key on 11.iv (NLS, 1976[2]). It inhabits open fields with flowers, small openings in pine woods, and occasionally roadsides. Most specimens are from ii (10), with five in xi, three in i, and one each in xii and iii. None was taken in iv or x. Temperatures of activity varied between 22°C (30.xii) and 35°C (15.iii), and times between 0915 and 1600 h.

Oligoria maculata is almost always encountered singly; in open areas, typical behavior is for the skipper to fly rapidly, land on a leaf a meter or less above the ground, rest there for only a few seconds, and then swiftly depart. The collector has only a very brief period to ascertain if the individual is "valuable," but by the time that decision is made (and the skippers are easily identified by the white UN dots on a brown ground), it is likely that the skipper has departed. We have never had a "second chance" with an *O. maculata*.

Nectar plants include *Pithecellobium keyense* (Big Pine Key, 30.xii), *Cirsium horridulum* (Big Pine Key, 18.ii), *Flaveria linearis* (No Name Key, 15.ii), *Bidens pilosa* (Cudjoe Key, 28-29.xi), and *Senecio mexicana* (Big Pine Key, 15.ii).

A copulating pair was taken on Big Pine Key (27.xi, 0952 h, 30°C) as they clung to a grass leaf 0.3 m above the ground in an open field in pine woods.

Specimens: Cudjoe Key, 6; Summerland Key, 1; No Name Key, 4; Big Pine Key, 12.

20. *Calpododes ethlius* Stoll, 1782. This large skipper is distinctly uncommon on the

Lower Keys. We have three specimens, two of which were taken in xii and one in i. No others have been seen, even under what should be favorable circumstances. The only recorded temperature is 29°C (18.i); times varied between 1320 and 1615 h. Whether the late hours are significant is impossible to say. Two specimens were taken on *Senecio mexicana* (Big Pine Key, 31.xii); the third was secured in an open field with much *Bidens pilosa* (upon which the skipper was not feeding).

Specimens: Big Pine Key, 3.

21. *Panoquina panoquinoides* Skinner, 1891. Kimball (p. 58) reported this small skipper from Big Pine Key (iv), Key West (vi, ix), and the Dry Tortugas (summer). On Big Pine Key, this species was reported as "abundant in salt marsh" on 4-6.iv (NLS, 1985[2]:29).

Panoquina panoquinoides is locally rather common; it is most frequently taken near the seaside. For example, five specimens were taken on No Name Key in an abandoned development adjacent to salt water canals. The Summerland Key specimen is from a disturbed lot on the Overseas Highway, immediately adjacent to a marine canal. The eight Lower Sugarloaf Key specimens were taken on roadsides in mangroves. The single Marathon specimen is from a salt water margin. The only specimens not immediately associated with near-marine areas are those from Big Pine Key, which were collected in pine woods. Most specimens (nine) were taken in ii, with five in xi, and two each in xii and iv. None was taken in i, iii, or x. Temperatures of activity varied between 33°C (15.ii) and 39°C (27.xi), and times between 0845 and 1500 h.

Five specimens were taken on *Flaveria linearis* (No Name Key, 15.ii) and seven were taken from *Eupatorium coelestinum* on a road through mangroves.

Specimens: Summerland Key, 1; Lower Sugarloaf Key, 8; No Name Key, 5; Big Pine Key, 3; [Marathon, 1].

PAPILIONIDAE

1. *Heraclides cresphontes* Cramer, 1777. This is the the only papilionid that we have encountered on the Lower Keys, where it is not uncommon. There are two specimens from xii, four from i, and three each from ii and iii. In the latter two months, as well as iv, many more individuals were seen than were collected. These swallowtails were exceptionally abundant on Summerland Key on 11.x but were very uncommon at the same site on 27.xi. Two *H. cresphontes* were seen on Lower Matecumbe Key on 8.ii, and two on Summerland Key on 26.iv. Times of collection were between 0930 and 1550 h, at temperatures between 29°C (15.ii) and 38°C (15.iii).

This swallowtail frequents both pine woods and tropical hammocks and their margins. Nectar plants include *Pithecellobium keyense* (Big Pine Key, 30.xii), *Carica papaya* (Caricaceae) (Big Pine Key, 17.i), *Schinus terebinthifolius* (Summerland Key, 12.x), *Lantana involucrata* (Big Pine Key, 27.iv), and, most frequently, *Senecio mexicana* (Big Pine Key, 31.xii, 17.i; Marathon, 15.iii). The papaya tree upon which the *H. cresphontes* was feeding was an isolated plant in pine woods.

Specimens: No Name Key, 1; Big Pine Key, 9; [Marathon, 1; Upper Matecumbe Key, 1].

2. *Heraclides aristodemus ponceanus* Schaus, 1911. There is a record of this species from Key West. Since *H. a. ponceanus* is otherwise unknown from the Lower Keys (as far south in the Upper Keys as Lower Matecumbe), I consider this individual a

vagrant.

3. *Heraclides andraemon bonhotei* Sharpe, 1900. Kimball (p. 32) cited a Key West record for this Bahamian swallowtail, which has also been taken on Key Largo and Long Key (as well as at Miami). The Key West individual was most likely a vagrant from one of these more northeastern key populations. Howe (1975:398-399) considered all Florida records as strays, and there is good evidence that there is no breeding population of this butterfly in the United States, although it may breed on one of the Upper Keys.

4. *Eurytides celadon* Lucas, 1852. Kimball (p. 33) noted the taking of this Cuban species at Key West, "Immediately after a hurricane." It could only have been a vagrant.

PIERIDAE

1. *Appias drusilla neumoegeni* Skinner, 1894. We have taken this butterfly at one locality on four different dates: 15.ii, 16.iii, 27.iv, and 11.x. The locality is the paved road on the eastern end of Big Pine Key; this road passes for a short distance through a fine stand of tropical hammock, and the butterflies occurred only there. We have only once (one individual) seen *A. d. neumoegeni* in pine woods, which cover much of Big Pine Key. The Summerland Key specimen is from an open field adjacent to tropical hammock. Three specimens each are from ii and iv, two each from iii and xi, and one from x. Times varied between 0845 and 1515 h, and temperatures between 29°C (15.ii) and 35°C (27.xi). In the Big Pine Key hammock, the butterflies were extremely attracted to a few tall *Lantana involucrata* bushes, to which they (and a few others) returned repeatedly. One was collected on a roadside *Flaveria linearis*, another on *Morinda royoc*, and a third on *Heliotropium angiospermum* (Boraginaceae).

The female taken on 27.xi is in the "wet season" coloration.

Specimens: Summerland Key, 1; Big Pine Key, 10.

2. *Ascia monuste phileta* Fabricius, 1775. During the winter-spring, *A. m. phileta* is uncommon on the Lower Keys. We have three specimens from xi, nine from xii, seven from i, eight from ii, and one from iii. None was collected in x. A few were seen in each month, but there was never an occasion when they were more common than at other times.

The butterflies are most commonly encountered singly along roadsides through hammock, pine woods, and even mangroves. None (xi-iii) is in the gray "migratory" phase, nor, considering the dates, would that be expected. However, of 10 specimens collected in iv, five are in the gray phase.

Temperatures varied between 27°C (18.i, 16.ii) and 37°C (15.iii), and times between 0845 and 1545 h.

Feeding individuals have been taken on *Heliotropium angiospermum* at Marathon (1.i, 19.i, 15.iii, 26.iv), on *Staphytarpheta jamaicensis* (Big Pine Key, 15.ii), and *Flaveria linearis* (No Name Key, 15.ii). On Big Pine Key (27.iv), *A. m. phileta* was feeding on *Lantana involucrata*, *Morinda royoc*, and *Borrchia* sp. (Asteraceae), the latter in a saline area with *Batis maritima* and *Salicornia bigelovii* (Chenopodiaceae). On several occasions, we observed these whites flying under overcast and cloudy conditions.

Specimens: Stock Island, 2; Lower Sugarloaf Key, 4; Summerland Key, 2; No Name Key, 2; Big Pine Key, 14 (GV 1); [Marathon, 14 (GV 5, FLG 1); Upper Matecumbe Key, 1].

3. *Colias eurytheme* Boiduval, 1852. Kimball (p. 33) listed this species from both Key Largo and the Dry Tortugas. The butterfly is unreported from southern Florida, although it does occur in central Florida, and as far south as Broward County (NLS, 1976[3]:12). It is likely that the records for the keys (1935, 1960) are of strays or were introduced by man, and that this species is not resident on the keys.

4. *Anteos maerula* Fabricius, 1775. This species has been recorded (NLS, 1980[2]:22) from Big Pine Key (5.iv); the individual was very worn and surely is a vagrant. The species occurs on Cuba and on the Central American mainland.

5. *Phoebis sennae eubule* Linnaeus, 1767. This large sulphur is uncommon in the winter-spring; we have five specimens from xii, six from i, three from ii, and none from iii, iv, x, or xi (although a few individuals were seen in those months). Although *Ph. s. eubule* is difficult to collect because of its speed, and high and often erratic flight, the above numbers reflect the uncommonness of the species. Flight times varied between 0915 and 1430 h at temperatures between 26°C (19.i) and 36°C (8.ii).

Phoebis s. eubule is most often encountered in tropical hammock (No Name Key, Upper Matecumbe Key), along paths and roadways. It was especially uncommon in pine woods, although even there an occasional individual was seen, presumably in passage to more favored habitats.

The only plant we have observed *Ph. s. eubule* using as a nectar source is *Bidens pilosa* (Big Pine Key, 20.i; Marathon, 20.i; Plantation Key, 9.ii). It is noteworthy that, on Big Pine Key, we never saw this species on *Senecio mexicana*, a species much used by *Ph. a. maxima*.

Specimens: Stock Island, 1; No Name Key, 6; Big Pine Key, 2; [Marathon, 3; Upper Matecumbe Key, 1; Plantation Key, 1].

6. *Phoebis philea* Johannson, 1763. This large sulphur is known only by six specimens (all females) from Summerland, No Name, and Big Pine keys. Three were taken in x, two in xii, and one in i. I saw a very fresh female on Big Pine Key on 15.ii and another female on No Name Key on 27.xi. Habitats include a roadside in pine woods, an open field with scattered second growth pines and palmettos, an open field adjacent to tropical hammock, and a roadside through hammock (two occasions). Flight times varied between 0845 and 1300 h, at temperatures between 29°C (15.ii) and 37°C (11.x). No individual was seen feeding. Two females were flying about and landing on *Cassia* sp. (Fabaceae) shrubs on Summerland Key (12.x).

Specimens: Summerland Key, 3; No Name Key, 2; Big Pine Key, 1 (FLG).

7. *Phoebis agarithe maxima* Neumoegen, 1891. By far the most common of the three species of *Phoebis* on the Lower Keys, *Ph. a. maxima* was most abundant in xii (17 specimens), less so in i (12), with six in ii, four in x, two in iv, and one each in iii and xi. Specimens taken in x, xi, xii, and iv are often very worn, but some individuals from xii are fresh. Temperatures varied between 22°C (30.xii) and 36°C (8.ii), and times between 0845 and 1550 h.

Phoebis a. maxima is tolerant of a wide array of habitats: open fields, hammock margins, along roadsides, and the edges of mangrove stands. On Cudjoe Key, it occurs in mixed pine-hardwoods. The butterfly does not shun ruderal and disturbed situations.

Records for food plants are few. On Lower Sugarloaf Key, one was taken feeding on *Flaveria linearis* (16.ii). On Big Pine Key, *Senecio mexicana* was favored above all native plants. We collected specimens on this vine on 31.xii, and on every succeeding visit, there were at least a few (often as many as 8-10) *Ph. a. maxima* foraging there.

Such "concentrations" of *Ph. a. maxima* are quite unusual, not only on the Keys but elsewhere.

One specimen (FLG 1939) is a dwarf female with a FW length of 26 mm.

Specimens: Lower Sugarloaf Key, 5; Summerland Key, 5; Cudjoe Key, 3; No Name Key, 5; Big Pine Key, 22 (3 GV, 4 FLG); [Marathon, 1 (GV); Lower Matecumbe Key, 1; Upper Matecumbe Key, 1].

8. *Eurema दौरα दौरα* Godart, 1819. Smith, Leston, and Lenczewski (1982) clarified the status of the south Florida populations of *E. दौरα*; previous to their paper, Floridian material was assigned to both the nominate subspecies and the Antillean *E. d. palmira* Poey. The latter taxon does not occur in south Florida.

During the winter-spring, *E. d. दौरα* was not common on the Keys (although it seems more abundant on the Upper in contrast to the Lower keys). Most specimens (12) were taken in xi and ii, with eight in i, four each in iii and x, and one each in xii and iv. Temperatures of activity varied between 24°C (20.i) and 41°C (26.iv), and times between 0900 and 1530 h.

This small yellow is associated with open weedy fields, hammock margins, and roadsides, especially (Summerland Key) where the roadside grasses have been mowed to the height of lawn grass. Elsewhere (Marathon), *E. d. दौरα* was common in a field of *Bidens pilosa* (1.i, 2.i, 18.i, 20.i). By far the most specimens were taken on Lower Matecumbe Key (8.ii) in a large field of *Flaveria linearis*, on which these small butterflies were not seen to feed. Rather, they dodged in and among the grass leaves and culms, only a few centimeters above the ground. On Boca Chica Key (29.xi), *E. d. दौरα* was feeding on oceanside *Bidens pilosa*.

The rarity of *E. d. दौरα* on Big Pine Key is noteworthy; it seems possible that pine woods are not the most favored habitat for this butterfly.

Specimens: Stock Island, 3; Boca Chica Key, 2; Lower Sugarloaf Key, 5; Summerland Key, 7; Cudjoe Key, 3; Big Pine Key, 5 (1 FLG); [Marathon, 8; Lower Matecumbe Key, 8; Upper Matecumbe Key, 1].

9. *Eurema boisduvaliana* Felder and Felder, 1865. Anderson (1974) reported the capture of a male of this orange on Sugarloaf Key on 14.x.1973, where it had been attracted to the flowers of *Schinus terebinthefolius*. The specimen was in good condition and "did not look as though it was a visitor from outside the Keys." The species has been taken in Cuba (Riley, 1975:127) but the distribution is Mexico to Costa Rica. We did not collect any specimens, but it may well be that there is (or was) a very local population of *E. boisduvaliana* on Sugarloaf Key.

10. *Pyrisitia lisa lisa* Boisduval and Leconte, 1829. Kimball (p. 36) listed this species from the Dry Tortugas and stated that it is abundant "throughout the state . . . especially from March to December, but flying on almost every sunny day." This statement makes all the more peculiar that fact that we took only six specimens of *P. l. lisa* on the Lower Keys (and none on the Upper Keys). Our single Big Pine Key specimen was taken flying along a dirt road in mixed pine-hardwoods on 17.i, between 1400 and 1445 h at a temperature of 31°C. On Summerland Key (11-12.x), three specimens were taken in a large field between 0845 and 1230 h (32-37°C). The two Boca Chica Key specimens were netted (29.xi) on oceanside *Bidens pilosa* (1045-1110 h, 36°C).

Since small pierids were distinctly uncommon during the period of this study, we collected them whenever we encountered them. Most, as noted above, were *E. d. दौरα*. Even given the dates reported by Kimball, it is remarkable that we did not

encounter other individuals of this species.

Specimens: Boca Chica Key, 2; Summerland Key, 3; Big Pine Key, 1.

11. *Abaeis nicippe* Cramer, 1779. Kimball (p. 36) reported this species from the Dry Tortugas. He also stated that "It may be found in any month but is most common in July." That we did not encounter this species may well be due to the time of the year.

12. *Nathalis iole* Boisduval, 1836. This is another species that Kimball (p. 36) reported from the Dry Tortugas. We did not encounter any individuals during the present study, but four specimens were collected on Big Pine Key in v.1983. They were flying in mowed roadside grass adjacent to a tropical hammock remnant.

LYCAENIDAE

1. *Chlorostrymon maesites maesites* Herrich-Schäffer, 1864. Kimball (p. 47) reported this hairstreak from Miami and Brickell Hammock. Howe (1975:278) considered it "rare" in south Florida and did not mention any specific records for the Keys. Pyle (1981:464) noted its occurrence "in the keys of southernmost Florida."

Presumably, Pyle's observations are based on the capture of 27 specimens of this species on Key West in v-ix.1973. There, *Ch. m. maesites* favored the flowers of *Schinus terebinthifolius* and *Pithecellobium keyense*, the latter especially attractive. Despite the long series, Anderson considered this species "not common" on Key West. We did not collect specimens.

There is an additional Lower Keys record for Stock Island (NLS, 1983[2]:29); in that instance, eggs were deposited on *Albizia lebbek* (Fabaceae). There are also numerous records (NLS, 1975, 1980, 1982, 1984, 1985) of the occurrence of *Ch. m. maesites* on Key Largo.

2. *Calycopis cecrops* Fabricius, 1793. This hairstreak is one of the less common theelines; we have taken it only on the Lower Keys, and usually singly there. Most specimens (seven) are from ii, with three in xii, two in i, and one each in iv and xi. None was taken in iii or x. Temperatures varied between 27°C (16.ii) and 35°C (16.ii), and times between 0915 and 1700 h.

Calycopis cecrops occurs in open areas such as fields and roadsides, in pine woods and mixed pine-hardwoods. In ii, these hairstreaks were especially attracted to *Flaveria linearis* (No Name Key, 15.ii; Lower Sugarloaf Key, 16.ii; Summerland Key, 16.ii), despite the profusion of *Bidens pilosa*, on which we took two specimens (Big Pine Key, 20.i; Stock Island, 29.xi). On Lower Sugarloaf Key, one specimen was taken on *Lantana involucrata* (25.xii), and on Cudjoe Key one was secured while feeding on *Acacia farnesiana* (Fabaceae) (9.ii).

Specimens: Stock Island, 1; Lower Sugarloaf Key, 5; Cudjoe Key, 1; Summerland Key, 1; No Name Key, 2; Big Pine Key, 4.

3. *Strymon melinus melinus* Hübner, 1818. No other hairstreak (or butterfly) shows so clearly the differences between the Upper and Lower Keys. We have 21 specimens from the latter (taken 11-12.x and 28.xi), and 83 from the Upper Keys, especially Lower Matecumbe Key. Most specimens (44) are from ii, with 26 from i, 17 from x, 14 from iv, two from xi, and one from iii; there is none from xii. Temperatures varied between 26°C (19.i) and 37°C (15.iii, 11.x), and times between 0845 and 1515 h.

Strymon m. melinus is almost exclusively a butterfly of open areas, especially those with *Bidens pilosa*, upon which these hairstreaks feed avidly. Individuals were taken on this plant at Marathon (1.i, 2.i, 18.i, 15.iii; 26.iv), Lower Matecumbe Key (8.ii),

Plantation Key (9.ii), and Stock Island (19.i). Of the long series from Upper Matecumbe Key, some individuals were feeding on *Sida hederacea* and *Heliotropium angiospermum*. On Summerland Key (11.x), these hairstreaks were feeding on *Melanthera aspera*. But *B. pilosa* is the "flower of choice" in all cases and at all localities. It is also pertinent that no specimens were taken on *Flaveria linearis*, a plant favored by many small butterflies and skippers.

The "rarity" of *S. m. melinus* on the Lower Keys, at the same time that it was extremely abundant on the Upper Keys, is puzzling and unique, insofar as our study is concerned. The Lower Key individuals were taken at the Key West dump site on Stock Island and in an open field on Summerland Key, where they were syntopic with *S. columella modestus*.

Specimens: Stock Island, 4; Summerland Key, 16; Big Pine Key, 1; [Marathon, 29; Lower Matecumbe Key, 40; Upper Matecumbe Key, 1; Plantation Key, 3].

4. *Strymon martialis* Herrich-Schäffer, 1864. In contrast to the preceding species, we found *S. martialis* quite uncommon during the winter-spring. However, others have taken it abundantly (i.1980) on *Suriana maritima* (Surianaceae). We collected three in i, two each in ii, iv, and xi, and one each in x and xii; none was taken in iii. Times varied between 0845 and 1630 h, and temperatures between 26°C (29.xii) and 35°C (16.ii, 26.iv).

We have taken *S. martialis* on three food plants: *Flaveria linearis* (Lower Sugarloaf Key, 29.xii; Summerland Key, 16.ii), *Bidens pilosa* (Marathon, 2.i, 18.i), and *Lantana involucrata* (Big Pine Key, 26.iv, 29.xi; Cudjoe Key, 29.xi). At Marathon, *S. martialis* was greatly outnumbered by *S. m. melinus*, with which it was syntopic. Habitats include weedy roadsides and small openings in pine woods. Escobio took a *S. martialis* (27.iv) on a large leaf about 2 m above the ground at the interface between tropical hammock and buttonwoods on Big Pine Key; these hairstreaks rarely fly so high.

Specimens: Lower Sugarloaf Key, 1; Summerland Key, 2; Cudjoe Key, 1; Big Pine Key, 4; [Marathon, 2].

5. *Strymon acis bartrami* Comstock and Huntington, 1943. We collected this hairstreak only on Big Pine Key and only in xi-i and iv. None was seen in the previous or intervening months, despite repeated visits to the precise localities where we had taken specimens. Temperatures varied between 22°C (30.xii; four specimens) and 41°C (26.iv; one specimen). Times of collection were between 0945 and 1700 h.

Strymon a. bartrami is distinctly a hairstreak of pine woods, whose understory includes the larval food plant (*Croton linearis*; Euphorbiaceae). The presence of pines (as on Cudjoe Key and No Name Key) without *C. linearis* apparently prevents the invasion of other keys locally. At one locality on Big Pine Key, four specimens were taken on 30.xii, all on *Bidens pilosa*. The precise spot was the overgrown yard of an abandoned home, with a profusion of the above plant. The surroundings were untouched pine woods. At another locality, two of these hairstreaks were taken in untouched pine woods, and at a third, one was taken as it sat on a low (0.5 m) palmetto leaf in mixed pine-hardwoods. A specimen was taken at this same locality on 26.iv. Another individual was seen in a large open field on the Overseas Highway, as it fed on *B. pilosa*, and Escobio saw still another near the flowers of *Pithecellobium keyense*, on which it presumably was about to feed. The long series (ten) from iv was taken in a large field with scattered second growth pines and a dense stand of *Croton linearis*, upon which, along with *Lantana involucrata*, these hairstreaks were feeding. Like-

wise, two specimens were taken (27.xi) feeding on the flowers of *Croton linearis*. In no case, not even in the yard of the abandoned home, was a *S. a. bartrami* seen more than 5 m from the *Pinus-Croton* association. Even when there are apparently suitable flowers (*B. pilosa*) further from the pines, these hairstreaks seem very reluctant to leave that haven.

Specimens: Big Pine Key, 20.

6. *Strymon columella modestus* Maynard, 1873. Kimball (p. 47) considered southern Florida (including the keys) *S. columella* as *S. c. modestus*, but also reported *S. c. cybirus* Hewitson, the West Indian subspecies, from the Dry Tortugas. I consider all our keys' material as *S. c. modestus*.

This hairstreak is common on the Lower Keys. Most specimens (48) are from xi, 15 are from i, with four in iv, three in ii, two in x, and one each in xii and iii. Temperatures of activity varied between 24°C (30.xii) and 37°C (11.x), and times between 0845 and 1530 h.

Like most other hairstreaks, *S. c. modestus* inhabits roadsides and fields. On Stock Island, these hairstreaks were taken at the Key West dump site, where they were abundant. There, they were feeding on *Bidens pilosa* (19.i, 29.xi), and this plant was favored at Marathon (1.i), Cudjoe Key (28-29.xi), and on Big Pine Key (30.xii), where the species is uncommon. On Summerland Key, the flowers used were *Flaveria linearis* (15.iii), *Melanthera aspera* (11-12.xi), and on Big Pine Key, they were feeding on *Croton linearis*, along with *S. a. bartrami*. On Boca Chica Key, these hairstreaks were using *Turnera ulmifolia* (Turneraceae) as a nectar source.

Specimens: Stock Island, 34; Boca Chica Key, 3; Summerland Key, 11; Cudjoe Key, 20; Big Pine Key, 4; [Marathon, 2; Lower Matecumbe Key, 1].

7. *Strymon limenius* Hewitson, 1868. This Antillean hairstreak has been reported from Big Pine Key and Key West (Anderson, 1974), where there may be (or have been; Simon and Miller, 1986:7) local populations. Anderson's three Big Pine Key specimens were taken on 23.xii.1972 feeding on *Bidens pilosa*. His single Key West specimen was secured on 23.v.1973 resting near the blossoms of *Schinus terebinthifolius*. Anderson also reported another Big Pine Key individual, in the collection of S. Roman, taken on 3.iv.1971. We did not encounter this butterfly.

8. *Electrostrymon angelia angelia* Hewitson, 1874. Anderson (1974) first reported this species from the Florida Keys. He took the first specimen on Key West on 6.iv.1973 and secured additional specimens every month between that date and xi.1973. The hairstreaks were attracted to the flowers of *Schinus terebinthifolius* and *Coccoloba uvifera*. Although Anderson considered *E. a. angelia* not common, with "seldom more than 3-5 specimens captured at one location," during the end of iv "as many as 20-25 specimens were seen flying about in clearings and open areas on clear, hot afternoons."

This hairstreak appears to be the rarest thecline on the Lower Keys. Miller (1978) noted the existence of a specimen in the Strecker collection from Florida, presumably taken before 1880. Pyle (1981:463) stated that this species is a "recent immigrant" to Key West. Only two specimens were taken by us, both on Big Pine Key. One was secured on 20.i between 0915 and 1030 h (T = 28°C) as it fed on *Bidens pilosa*. The second was netted on 14.ii between 1515 and 1600 h (T = 30°C) as it too fed on *B. pilosa*. The first individual was from an open flowery field on the Overseas Highway, the second from a roadside through pine woods, with a dense and tall (1.5 m) understory of *Pteridium aquilinum* (Pteridaceae).

Specimens: Big Pine Key, 2.

9. *Brephidium isophthalma pseudofea* Morrison, 1873. Although I have specimens from only two keys, *B. i. pseudofea* is certainly more abundant and widespread on the Lower Keys than these records indicate. Most specimens are from the eastern edge of Big Pine Key; seven are from ii, three from iii, two from iv, and two from xi. Times of activity varied between 0845 and 1515 h, at temperatures between 30°C (14.ii) and 38°C (27.xi).

A series of seven Big Pine Key specimens is from the typical habitat of these tiny blues: *Batis maritima* flats. A second Big Pine Key locality is somewhat unusual; here, these butterflies were collected in a local stand of *Batis-Salicornia-Borrchia*, which was an understory to buttonwood (*Conocarpus erecta*; Combretaceae). At both sites the butterflies were moderately common, and many more could have been secured. During most of the period of this study, we searched *Batis* flats on Lower Sugarloaf Key without success. Yet on 27.xi, two specimens were taken there feeding on *Bidens pilosa* on a roadside through mangroves, a rather unusual situation for this blue.

Specimens: Lower Sugarloaf Key, 2; Big Pine Key, 12.

10. *Leptotes cassius theonus* Lucas, 1857. This is the most common of the blues on both Upper and Lower Keys. It is a butterfly of roadsides, open fields or other flowery exposed areas, including small openings in pine woods. Most specimens (32) are from i, with 14 in ii, 12 in xii, and two each in x and xi. One was netted in iv. None was collected in iii. The lower numbers in iii-iv and x-xi are not a sample artifact, since many less individuals were seen in those months than at other times. In fact, in iii-iv, on Cudjoe and Summerland keys, for example, very few blues of any species were encountered. Temperatures of activity varied between 22°C (30.xii) and 37°C (11.x), and times between 0845 and 1630 h. Although most often encountered on bright and sunny days, *L. c. theonus* may be collected on cool and overcast days as well.

Food plants include *Bidens pilosa* (Marathon, 1.i; Big Pine Key, 18.i, 20.i; Cudjoe Key, 19.i; Stock Island, 19.i; Plantation Key, 9.ii), *Lantana involucrata* (Lower Sugarloaf Key, 25.xii); *Flaveria linearis* (Big Pine Key, 15.ii; No Name Key, 15.ii), and *Heliotropium angiospermum* (Upper Matecumbe Key, 8.ii).

A pair was taken *in copula* on 19.i on Big Pine Key (FLG 1918-1919).

Specimens: Stock Island, 2; Boca Chica Key, 1; Lower Sugarloaf Key, 8; Summerland Key, 4; Cudjoe Key, 3; No Name Key, 1; Big Pine Key, 21 (1 FLG); [Marathon, 15 (6 GV, 2 FLG); Lower Matecumbe Key, 4; Upper Matecumbe Key, 1; Plantation Key, 2; north Key Largo, 1].

11. *Hemiargus thomasi bethunebakeri* Comstock and Huntington, 1943. Kimball (p. 49) recorded this species from the Dry Tortugas, and Howe (1975:Pl. 57, Figs. 25, 26) figured a pair from Key Largo, where the species is at times abundant. Our few specimens are from the Lower Keys only. This species, and *H. c. antibubastus*, were uncommon during winter-spring. There are three specimens each from xii and i, two each from iii and iv, and one from ii. Flight times were between 0845 and 1600 h, at temperatures between 24°C (30.xii) and 34°C (16.iii).

This blue is most commonly encountered along roadsides and in openings in pine woods, although it is not restricted to that habitat. The two specimens from iv were taken from an abandoned dirt road through buttonwoods; the butterflies were hovering over *Borrchia* sp., but were not feeding. Food plants include *Lantana involucrata* (Lower Sugarloaf Key, 25.xii) and *Coreopsis leavenworthi* (Big Pine Key,

17.i).

Specimens: Lower Sugarloaf Key, 2; Big Pine Key, 9.

12. *Hemiargus ammon* Lucas, 1857. A single individual of this species was reported (NLS, 1985[2]:29) from Big Pine Key, taken 5.iv.1984; the identification was regarded as tentative. The species occurs on Cuba, the Bahama and Cayman islands (Riley, 1975:110).

13. *Hemiargus ceraunus antibubastus* Hübner, 1818. Kimball (p. 49) reported this species from the Dry Tortugas. The species is uncommon on both the Upper and Lower keys. We collected most specimens (six) in i, with four in xi, one each in xii and iv, and none in ii, iii, or x. Temperatures of activity varied between 24°C (30.xii) and 35°C (26.iv). Times of activity were between 0930 and 1415 h.

Hemiargus c. antibubastus is as uncommon as the previous species on both the Upper and Lower keys. Like its congener, it too is an inhabitant of openings and roadsides. This butterfly has been taken feeding only on *Bidens pilosa* (Stock Island, 19.i; Marathon, 20.i).

Specimens: Stock Island, 6; Big Pine Key, 5; [Marathon, 1].

HELICONIIDAE

1. *Agraulis vanillae nigrrior* Michener, 1942. This butterfly is uncommon during the winter-spring, although the numbers of specimens collected do not reflect the numbers of individuals seen on the wing. There are five specimens from i, three from iv, and two each from xii, ii, and iii. Individuals were also seen in x and xi but were not collected. Times of collection varied between 0915 and 1445 h, at temperatures between 24°C (30.xii) and 36°C (8.ii).

Agraulis v. nigrrior occurs in all major habitats, from mangrove stands to open fields, although it favors open areas. It occurs in pine woods, but sparingly. Nectar flowers are *Heliotropium angiospermum* (Upper Matecumbe Key, 8.ii), *Morinda royoc* (Summerland Key, 26.iv), and *Bougainvillea glabra* (Cudjoe Key (19.i)). We have collected four pairs *in copula*: Big Pine Key, 18.i, 1300 h, 28°C (overcast); Big Pine Key, 16.iii, 0955 h, 34°C (in roadside grass); Lower Matecumbe Key, 8.ii, 1030-1215 h, 31°C; Marathon, 26.iv, 1342 h, 30°C.

Specimens: Summerland Key, 1; Big Pine Key, 9 (1 GV); [Marathon, 2; Lower Matecumbe Key, 1; Upper Matecumbe Key, 1].

[2. *Dryas iulia largo* Clench, 1975. Kimball (p. 39) stated that this species did not occur "below Marathon" and this appears to be true 20 years later. We have not seen or collected this species on the Lower Keys, and on the Upper Keys *D. i. largo* is uncommon during the winter-spring. Our two specimens are from i and ii; none was taken in x, xi, xii, iii, or iv. The only temperature recorded is 36°C (8.ii); times varied between 1015 and 1430 h. Both specimens were taken associated with tropical hammock, either within that habitat or along its edge.

Specimens: Marathon, 1; Upper Matecumbe Key, 1.]

3. *Heliconius charitonius tuckeri* Comstock and Brown, 1950. This species is relatively uncommon on both the Upper and Lower Keys during the winter-spring. There are six specimens from i, two from ii, one from xi, and none from x, xii, iii, and iv, although individuals were seen in iii, iv, and x but not collected. Temperatures varied between 24°C (19.i) and 36°C (8.ii), and times between 0930 and 1400 h.

Heliconius ch. tuckeri is almost exclusively an inhabitant of hammock or other sun-and-shade situations; it does not occur in the pine woods on Big Pine Key but is

not uncommon on that key in tropical hammock and along its edges. On Cudjoe Key, the species occurs in mixed pine-hardwoods but is uncommon.

Heliconius ch. tuckeri has been seen feeding on *Lantana ovatifolia* (Cudjoe Key, 19.i), *Heliotropium angiospermum* (Marathon, 26.iv), and *Morinda royoc* (Big Pine Key, 27.iv).

Specimens: Stock Island, 1; Cudjoe Key, 1; Big Pine Key, 4 (1 FLG); [Marathon, 1; Upper Matecumbe Key, 2].

NYMPHALIDAE

1. *Euptoieta claudia* Cramer, 1775. This species has been reported from Big Pine Key (NLS, 1967[3]:12), where one individual was collected on 17.v. Kimball (p. 40) reported *E. claudia* from Key Largo. It is only questionably resident on the Upper Keys and surely not so on the Lower Keys.

[2. *Athanasia frisia* Poey, 1832. We have no specimens of this species from the Lower Keys. Remarkably, this West Indian species appears not to have been recorded from the Lower Keys; most records are from Key Largo (NLS 1980, 1982), Plantation Key (NLS 1979, 1982), and Upper Matecumbe Key (NLS 1982). All our material was collected on a single day (8.ii) between 1030 and 1515 h, at temperatures between 31°C and 37°C. The butterflies were very abundant in a large field with much *Bidens pilosa*, *Sida hederacea*, and *Heliotropium angiospermum*. The butterflies fly weakly and perch often on the leaves of grasses and other forbs, where they are easily caught. Many more were seen than were collected; this is the same site where *Strymon m. melinus* was so abundant. No *A. frisia* was seen feeding.

Specimens: Lower Matecumbe Key, 11.]

3. *Phyciodes tharos tharos* Drury, 1773. This species was uncommon during the time of this study and was equally rare on both the Upper and Lower keys. There are no specimens from x or xii, four from i, six from ii, four from iii, and one each from iv and xi. Temperatures of activity varied between 27°C (18.i) and 40°C (15.iii), and times between 0845 and 1700 h.

This small butterfly is an inhabitant of roadsides and grassy areas; it occurs in pine woods and along hammock margins. We have seen *Ph. th. tharos* feeding only on *Bidens pilosa* (Marathon, 1.i, 18.i). Elsewhere, specimens were collected as they fluttered along roads or paths. The specimens from Lower Matecumbe Key, taken 8.ii, are from the same large field where *A. frisia* was very abundant.

(There is a report [NLS, 1970:14] of *Phyciodes phaon* Edwards from the "Lower Keys," date not given. I regard this record as suspicious and do not include this common mainland nymphalid as a member of the Lower Keys fauna.)

Specimens: Big Pine Key, 7 (1 FLG); [Marathon, 4; Lower Matecumbe Key, 4; north Key Largo, 1].

4. *Vanessa virginiensis* Drury, 1773. Kimball (p. 42) recorded this species from the Dry Tortugas. We did not collect any specimens.

5. *Vanessa cardui cardui* Linnaeus, 1758. Kimball (p. 42) reported this species from Key West (8-10.v.1916). Escobio took a specimen on Stock Island (28.xi) in an open field with much *Bidens pilosa* and *Sida hederacea* (0930-1040 h; 31°C).

Specimen: Stock Island, 1.

6. *Vanessa atalanta rubria* Fruhstorfer, 1909. Kimball (p. 42) noted the occurrence of this species on Key West and the Dry Tortugas. We have two specimens from i (one of which is extremely worn), and one each from ii and iii. Temperatures of activity

varied between 33°C (15.ii) and 37°C (15.iii), and times between 0945 and 1540 h.

One specimen (1.i) was taken inside a dense hammock at Marathon. The three remaining individuals were taken while feeding on *Senecio mexicana* in pine woods but "residential" areas (Big Pine Key, 2.i, 15.ii; Marathon, 15.iii).

Specimens: Big Pine Key, 2; [Marathon, 2].

7. *Junonia coenia* Hübner, 1822. No other lepidopteran on the Florida Keys, nor in south Florida, presents the taxonomic problems as *Junonia*. Kimball (p. 42) listed, for the entire state of Florida, only *Precis orithya evarete* Cramer, 1779. But in the text, he stated that this taxon had been known as *Junonia coenia*. He further noted that the subspecies *evarete* "is general and common throughout the state . . . except that in the Keys, including the Dry Tortugas, it may be entirely replaced by the subspecies *zonalis* . . . The dates for *zonalis* also cover most of the year, but how much the two subspecies overlap geographically I cannot say." From the above, it is apparent that Kimball regarded *J. o. evarete* as statewide, but that *J. o. zonalis* likewise occurred, primarily in the southern portion of the Florida peninsula and the Keys.

Miller and Brown (1981:175-176) considered *J. coenia* and *J. evarete* as distinct species, the latter with two North American subspecies: *zonalis* Felder and Felder 1867, and *genoveva* Stoll 1782. Riley (1975:74) likewise considered *J. coenia* and *J. evarete* separate species but felt that the name *genoveva* was applicable to the "dry season" form of *J. e. zonalis*. He reported the latter subspecies from the Bahamas to the Cayman Islands, Jamaica, and Cuba; on the last-named island, *J. e. zonalis* occurs with *J. coenia*.

Most recently, Turner and Parnell (1985) showed conclusively that on Jamaica, there are two biological entities. Moreover, by referring to Cramer's original plates, they showed that the names as now (and above) used have been reversed: *J. evarete* is properly applied to those *Junonia* that have, among other characters, the anterior UPHW ocellus normally one-fifth to one-third larger than the posterior eyespot, the UNHW "basically dull gray to dark brown with maculations and submarginal eyespots largely obliterated by the ground color," and the antennae "dark tawny or brown . . . with black club." At least the HW characters are usually those associated with *J. genoveva*. These authors characterized *J. genoveva*, on the other hand, as having the UNHW anterior ocellus one-third to twice as large as posterior ocellus, the UNHW coloration "basically brown with conspicuous maculations of variable intensity light brown to dark or reddish brown" and the submarginal ocelli usually distinct, with the antennae pale cream or white with a dark club. On Jamaica, at least, these two entities act as distinct species, and other evidence presented by Turner and Parnell leaves no doubt that they are two separate species.

Pyle (1981:Figs. 688-689, 691-692) has excellent photographs of *J. coenia* and *J. evarete* (= *J. genoveva sensu* Turner and Parnell). The figures of the latter (689, 692) show (dorsally) a butterfly without pale (white or whitish) markings on the UP, the anterior UPHW ocellus about twice as large as the posterior, with a "simple" pupil with black and pale bluish scales. The UN photograph (HW almost completely obscuring FW) shows a whitish subapical FW band; the two major UNHW ocelli are both small, very obscure, and of about the same size. In contrast to this are the plates of *J. coenia* (688, 691). The UP has pale (tan) markings on the FW, the UPFW ocellus is large and is "tied" to the FW inner margin by a black bar (absent in *J. evarete*). Moreover, the anterior UPHW ocellus is very large (about four times the size of the

posterior ocellus), and has a "pupil" composed largely of blue, pink, and some black scales. The UN photograph of *J. coenia* shows the UNFW subapical bar white, this color tending posteriorly to the inner margin. The UNHW ocelli are present but faint and show the same relative sizes as the UPHW ocelli.

Riley (1975:74) stated that "two simple characters" of the UP distinguish the two species. In *J. coenia* the large UPFW ocellus is inwardly bordered by a white crescent, and on the UPHW the anterior large ocellus is outwardly black, which changes to blue, and then to red or orange inwardly. In *J. evarete*, the large UPFW ocellus is always ringed completely with red or reddish brown, never white-edged, and the UPHW anterior ocellus rarely has blue scales (more frequent in females) but never has red scaling in either sex.

I have 79 specimens of *Junonia* from the Keys (both Upper and Lower). These specimens are readily divided into two unequally sized groups: 53 resemble Pyle's Figs. 689 and 692 (= *J. g. zonalis*), and 26 are like his Figs. 688 and 691 (= *J. coenia*). Thus the "problem" seems to be easily solvable: these two species occur on the Florida Keys (and in southern Florida).

However: Pyle's figures of *J. g. zonalis* do not agree with West Indian specimens of this taxon; I have examined 131 specimens from the Antillean islands; none has the FW "pale" areas completely orange as do Pyle's figures, nor are those figures of an aberrantly colored specimen. My long series from the Keys agrees completely with Pyle's figures, but neither those figures nor my series agree with Antillean *J. g. zonalis*.

Riley (1975:Pl. 8, Fig. 5) has a painting of the eastern Caribbean subspecies *J. g. michaeli* Munroe. It too is like *J. g. zonalis* from the Antilles and unlike the Keys specimens or Pyle's figures. Riley's character of the UPHW anterior ocellus is excellent in this case, since these specimens (as Pyle's figures show) have small anterior ocelli with primarily black scales and some (few) blue scales.

Although I do so with some hesitation, I consider my 53 butterflies *J. coenia*, despite the fact that they do not completely agree with anyone's published concepts of that species.

Junonia coenia has been taken in all winter-spring months (except x) on the Keys, but these butterflies were most common in ii (24 specimens), with 16 in xii, nine in xi, two in i, and one each in iii and iv. Temperatures of activity varied between 21°C (30.xii) and 39°C (27.xi), and times between 0845 and 1550 h. Most specimens were taken along weedy or grassy roadsides, the latter adjacent to fields, hammocks, or mangroves. We rarely encountered this species feeding; a notable exception is a long series taken from *Heliotropium angiospermum* on Upper Matecumbe Key (8.ii), along a newly constructed dirt road through tropical hammock. Elsewhere, specimens were taken feeding on *Flaveria linearis* (Big Pine Key, 15.ii; No Name Key, 15.ii), *Eupatorium coelestinum* (Lower Sugarloaf Key, 27.xi), *Bidens pilosa* (Boca Chica Key, 28.xi), and *Senecio mexicana* (Big Pine Key, 1.i). Very often, *J. coenia* was seen or collected singly, flying down open roads, both paved and dirt, or landing briefly on bare ground. In the latter circumstance, the butterflies were very wary. Such activity occurs not only on bright and sunny days but also on cool, and even windy, days (Big Pine Key, 24.xii; Lower Sugarloaf Key, 30.xii). On the former date a male was taken drinking from a rain puddle in a dirt road.

This species shows about equal abundance on the Lower and Upper keys, but the differences in abundance on different keys in each group are striking. For instance,

the low number (five) from Big Pine Key contrasts strongly with the high number (24) from Lower Sugarloaf Key. Since we collected any *Junonia* we saw, such differences are not due to collecting bias.

Specimens: Stock Island, 2; Boca Chica Key, 1; Summerland Key, 1; Lower Sugarloaf Key, 24; No Name Key, 4; Big Pine Key, 5; [Marathon, 2; Lower Matecumbe Key, 3; Upper Matecumbe Key, 11].

8. *Junonia evarete* Cramer, 1775. Twenty-six specimens are assignable to this taxon (see discussion above). Eleven were taken in x, 10 in xi, two in ii, and three in iv; none was collected in xii, i, or iii. Times were between 0845 and 1400 h, at temperatures between 30°C (27.xi) and 39°C (11.x, 27.xi). Only two individuals were taken while feeding, on *Eupatorium coelestinum* (with *J. coenia*) on 29.xi, on a road through mangroves.

The Big Pine Key specimens were taken in pines and in an open second-growth pine field (two). The latter locality is discussed in detail under *Anaea floridalis*. One individual was taken on bare ground adjacent to the Overseas Highway on Summerland Key; others on that key were along the edges and within openings of a field adjacent to tropical hammock. The Cudjoe Key series is from a small field of *Bidens pilosa* and *Sida hederacea* (on which they were not feeding).

Although the two species of *Junonia* were taken on a total of seven Lower Keys, only on Big Pine Key and Lower Sugarloaf Key did we collect both species. Only on the latter did we collect the two species precisely syntopically (on a road through mangroves, feeding). Note also that *J. coenia* was more abundant in xii-ii, whereas *J. evarete* was more common in x-xi. There seems to be a distinct lack of synchrony between the two species.

A Big Pine Key specimen, taken in ii, is unusual in that the UNHW is uniform dark rich purple-brown.

Note that we took no specimens on the Upper Keys. Published records (NLS, 1974, 1976, 1977, 1982) for both Upper (Key Largo, Plantation Key) and Lower (Stock Island, Big Pine Key) keys, assigned at that time to *J. evarete* (or Type A *Junonia*), presumably are now to be considered *J. coenia* as the name is used here. These records are from ii, iv, v, viii, and x-xii, agreeing with the dates for our *J. coenia*. The absence of *J. evarete* from the Upper Keys is also re-enforced.

Specimens: Lower Sugarloaf Key, 2; Summerland Key, 8; Cudjoe Key, 6; Big Pine Key, 10.

9. *Anartia jatrophae guantanamo* Munroe, 1942. During the winter-spring, this butterfly is quite uncommon on the Keys. There are three specimens from xii, two from i, and one each from iii and xi, but none from ii, iv, or x. *Anartia j. guantanamo* is, during the summer, often amazingly abundant on the south Florida mainland, where there may be, in the proper habitat, hundreds of individuals in a very circumscribed area. Thus, its rarity on the Keys comes as somewhat of a surprise. Temperatures of activity varied between 24°C (30.xii, 20.i) and 37°C (15.iii), and times between 0930 and 1545 h.

Anartia j. guantanamo flies along roadsides and in open areas, including pine woods. Individuals are very aggressive toward other Lepidoptera. Although bright and sunny days are favored, at least one individual was taken on a cool and overcast day (Big Pine Key, 24.xii). One individual was seen but not collected as it flew along a road on Summerland Key (26.iv).

The only flower from which we have seen this nymphalid take nectar is *Bidens*

pilosa (Marathon, 20.i).

Specimens: Big Pine Key, 4; [Marathon, 2].

10. *Anartia chrysopelea* Hübner, 1825. Anderson (1974) first reported this butterfly (as *A. lytrea* from Hispaniola; his excellent photograph shows clearly that it is rather *A. chrysopelea* from Cuba) from Key West. The single fresh specimen was taken on 22.ii.1973; Anderson also noted that there was a Big Pine Key specimen, pointed out to him by Clench, taken in 1972. These two individuals were almost certainly vagrants or waifs from Cuba, which is about 90 mi. (144 km) south of the Lower Keys. There may have existed local populations of this butterfly on the keys during that period; *A. chrysopelea* does not appear to be there today.

11. *Siproeta stelenes insularis* Holland, 1916. Kimball (p. 43) listed specimens of this Antillean population from Key Largo (i.1950) and Key West (1935-1936); it has also been reported from Plantation Key (10.iii;NLS, 1979[2]:12). Howe (1975:Pl. 14, Fig. 16) has a painting of a specimens from Big Pine Key. Even as recently as 1975 (Howe, 1975:139), it was uncertain whether *S. s. insularis* was established in southern Florida. There is no question that this butterfly is well established at least on the southern Florida mainland.

We have one specimen, taken 16.ii, T = 35°C, 1410-1500 h, as it fed on *Flaveria linearis* in an open field, surrounded by hammock and scrubby buttonwoods.

Specimen: Summerland Key, 1.

12. *Eunica monima* Cramer, 1782. Kimball (p. 43) gave records for this small nymphalid from Key Largo (v, vii; 20.viii.1928) and Key West (no date given). The species has been recorded from Key Largo (24.xi) and Big Pine Key (1.xi;NLS, 1982[2]:27). We have not collected it.

[13. *Eunica tatila tatilista* Kaye, 1926. Although this butterfly is apparently common on the Upper Keys (NLS 1964, 1970, 1974, 1975, 1976, 1979, 1982, 1984) from Key Largo to Islamorada and Upper Matecumbe Key and has been reported from iii-vi and ix-xi, it appears to be absent from the Lower Keys, whence there are no published records. We did not collect it.]

14. *Diaethria clymena* Cramer, 1776. Kimball (p. 43) gave records for this tropical species from Key West (vii.1895; vii.1897). In almost a century, no further material has been collected on the Lower Keys, and these records surely are of vagrants, or a temporary local population due to strays.

15. *Marpesia chiron* Fabricius, 1775. This species has been reported from Big Pine Key (NLS, 1986[2]:34). The specimen was taken while feeding on *Lantana* sp. on 7.xi.1985.

16. *Marpesia eleucea* Hübner, 1818. Anderson (1974) reported the capture of a male on 14.x.1973 on Sugarloaf Key. The butterfly was attracted to the flowers of *Schinus terebinthefolius*. No additional individuals were seen, but that taken was "in good condition and did not look as though it was a visitor from outside the Keys."

17. *Marpesia petreus* Cramer, 1776. Anderson (1974) reported this butterfly as "common" on Sugarloaf Key on 14.x.1973, where they were feeding on the blossoms of *Schinus terebinthefolius*.

On Cudjoe Key on 14.ii, a *Marpesia* was closely (1.5 m) observed feeding on roadside *Flaveria linearis* but was not netted. Since the only orange species of *Marpesia* known to be resident in southern Florida is *M. petreus*, it presumably was that species, but there is always a possibility that it was a vagrant (or even resident?) *M. eleucea*, which occurs in Cuba (see previous comment). The time was 1230-1400 h

and the temperature 28°C, in disturbed pine woods.

APATURIDAE

1. *Anaea floridalis* Johnson and Comstock, 1941. Although *A. floridalis* is often attributed to the "Florida Keys," it appears that the only Key population is on Big Pine Key. We have seen the larval food plant (*Croton linearis*) only on that key, and all our specimens are from there. Cudjoe and No Name keys are pineclad, but *C. linearis* does not occur there, nor does *A. floridalis*.

There are 10 specimens from i, six from xi, five from x, four each from xii and ii, two from iv, and three from iii. Temperatures varied between 29°C (17.i) and 39°C (11.x), and times between 0845 and 1545 h.

Anaea floridalis inhabits pine woods and is regularly seen "dashing" through this habitat. Openings in pines are among the most favored situations. An open field with second growth pines and a dense understory of *C. linearis* on the Overseas Highway is typical (Fig. 4). In fact, on 17.i, two female *A. floridalis* were seen and collected ovipositing on *C. linearis* in this field. On the same date, a pair (?; only one collected) of these butterflies was seen on the ground on an open dirt road in this same field, within 10 cm of each other. On 25.xii, in the early morning (0930 h), while the temperature was still cool, two *A. floridalis* were seen, independently, sunning on the lower leaves of palms (*Coccothrinax* sp.) in the yard of an abandoned home in pines.

On 2.1, six were collected in open pine woods adjacent to an abandoned grapefruit grove; one of the butterflies was feeding on a rotting grapefruit still on the tree.

Specimens: Big Pine Key, 34.

SATYRIDAE

1. *Neonympha areolata areolata* Smith, 1797. Of the two satyrids known from mainland south Florida, only this species is known from the Keys. Kimball (p. 38) noted its occurrence on Big Pine Key. We have not collected it.

DANAIDAE

1. *Danaus plexippus plexippus* Linnaeus, 1758. Kimball (p. 37) reported the Monarch (as *D. p. megalippe*) from Key West (18.xii.1936) and Key Largo (16.vii.1947); our specimens are the nominate subspecies.

Monarchs were observed and collected only in xii (2) and i (6), and none was seen in previous or subsequent months. The eight collected are all fresh and were undoubtedly resident. Temperatures of activity varied between 24°C (30.xii) and 31°C (17.i), and times between 0945 and 1630 h.

Habitats include pine woods (Big Pine Key), hammock margin (No Name Key), and roadsides (Marathon). Monarchs were seen taking nectar from *Pithecellobium keyense* (Big Pine Key, 30.xii) and *Senecio mexicana* (Big Pine Key, 1.i, 17.i).

Specimens: No Name Key, 1; Big Pine Key, 4; [Marathon, 3].

2. *Danaus gilippus berenice* Cramer, 1780. Queens were collected in x (seven), i (one), ii (nine), iii (one), and iv (five). Times of capture varied between 0900 and 1500 h, and temperatures between 29°C (17.ii, 15.iii) and 37°C (11.x). Another individual (not collected) was seen on Big Pine Key in pine woods on 31.xii, between 1320 and 1550 h. The single individual from Big Pine Key was taken as it "floated" through pine woods. The two series from Summerland Key were collected in the same open field (16-17.ii, 11.x). There, these butterflies were feeding on *Flaveria linearis*,

Bidens pilosa, and *Solanum blodgettii* (16-17.ii, 15.iii). A pair was taken in copula on 16.ii at 1418 h at 35°C; the mated pair was in deep (0.75 m) grass in the field noted above. The series from Marathon was collected along a road and path through and adjacent to hammock, where the butterflies were feeding on *Bidens pilosa*.

Specimens: Summerland Key, 17; Big Pine Key, 1; [Marathon, 5].

DISCUSSION

Perhaps one of the more interesting facts that has emerged from the present study is the sequencing in use of flowers by many species of butterflies on the Lower Keys.

First, *Bidens pilosa* is always in bloom and is thus always a potential food source for many species. In x (and to a much lesser extent in xi), *Schinus terebinthifolius* was the predominant nectar source for a wide spectrum of butterflies, from large *Heracles cresphontes* to tiny *Leptotes c. theonus*. In xii, the primary source of nectar was *Pithecellobium keyense*. This plant has white to pinkish flowers in globose heads and varies from a small shrub to a moderately large tree with a height of 6 m. Since even small plants of this species bear flowers, its nectar is available to those butterflies and skippers that fly near to the ground (*W. otho*, *A. campestris*, *E. brunneus*, *S. acis*) as well as to those that normally fly much higher (*H. cresphontes*, *D. plexippus*). By i, *P. keyense* was finished flowering completely.

For i and ii, the major plant used by many species was *B. pilosa*. But by the end of ii, *Flaveria linearis* came into full bloom (there had been abundant flowers on this low herb previously but they were generally ignored by most species in favor of *B. pilosa*), and it was the plant most often used by moderately sized to small species in ii and iii. By the middle of iii, *Pluchea odorata* was beginning to come into flower, and the pinkish corymbs of this shrub to small tree (2 m) were immensely attractive to a variety of species, from moderate to small size. As more plants of this species came into flower in iii, the more it was used by butterflies and skippers.

By iv, *P. odorata* was no longer in flower, and *F. linearis* had also gone to seed. In that month, however, several plants were in full flower (*Morinda royoc*, *Lantana involucrata*, *Croton linearis*, *Coccoloba uvifera*, *Byrsonima lucida*), and this variety allowed butterflies and skippers to "select" from a broader spectrum of nectar sources than previously. Thus, as the season advanced, different nectar sources were used as they became available.

It is interesting that *B. pilosa* is always in bloom and is very abundant along roadways and in fallow fields and disturbed areas, during that period when *F. linearis* is likewise in full bloom (and it too is a roadside and field plant). Butterflies and skippers preferred the latter to the former, and stands and patches of *B. pilosa* were virtually unused. *Heliotropium angiospermum*, although of local occurrence, blooms during the entire year; at Marathon, this plant was consistently (and almost exclusively) used by *A. m. phileta*.

But certainly, as indicated in the text, the red-and-orange flowers of the introduced *Senecio mexicana* were utilized by not only the largest number of butterflies and skippers, but most consistently and by a wide variety of sizes, from *W. otho* to *H. cresphontes*. If collecting had been poor during a particular day, we often resorted to a visit to one of these vines on Big Pine Key or at Marathon. We could be assured that, regardless of how poor collecting had been elsewhere, these plants would be patronized by butterflies of many species.

The above statement was true from xii to ii. In iii, and x-xi, at both localities,

numbers of visitors dropped off sharply, and by iv, there were almost no butterflies or skippers using either of these particular plants. Whether, during the winter, when a wide variety of native plants is not in bloom, *S. mexicana* is a major nectar source, and with the flowering of larger numbers of native species in iii and iv, many attractive to lepidopterans, attention shifts from *S. mexicana* to native plants, is unknown.

On 27.iv.1986, Escobio and I stopped at a large vine, fully in flower, of *S. mexicana* on the Overseas Highway on Plantation Key. The plant was growing on the outer face of tropical hammock. In 20 minutes, we saw less than ten butterflies flying disinterestedly among the flowers. Thus, the lack of attraction of *S. mexicana* was not a purely local phenomenon on Big Pine Key and at Marathon.

To arrive at a number of species of butterflies and skippers known from mainland south Florida (= south of a line from Naples in the west to Miami in the east) is difficult. As noted in the introduction, Kimball did not always give specific localities for those species which he considered common and "statewide" in distribution. In other cases both he and Klots (1951) cited unusual or marginal records from south Florida. Also, since at least the eastern (Miami) portion of this area has been massively modified in the years since the above books were written, some (many?) of these old records are no longer "valid," in the sense that species, once recorded from Miami, may not be found there today. This is exceptionally unfortunate, in that the Upper Keys begin with Key Biscayne, off the Miami coast, and parallel the east coast of Florida to Key Largo. Thus, that very area which was, at one time, the northernmost and least-far-removed source for Keys' butterflies is currently so disturbed by destruction of habitat and cultivation of crops that many old records may not be re-enforced. Although the above statement is true, the cultivation of vegetables has favored the entrance into south Florida of at least one species, *Pontia protodice* Boisduval and Leconte (Pieridae), which is now abundant in this area.

Judging from all published records, as well as information from fellow collectors, there are about 128 species of butterflies and skippers known from this region: 46 species of hesperiids, nine papilionids, 18 pierids, 19 lycaenids, one riodinid, one libytheid, three heliconiids, two apaturids, 20 nymphalids, two satyrids, and four danaids. My own collecting activities here (beginning in 1977) have yielded a far lesser number of species: 15 skippers, five papilionids, 10 pierids, nine lycaenids, one riodinid, three heliconiids, two apaturids, 10 nymphalids, two satyrids, and three danaids, a total of 70 species. Although this number is undoubtedly less than reality, it seems likely that the number of resident species is less than the 128 species recorded. Such species as *Historis odius* Fabricius, *Lycorea cleobaea* Godart, *Pyrisitia dina* Poey, *Anteos maerula* Fabricius, or *Diaethria clymena* Cramer, to name a few included in the above computation, can hardly be expected as daily (or even regular) occurrences or captures. On the other hand, as the situation with *P. protodice* noted above points out, one cannot cavalierly disregard some unique records. A case in point is *M. chiron*, which has been reported from both the mainland (Klots, 1951:280) and more recently from the Keys. Another is *S. stelenes*, now well established on the mainland, after many years of reports of "strays."

To sum up the above, it is virtually impossible to give a finite number of species from which the Keys' butterfly fauna was derived. Also, the Upper Keys have not been collected so intensively as the Lower Keys, most especially during the winter-spring, the time that the material for the present paper was collected. Thus, we do not have a "complete" picture of the Upper Keys fauna; that it is not so large as that

of the mainland is certain. But just how much smaller it is remains to be determined. One other fact is pertinent: the abundance of a particular species may vary tremendously on two different keys, even on the same day (see text discussion of *S. m. melinus*, for instance). Thus, if one collects on an "off day" on a particular key, he may simply not encounter examples of a particular species, because it is on that day uncommon. These facts should be kept in mind in the following comments.

Sixty-one species are known from the Upper Keys (*Phocides p. okeechobee*, *Epargyreus z. zestos*, *Polygonus l. savigny*, *P. m. manuely*, *Urbanus p. proteus*, *U. d. dorantes*, *Ephyriades b. floridensis*, *Pyrgus oileus*, *Cymaenes t. tripunctus*, *Lerema accius*, *Hylephila ph. phylea*, *Wallengrenia otho*, *Atalopedes campestris*, *Asbolis capucinus*, *Lerodea eufala*, *Panoquina sylvicola*, *Battus p. lucayus*, *Heraclides cresphontes*, *H. a. ponceanus*, *H. a. bonhotei*, *Eurytides marcellus*, *Appias d. neumoegeni*, *Ascia m. phileta*, *Colias eurytheme*, *Phoebis s. eubule*, *Ph. philea*, *Ph. a. maxima*, *Aphrissa s. floridensis*, *Eurema d. दौरa*, *Pyrisitia l. lisa*, *P. nise*, *Kricogonia lyside*, *Chlorostrymon m. maesites*, *Ch. s. simaethis*, *Strymon m. melinus*, *S. martialis*, *S. c. modestus*, *Electrostrymon endymion*, *Tmolus azia*, *Brephidium i. pseudofea*, *Leptotes c. theonus*, *Hemiargus t. bethunebakeri*, *H. c. antibubastus*, *Agraulis v. nigrior*, *Dryadula phaetusa*, *Dryas i. largo*, *Heliconius ch. tuckeri*, *Athanassa frisia*, *Phyciodes th. tharos*, *Vanessa a. rubria*, *Euptoieta claudia*, *Junonia coenia*, *Anartia j. guantanamo*, *Siproeta s. insularis*, *Eunica monima*, *E. t. tatilista*, *Marpesia petreus*, *Hamadryas a. diasia*, *Danaus p. plexippus*, *D. g. berenice*, *D. e. tethys*).

The 17 species known from the Upper (but not the Lower) Keys may be grouped into four categories: A) those species that are vagrants but which have or may have had temporarily successful populations on the Upper Keys. Most of these species are wanderers from the West Indies or Central America, but some are wanderers from the Florida mainland (*Panoquina sylvicola*, *Battus p. lucayus*, *Eurytides marcellus*, *Aphrissa s. floridensis*, *Pyrisitia nise*, *Kricogonia lyside*, *Electrostrymon endymion*, *Dryadula phaetusa*, *Hamadryas a. diasia*); B) those species that have invaded the Upper Keys from the mainland and are established there (*Polygonus m. manuely*, *Dryas i. largo*, *Athanassa frisia*, *Danaus e. tethys*); C) those species that have (relatively recently) invaded the Upper Keys from elsewhere (not the mainland except indirectly) and are established there (*Ch. s. simaethis*, *Tmolus azia*, *Eunica t. tatilista*); D) one species that has invaded from the West Indies and has evolved an endemic subspecies on the Upper Keys (*Heraclides a. ponceanus*). It might be more appropriate to consider (D) as (B), since *H. a. ponceanus* at one time occurred on the south Florida mainland.

Thus, of the 61 species recorded from the Upper Keys, 17 are "interloper" species; this gives a "native" fauna of 44 species (14 hesperiids, one papilionid, eight pierids, eight lycaenids, two heliconiids, eight nymphalids, and two danaids).

Sixty-nine species are known from the Lower Keys (*Phocides p. okeechobee*, *Epargyreus z. zestos*, *Polygonus l. savigny*, *Urbanus p. proteus*, *U. d. dorantes*, *Ephyriades b. floridensis*, *Erynnis zarucco*, *Pyrgus oileus*, *P. communis*, *Cymaenes t. tripunctus*, *Lerema accius*, *Hylephila ph. phylea*, *Hesperia meskei*, *Wallengrenia otho*, *Atalopedes campestris*, *Euphyes p. klotsi*, *Asbolis capucinus*, *Lerodea eufala*, *Oligoria maculata*, *Calpodus ethlius*, *Panoquina panoquinoides*, *Heraclides cresphontes*, *H. a. ponceanus*, *H. a. bonhotei*, *Eurytides celadon*, *Appias d. neumoegeni*, *Ascia m. phileta*, *Colias eurytheme*, *Anteos maerula*, *Phoebis s. eubule*, *Ph. a. maxima*, *Eurema d.*

daira, *E. boisduvaliana*, *Pyrisitia l. lisa*, *Abaeis nicippe*, *Nathalis iole*, *Chlorostrymon m. maesites*, *Calycopis cecrops*, *Strymon m. melinus*, *S. martialis*, *S. a. bartrami*, *S. c. modestus*, *S. limenius*, *Electrostrymon a. angelia*, *Brephidium i. pseudosea*, *Leptotes c. theonus*, *Hemiargus t. bethunebakeri*, *H. ammon*, *H. c. antibubastus*, *Agraulis v. nigrior*, *Heliconius ch. tuckeri*, *Phyciodes th. tharos*, *Vanessa virginiensis*, *V. c. cardui*, *V. a. rubria*, *Junonia coenia*, *J. evarete*, *Anartia j. guantanamo*, *A. chrysopelea*, *Siproeta s. insularis*, *Eunica monima*, *Diaethria clymena*, *Marpesia chiron*, *M. eleucha*, *M. petreus*, *Anaea floridalis*, *Neonympha a. areolata*, *Danaus p. plexippus*, *D. g. berenice*).

Of these 69 species, A) 11 may be considered vagrants (*Heraclides a. ponceanus*, *H. a. bonhoti*, *Eurytides celadon*, *Anteos maerula*, *Eurema boisduvaliana*, *Strymon limenius*, *Hemiargus ammon*, *Anartia chrysopelea*, *Diaethria clymena*, *Marpesia chiron*, *M. eleucha*). It is possible that *S. limenius* is established on the Lower Keys, but we did not take it there. On the other hand, it may have had a moderately successful (but temporary) foothold but has not survived. B) Eleven species may be considered remnants of a mainland fauna (*Erynnis zarucco*, *Hesperia meskei*, *Euphyes p. klotzi*, *Oligoria maculata*, *Calpodus ethlius*, *Panoquina panoquinoides*, *Appias d. neumogeni*, *Nathalis iole*, *Strymon a. bartrami*, *Anaea floridalis*, *Neonympha a. areolata*). Of these, *N. a. areolata* may have been a mainland vagrant, although it seems unlikely that such a delicate creature could have been wafted as an adult.

The contrast between the Upper Keys (9) and Lower Keys (11) vagrants is small. The number of mainland-affiliated species on the Upper Keys (7) stands in contrast to the number (11) on the Lower Keys. It seems likely that this difference is due to the differing histories of the Upper and Lower Keys, the Upper Keys being essentially new land, emerged from the ocean floor and colonized haphazardly by over-water invasion from the mainland, and the Lower Keys as an isolated portion of the mainland, supporting a depauperate mainland fauna but with more species that are derived (*sensu lato*) from the mainland. The total number of species on the two groups of keys (61 on the Upper Keys, 69 on the Lower Keys) reflects this difference also.

Finally, the number of Upper Keys species that are established (44) differs from the number of established species on the Lower Keys (56), regardless of their derivations. Although the differences in "total species" and "established species" are of about the same magnitude (14 in the former, 13 in the latter), this similarity is not due to the same species in the two cases. Rather, different species contribute to these differences. The richer butterfly fauna of the Lower Keys is obvious.

ACKNOWLEDGMENTS

I wish to acknowledge the enthusiastic cooperation and sacrifice of time of Jose Escobio. He not only has been a fellow-collector in the field but has aided me in many laboratory-associated tasks. I am in his debt. Philip A. Arana likewise helped in field work. Fernando L. Gonzalez and George Valladares allowed me to examine specimens collected by them; they are included, with the proper designations (FLG, GV), in the text. Daniel F. Austin of Florida Atlantic University identified some of the food plants for me; I am pleased to recognize herein his hearty and knowledgeable cooperation. Susan Borkin of the Milwaukee Public Museum has been extremely gracious in supplying necessary literature.

TABLE 1.

	Lower Keys	Upper Keys
HESPERIIDAE		
1. <i>Phocides p. okeechobee</i>	X	X
2. <i>Epargyreus z. zestos</i>	X	X
3. <i>Polygonus l. savigny</i>	X	X
4. <i>Polygonus m. manuely</i>		X
5. <i>Urbanus p. proteus</i>	X	X
6. <i>Urbanus d. dorantes</i>	X	X
7. <i>Ephyriades b. floridensis</i>	X	X
8. <i>Erynnis zarucco</i>	X	
9. <i>Pyrgus oileus</i>	X	X
10. <i>Pyrgus communis</i>	X	
11. <i>Cymaenes t. tripunctus</i>	X	X
12. <i>Lerema accius</i>	X	X
13. <i>Hylephila ph. phylea</i>	X	X
14. <i>Hesperia meskei</i>	X	
15. <i>Wallengrenia otho</i>	X	X
16. <i>Atalopedes campestris</i>	X	X
17. <i>Euphyes p. klotsi</i>	X	
18. <i>Asbolis capucinus</i>	X	X
19. <i>Lerodea eufala</i>	X	X
20. <i>Oligoria maculata</i>	X	
21. <i>Calpodes ethlius</i>	X	
22. <i>Panoquina panoquinoides</i>	X	
23. <i>Panoquina sylvicola</i>		X
PAPILIONIDAE		
1. <i>Battus p. lucayus</i>		X
2. <i>Heraclides cresphontes</i>	X	X
3. <i>Heraclides a. ponceanus</i>	X	X
4. <i>Heraclides a. bonhotei</i>	X	X
5. <i>Eurytides marcellus</i>		X
6. <i>Eurytides celadon</i>	X	
PIERIDAE		
1. <i>Appias d. neumogeni</i>	X	X
2. <i>Ascia m. phileta</i>	X	X
3. <i>Colias eurytheme</i>	X	X
4. <i>Anteos maerula</i>	X	
5. <i>Phoebis s. eubule</i>	X	X
6. <i>Phoebis philea</i>	X	X
7. <i>Phoebis a. maxima</i>	X	X
8. <i>Aphrissa s. floridensis</i>		X
9. <i>Eurema d. दौरa</i>	X	X
10. <i>Eurema boisduvaliana</i>	X	
11. <i>Pyrisitia l. lisa</i>	X	X
12. <i>Pyrisitia nise</i>		X
13. <i>Abaeis nicippe</i>	X	?
14. <i>Nathalis iole</i>	X	
15. <i>Kricogonia lyside</i>		X

	LYCAENIDAE		
1. <i>Chlorostrymon m. maesites</i>		X	X
2. <i>Chlorostrymon s. simaethis</i>			X
3. <i>Calycopis cecrops</i>		X	
4. <i>Strymon m. melinus</i>		X	X
5. <i>Strymon martialis</i>		X	X
6. <i>Strymon a. bartrami</i>		X	
7. <i>Strymon c. modestus</i>		X	X
8. <i>Strymon limenius</i>		X	
9. <i>Electrostrymon a. angelia</i>		X	
10. <i>Electrostrymon endymion</i>			X
11. <i>Tmolus azia</i>			X
12. <i>Brephidium i. pseudofea</i>		X	X
13. <i>Leptotes c. theonus</i>		X	X
14. <i>Hemiargus t. bethunebakeri</i>		X	X
15. <i>Hemiargus ammon (?)</i>		X	
16. <i>Hemiargus c. antibubastus</i>		X	X
	HELICONIIDAE		
1. <i>Agraulis v. nigrior</i>		X	X
2. <i>Dryadula phaetusa</i>			X
3. <i>Dryas i. largo</i>			X
4. <i>Heliconius ch. tuckeri</i>		X	X
	NYMPHALIDAE		
1. <i>Euptoieta claudia</i>		X	X
2. <i>Athanassa frisia</i>			X
3. <i>Phyciodes th. tharos</i>		X	X
4. <i>Vanessa virginiensis</i>		X	
5. <i>Vanessa c. cardui</i>		X	
6. <i>Vanessa a. rubria</i>		X	X
7. <i>Junonia coenia</i>		X	X
8. <i>Junonia evarete</i>		X	
9. <i>Anartia j. guantanamo</i>		X	X
10. <i>Anartia chrysopelea</i>		X	
11. <i>Siproeta s. insularis</i>		X	X
12. <i>Eunica monima</i>		X	X
13. <i>Eunica t. tatilista</i>			X
14. <i>Diaethria clymena</i>		X	
15. <i>Marpesia chiron</i>		X	
16. <i>Marpesia eleuchea</i>		X	
17. <i>Marpesia petreus</i>		X	X
18. <i>Hamadryas a. diasia</i>			X
	APATURIDAE		
1. <i>Anaea floralis</i>		X	
	SATYRIDAE		
1. <i>Neonympha a. areolata</i>		X	
	DANAIDAE		
1. <i>Danaus p. plexippus</i>		X	X
2. <i>Danaus g. berenice</i>		X	X
3. <i>Danaus e. tethys</i>			X

Table 1. List of skippers and butterflies known from the Lower (left column) and Upper (right column) keys.



Fig. 1. Lower Sugarloaf Key. The shrubby growth on the right side of the road is backed by mangroves. Typical habitat of *W. otho*, *Ph. agarithe*, *S. columella*, *C. cecrops*, *A. vanillae*, *L. cassius*. (15.iii.1986).



Fig. 2. No Name Key. Roadside with abundant *Flaveria linearis* in bloom. Area to left of road is mixed pine-hardwoods. In iii and iv, this road had abundant *Pluchea odorata* and *Byrsonima lucida*. A wide spectrum of skippers (*Ph. pigmalion*, *E. brunneus*, *W. otho*, *A. campestris*, *E. pilatka*) and butterflies (*Ph. agarithe*, *H. cresphontes*, *L. cassius*, *A. monuste*) occurred here. (15.iii.1986).



Fig. 3. Big Pine Key. The red-flowered introduced composite *Senecio mexicana*, certainly the most favored introduced plant for a wide variety of butterflies. (15.iii.1986).



Fig. 4. Big Pine Key. Field on Overseas Highway, with scattered second-growth pines and understory of *Croton linearis* and large stands of *Lantana involucrata*. Typical habitat of *A. floridae*, *S. acis*, *S. columella*, *O. maculata*, *E. brunneus*, *Ph. agarithe*, *Ph. philea*. (16.iii.1986).

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