

FALL DRAGONFLY (ODONATA) AND BUTTERFLY (LEPIDOPTERA) MIGRATION AT ST. JOSEPH PENINSULA, GULF COUNTY, FLORIDA

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ABSTRACT

I describe the fall 1999 migration of 5 Lepidoptera and 4 Odonata species north along St. Joseph Peninsula, Gulf County, in the Florida Panhandle. Highest counts were for the Gulf fritillary butterfly (*Agraulis vanillae* (L.), Lepidoptera: Nymphalidae) which accounted for 58% of the insects counted; the highest rate was 3,162/h, with an estimate of total season migration of over 250,000 individuals. The common green darner dragonfly (*Anax junius* (Drury 1773) Odonata: Aeshnidae) was the next most common with a maximum rate of 3,297/h. The median and peak period for these two species was the first week in October. The observed flight pattern may demonstrate a reluctance to cross open water.

Key Words: Odonata, dragonfly, *Anax junius*, common green darner, butterfly, Lepidoptera, Gulf fritillary, *Agraulis vanillae*, migration, dispersal

RESUMEN

Se describe la migración de 5 especies Lepidóptera y 4 especies Odonata en el otoño de 1999 hacia el norte a lo largo de la península de St. Joseph, condado del Golfo, en la región noroeste de la Florida. Las cuentas mas altas fueron de la mariposa *Agraulis vanillae* (L.) (Lepidoptera: Nymphalidae), la cual constituyo el 58% de los insectos contados; la cuenta mas alta fue de 3,162/h, con un estimado de migración estacional total de mas de 250,000 individuos. La libélula *Anax junis* (Drury 1773) (Odonata: aeshnidae) le sigue en numero con una cuenta total de 3,297/h. El medio y periodo cumbre para estas dos especies fue la primera semana de Octubre. El patrón de vuelo observado puede demostrar una aversión a cruzar el agua.

Due to its southern location, Florida may be either a migration pathway, stopover, or destination for migrant insects. Migrating butterflies usually fly close enough to the ground and often in sufficient numbers to attract public attention. Large scale fall movements of the monarch butterfly (*Danaus plexippus* (L.), Lepidoptera: Nymphalidae) have been documented westward along the Gulf Coast (Urquhart & Urquhart 1978, Van Hook & Hermann 1999). Additionally, 5 species of butterflies have been reported migrating in a generally southward direction in peninsular Florida (Walker 1979; Walker 1991). Localized fall movements of massive numbers of the common green darner dragonfly (*Anax junius* (Drury 1773) Odonata: Aeshnidae) have been documented on the Atlantic coast of Florida (Russell et al. 1998). This paper presents fall migration observations for both Odonata and Lepidoptera at a location along the Gulf Coast in the Florida Panhandle.

MATERIALS AND METHODS

Both butterflies (Lepidoptera) and dragonflies (Odonata) were counted on St. Joseph Peninsula, Gulf County, Florida from 14 Aug through 7 Dec, 1999. The peninsula is 24 km long, oriented north-south, roughly parallel to the mainland

(Fig. 1). The count location was on an elevated, 50 m long boardwalk bisecting the peninsula, at Eagle Harbor (29°45.98'N, 85°24.29'W) in St. Joseph Peninsula State Park. At the boardwalk, the peninsula has a width of 200 m and is 11 km from the north tip (Fig. 1).

There are only a few small freshwater wetlands on the peninsula that support small breeding populations (<50 pair) of Odonata including *A. junius*, black saddlebags (*Tramea lacerata* Hagen 1861, Odonata: Libellulidae) and Carolina saddlebags (*Tramea carolina* (L.), Odonata: Libellulidae). There were low numbers of breeding butterflies including *D. plexippus* and Gulf fritillary butterfly (*Agraulis vanillae* (L.), Lepidoptera: Nymphalidae) on the peninsula.

Counts were made in 2, 5-minute periods per hour, 1-2 days per week, from 3 to 11 hours each day. All species with ≥ 3 cm wing span were counted. Flight direction, estimated height, predation, perching, tandem flights, and copulation, were recorded. Weather conditions, particularly frontal boundary, and wind direction were recorded.

Hourly flight rates (in any flight direction) were calculated from the average of the 2, 5-minute counts in an hour. Highest observed hourly migration rates for the fall for each species were reported. Linear interpolation between the observed hourly flight rates, first between hours in a day,

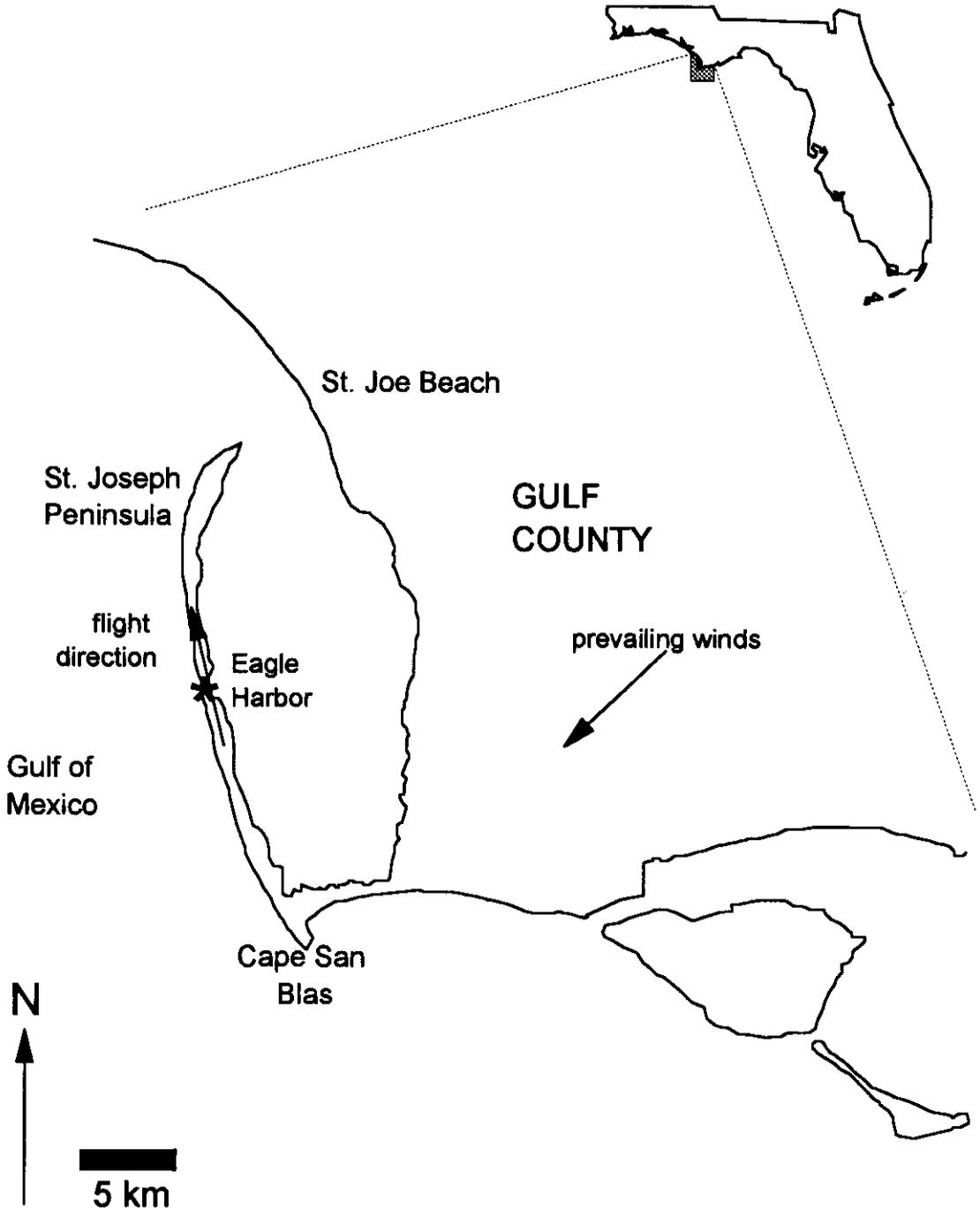


Fig. 1. Location of the migration count site (*) for Odonata and Lepidoptera on the St. Joseph Peninsula, Gulf County, Florida 14 Aug-7 Dec 1999.

and then between days, gave an hourly rate for each unobserved daylight hour from 14 Aug to 7 Dec. All observed and interpolated hourly rates were summed to get an index of total fall flight

magnitude. The date ranges when the middle 50% of the individuals of a species migrate were calculated (that is, the period between the dates on which migration was 25 and 75% complete).

RESULTS AND DISCUSSION

A total of 12,616 insects were counted in 222, 5-minute count intervals on 19 days from 14 Aug to 7 Dec. Most (98.7%) were heading north along the peninsula (Fig. 1), with the remainder either patrolling (Odonata) or heading south (both Odonata and Lepidoptera). The most common migrant was the Gulf fritillary butterfly, *A. vanillae*, followed by the common green darner dragonfly, *A. junius* (Table 1). All insects appeared to use powered flight rather than soaring. Although there were peak flights during the first week of October (Fig. 2), there was a steady and persistent flight on each clear day.

One possible flight pattern is that the insects head south down the continent, fly west when reaching the Gulf, and are then funneled north via the peninsula. The northeast prevailing wind direction in the fall (Winsberg 1990) would provide a further push from the mainland onto the peninsula (Fig. 1). Local sea breezes, would complicate this general pattern. The insects may exhibit some risk avoidance by not crossing the open Gulf. This migration route has been documented for 3-5,000 hawks annually, with the heaviest flights 3-4 days after the passage of northern cold fronts when the wind is from the northeast (Stedman 1984). After reaching the north tip of the peninsula, it is unknown whether the insects fly the 2-km distance to the mainland or head southwest over the Gulf (to uncertain landfall). The low number of south-flying insects counted suggests that they are not back-tracking down the peninsula. Observations from the peninsula may not

necessarily reflect the direction of a potentially larger migration on the mainland.

There have been observations from boats (e.g., Lowery 1946) and oil platforms (Baust et al. 1981, Russell 1999) of some dragonflies and butterflies flying over the Gulf. My observations of monarch migration match previously recorded western movement of eastern populations (Urquhart & Urquhart 1978; Van Hook & Hermann 1999); and destinations may be either the Gulf Coast states, or Mexico. These data do not suggest a peninsular Florida destination for all Gulf fritillary (*A. vanillae*) and cloudless sulphur butterflies (*Phoebis sennae* (L) Lepidoptera: Pieridae), as suggested by other studies (Walker 1979; Walker 1991). Previous reports of the long-tailed skipper (*Urbanus proteus* L., Lepidoptera: Hesperidae) at Carabelle Beach (80 km east), indicated flight directions in both coastal directions (roughly east and west, Walker and Littell 1994). Destination and migration patterns of Odonates are generally unknown (May 1992) though northward movement of *A. junius* in summer and scarcity of adult *A. junius* and *T. lacerata* in winter in Florida have been suggested (Paulson 1966; Dunkle 1989).

The peak day on 2 Oct (Figs. 2, 3) was 3 days after the passage of a cold front. Some studies have reported the passage of cold fronts as an impetus for migration (Russell et al. 1998), but the following weekend also had high numbers, despite no frontal activity. During drizzle the flight dropped off to zero, but on the 2 overcast days (18 Sep, 27 Sep) the high *A. vanillae* rates were still 48 and 2,472/h; while for *A. junius* the high rates were 336 and 252/h respectively.

TABLE 1. MIGRATION LEVELS DURING FALL 1999 OF DRAGONFLIES (COMMON GREEN DARNER, BLACK SADDLEBAGS, WANDERING GLIDER, CAROLINA SADDLEBAGS) AND BUTTERFLIES (GULF FRITILLARY, LONG-TAILED SKIPPER, CLOUDLESS SULFUR, MONARCH, BUCKEYE) AT ST. JOSEPH PENINSULA, FLORIDA.

Species	Highest hourly rate ¹ (date and hour)	% total ²	50% period ³ (median)	Est. total ⁴
Odonata				
<i>Anax junius</i>	3,297 (2 Oct, 7 pm)	23.2%	27 Sep-6 Oct (1 Oct)	77,970
<i>Tramea lacerata</i>	228 (2 Oct, 11 am)	3.3%	13 Sep-16 Oct (Sep 30)	20,938
<i>Pantala flavescens</i>	138 (16 Oct, 4 pm)	1.8%	17 Sep-8 Nov (2 Nov)	9,052
<i>Tramea carolina</i>	108 (11 Sep, 1 pm)	1.0%	12 Sep-2 Nov (2 Oct)	4,762
Lepidoptera				
<i>Agraulis vanillae</i>	3,162 (3 Oct, 10 am)	57.8%	28 Sep-17 Oct (6 Oct)	273,201
<i>Urbanus proteus</i>	522 (21 Oct, 2 pm)	7.4%	2 Oct-23 Oct (14 Oct)	43,908
<i>Phoebis sennae</i>	114 (3 Oct, 10 am)	2.2%	11 Sep-11 Oct (1 Oct)	11,447
<i>Danaus plexippus</i>	138 (6 Nov, 12 pm)	2.1%	2 Oct-8 Nov (22 Oct)	12,244
<i>Junonia coenia</i>	42 (2 Oct, 2 pm)	1.0%	8 Oct-9 Nov (23 Oct)	6,088

¹Average rate from 2 5-minute counts/h, and date and hour of the count in parenthesis.

²Percentage of total count of all insects for this species.

³The 50% period is the period between 25% and 75% completion of seasonal migration.

⁴Estimated total is based on linear interpolation between observed hourly rates both between hours and days.

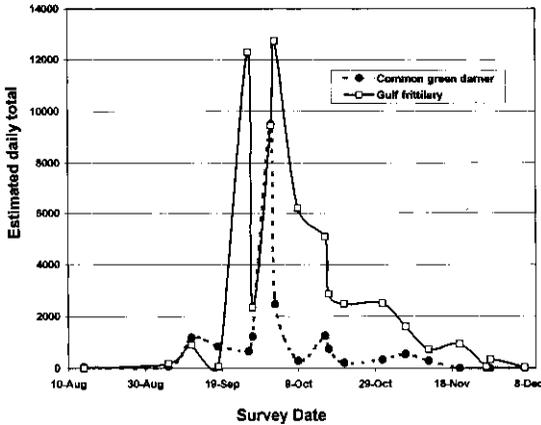


Fig. 2. Estimated daily survey totals for Gulf fritillary butterfly (*Agraulis vanillae*) and common green darter (*Anax junius*) from 14 Aug-7 Dec 1999 on the St. Joseph Peninsula, Gulf County, Florida.

For both the Lepidoptera and Odonata the period when the middle 50% of the seasonal flight occurred varied by species (Table 1) with the earliest being *P. sennae* and the latest being the buckeye, *Junonia coenia* (L., Lepidoptera: Nymphalidae). The whole extent of the flight period was much larger. For example, the flights ranged from 14 Aug to 28 Nov for the dragonflies *A. junius* and the wandering glider *Pantala flavescens* (F., Odonata: Libellulidae). Flights began on 5 Sep for all butterflies and extended to 28 Nov for *D. plexippus* and *J. coenia*. By 7 Dec, *A. vanillae* was the only species observed.

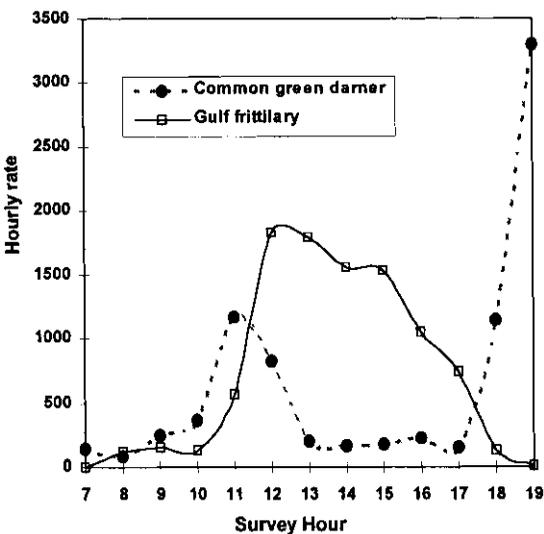


Fig. 3. Hourly flight rates by hour of the day (07:00-19:00) on 2 Oct 1999 for migrating Gulf fritillary butterfly (*Agraulis vanillae*) and common green darter (*Anax junius*) on the St. Joseph Peninsula, Gulf County, Florida.

Flight height of the Odonata was about 2-m over the boardwalk, for a total of 9-m over the base of the fore dune. The Lepidoptera were within 2-3 m of the ground, but on encountering the boardwalk most flew over it. The flights were normally on the leeward side of the fore dune.

Though there wasn't a consistent daily pattern, flights usually began increasing by 9 am (e.g., Fig. 3) The occasional peak hourly rates of *A. junius* in the evening (e.g., Fig. 3) may represent an evening descent from above the height of direct observation (Corbet 1999).

Behaviors other than flight included 51 instances of predation by *A. junius* on *A. vanillae*, stable fly (*Stomoxys calcitrans* (L), Diptera: Muscidae, see Wright 1945; Fye et al. 1980), mosquitoes (Diptera: Culicidae), long-tailed skipper (*U. proteus*), buckeye butterfly *J. coenia*, and black saddlebags dragonfly *T. lacerata*. The only other instances of predation were twice by *T. lacerata* on stable flies, and once by a wandering glider dragonfly (*P. flavescens*) on the buckeye butterfly (*J. coenia*). No predation on dragonflies was observed despite abundance of potentially predatory birds including merlin (*Falco columbarius*), American kestrel (*Falco sparverius*) (e.g., Walter 1996) barn swallow (*Hirundo rustica*), tree swallow (*Tachycineta bicolor*), and loggerhead shrike (*Lanius ludovicianus*). Only dragonflies were observed preying on Lepidoptera, as described above. There was some mortality from vehicles on the peninsula road of both butterflies and dragonflies. Some butterflies paused within 100 m north of the boardwalk on flowering plants.

There were 28 pairs of *A. junius* flying in tandem (latest date 3 Oct). There were 9 pairs of *T. lacerata* flying in tandem (as late at 20 Nov) and one instance of flying in the wheel position indicating copulation (20 Nov). There was one instance of a paired *P. flavescens* in the wheel position on 6 Nov. This indicates that at least some Odonates were reproductively mature. No mating among the butterflies was observed.

The estimated seasonal totals ranged from 4,700 for *T. carolina*, to 273,000 for *A. vanillae* (Table 1). There was an average 40% variance of the two counts in a given hour. The temporal variability within the day (e.g., Fig. 3) and sharp peaks between days (Fig. 2), indicate that the linear interpolation method should not be viewed as an absolute number, but rather as an index of the relative abundance of the migrants. These migration levels are less than the millions in massive migratory swarms (May 1995; Russell et al. 1998) of Odonates, and less than the estimated 30 million seasonally migrating Lepidoptera in peninsular Florida (Walker 1991). This study does indicate a slow and steady migration for both dragonflies and butterflies at this location. Although none of these species are considered threatened (Logan 1997) or rare (Deyrup & Franz

1994), their migrations may be endangered (Brower & Malcom 1991). Further studies along obvious migration corridors, and observations from the tip of St. Joseph Peninsula, would help piece together flight patterns. More intensive surveys over multiple years would help determine if there were synoptic or local weather correlates to migration. Protection along migration paths might include avoiding use of insecticides, and not mowing nectar plants. The impact of coastal development on these routes is unknown.

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