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SYNANTHROPY AND FAUNISTICS OF SOME PHORIDAE (DIPTERA) FROM CUBA

F. GREGOR
Institute of Parasitology, Czechoslovak Academy of Sciences, Prague

Abstract. Material of 498 specimens of 23 species of Phoridae collected by a trapping method in Cuba in 1966 is quantitatively and qualitatively analysed. A review of faunistic data, chorology, seasonal incidence and food preference is given and possible importance of the main species, mostly of the genus *Megaselia*, as potential vectors and causative agents of myiasis, is discussed.

This paper is a continuation of my recent paper on the synanthropic flies from Cuba (Gregor 1972, 1975). The family Phoridae is taxonomically rather difficult, its faunistics being especially neglected. Until the volume (Nr. 43) of „A catalogue of the Diptera of the Americas south of the United States" appears, the only serious source of information on the Phoridae of West Indies remain the papers of Borgmeier (1962, 1968, 1969a, 1969b, 1971a, 1971b). Data concerning bionomy and the potential medical importance of these flies exist only in relation to the nearly cosmopolitan species *Megaselia scalaris* (Loew) (Patton 1922, see James 1947).

MATERIAL AND METHODS

The technique of baiting as well as other details are given in the previous papers (Gregor 1972, 1975). The material totalling 78 males and 343 females from the same locality in Havana, and 23 males and 54 females from free nature of various Cuban provinces was collected between March to September of 1966. The material was preserved in 75% ethylalcohol, its greatest part being deposited in the collection of the Institute of Parasitology of the Czechoslovak Academy of Sciences, and a minor part in possession of Borgmeier, who died in 1975 (these specimens are described with an abbreviation "B" incl. with the number of specimens in the faunistic part of this paper). The author used the determination keys by Borgmeier (1962, 1971a), selected specimens were revised and/or determined directly by the late T. Borgmeier who set about this task with extreme kindness and interest. The state of their determination follows from the letter of Borgmeier, from February 21st, 1969: "...Auch sind wir noch weit entfernt, alle *Megaselia* bestimmen zu können. Als neu habe ich einige Arten bezeichnet, die genügend charakteristisch sind, dass man sie wiederkennen kann. Vielleicht ist es gut, die neuen Arten nicht mit ihren Namen in der Literatur zu erwähnen, bis ich sie publiziert habe". Four of these new species were meanwhile described by Borgmeier. In the instance of *Puliciphora* sp. 1 only the name "*brevicauda*" was proposed but unpublished. Of the 23 species and forms discussed in this paper, 8 remained unidentified.

Since the time of exposure in individual baitings varied between 1–7.30 hours, it appeared necessary to convert all samples to a common time representing 10 hours of exposure, for the purpose of a quantitative analysis. In this way, the comparability of the individual samples increased. Checking and considering 1 hour exposure only, as done in two of the previous papers (Gregor 1972, 1975), would appear less opportune and/or adequate due to low abundance and density of phorids in our samples.

RESULTS

List of species

This review summarizes all the individual collections including the baited materials with the exception of *Megaselia quartobsoleta* Borgm. 1969, *M. subpicta* (Malloch 1912) and *M.* pr. *littoralis* (Malloch 1914) from the same locality Havana, which will be dealt with below.

Conicera (Hypocerina) neotropica Brues, 1904

Prov. Oriente: La Gran Piedra, 1200 m, forest margin, human faeces, 1 ♂ 17. VII. (B 1 ♂). – Known from Grenada, Bahamas, West Indies (Borgmeier 1968, p. 17).

Chaetopleurophora nigroscutellata Borgmeier, 1969

Prov. Habana-Marianao, fresh human faeces, 2 ♂ 10. III. (B 1 ♂). — Cuba (Borgmeier 1969, p. 36, 1971b, p. 178).

Gymnoptera neotropica Borgmeier, 1958

Prov. Las Villas: Trinidad, 80 m, bush, tinned beef, rainy, 26 °C, 2 ♀ 29. VI. (B 1 ♀). – Brazil: Rio de Janeiro; West Indies: Antilles, Dominica (Borgmeier 1968, p. 38, 1971b, p. 181).

Apocephalus ecitonis Borgmeier, 1928

Prov. Habana: Habana-Marianao, intestines from *Cataractes rubra*, 1 ♀ 8. III. (B 1 ♀); Prov. Las Villas: Trinidad, 80 m, bush, old beef meat, rainy, 26 °C, 1 ♀ 29. VI. – Known from Brazil (Borgmeier, 1960, p. 70).

Apocephalus sp.

Prov. Habana: Cuatro Caminos, 80 m, forest, human faeces, 2 ♂ 18. VIII. (B 1 ♂).

Megaselia (Megaselia) femoralis (Enderlein, 1912)

Prov. Oriente: Bueycito, 250 m, forest margin, old beef meat, 1 ♀ 14. VII. (B 1 ♀). — Known from Brazil, Costa Rica (Borgmeier, 1962, p. 295), Texas, Dominica (Borgmeier, 1968, p. 123, 1971b, p. 193).

Megaselia (Megaselia) luteifasciata (Borgmeier, 1925)

Prov. Las Villas: Trinidad, bush, 80 m, rainy, 26 °C, tinned beef, 1 ♀ 29. VI. (B 1 ♀). — Known from Brazil (Borgmeier, 1968, p. 136).

Megaselia (Megaselia) scalaris (Loew, 1866)

Prov. Pinar del Rio: Soroa, 500 m, forest, 1 ♂ on cheese 14. IV. (B 1 ♂); Soroa, 200 m, aluvial forest, human faeces, 1 ♀ 4. VIII; San Diego de los Baños, 250 m, rocky valley, blood and intestines of cattle, 1 ♀ 23. IV. (B 1 ♀). Prov. Habana: Habana-Marianao, intestines of *Cataractes rubra* 1 ♀ 8. VIII., fresh human faeces 1 ♀ 6. VI. (B 1 ♀), fresh liver 1 ♀ 23. V., old liver 1 ♀ 6. VI., 2 ♀ 31. VIII. and 1 ♀ 14. IX. — "Nearly cosmopolitan" (Borgmeier, 1968, p. 153).

Megaselia (*Megaselia*) *subflava* (Malloch, 1912)

Prov. Pinar del Rio: Sierra de Cajalbana, La Mulata, 100 m, pinetum, cloudy and rainy, fresh human faeces, 1 ♂ 21. VI.; Prov. Habana: Habana-Marianao, fresh human faeces, 1 ♂ 14. III. (B 1 ♂). — West Indies: Baymo, Puerto Rico, Grenada (Borgmeier, 1968, p. 158, 1971b, p. 198).

Megaselia (*Megaselia*) *subpicta* (Malloch, 1912)

Prov. Pinar del Rio: San Diego de los Baños, 250 m, rocky valley, blood and intestines of cattle, 2 ♀ 23. IV.; Soroa, 500 m, forest, 1 ♀ 14. IV. cheese; Guajaibon, 5 m, aluvial forest, intestines, 1 ♀ 14. III., 1 ♂ 3. V. old liver, 1 ♀ tinned moluses 25. V. (B 1 ♀); Prov. Habana: Habana-Marianao, 7 ♂, 97 ♀ 8. III.—15. IX. (B 1 ♂, 5 ♀), (further trophical and fenological data see the next text); Cuatro Caminos, 80 m, bush, tinned molluses, 4 ♀ 20. V.; Prov. Matanzas: Boca de Canasi, 5 m, coastal bush, 1 ♀ cheese 2. IV. (B 1 ♀); Prov. Las Villas: Playa Larga, 5 m, forest, 4 ♀ 7.—9. VIII. faeces and tinned beef, 10 m, light forest, old beef meat 1 ♀ 10. VIII.; Trinidad, 80 m, bush, old beef meat, 2 ♀ 29. VI.— Known from Florida and Brazil (Borgmeier 1962, p. 361, 362, 1969, p. 16.).

Megaselia (*Aphiochaeta*) *perdita* (Malloch, 1912)

Prov. Pinar del Rio: Soroa, 200 m, aluvial forest, intestines, 3 ♀ 3. V.; Prov. Matanzas: Boca de Canasí, coastal bush, cheese, 2 ♀ 3. IV. (B 1 ♀); Prov. Las Villas: Playa Larga, 5 m, forest, old beef meat, 1 ♀ 9. VIII. (B 1 ♀); Trinidad, 80 m, bush, rainy, old beef meat, 1 ♀ 29. VI. (1 ♀). — U.S.A., Mexico, Colombia, Ecuador, Brazil (Borgmeier 1968, p. 199).

Megaselia (*Aphiochaeta*) *quartobsoleta* Borgmeier, 1969

Prov. Pinar del Rio: San Diego de los Baños 250 m, rocky valley, forest, intestines with blood, 3 ♀ 23. IV.; Guajaibon, 5 m, aluvial forest, intestines, 1 ♀ 14. III., bush, 20 m, old meat, 4 ♀ 31. III.; Prov. Habana: Habana-Marianao, 1 ♂, 146 ♀, 8. III. 16. IX. (B 2 ♀ for) (further trophic and ecological data see the next text); Boca de Canasí, 30 m, coastal bush, cheese, 1 ♂ 3 ♀ 2. IV.; Boca Ciega, 20 m, bush, fresh human faeces, 1 ♀ 20. III.; Prov. Las Villas: Playa Larga, 5 m, forest, old beef meat 1 ♀ 9. VIII. — Cuba (Borgmeier 1969, p. 82, 1971, p. 202).

Megaselia (*Aphiochaeta*) *submimica* Borgmeier, 1969

Prov. Pinar del Rio: Soroa, 500 m, cheese, 2 ♂ 14. IV.; Prov. Habana: Habana-Marianao, 4 ♀ on fresh human faeces 11. III. (B 2 ♀), 1 ♀ on intestines 1. IV., 2 ♀ on intestines 14. III. (1 ♀). — Cuba (Borgmeier 1971, p. 203, 1969, p. 81).

Megaselia sp. 1 pr. *chiloensis* Schmitz, 1929

Prov. Habana: Habana-Marianao, intestines of *Cataractes rubra*, 1 ♂ 8. III. (B 1 ♂).

Megaselia (*Megaselia*) sp. 2 pr. *littoralis* (Malloch, 1914)

Prov. Pinar del Rio: Sierra de Cajalbana, La Mulata, 70 m, pinetum, fresh human faeces 2 ♀ 21. VI.; Soroa, 500 m, forest, cheese, 1 ♂ 14. IV.; Viñales, "mogote", 300 m, fresh human faeces 2 ♀ 22. VI.; La Guira, 200 m, forest, fresh human faeces, 1 ♀ 3. III.; Guajaibon, 5 m, aluvial forest, intestines, 1 ♀ 3. V.; Prov. Habana: Habana-Marianao, 47 ♀ 8. III.—15. IX. (B 4 ♀) (for further biological data see the next text).

Megaselia (*Megaselia*) sp. 3 (Abt. VII in Borgmeier 1962)

Prov. Pinar del Rio: Soroa, 500 m, forest, cheese, 4 ♂ 15. IV. (B 1 ♂); Prov. Habana: Habana-Marianao, human faeces, 1 ♀ 17. VIII. (B 1 ♀); Prov. Las Villas: Playa Larga, 5 m, forest, human faeces 1 ♂ 7. VIII. (B 1 ♂).

Megaselia (*Megaselia*) sp. 4 (Abt. VII in Borgmeier, 1962)

Prov. Habana: Habana-Marianao, old meat, 2 ♂ 29. VI. (B 1 ♂); Prov. Las Villas: Trinidad, 80 m, bush, old beef meat, 2 ♀ 29. VI. (B 1 ♀).

Plastophora juli mucronata (Borgmeier, 1925)

Prov. Oriente: La Gran Piedra, 1200 m, forest margin, human faeces, 2 ♂ 2 ♀ 17. VII. (B 1 ♂ 1 ♀). — U.S.A., Costa Rica (nominate form), Brazil ssp. *mucronata* (Borgmeier 1968, p. 242, 1971b, p. 209).

Pseudacteon antiguensis (Malloch, 1912)

Prov. Pinar del Rio: Soroa, 500 m, forest, cheese, 2 ♂ 14. IV. (B 2 ♂); Prov. Habana: Habana-Marianao, old beef meat, 2 ♂ 16. VII.; Prov. Oriente: Bueycito, 250 m, forest margin, old beef meat, 1 ♂ 14. VI. (B 1 ♂). — West Indies, Brazil (Borgmeier 1968, p. 246).

Puliciphora sp. 1

Prov. Habana: Habana-Marianao, intestines of *Cataractes rubra*, 1 ♂ 10. III. (B 1 ♂), fresh human faeces, 1 ♂ 1 ♀ 14. III., 2 ♂ 30. III. (B 1 ♂), 1 ♂ 23. V., old beef meat, 3 ♂ 1 ♀ 16. VIII. (B 1 ♀).

Puliciphora sp. 2

Prov. Habana: Habana-Marianao, fresh human faeces, 11 ♂ 14. III., 4 ♂ 30. III. (B 3 ♂), 20 ♂ 25. IV. (B 2 ♂), old beef meat, 1 ♂ 16. VIII., dead molluscs 2 ♂ 16. VIII., molluscs, and intestines, 1 ♂ 14. IX.; Cuatro Caminos, forest, fresh human faeces, 1 ♀ 18. VIII.

Puliciphora sp. 3

Prov. Habana: Habana-Marianao, 2 ♂ on fresh human faeces 29. III. (B 2 ♂).

Beckerina setifrons Borgmeier, 1969

Prov. Habana: Cayo Cantiles, const, fresh fish, 1 ♀ 2. V. 1966, leg. J. de la Cruz (B 1 ♀). — Cuba (Borgmeier 1969, p. 62).

Chorology

The differences of the average abundance in Phoridae having the greatest abundance, viz.: *M. quartobsoleta*, *M. subpicta* and *M.* pr. *littoralis*, in the various habitats (Table 1) are rather striking and they do not seem to be accidental, especially in the habitats Nos. 1—4 and 9 (represented by a satisfactory number of samples). The three species mentioned were present in the habitat which may be characterized as "degraded semideciduous forest" (3) and the "bush of non-cultivated pastureland" (4) as well as in the anthropobiocenosis (9) manifesting a similar configuration of the woods in spacial structure. *M. quartobsoleta* and *M.* pr. *littoralis* were absent from the semideciduous tropical forest (1, 2). In these climax associations the presence of *M. subpicta* appeared to be characteristic, the abundance of which decreased towards the clearing margins of the forest and in the bush. The three species mentioned were completely absent from habitats having no continuous cover of woods (6, 7) and they reached the absolutely highest (although not very apparent) values of dominance in the habitat of Havana (9) representing an anthropobiocenosis of very manifold appearance and environmental conditions. Of the other species, we only can state that 10 of the total 23 species were taken exclusively in free nature and 4 were taken only within the anthropobiocenosis (locality Havana). In this second group the genus *Puliciphora* is representing by two forms, *P.* sp. 1 (8 ♂, 2 ♀) and *P.* sp. 3 (2 ♂), respectively. The next form, *P.* sp. 2 was only once baited in nature (1 ♂), the other 38 ♂ and 1 ♀ were taken in an anthropobiocenosis only.

Table 1. The occurrence of *Megaselia quartobsoleta*, *M. subpicta* and *M.* pr. *littoralis* in various habitats of Cuba

Habitat	1	2	3	4	5	6	7	8	9
Number of samples	8	9	10	13	4	5	3	2	91
M. quartobsoleta			1.9	3.0	0.2				4.6
M. subpicta	2.7	1.2	1.2	0.3					2.9
M. pr. *littoralis*		1.0	0.7	1.4	1.6			1.0	3.8

The numbers represent the average number of specimens baited within ten hours. Habitats: 1 and 2 — tropical semideciduous forest, 3 — partially deforested area for grazing, 4 — bush, pastureland with extensive grazing, 5 — coastal bush (no grazing), 6 — seashore (no grazing), 7 — pastureland with intensive grazing, 8 — pinetum, 9 — suburban area of Havana.

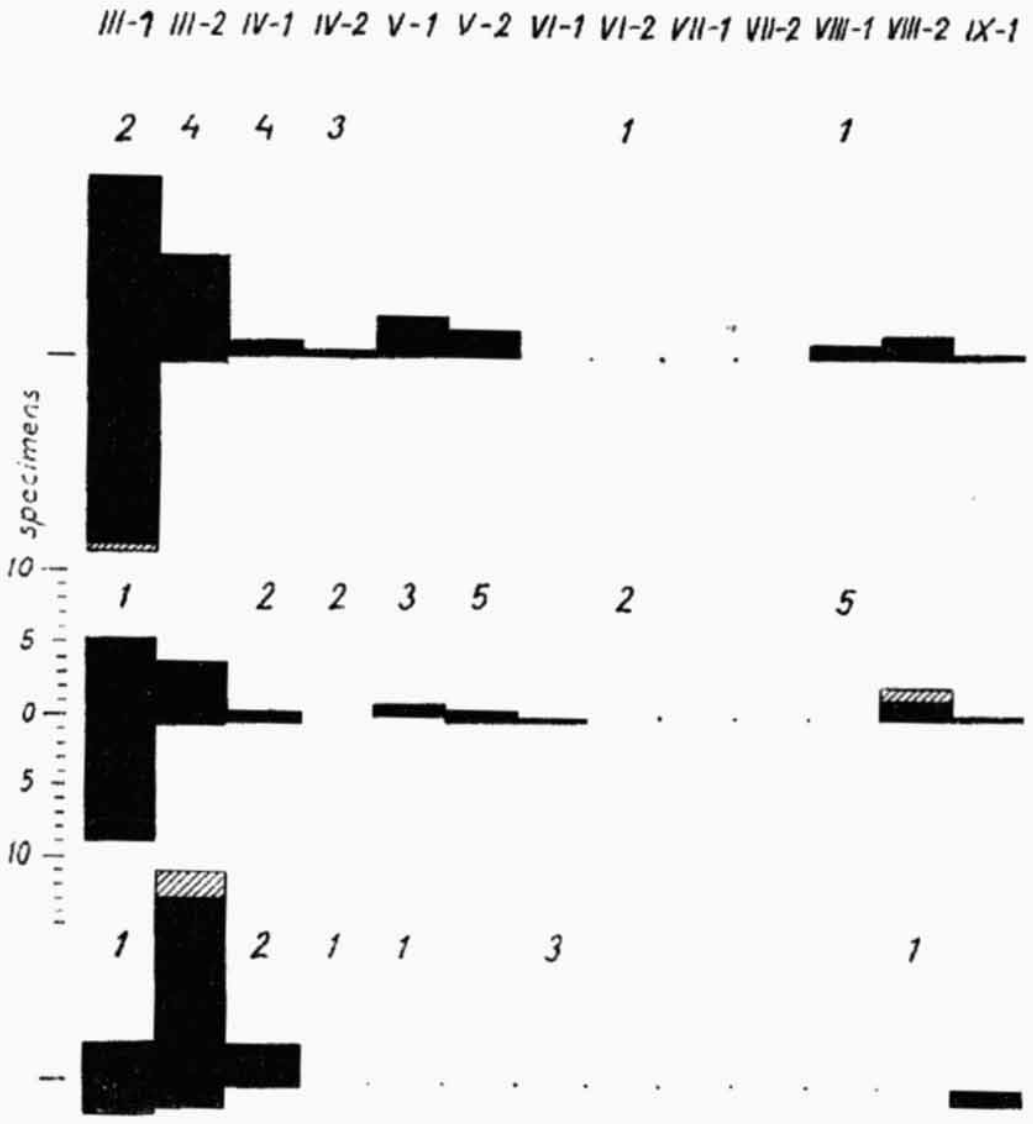

Fig. 1. The seasonal occurrence of *M. quartobsoleta*, *M. subpicta* and *M.* pr. *littoralis* (from above to below) from March to September 1966 in various habitats in fr ee nature and on various baits (numbers) and in Havana (columns). The columns above the horizontal axis represent data obtained from 'old meat, below the axis are data obtained from faeces. Black columns — females, crosshatched columns — males.

Seasonal incidence

The fluctuation in numbers during the six months could be followed only in the same locality of Havana and in the species *M. quartobsoleta*, *M. subpicta* and *M.* pr. *littoralis*, as indicated in Fig. 1. The maximum numbers of these species appeared during March and after a strong decrease during April there followed a slight increase during May (absent in *M.* pr. *littoralis*). During the summer months of June and July, there was a complete absence and only during August and September a scarce occurrence of these flies could be observed again. To complete this picture the absolute numbers of occurrence in free nature are given in the graph from various habitats. Generally, a more frequent occurrence of *M. quartobsoleta* could be observed in the spring than during the summer. The interval between the two peaks of the spring aspect was about two months and it could be due to the voltine phenomenon.

Food preference in the adult fly

Table 2 shows the range of the basic kinds of food (substrate) interesting from the sanitary viewpoint. The species *M. quartobsoleta*, *M. subpicta* and *M.* pr. *littoralis* are concerned, as observed in the same locality of Havana (this habitat was characterised in detail by Gregor 1972). Generally, no preferrence of the individual kinds of substrate could be observed in *M. quartobsoleta* and *M. subpicta*, only the attractiveness of faeces decreased with the length of exposition. Contrary to these two species *M.* pr. *littoralis* manifests an increased affinity to faeces preferring slightly older substrate of this type to the fresh one, old beef meat being practically ignored. Cheese appeared to be highly attractive for *M. quartobsoleta* and *M.* pr. *littoralis*. The tinned meat of big molluses was less attractive, cow dung was practically ignored. The food selection by *M. scalaris* inclining to cause facultative myiasis appears to be of same trend as in the species named. I never observed any occurrence of Phoridae in my material although I used fruit as bait in several cases. Cheese appeared to be very attractive, both qualitatively and quantitatively, for other species of Phoridae.

Table 2. The attractiveness of various types of bait to three species of *Megaselia*

Species / Bait	*M. quartobsoleta*		*M. subpicta*		*M.* pr. *littoralis*		Number of samples	
Old beef meat	4.5	(0.3)	4.0	(1.4)	0.2		9	(14)
Diverse intestines	8.2	(1.7)	2.8	(0.3)	1.6	(0.1)	27	(11)
Tinned meat of big molluses	1.9		1.2				8	
Old cheese	3.3	(12.0)	0.5	(1.0)	3.0	(0.5)	3	(2)
Fresh human faeces	3.7	(0.2)	3.5	(0.5)	2.0	(0.4)	23	(36)
Old human faeces (24 – 32 h.)			1.2		2.6		4	
Cow dung			1.4				4	

A comparison of the abundance of *Megaselia quartobsoleta*, *M. subpicta* and *M.* pr. *littoralis* trapped between March to September 1966 in the same locality of Havana and from various habitats in free nature (data in parentheses). The numbers represent the average number of specimens baited within ten hours.

Although cheese was applied only in five instances as bait (compared with the total of 183 baitings), it attracted the total of 8 species: *M. scalaris*, *M. subpicta*, *M. perdita*, *M. quartobsoleta*, *M. submimica*, *M.* pr. *littoralis*, *M.* sp. 3 and *P. antiguensis*.

Notes to ecology and ethology

In the Department of Parasitology laboratory of the Institute of Biology of the Cuban Academy of Sciences in Havana, several times, I could observe rather numerous flies of *M. quartobsoleta* and *M. subpicta* on dissected material of various animals. The other species of Phoridae including *M. scalaris* were surprisingly absent.

From samples taken from traps in free nature it appears that the species of the genus *Puliciphora* occurred mostly during cloudy periods of weather, or during a fine rain and temperatures between 20—28 °C (45 adults present in 10 of 13 baitings). Only exceptionally the flies occurred during a sunny period, exclusively after raining and under a high humidity (4 adults present in 3 of 13 cases of baiting). Similarly, *M. subflava* was taken only during rainy periods at 28 °C, or during cloudy weather at 23 °C and 90 % of relative humidity. This probably obligatory psychrophily or skinophily could not be observed in other species of Phoridae, or it was accidental.

DISCUSSION AND CONCLUSIONS

The data of faunistic character appear to be rather representative in this paper. In contrast, the facts of bionomical character suggesting the sanitary importance of the individual species of Phoridae concerned are rather limited and just tentative. Important for Cuba appears to be the occurrence of the following species: *Megaselia scalaris*, *M. subpicta*, *M. quartobsoleta*, *M.* pr. *littoralis*. They seem to be of a similar bionomy and appear to be hemisynanthropic, communicative, widely saprophagous and occasionally causing myiasis in man. Patton 1922 (see James 1947) summarised the cases of wound, intestinal and ophthalmic myiasis with *M. scalaris* and stated that obviously a minority of actual cases could be registered due to the small size of larvae, which are mostly overlooked. It is possible that even other species of the genus *Megaselia* could cause myiasis. Man may become infected by contaminated cheese, because it appears highly attractive for some phorid flies and very likely represents an adequate substrate for their larvae. Other literary data concerning the bionomics of species treated in this paper are very limited. Concerning *G. neotropica*, Borgmeier (1969b, p. 6) writes: "...many puparia and several males and females reared from dead *Calosoma* beetle, III.—IV....". As for *M. subflava*, Borgmeier 1969a, p. 100) writes: "...sticky trap..." and for *P. antiguensis*, Borgmeier (1969b, p. 41) writes: "This is a very striking species which is a parasite of *Solenopsis geminata* and *S. saevissima*."

In *M. quartobsoleta* and *M. subpicta* endophily could be evidenced, similarly as a trend towards eusynanthropy in *M.* pr. *littoralis*. Some of the so far unidentified species of the genus *Piluciphora* also had a strong tendency towards eusynathropy.

Quantitatively, the occurrence of Phoridae in Cuba concentrates probably during the finishing phase of the cold and dry period of season. This seems to be indicated by the striking occurrence of Phoridae in the pre-spring aspect of the season. Only further studies, primarily during winter and devoted to the autecology of the individual species stressed in this paper, can contribute to these open problems.

СИНАНТРОПИЯ И ФАУНИСТИКА НЕКОТОРЫХ ВИДОВ PHORIDAE (DIPTERA) ИЗ КУБЫ

Ф. Грегор

Резюме. В работе дан количественный и качественный анализ 498 особей мух, относящихся к 23 видам семейства Phoridae, добытых в ловушках в 1966 г. на Кубе. Представлены фаунистические данные, хорология, сезонная динамика и выбор пищи, и обсуждается возможное значение самых важных видов, особенно рода *Megaselia*, как потенциальных переносчиков и возбудителей миаза.

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F. G., Parasitologický ústav ČSAV,
Flemingovo n. 2, 166 32 Praha 6,
ČSSR