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Research Article

The Dipterans (Insecta: Diptera) of the Bulgarian Black Sea Coast

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Abstract: Up until now, a total of 1556 dipteran species of 82 families have been reported from the Bulgarian Black Sea Coast. The families Cecidomyiidae, Chironomidae, Syrphidae, Chloropidae and Tachinidae (101–162 species) are the most numerous. The families of Ephydridae (70.4 % of all Bulgarian species presented), Chloropidae (67.5 %), Tabanidae (55.3 %), Calliphoridae (46.3%) and Cecidomyiidae (44.4 %) show the biggest relative species richness in the Black Sea Coast area. Recorded low relative species richness is often due to lack of sufficient investigations, such as for the families Tipulidae, Mycetophilidae and Phoridae. The faunistic similarity between the different parts of the coast is scrutinised. The dipterans belong to 116 areographical categories, divided into 2 groups: 1) species with a Mediterranean type of distribution (191 species – 12.3%) – more thermophilic and distributed mainly in the southern parts of the Palaearctic; 2) species with Palaearctic and Eurosiberian type of distribution (1365 species – 87.7%) – more eurybiontic and widely distributed in the Palaearctic. The distribution of the zoogeographical categories in the different parts of the coast is presented. A total of 30 (1.9%) endemics have been established. Of the reported species, 40 are plant pests and 63 have a medical importance.

Key words: Diptera, Bulgarian Black Sea Coast, faunistic composition, distribution, zoogeography

Introduction

During the last 70 years, the Black Sea Coast has been under significant anthropogenic impact and landscape changes. The dynamic nature of the fauna and its conservation require periodic updating of the faunistic diversity of the taxonomic groups. The present study covers, for the first time, all dipteran families from the Black Sea Coast of Bulgaria.

The first data on Diptera from the Bulgarian Black Sea Coast were reported by Löw (1862). Later, the works of Nedelkov (1912), Szilády (1934), Zilahi (1934), Jacentkovský (1936, 1937), Valkanov (1936) and Drensky (1939, 1942) appeared, which contained data from the coast. After World War II, a large number of articles related to dipterans of the Black Sea Coast were published. Studies on Chironomidae (Cvetkov 1955a, 1955b, 1957, 1958, Michailova 1973a, 1973b, 1974, 1975, 1980, 1982, 1989), Culicidae (Božkov 1961, 1966, 1991, Božkov et al. 1969, Christova et al. 1971, Mikov 2005, 2008, Mikov et al. 2013), Cecidomyiidae and Sciaridae (Skuhrava et al. 1991, 1992, Dimitrova & Mohrig 1993) predominate and separate families of Brachycera from the coastal habitats (Beschovski 1964a, 1964b, 1965, 1966a, 1966b, 1972a, 1972b, 1973a, 1973b, 1975a,

1975b, 1976, 1978, 1993, 1994, 1996, Lavčiev 1969, 1980, 2003, Zielke 1916a, 1916b, 2018, 2019). Some applied entomological studies that are not related to the coast include faunistic data. The hydrobiological studies of the coastal water bodies have also had an important faunistic contribution (Valkanov 1948, 1954, 1957, Caspers 1951a, 1951b, 1952, Stoichev 1996, 1998, Vassilev & Konsulov 1998, Kovachev et al. 1999, Georgiev & Nikolov 2010, Varadinova et al. 2010, Todorova 2014, Hubenov et al. 2015). Volumes from the Fauna of Bulgaria series and catalogues have been published (Beschovski 1985, 2009, 2013, Lavčiev 2003, Bechev 2006, 2010, Kechev et al. 2020, Hubenov 2021a, Kechev 2021), which include data from the Bulgarian Black Sea Coast. The studies of some foreign authors also contain information about the coast of Bulgaria (Slípka 1959, Hradský & Moucha 1964, 1967, Bankowska 1967a, 1967b, Starý 1982, 2009, Krzemiński 1984, Mendl 1986, Wagner & Joost 1988, Krzemiński & Starý 1989, Povolný & Verves 1990, Starý & Krzemiński 1993, Ježek et al. 2020, Černý et al. 2022, Lutovinovas et al. 2022, Dvořák et al. 2024).

The aim of this work is to present the fauna, distribution and zoogeography of dipterans from the Bulgarian Black Sea Coast.

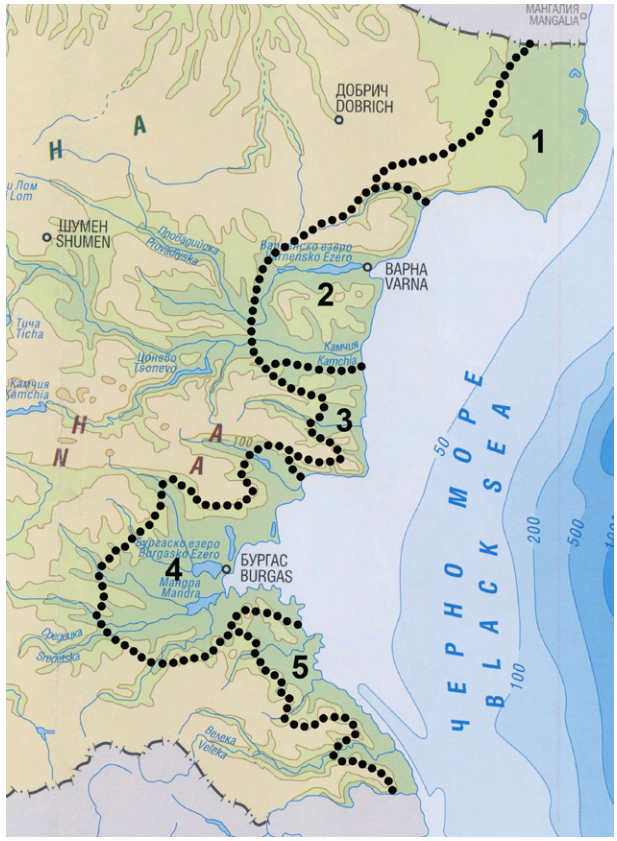

Fig. 1. Partition of the Black Sea Coast: 1) Dobrudzha district, 2) Varna district, 3) Stara Planina district, 4) Burgas district, 5) Strandzha district

Materials and methods

The Bulgarian Black Sea Coast (Fig. 1) stretches for 380 km from the border with Romania at Cape Sivriburun to the Rezovska River at the border with Turkey. The width of this territory varies from 5 to 60 km. It is divided into 5 parts (Galabov 1966, Daneva & Mishev 1979, Krastev 2002): **Dobrudzha** (from the border with Romania to the Batova River), **Varna** (between the valleys of the Batova and Kamchia Rivers), **Stara Planina** (between the valleys of the Kamchia and Hadzhiyska Rivers), **Burgas** (from the foot of the Eminska Planina Mts. and the Hadzhiyska River to Medni Rid) and **Strandzha** (south of the Burgas Lowland to the Rezovska River) districts. The Black Sea Coast includes lowlands below 100 m a.s.l., plateaus and plains up to about 350 m a.s.l. and hilly lands up to about 600 m a.s.l. In the Black Sea coastal zone, the altitudinal belt up to 300 m a.s.l. prevails. The Bulgarian Black Sea Coast belongs to the Continental-Mediterranean climatic zone, with the Mediterranean climatic influence being stronger in the Burgas and Strandzha regions (Sabev & Stanev 1959, Tichkov 1976, Stanev 1991, Velev 2002, 2010). The Mediterranean-Black Sea precipitation regime is presented. There are about 40 lakes, marshes and river spills along the coast (Varbanov 2002, Hristova 2012). The lakes are of the firth and lagoon type. Nineteen rivers enter the Black Sea, and their mouth areas have a firth character. The Black Sea region is included in the Euxinian Province of the European deciduous forest area and in the zone of the xerothermic oak forests (Stojanov 1966, Velchev et al. 1982, Bondev 1991, 2002, Velchev 2002). The Eastern Stara Planina and Strandzha Mts. are rich in Euxinian elements. The vegetation along the coast contains Mediterranean elements with typical communities around rivers being the flooded (longose) forests. Specific psammophyte vegetation is developed on the sand dunes. Characteristic halophyte communities are represented on the saline soils. The coastal strip with a width of 5 to 40 km forms the Black Sea zoogeographical region (Georgiev 1978, 2002, Hubenov 2021b). There is a Mediterranean influence on the fauna, which increases to the south. The Mediterranean elements in some halophilic and halobiontic insects reach 72%. Caspian relicts are concentrated in the coastal firth lakes and river mouths. A specific fauna is connected with the hyperhaline lakes.

The material had been collected after 1890 from 261 localities. The main part of it is stored in

the National Museum of Natural History and the Institute of Biodiversity and Ecosystem Research. All dipteran species reported from the Bulgarian Black Sea Coast are included. For a number of widespread species the authors did not give the localities and mentioned they occur everywhere. In some publications, the localities are presented generalised for the entire coast. A number of foreign publications contain data on the Bulgarian Black Sea Coast.

Weaknesses of the literature data that limit the obtaining of an equivalent information when comparing taxonomic groups include: different levels of study of the separate families; lack of exact localities for some of the reported species; insufficient data for the vertical distribution; existence of rich synonymy; outdated data; lack of generalised investigations; unexplored parts of the coast; prolonged periods of data accumulation; priority studies on groups of economic and medical importance. Some old data for Chironomidae collected during the hydrobiological studies are problematic since determination of the larvae is not always possible.

The classification of the dipterans is based on the works of Soós & Pap (1984-1993), McAlpine (1989), Wood & Borkend (1989), Woodley (1989), Nagatomi (1996), Papp & Darvas (1997, 1998, 2000a, 2000b), Yeates & Wiegmann (1999), Nartshuk (2003), Ziegler (2003), Oosterbroek (2006), Yeates et al. (2007) and Pape et al. (2011).

Areographical analysis for the taxa categorization was used. This method allows obtaining data information about species complexes with different zoogeographical character based on the published data regarding species distribution and results of the faunistic research. These complexes contain zoogeographical information about the taxonomic groups which, combined with the origin of the ranges, determines the zoogeographical character of the fauna. The distribution of the species according to the zoogeographical categories in the different coastal parts is scrutinised. The classification of the areas is based on the works of Geptner (1936), Darlington (1957), Kryzhanovsky (1965, 1976, 2002), de Lattin (1967), Emeljanov (1974, 2018), Müller (1974, 1980), Udvardi (1975), Crosskey & White (1977), Malicky et al. (1983), Gorodkov (1984), Grehan (1988, 1993), Lopatin (1989), Vigna Taglianti et al. (1999), Procheş & Ramdhani (2012), Holt et al. (2013) and Ficetola et al. (2017). The border between the Western and Eastern Palaearctic along the Yenisei River is accepted. To compare the fauna, Czekanowski-Dice-Sørensen coefficient of similarity is used (Czekanowski 1909, Dice 1945, Sørensen 1948).

Results

A total of 1556 dipteran species of 82 families have been recorded from the Bulgarian Black Sea Coast so far (Table 1), which accounts for 30.0% of the 5190 species, known from Bulgaria – Nematocera 395 species (25.4%) and Brachycera 1161 species (74.6%). The families Tachinidae (162 species – 10.4%), Cecidomyiidae (116 species – 7.5%), Chloropidae (112 species – 7.2%), Syrphidae (110 species – 7.1%) and Chironomidae (101 species – 6.5%) are the most numerous. The remaining families contain less than 100 species. Of the largest families (with over 200 species in Bulgaria), Limoniidae, Mycetophilidae, Cecidomyiidae, Chironomidae, Dolichopodidae, Phoridae, Syrphidae, Agromysidae, Muscidae and Tachinidae, between 0.9% and 44.4% of the Bulgarian species have been reported from the Black Sea Coast. The families Mycetophlidae and Phoridae, widely represented in other parts of the country, have not been studied along the coast. It is expected that a significant number of species of the Tachinidae family will additionally be established for the Black Sea Coast. The families Culicidae, Stratiomyidae, Tabanidae, Chamaemyiidae, Sciomyzidae, Chloropidae and Ephydridae are best represented – between 55.3% and 74.5% of the Bulgarian species. The families Culicidae, Ceratopogonidae, Chironomidae, Chloropidae, Ephydridae and Muscidae have been studied longest and the most systematically in the whole country. Along the Black Sea Coast, they comprise between 30.8% and 74.5% of the Bulgarian species. Some smaller families are well represented, of which between 30% and 75.0% of the taxa found in Bulgaria have been established along the coast. Of the infraorders, Orthorrhapha includes 250 species (16.1% of the coastal species and 28.3% of the Bulgarian species), related to the better study of Stratiomyidae (60.0% of the Bulgarian species), Tabanidae (55.3%), Asilidae (28.7%) and Dolichopodidae (30.7%). Significantly more species include Cyclorrhapha (911 species – 58.5% of the coastal species and 36.6% of the Bulgarian species). This infraorder combines 52 families of the Black Sea Coast, some of which (Tethinidae, Canacidae and Ephydridae) are connected with the coastal habitats and others are rich in species. The diverse habitats of the coast support a rich dipteran fauna, which is unsufficiently studied. The number of the established species is probably about 50-60% of the real species composition of the Bulgarian Black Sea Coast.

The wide distribution of Diptera suggests that thorough research would reveal similar species in different regions. Most dipterans have vast ranges

Table 1. Distribution of the dipterans (Insecta: Diptera) of the Bulgarian Black Sea Coast. The number in brackets after the families give the number of the established species in Bulgaria. In the second column, the figure after the brackets indicates the percentage from the Bulgarian species.

Families	Total number	Zoning of the Bulgarian Black Sea Coast				
		Dobroudzha	Varna	Stara Planina	Bourgas	Strandzha
NEMATOCERA (1674)	**395 (25.4) 23.6**	**94 (19.0)**	**279 (32.5)**	**46 (19.7)**	**129 (21.4)**	**110 (19.1)**
Tipulomorpa (343)	**45 (2.9) 13.1**	**3 (0.6)**	**19 (2.2)**	**12 (5.1)**	**4 (0.7)**	**31 (5.4)**
Tipulidae (89)	4 (0.3) 4.5	3 (0.6)	4 (0.5)	3 (1.3)	3 (0.5)	3 (0.5)
Limoniidae (221)	41 (2.6) 18.6		15 (1.7)	9 (3.9)	1 (0.2)	28 (4.8)
Bibionomorpha (687)	**178 (11.4) 25.9**	**27 (5.4)**	**161 (18.7)**	**16 (6.9)**	**14 (2.3)**	**27 (4.7)**
Bibionidae (13)	2 (0.1) 15.4	1 (0.2)	2 (0.2)	1 (0.4)	1 (0.2)	1 (0.2)
Mycetophilidae (262)	14 (0.9) 5.3	3 (0.6)	9 (1.0)			4 (0.7)
Ditomyiidae (3)	1 (0.06) 33.3		1 (0.1)			
Bolitophilidae (10)	1 (0.06) 10.0					1 (0.2)
Diadocidiidae (3)	1 (0.06) 33.3		1 (0.1)			
Keroplatidae (48)	15 (1.0) 31.2		9 (1.0)	2 (0.9)		8 (1.4)
Sciaridae (84)	28 (1.8) 33.3	1 (0.2)	26 (3.0)			
Cecidomyiidae (261)	116 (7.5) 44.4	22 (4.4)	113 (13.2)	13 (5.6)	13 (2.2)	13 (2.3)
Psychodomorpha (109)	**7 (0.4) 6.4**	**1 (0.2)**	**2 (0.2**	**1 (0.4)**	**5 (0.8)**	
Psychodidae (102)	6 (0.4) 5.9	1 (0.2)	2 (0.2)	1 (0.4)	4 (0.7)	
Trichoceridae (7)	1 (0.06) 20.0				1 (0.2)	
Ptychopteromorpha (5)	**1 (0.06) 20.0**		**1 (0.1)**			
Ptychopteridae (6)	1 (0.06) 16.6		1 (0.1)			
Culicomorpha (521)	**164 (10.5) 31.5**	**63 (12.7)**	**96 (11.2)**	**17 (7.3)**	**106 (17.6)**	**52 (9.0)**
Chaoboridae (1)	1 (0.06) 100.0	1 (0.2)				
Culicidae (47)	35 (2.2) 74.5	19 (3.8)	25 (2.9)	12 (5.1)	29 (4.8)	25 (4.3)
Ceratopogonidae (66)	27 (1.7) 40.9		16 (1.9)		25 (4.2)	1 (0.2)
Chironomidae (328)	101 (6.5) 30.8	43 (8.7)	55 (6.4)	5 (2.1)	52 (8.6)	26 (4.5)
BRACHYCERA (3506)	**1161 (74.6) 33.1**	**402 (81.0)**	**580 (67.5)**	**187 (80.3)**	**473 (78.6)**	**467 (80.9)**
Orthorrhapha (881)	**250 (16.1) 28.3**	**65 (13.1)**	**154 (17.9)**	**16 (6.9)**	**97 (16.1)**	**55 (9.5)**
Stratiomyomorpha (51)	**30 (1.9) 58.8**	**3 (0.6)**	**23 (2.7)**	**2 (0.9)**	**11 (1.8)**	**11 (1.9)**
Stratiomyidae (50)	30 (1.9) 60.0	3 (0.6)	23 (2.7)	2 (0.9)	11 (1.8)	11 (1.9)
Tabanomorpha (107)	**51 (3.3) 47.7**	**20 (4.0)**	**31 (3.6)**	**7 (3.0)**	**27 (4.5)**	**15 (2.6)**
Rhagionidae (18)	3 (0.2) 16.7		1 (0.1)			3 (0.5)
Athericidae (2)	1 (0.06) 50.0			1 (0.4)		
Tabanidae (85)	47 (3.0) 55.3	20 (4.0)	30 (3.5)	6 (2.6)	27 (4.5)	12 (2.1)
Asilomorpha (221)	**68 (4.4) 30.8**	**13 (2.6)**	**43 (5.0)**	**4 (1.7)**	**29 (4.8)**	**14 (2.4)**
Acroceridae (3)	1 (0.06) 33.3				1 (0.2)	
Bombyliidae (89)	28 (1.8) 31.5	8 (1.6)	24 (2.8)	3 (1.3)	13 (2.2)	2 (0.3)
Mythicomyiidae (2)	1 (0.06) 50.0				1 (0.2)	1 (0.2)
Therevidae (10)	5 (0.3) 50.0	1 (0.2)	4 (0.5)			
Asilidae (115)	33 (2.1) 28.7	4 (0.8)	15 (1.7)	1 (0.4)	14 (2.3)	11 (1.9)
Empidomorpha (502)	**101 (6.5) 20.1**	**29 (5.8)**	**57 (6.6)**	**3 (1.3)**	**30 (5.0)**	**15 (2.6)**
Empididae (183)	14 (0.9) 7.6	3 (0.6)	6 (0.7)		3 (0.5)	4 (0.7)
Hybotidae (87)	19 (1.2) 21.8	5 (1.0)	8 (0.9)		7 (1.2)	3 (0.5)
Microphoridae (5)	1 (0.06) 20.0					1 (0.2)
Dolichopodidae (225)	67 (4.3) 30.7	21 (4.2)	43 (5.0)	3 (1.3)	20 (3.3)	7 (1.2)
Cyclorrhapha (2491)	**911 (58.5) 36.6**	**337 (67.9)**	**426 (49.6)**	**171 (73.4)**	**379 (63.0)**	**412 (71.4)**
Aschiza (565)	**119 (7.6) 21.1**	**20 (4.0)**	**42 (4.9)**	**16 (6.9)**	**50 (8.3)**	**70 (12.1)**
Lonchopteridae (4)	2 (0.1) 50.0	1 (0.2)	2 (0.2)	1 (0.4)	1 (0.2)	1 (0.2)
Phoridae (230)	2 (0.1) 0.9	1 (0.2)				1 (0.2)
Pipunculidae (26)	5 (0.3) 19.2		4 (0.5)		1 (0.2)	1 (0.2)
Syrphidae (304)	110 (7.1) 36.2	18 (3.6)	36 (4.2)	15 (6.4)	48 (8.0)	67 (11.6)
Schizophora (1925)	**792 (50.9) 41.1**	**317 (63.9)**	**384 (44.7)**	**155 (66.5)**	**329 (54.7)**	**342 (59.3)**
Acalyptrata (941)	**431 (27.7) 45.8**	**199 (40.1)**	**261 (30.4)**	**40 (17.2)**	**208 (34.6)**	**142 (24.6)**
Psilidae (7)	1 (0.06) 14.3		1 (0.1)			

Table 1. Continuation.

Families	Total number	Zoning of the Bulgarian Black Sea Coast				
		Dobroudzha	Varna	Stara Planina	Bourgas	Strandzha
Conopidae (41)	16 (1.0) 39.0	1 (0.2)	10 (1.2)		3 (0.5)	5 (0.9)
Lonchaeidae (5)	1 (0.06) 20.0				1 (0.2)	
Otitidae (13)	8 (0.5) 61.5	1 (0.2)	6 (0.7)		1 (0.2)	
Platystomatidae (4)	1 (0.06) 25.0		1 (0.1)			
Tephritidae (79)	32 (2.1) 40.5	7 (1.4)	29 (3.4)	2 (0.9)	10 (1.7)	4 (0.7)
Piophilidae (3)	1 (0.06) 33.3	1 (0.2)	1 (0.1)	1 (0.4)	1 (0.2)	1 (0.2)
Lauxaniidae (23)	5 (0.3) 13.0		2 (0.2)			6 (1.0)
Chamaemyiidae (29)	19 (1.2) 65.5	14 (2.8)	11 (1.3)		8 (1.3)	8 (1.4)
Coelopidae (3)	2 (0.1) 66.7	1 (0.2)	2 (0.2)		1 (0.2)	
Dryomyzidae (2)	1 (0.06) 50.0				1 (0.2)	
Sciomyzidae (37)	23 (1.5) 62.2	3 (0.6)	16 (1.9)		4 (0.7)	5 (0.9)
Helcomyzidae (1)	1 (0.06) 100.0	1 (0.2)	1 (0.1)			
Sepsidae (11)	1 (0.06) 9.0					1 (0.2)
Odiniidae (2)	1 (0.06) 50.0					1 (0.2)
Agromyzidae (309)	36 (2.3) 11.6	3 (0.6)	4 (0.5)	6 (2.6)	19 (3.2)	14 (2.4)
Opomyzidae (7)	5 (0.3) 71.4		4 (0.5)		2 (0.3)	2 (0.3)
Anthomyzidae (5)	1 (0.06) 20.0		1 (0.1)			
Periscelididae (1)	1 (0.06) 100.0					1 (0.2)
Asteiidae (3)	2 (0.1) 66.7	1 (0.2)	1 (0.1)	1 (0.4)	1 (0.2)	1 (0.2)
Carnidae (8)	3 (0.2) 37.7	1 (0.2)	2 (0.2)	1 (0.4)	2 (0.3)	1 (0.2)
Tethinidae (7)	7 (0.4) 100.0	6 (1.2)	3 (0.3)	3 (1.3)	5 (0.8)	4 (0.7)
Canacidae (1)	1 (0.06) 100.0	1 (0.2)	1 (0.1)	1 (0.4)	1 (0.2)	1 (0.2)
Milichiidae (8)	5 (0.3) 62.5	2 (0.4)	2 (0.2)		5 (0.8)	1 (0.2)
Chloropidae (166)	112 (7.2) 67.5	68 (13.7)	71 (8.3)	9 (3.9)	68 (11.3)	38 (6.6)
Siphonellopsidae (2)	2 (0.1) 100.0		2 (0.2)			
Heleomyzidae (51)	11 (0.7) 21.6	2 (0.4)	6 (0.7)	1 (0.4)	3 (0.5)	2 (0.3)
Trixoscelididae (1)	1 (0.06) 100.0	1 (0.2)				
Sphaeroceridae (60)	20 (1.3) 33.3	12 (2.4)	12 (1.4)	2 (0.9)	6 (1.0)	6 (1.0)
Curtonotidae (1)	1 (0.06) 100.0		1 (0.1)		1 (0.2)	
Camillidae (1)	1 (0.06) 100.0	1 (0.2)			1 (0.2)	
Drosophilidae (17)	11 (0.7) 64.7	2 (0.4)	2 (0.2)		3 (0.5)	8 (1.4)
Campichoetidae (2)	1 (0.06) 50.0	1 (0.2)	1 (0.1)			
Diastatidae (4)	2 (0.1) 50.0	2 (0.4)	2 (0.2)			
Ephydridae (135)	95 (6.1) 70.4	67 (13.5)	66 (7.7)	13 (5.6)	61 (10.1)	32 (5.5)
Calyptrata (985)	**361 (23.2) 36.6**	**118 (23.8)**	**123 (14.3)**	**115 (49.4)**	**121 (20.1)**	**200 (34.7)**
Hippoboscidae (13)	4 (0.2) 30.8	2 (0.4)	2 (0.2)	2 (0.9)	2 (0.3)	4 (0.7)
Nycteribiidae (7)	7 (0.4) 100.0					7 (1.2)
Scathophagidae (11)	1 (0.06) 9.1		1 (0.1)		1 (0.2)	
Anthomyiidae (53)	14 (0.9) 26.4	9 (1.8)	8 (0.9)	8 (3.4)	10 (1.7)	12 (2.1)
Fanniidae (27)	9 (0.6) 33.3	3 (0.6)	4 (0.5)	3 (1.3)	3 (0.5)	8 (1.4)
Muscidae (267)	98 (6.3) 36.7	20 (4.0)	48 (5.6)	9 (3.9)	40 (6.6)	55 (9.5)
Calliphoridae (41)	20 (1.3) 46.3	7 (1.4	9 (1.0)	5 (2.1)	18 (3.0)	9 (1.6)
Sarcophagidae (122)	39 (2.5) 32.0	17 (3.4)	17 (2.0)	7 (3.0)	20 (3.3)	12 (2.1)
Rhinophoridae (8)	1 (0.06) 12.5		1 (0.1)			
Oestridae (2)	2 (0.1) 100.0	1 (0.2)	2 (0.2)	1 (0.4)	2 (0.3)	1 (0.2)
Hypodermatidae (4)	1 (0.06) 25.0	1 (0.2)	1 (0.1)	1 (0.4)	1 (0.2)	1 (0.2)
Gasterophilidae (4)	3 (0.2) 75.0	3 (0.6)	3 (0.3)	3 (1.3)	3 (0.5)	3 (0.5)
Tachinidae (436)	162 (10.4) 37.2	55 (11.1)	27 (3.1)	76 (32.6)	21 (3.5)	88 (15.2)
Species	**1556**	**496 (31.9)**	**859 (55.2)**	**233 (15.0)**	**602 (38.7)**	**577 (37.1)**
Families	**82**	**53 (64.6)**	**66 (80.5)**	**37 (45.1)**	**56 (68.3)**	**56 (68.3**

Table 2. Similarity of the dipteran fauna in the different parts of the Bulgarian Black Sea Coast. Common species are given in brackets

Zoning	Varna	Stara Planina	Bourgas	Strandzha
Dobroudzha	45.0 (305)	38.8 (131)	50.3 (276)	40.8 (215)
Varna		27.2 (141)	45.7 (334)	35.3 (250)
Stara Planina			35.1 (137)	36.4 (134)
Bourgas				43.0 (249)

and endemics are poorly represented [30 species – 1.9% (Nematocera – 0.4% and Brachycera – 1.5%)]. Often these are newly described taxa or rare species with unclear ranges. The distribution of Diptera along the Bulgarian Black Sea Coast is related to the specific natural conditions of the respective regions, the peculiarities of the families and the level of their study. This is evident when comparing the established species between the separate regions of the coast. They have not been evenly studied in terms of families, as separate families are well studied in some regions and almost unexplored in others. Thus, Sciaridae is represented only in the Varna district, Ceratopogonidae – around Varna and Burgas, Dolichopodidae is almost absent in the Stara Planina district, Sciomyzidae prevails in the Varna district, most Agromyzidae are found in the Burgas district and Tachinidae – from the Strandzha district. Culicidae, Chironomidae (excluding the Stara Planina district) and Ephydridae are most evenly represented in the separate parts of the coast. The families studied more extensively throughout the years by various research groups are evenly represented along the coast. Investigations on the synbovil and synanthropic forms of Tabanidae, Fanniidae, Muscidae, Calliphoridae and Sarcophagidae have enriched the faunistic composition of the Brachycera in the Black Sea Coast. Many families have not been studied and the taxa reported are from accidentally collected materials. These families are represented by widely distributed species, which do not allow for the drawing of conclusions about their presence in the separate parts of the coast. Single taxa and fragmentary data have been reported. Most material has been collected around the popular scientific and resort centres. With respect to most families, the regions of Varna and Burgas are better studied (over 40% of the species found), while the Stara Planina Mts. part is poorly studied (15.0% of the species known). When considering Brachycera and Nematocera in general (Table 1), the differences between the separate regions reach 13.5%.

Of the established dipterans, 63 species have a medical significance, and 40 species are pests on the vegetation. Of the suborder Nematocera, 22 species have a human or veterinary medical significance, and 20 species are pests on forestry or agriculture. Most representatives with medical significance include the family Culicidae (12), followed by Ceratopogonidae (6) and Psychodidae (4). The majority of vegetation pests belong to the family Cecidomyiidae (16). Only 4 species are shared out among Tipulidae (2), Bibionidae (1) and Sciaridae (1). Of the suborder Brachycera, 41 species have a human or veterinary medical significance, and 20 species are pests on forestry or agriculture. Most representatives of medical significance include Muscidae (10) and Tabanidae (8), followed by Sarcophagidae (5), Calliphoridae (4), Gastrophilidae (3), Fanniidae (3) Hippoboscidae (3), Oestridae (2), Piophilidae (1), Anthomyiidae (1) and Hypodermatidae (1). Most vegetation pests belong to Anthomyiidae (5), Tephritidae (4) and Chloropidae (4). The families Psilidae, Lonchaeidae, Agromyzidae, Opomyzidae, Heleomyzidae, Drosophilidae and Ephydridae are presented with one species each.

The zoogeographical categorization of the species is made on the basis of current data about their distribution. Thus, the dipterans are divided into 116 areographical categories, combined in 3 main groups and 6 complexes (Table 3).

Species distributed in the Palaearctic and beyond it. This group (470 species – 30.2%) includes 38 categories, of which 27 combine species of northern type (widely distributed in the Holarctic and Palaearctic) and eleven – species of southern type (distributed in the southern parts of the Palaearctic). In the Super Palaearctic complex, the Holarctic species are best represented [137 species – 8.8% (from 6.9% in the Stara Planina district to 9.9% in the Dobrudzha district)]. Of the other areographical categories, the Palaearctic-Oriental species [73 species – 4.7% (10 – 31 species, from 3.6% to 5.0% in the separate districts)] and the Holarctic-Oriental [41 species – 2.6% (9 – 27 species, from 2.2% to 4.7%)] forms are better represented. Among dipterans, there is a significant number of synanthropic and synbovillous forms with a cosmopolitan or subcosmopolitan distribution. Their ranges are structured and affected by the development of

Table 3. Zoogeographical characteristic of Diptera of the Bulgarian Black Sea Coast

Classification of the areas	Total number	Zoning of the Bulgarian Black Sea Coast				
		Dobrud-zha	Varna	Stara Planina	Burgas	Strand-zha
Species distributed in Palaearctic and out of it	**470 (30.2)**	**198 (39.9)**	**234 (27.2)**	**95 (40.8)**	**215 (35.7)**	**222 (38.5)**
North type	**439 (28.2)**	**186 (37.5)**	**225 (26.2)**	**89 (38.2)**	**197 (32.7)**	**208 (36.0)**
Cosmopolitan	29 (1.9)	21 (4.2)	21 (2.4)	18 (7.7)	20 (3.3)	21 (3.6)
Semicosmopolitan	17 (1.1)	11 (2.2)	11 (1.3)	9 (3.9)	11 (1.8)	10 (1.7)
Holarctic-Paleotropical-Neotropical	3 (0.2)	1 (0.2)	2 (0.2)		2 (0.3)	1 (0.2)
Holarctic-Paleotropical-Australian	5 (0.3)	4 (0.8)	3 (0.3)	3 (1.3)	3 (0.5)	5 (0.9)
Holarctic-Paleotropical	4 (0.3)	2 (0.4)	1 (0.1)		1 (0.2)	1 (0.2)
Holarctic-Neotropical-Afrotropical	2 (0.1)	2 (0.4)				1 (0.2)
Holarctic-Neotropical-Oriental	13 (0.8)	8 (1.6)	11 (1.3)	5 (2.1)	7 (1.2)	8 (1.4)
Holarctic-Afrotropical-Australian	2 (0.1)	2 (0.4)			1 (0.2	
Holarctic-Oriental-Australian	5 (0.3)		2 (0.2)		2 (0.3)	1 (0.2)
Holarctic-Afrotropical	6 (0.4)	4 (0.8)	4 (0.5)	2 (0.9)	4 (0.7)	4 (0.7)
Holarctic-Oriental	41 (2.6)	12 (2.4)	19 (2.2)	9 (3.9)	21 (3.5)	27 (4.7)
Holarctic-Neotropical	10 (0.6)	5 (1.0)	5 (0.6)	3 (1.3)	6 (1.0)	6 (1.0)
Holarctic-Australian	8 (0.5)	2 (0.4)	5 (0.6)	1 (0.4	3 (0.5)	3 (0.5)
Holarctic	137 (8.8)	49 (9.9)	69 (8.0)	16 (6.9)	56 (9.3)	56 (9.7)
Palaearctic-Paleotropical-Neotropical	1 (0.06)				1 (0.2)	1 (0.2)
Palaearctic-Paleotropical-Australian	8 (0.5)	4 (0.8)	5 (0.6)	2 (0.9)	5 (0.8)	6 (1.0)
Palaearctic-Afrotropical-Neotropical	1 (0.06)		1 (0.1)			
Palaearctic-Afrotropical-Australian	1 (0.06)	1 (0.2)			1 (0.2)	1 (0.2)
Palaearctic-Oriental-Australian	3 (0.2)	2 (0.4)	1 (0.1)		1 (0.2)	1 (0.2)
Palaearctic-Paleotropical	25 (1.6)	13 (2.6)	15 (1.7)	4 (1.7)	12 (2.0)	8 (1.4)
Palaearctic-Afrotropical	15 (1.0)	8 (1.6)	9 (1.0)	3 (1.3)	7 (1.2)	6 (1.0)
Palaearctic-Oriental	73 (4.7)	24 (4.8)	31 (3.6)	10 (4.3)	26 (4.3)	29 (5.0)
Palaearctic-Australian	1 (0.06)	1 (0.2)	1 (0.1)	1 (0.4	1 (0.2)	1 (0.2)
West Palaearctic-Afrotropical	13 (0.8)	6 (1.2)	5 (0.6)		6 (1.0)	5 (0.9)
West Palaearctic-Oriental	8 (0.5)	1 (0.2)	3 (0.3)			4 (0.7)
West Palaearctic-Neotropical	1 (0.06)	1 (0.2)				
Disjunct Palaearctic-Oriental	7 (0.4)	2 (0.4)	1 (0.1)	3 (1.3)		2 (0.3)
South type	**31 (2.0)**	**12 (2.4)**	**9 (1.0)**	**6 (2.6)**	**18 (3.0)**	**14 (2.4)**
South Palaearctic-Paleotropical-Australian	2 (0.1)	2 (0.4)	1 (0.1)	2 (0.9)	2 (0.3)	1 (0.2)
Southwest Palaearctic-Neotropical-Afrotropical-Australian	1 (0.06)					1 (0.2)
South Palaearctic-Paleotropical	8 (0.5)	5 (1.0)	3 (0.3)	1 (0.4	4 (0.7)	2 (0.3)
South Palaearctic-Afrotropical	1 (0.06)				1 (0.2)	
Southwest Palaearctic-Afrotropical	3 (0.2)		1 (0.1)		1 (0.2)	1 (0.2)
South Palaearctic-Oriental	5 (0.3)	2 (0.4)	1 (0.1)		1 (0.2)	2 (0.3)
Southwest Palaearctic-Oriental	3 (0.2)	1 (0.2)	1 (0.1)	1 (0.4	3 (0.5)	2 (0.3)
Afrotropical-Mediterranean	5 (0.3)	1 (0.2)	1 (0.1)	1 (0.4	4 (0.7)	3 (0.5)
Oriental-Mediterranean	1 (0.06)					1 (0.2)
Oriental-East Mediterranean	1 (0.06)				1 (0.2)	
European-Neotropical-Oriental	1 (0.06)	1 (0.2)	1 (0.1)	1 (0.4	1 (0.2)	1 (0.2)
Species with Palaearctic distribution	**1086 (69.8)**	**298 (60.1)**	**625 (72.8)**	**126 (54.1)**	**387 (64.3)**	**351 (60.8)**
Palaearctic type	**489 (31.4)**	**170 (34.3)**	**273 (31.8)**	**77 (33.0)**	**204 (40.6)**	**195 (33.8)**
Holopalaearctic	17 (1.1)	11 (2.2)	13 (1.5)	6 (2.6)	15 (2.5)	10 (1.7)
Transpalaearctic	109 (7.0)	41 (8.3)	56 (6.5)	16 (6.9)	49 (8.1)	55 (9.5)
West and Central Palaearctic	68 (4.4)	26 (5.2)	48 (5.6)	14 (6.0)	28 (4.7)	21 (3.6)
West Palaearctic	92 (5.9)	36 (7.3)	48 (5.6)	16 (6.9)	37 (6.1)	39 (6.8)
Disjunct Palaearctic	19 (1.2)	3 (0.6)	11 (1.3)	4 (1.7)	5 (0.8)	5 (0.9)
South Palaearctic	2 (o.1)		2 (0.2)		1 (0.2)	1 (0.2)
Southwest Palaearctic	6 (0.4)	1 (0.2)	3 (0.3)	1 (0.4	1 (0.2)	2 (0.3)
Eurosiberian-Anatolian-Central Asian	4 (0.3)		2 (0.2)		1 (0.2)	1 (0.2)
Eurosiberian-Central Asian	28 (1.8)	5 (1.0)	13 (1.5)	5 (2.1)	10 (1.5)	10 (1.7)

Table 3. Continuation.

Classification of the areas	Total number	Zoning of the Bulgarian Black Sea Coast				
		Dobrud-zha	Varna	Stara Planina	Burgas	Strand-zha
West Eurosiberian-Central Asian	4 (0.3)	3 (0.6)	2 (0.2)	1 (0.4	2 (0.3	
West Eurosiberian-West Central Asian	1 (0.06)		1 (0.1)			
West Eurosiberian-Iran-Turanian	2 (0.1)		1 (0.1)		2 (0.3	1 (0.2)
West Eurosiberian-Anatolian-Iranian	1 (0.06)					1 (0.2)
West Eurosiberian-Anatolian-Turanian	1 (0.06)		1 (0.1)			
West Eurosiberian-Turanian	1 (0.06)	1 (0.2)	1 (0.1)	1 (0.4	1 (0.2)	1 (0.2)
West Eurosiberian-Anatolian	3 (0.2)	3 (0.6)	1 (0.1)		1 (0.2)	1 (0.2)
European-Anatolian-North African	18 (1.2)	2 (0.4)	6 (0.7)	1 (0.4	13 (2.2)	7 (1.2)
European-North African	53 (3.4)	19 (3.8)	36 (4.2)	5 (2.1)	22 (3.7)	20 (3.5)
European-Anatolian-Central Asian	7 (0.4)	3 (0.6)	4 (0.5)	1 (0.4		2 (0.3)
European-Central Asian	7 (0.4)	3 (0.6)	2 (0.2)		2 (0.3	2 (0.3)
European-West Central Asian	9 (0.6)	2 (0.4)2	4 (0.5)	1 (0.4	4 (0.7)	2 (0.3)
European-Southwest Asian	13 (0.8)	3 (0.6)	4 (0.5)	2 (0.9)	3 (0.5)	5 (0.9)
European-Anatolian-Iran-Turanian	5 (0.3)	3 (0.6)	3 (0.3)	2 (0.9)	4 (0.7)	3 (0.5)
European-Iran-Turanian	1 (0.06)	1 (0.2)			1 (0.2)	1 (0.2)
European-Anatolian-Iranian	7 (0.4)	2 (0.4)	4 (0.5)		2 (0.3	2 (0.3)
European-Anatolian-Turanian	1 (0.06)					1 (0.2)
European-Iranian	2 (0.1)		1 (0.1)			1 (0.2)
European-Turanian	8 (0.5)	2 (0.4)	6 (0.7)	1 (0.4	1 (0.2)	1 (0.2)
Species distributed in one subregion	**597 (38.4)**	**128 (25.8)**	**352 (41.0)**	**49 (21.0)**	**183 (30.4)**	**156 (27.0)**
Eurosiberian type	**407 (26.2)**	**82 (16.5)**	**250 (29.1)**	**31 (13.3)**	**93 (15.4)**	**94 (16.3)**
Holoeurosiberian	23 (1.5)	9 (1.8)	10 (1.2)	3 (1.3)	12 (2.0)	6 (1.0)
Transeurosiberian	13 (0.8)	3 (0.6)	7 (0.8)		2 (0.3	2 (0.3)
West and Central Eurosiberian	26 (1.7)	9 (1.8)	16 (1.9)		11 (1.8)	8 (1.4)
West Eurosiberian	26 (1.7)	5 (1.0)	13 (1.5)	2 (0.9)	7 (1.2)	7 (1.2)
Disjunct Eurosiberian	34 (2.2)	4 (0.8)	15 (1.7)	6 (2.6)	6 (1.0)	9 (1.6)
European and South Siberian	5 (0.3)	1 (0.2)	2 (0.2)			3 (0.5)
European-Anatolian	19 (1.2)	2 (0.4)	15 (1.7)	1 (0.4	3 (0.5)	5 (0.9)
European	217 (13.9)	42 (8.5)	144 (16.8)	14 (6.0)	42 (7.0)	47 (8.1)
East European-Siberian	1 (0.06)		1 (0.1)			
East European	3 (0.2)	1 (0.2)	2 (0.2)			1 (0.2)
Central and East European	2 (0.1)	1 (0.2)	1 (0.1)			
Central and South European-Anatolian	7 (0.4)		2 (0.2)	1 (0.4	3 (0.5)	4 (0.7)
Central and South European	20 (1.3)	3 (0.6)	14 (1.6)	4 (1.7)	3 (0.5)	2 (0.3)
Central and Southeast European	11 (0.7)	2 (0.4)	8 (0.9)		4 (0.7)	
Mediterranean type	**160 (10.3)**	**41 (8.3)**	**83 (9.7)**	**15 (6.4)**	**83 (13.8)**	**55 (9.5)**
Mediterranean and South Siberian	1 (0.06)					1 (0.2)
North Mediterranean and South Far East	1 (0.06)	1 (0.2)	1 (0.1)	1 (0.4	1 (0.2)	1 (0.2)
Mediterranean-Central Asian	5 (0.3)	1 (0.2)			4 (0.7)	4 (0.7)
Mediterranean-West Central Asian	8 (0.5)	2 (0.4)	5 (0.6)	2 (0.9)	5 (0.8)	4 (0.7)
Mediterranean-Iran-Turanian	6 (0.4)	1 (0.2)	2 (0.2)		3 (0.5)	1 (0.2)
Mediterranean-Iranian	7 (0.4)	2 (0.4)	5 (0.6)		5 (0.8)	3 (0.5)
Mediterranean-Turanian	2 (0.1)		1 (0.1)	1 (0.4	1 (0.2)	
East Mediterranean-Central Asian	1 (0.06)				1 (0.2)	1 (0.2)
East Mediterranean-Iran-Turanian	1 (0.06)				1 (0.2)	
North Mediterranean-West Central Asian	2 (0.1)	1 (0.2)	1 (0.1)		1 (0.2)	2 (0.3)
North Mediterranean-Iranian	3 (0.2)		2 (0.2)		2 (0.3	1 (0.2)
Northeast Mediterranean-Iranian	1 (0.06)					1 (0.2)
Southeast European-West Central Asian	1 (0.06)	1 (0.2)				1 (0.2)
Central and South European-Iran-Turanian	2 (0.1)	2 (0.4)	2 (0.2)	1 (0.4	2 (0.3	2 (0.3)
Central and Southeast European-Iranian	3 (0.2)	1 (0.2)		1 (0.4		1 (0.2)
Central (Middle) and South European-Turanian	3 (0.2)	2 (0.4)	2 (0.2)		1 (0.2)	1 (0.2)

Table 3. Continuation.

Classification of the areas	Total number	Zoning of the Bulgarian Black Sea Coast				
		Dobrud-zha	Varna	Stara Planina	Burgas	Strand-zha
Central and Southeast European-Lebanonian	1 (0.06)	1 (0.2)				
Central and South European-Anatolian-North African	1 (0.06)				1 (0.2)	
Central and South European-North African	5 (0.3)	2 (0.4)	1 (0.1)		2 (0.3	1 (0.2)
South European-North African	20 (1.3)	8 (1.6)	14 (1.6)	1 (0.4	13 (2.2)	3 (0.5)
Southeast European-Iranian	1 (0.06)		1 (0.1)			1 (0.2)
South European-Turanian	1 (0.06)					1 (0.2)
Holomediterranean	24 (1.5)	3 (0.6)	11 (1.3)	3 (1.3)	12 (2.0)	8 (1.4)
East Mediterranean	7 (0.4)	1 (0.2)	5 (0.6)	2 (0.9)	2 (0.3)	1 (0.2)
North Mediterranean	9 (0.6)	3 (0.6)	6 (0.7)		3 (0.5)	3 (0.5)
South European	15 (1.0)	2 (0.4)	8 (0.9)		9 (1.5)	3 (0.5)
Northeast Mediterranean	1 (0.06)	1 (0.2)			1 (0.2)	
Southeast European-Anatolian	7 (0.4)	2 (0.4)	5 (0.6)		3 (0.5)	4 (0.7)
Southeast European	16 (1.0)	3 (0.6)	7 (0.8)	1 (0.4	9 (1.5)	4 (0.7)
Balkan-Caucasian-Iranian	1 (0.06)		1 (0.1)	1 (0.4		
Balkan-Caucasian	1 (0.06)	1 (0.2)	1 (0.1)	1 (0.4	1 (0.2)	1 (0.2)
Balkan-Anatolian	3 (0.2)		2 (0.2)			1 (0.2)
Endemics	**30 (1.9)**	**5 (1.0**	**19 (2.2)**	**3 (1.3)**	**7 (1.2)**	**7 (1.2)**
Balkan subendemic	1 (0.06)		1 (0.1)			
Balkan endemic	10 (0.6)	3 (0.6)	6 (0.7)	3 (1.3)	4 (0.7)	2 (0.3)
Bulgarian endemic	15 (1.0)	2 (0.4)	11 (1.3)		2 (0.3	2 (0.3)
Regional endemic	4 (0.3)		1 (0.1)		1 (0.2)	3 (0.5)
Species	**1556**	**496**	**859**	**233**	**602**	**577**

the human civilization (before the contemporary research). These species most often have a high abundance, present in diverse habitats and increase the percentage of the Super Palaearctic taxa in the non-specialized studies.

Species distributed within the Palaearctic region. The group (1086 species – 69.8%) includes from 126 to 625 species (from 54.1% to 72.8%) in the separate parts of the Bulgarian Black Sea Coast. It is divided into species distributed only in the Palaearctic, but in more than one subregion and species distributed within one Palaearctic subregion.

Species distributed only in the Palaearctic but in more than one subregion (**Palaearctic type**). Taxa, whose areas include more than one Palaearctic subregion in latitudinal direction, belong to this group. In total, 28 areographical categories are represented in the dipteran fauna of the Bulgarian Black Sea Coast (Table 3), which combine 489 species (31.4%). The character of the Palaearctic complex is determined by the Transpalaearctic [109 species – 7.0% (from 6.5% to 9.5% in the separate coastal areas)], West Palaearctic [92 species – 5.9% (from 5.6% to 7.3%)], West and Central Palaearctic [68 species – 4.4% (from 3.6% to 6.0%)] and European-North African [53 species – 3.4% (from 2.1% to 4.2%)] species. The Eurosiberian-Central Asian (28 species), European-Anatolian-North African (18 species), Holopalaearctic and Disjunct Palaearctic (17 – 19 species) taxa are well represented. The correlation of the mentioned categories is consistent in the separate vegetation belts and varies from 0.4% to 9.5% (1 to 56 species). Seventeen species (1.2%), from 3 to 11 species in the separate coastal regions have longitudinal disjunction of the areas with regard to Siberia and Central Asia. Probably, some of these species are presented with sparse populations and will be studied in more details as a result of further research. Most often, a latitudinal disjunction of the areas of this complex is lacking (Gorodkov 1984, Josifov 1988, Hubenov 2015).

Species distributed within one subregion of the Palaearctic. This group (597 species – 38.4%) includes from 49 to 352 species (from 21.0% to 41.0%) in the separate parts of the Bulgarian Black Sea Coast (Table 3). The group combines species with Eurosiberian and Mediterranean types of distribution (50 categories), as well as endemics. The Mediterranean-Central Asian species are also included here, following Kryzhanovsky (1965, 2002) and Lopatin (1989), who combine the Mediterranean and Central Asian subregions.

The Eurosiberian species include 14 areographical categories (407 species or 26.2%). These are from 31 to 250 species (from 13.3% to 29.1%) in the separate parts of the Bulgarian Black Sea Coast. The European [217 species (13.9%) – from 14 to 144 species (from 6.0% to 16.8%) in the separate parts of the coast], Disjunct Eurosiberian [34 species (2.2%) – from 4 to 15 species (from 0.8% to 2.6%)], West and Central Eurosiberian [26 species (1.7%) – from 0 to 16 species (from 0% to 1.9%)] and West Eurosiberian [26 species (1.7%) – from 2 to 13 species (from 0.9% to 1.5%)] taxa are the most numerous. The Holoeurosiberian, European-Anatolian, Central and South European, Transeurosiberian and Central and Southeast European species are well represented. The Eurosiberian complex includes 34 species with disjunctive areas – a longitudinal disjunction for Siberia and Central Asia and latitudinal disjunction with boreomontane or boreoalpine distribution (Gorodkov 1984; Josifov 1988; Hubenov 2015). In other systematic groups (such as Cerambycide of Coleoptera), the boreomontane and montane species connected with the coniferous communities descend below 1000 m a.s.l. due to the large afforestations of conifers in the lowlands (Georgiev & Hubenov 2006).

The Mediterranean species include 32 areographical categories (160 species or 10.3%). These are from 1 to 24 species (0.06% to 1.5%) in the separate parts of the Bulgarian Black Sea Coast (Table 3). They are better represented in the southern parts of the coast (Burgas and Strandzha districts). Because of the big variety of their areas, the group is divided into subgroups with different origin, distribution and ecological peculiarities of the taxa. This complexity contributes to establishing of various zoogeographical classifications of Bulgaria (Josifov 1981, 1986, 1988, 1999, Gruev 1988, 1995, 2000a, 2000b, 2000c, 2002, Heiss & Josifov 1990, Gruev & Kusmanov 1994, Hubenov 1996, 2008, Gruev & Bechev 2000, Popov 2002). For the separate areographical categories, the difference between the regions of the Bulgarian Black Sea Coast is the largest in the South European-North African species (1.8%). The Holomediterranean (24 species – 1.5%), South European-North African (20 species – 1.3%), Southeast European (16 species – 1.0%) and South European (15 species – 1.0%) taxa are the most numerous.

Endemics. This category includes taxa, which are not distributed outside the Balkan Peninsula. The percentage of endemism is low in Diptera (30 species – 1.9%). The endemism is differently presented in Nematocera (7 species – 0.4%) and Brachycera (23 species – 1.5%). The Bulgarian (15 species – 1.0%) and Balkan (10 species – 0.6%) endemic forms prevail. The greatest number of endemics (19 species – 2.2%) have been found in the Varna district of the coast. The Burgas district is significantly poorer in endemic taxa (7 species – 1.2%). Local endemics have not been established among Diptera of the Bulgarian Black Sea Coast. Some of the endemic dipterans (9 species) were described after 1990 or are rare taxa with unclear range.

Discussion

The faunistic similarity among the different parts of the Bulgarian Black Sea Coast (Table 2) is related to their specific natural conditions and insufficient research. A higher similarity (from 45.0% to 50.2%) is noticed among the low parts of the coast – Burgas, Varna and Dobrudzha districts. The similarity between these territories is greater than their similarity with the neighboring Stara Planina and Strandzha districts (from 27.2% to 43.0%). The poor research of the Stara Planina coast and the small number of common species probably determine the low similarity between the Varna, Stara Planina and Burgas parts of the coast (from 27.2% to 35.1%). The better research of the Varna and Burgas districts and the many common species increase their faunistic similarity (45.7%), although they are not neighboring territories. Further investigations of the separate parts of the Bulgarian Black Sea coast would likely confirm them to be similar in terms of the species composition of Diptera. This is related both to the natural habitats and the wide distribution of the dipterans, their high mobility and low level of endemism.

The difference (%) between the separate districts for Super Palaearctic species reaches 13.6% and varies from 27.2% (Varna district) to 40.8% (Stara Planina district). For the separate areographical categories, this difference is the highest for the the cosmopolitan (5.3%) and subcosmopolitan (2.6%) species. The establishment of other species of the group in the district of the Stara Planina coast is very likely, owing to their distribution and insufficient studies of this part of the Bulgarian Black Sea Coast. It is accepted that the taxa of northern type have the vast ranges and ecological flexibility. The species of southern type (31 species – 2.0%) are better represented in the southern parts of the coast (Burgas and Strandzha districts). They are not important for the zoogeographical characteristic due to their small number (6 – 18 species, from 1.0% to 3.0%). Usually, the Super Palaearctic group is scantly presented and is not determinant for the zoogeographical characteristic of the most taxa in the

Bulgarian terrestrial fauna (with the exception of the coastal fauna). In the highly mobile forms (such as Diptera), the group is well represented and exceeds 25% (Hubenov 2015, 2019, 2025a, 2025b). Along the Bulgarian Black Sea Coast, it is represented (%) better in the Stara Planina and Dobrudzha parts of the coast (Table 3).

Species from the Palearctic complex are well represented in the high mobile groups and comprise about 20-30% of the species. The difference between the separate coastal districts (from 77 to 273 species) reaches 8.8% and varies from 31.8% (Varna district) to 40.6% (Burgas district) of the species. For the separate areographical categories, this difference is largest for the Transpalaearctic species (3.0%). The vast areas and wide vertical distribution of the taxa of this complex are an indication of the greater ecological flexibility of its species. The dominance of the Palaearctic complex is related to the insufficient studies of these territories and the non-systematic sampling, resulting in the collection of more common and widespread species (Hubenov 2019).

The ratio of the areographical categories is different for the separate families: in some cases, the Holoeurosiberian, Disjunct Eurosiberian and European species are almost equal in number, with a total of 50% Eurosiberian forms, while in other families the Central and South European species are better represented or in general, the Eurosiberian taxa are poorly represented. The number of species by areographical categories varies in the separate coastal regions from 0% to 16.8% (0-144 species). For the separate categories, this difference is greatest in the European taxa (10.8%). The greatest number of Eurosiberian species has been established in the Varna district of the coast (250 species – 29.1%). In all other regions of the Bulgarian Black Sea Coast, taxa with Super Palaearctic and Palaearctic ranges dominate. Probably, some "Eurosiberian" species actually could be Palaearctic taxa. The Bulgarian Black Sea Coast has specific climatic conditions, which are connected with the presence of the Eurosiberian species. These climatic conditions are well expressed on the eastern slopes of the Stara Planina and Strandzha Mts., where an inversion of the vegetation is observed - the oak forests are above beech forests (Bondev 1991, 2002, Velchev 2002).

Most Mediterranean species (22 species – 68.5%) are found in two or three regions of the coast. The significant percentage of these species and their relatively scarce populations are due to the lower ecological flexibility of the Mediterranean forms in comparison with the previous ones. There are no significant differences in the distribution of the well presented areographial categories among the separate parts of the coast. When comparing them, a higher percentage of the Mediterranean forms southwards is noticed (from 8.3% to 13.8%), which is connected with the geographical location of the regions and the strengthening of the Mediterranean influence south of the Stara Planina Mts. This does not apply to the Stara Planina Mts. coast (6.4%), due to its poor research (only 15 Mediterranean species have been established – 6.4% of the all Mediterranean forms). The percentage of the Mediterranean species is slightly higher than the average one for Bulgaria (9.1% – Hubenov 2021a) and significantly higher than the percentage for the mountains (from 3.3% to 9.2% – Hubenov 2017, 2019, 2025).

Conclusion

This study reveals that 1556 dipteran species belonging to 82 families are so far recorded along the Bulgarian Black Sea Coast, representing 30.0% of the 5190 dipteran species known from Bulgaria. The most species-rich families are Tachinidae (162 species; 10.4%), Cecidomyiidae (116 species; 7.5%), Chloropidae (112 species; 7.2%), Syrphidae (110 species; 7.1%), and Chironomidae (101 species; 6.5%). All remaining families are represented by fewer than 100 species. The highest relative species richness in the Black Sea Coast region is observed in the families Ephydridae (70.4% of the Bulgarian fauna), Chloropidae (67.5%), Tabanidae (55.3%), Calliphoridae (46.3%), and Cecidomyiidae (44.4%). Conversely, low relative species richness recorded for some families is likely attributable to insufficient research effort, particularly in Tipulidae, Mycetophilidae, and Phoridae.

The dipteran fauna can be divided into 2 main groups: 1) species with Mediterranean type of distribution (191 species – 12.3%) – more thermophilic and distributed mainly in the southern parts of the Palaearctic and the lower parts of the mountains. The species of the southern type, distributed in the Palaearctic and beyond it, are related to this group as well; 2) species with Palaearctic and Eurosiberian type of distribution (1365 species – 87.7%) – more eurybiontic and widely distributed in the Palaearctic. The species of the northern type, distributed in the Palaearctic and beyond it, are related to this group as well. The zoogeographical character of Diptera is determined by the second group.

The percentage of species with a Mediterranean type of distribution of the Bulgarian Black Sea coast is 2.1% higher than the average for Bulgaria (10.2%).

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Supplementary material. Table. Species composition and distribution of the dipterans (Insecta: Diptera) of the Bulgarian Black Sea Coast

Excel Spreadsheet:
https://acta-zoologica-bulgarica.eu/2026/002996.xls.

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