Diversity and distribution models of horse flies (Diptera: Tabanidae) from Ecuador

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Abstract. Worldwide information about Tabanidae is biased toward taxonomical research, which has been the main source of diversity data for this group of flies. In Ecuador, studies on horse flies have been irregular since the first descriptions of three Andean specimens in 1848. Catalogues, checklists and collections in national museums demonstrate that despite its size, Ecuador is at present the richest country in number of tabanids species in the Neotropics after Brazil, Colombia and Mexico, and has one of the highest numbers of species *per* unit area. The tabanofauna is predominantly shared with Colombia (62.6%), Peru (47%), Brazil (35.9%), Panama (35.4%), and Venezuela (30.3%) that have biogeographic areas in common with Ecuador. Endemism rate of this group is around 12.6%, with *Diachlorus*, *Dicladocera*, *Esenbeckia, Eristalotabanus* (monotypic), and *Leucotabanus* genera as the most representatives. We add new records of Tabanidae for the country. The genus *Hemichrysops* was recorded for first time. The number of species in Ecuador now totals 198. A catalogue of all Ecuadorian species is compiled with a localities-gazetteer. We also present and discuss for the first time, the distribution of well known horse flies species (*Chrysops varians* var. *tardus*, *Dicladocera macula* and *Fidena rhinophora*) using georeferenced localities and niche modelling analyses.

Résumé. Diversité et modèles de distribution des taons (Diptera : Tabanidae) de l'Equateur. L'information existante sur les Tabanidae à l'échelle mondiale concerne principalement la recherche taxonomique qui a été la source principale de données concernant la diversité de ce groupe de mouches. En Équateur, les études sur les taons ont été irrégulières depuis les premières descriptions en 1848 de trois spécimens des Andes. Les catalogues, listes et collections d'espèces dans les musées nationaux démontrent qu'en dépit de sa taille restreinte, l'Equateur représente actuellement l'un des pays néotropicaux les plus riches en espèces de Tabanidae après le Brésil, la Colombie et le Mexique. L'Equateur abrite l'une des plus fortes densités d'espèces par unité de surface. Sa faune de Tabanidae est partagée principalement avec la Colombie (62,6% d'espèces en commun), le Pérou (47,0%), le Brésil (35,9%), Panama (35,4%) et le Vénézuela (30,3%). Le taux d'endémisme de ce groupe en Equateur est d'environ 12,6%. Les genres *Diachlorus*, *Dicladocera*, *Esenbeckia, Eristalotabanus* (monotypique) et *Leucotabanus* sont les plus représentatifs. Dans cette étude, nous présentons de nouveaux données de Tabanidae pour le pays (dont le genre *Hemichrysops* observé pour la première fois), menant ainsi à une liste de 198 espèces pour le pays. Un catalogue de toutes les espèces équatoriennes est annexé avec toutes les localités. Pour la première fois pour ces insectes, nous présentons et discutons également la distribution de certaines espèces bien connues (*Chrysops varians* var. *tardus*, *Dicladocera macula* et *Fidena rhinophora*) à l'aide de localités géoréférencées et de modèles de niche.

Keywords: Andes, Biogeography, Neotropical Region, Niche modelling, Tabanomorpha.

According to the last catalogue of Neotropical Tabanidae (Fairchild & Burger 1994), 1172 valid species and subspecies have been described from the Neotropical Region of which larvae are known from only 4.1% (Coscarón 2002). In Ecuador, the study of tabanid flies began with the description of three Andean species from Quito: *Esenbeckia testaceiventris* Macquart 1848, *Tabanus peruvianus* Macquart 1848, and *Dasychela ocellus* (Walker) 1848. Since these first descriptions, sporadic collections and expeditions by international governmental and private institutions have been the main source of diversity information for this group. Most of the Tabanidae records from Ecuador have been reported singly in scattered publications.

Ecological studies on Ecuadorian Tabanidae are scarce as only three reports have been found in the

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literature. Buestán (1980) identified within a one-year survey in the Guayas province, a unimodal peak of abundance for three perennial fly species in the summer. Buestán (2006) reported the transmission of *Dermatobia hominis* bot fly (Diptera: Oestridae) by *Chrysops varians* var. *tardus.* This was the first case of a horse fly-vectored myiasis reported in Ecuador. Such information makes these flies of particular socio-economic importance. Cárdenas (2007) presented a detailed ecological study of changes in horse fly communities along a 1-km altitudinal gradient in a Chocoan cloud forest. There were significant differences in heterogeinity and evenness of tabanid communities, and an important role of climatic variables in the daily activity of these flies.

The biogeography of Ecuadorian tabanofauna is completely unknown. Only two important works by Fairchild (1969a, 1969b) reviewed the distributional patterns of tabanids in Central and South America. Biogeographic "zones" identified by Fairchild are remarkably similar to biogeographical regions proposed by Morrone (2001, 2006) on which our comments and discussions are based.

Though tabanids have been implicated in transmission of pathogens of relative importance of cattle and humans (Krinsky 1976; Davies 1990; Otte & Abuabara 1991; Buestán 2006) further research on natural history, vectorial capabilities and control are necessary. A starting point to achieve these goals is the use of numerical technologies such as georeferenced databases, geographical information system (GIS) and niche modelling analyses. These techniques represent the basic elements of modern investigations of species distributions (Elith *et al.* 2006) with widespread applications in biogeography, macroecology, evolution (Graham *et al.* 2004), parasitology and disease transmission (Peterson 2006). It is therefore necessary to rely on complete and updated species georeferenced localities databases of collected specimens. Museum fauna checklists are thus indispensable (refer to Henriques & Gorayeb 1993 and Henriques 1995 for catalogue examples; see Winston 2007 for a discussion on this subject).

We present a revision of the Ecuadorian tabanid fauna. We first compared the taxonomic diversity with other biogeographically-related countries and provide a gazetteer of georreferenced collection localities. Second, we analyze the potential distribution of three well known species (including bot fly vector *Chrysops varians* var. *tardus*) using maximum entropy ecological niche modelling.

Table 1. Horse fly diversity in the Neotropical Region.

Top values correspond to the number of shared species between Neotropical countries. Bottom values correspond to the individual percentage of each country shared with another country. Data in parentheses correspond to the number of Tabanidae species *per* 10,000 km^2 (diversity density). Analyses were based on 1214 Neotropical species.

	Mex.	**C. Rica**	**Pan.**	**Ven.**	**Col.**	**Ecu.**	**Per.**	**Bra.**	**Bol.**	**Arg.**	**Chi.**
Mexico (1.05)		43 21.3%	38 18.8%	20 9.9%	27 13.4%	18 8.9%	14 6.9%	15 7.4%	10 5%	8 4%	0 0%
Costa Rica (27.6)	43 30.7%		124 88.6%	40 28.6%	83 59.3%	59 42.1%	33 23.6%	35 25%	22 15.7%	12 8.6%	1 0.7%
Panama (20)	38 25%	124 81.6%		46 30.3%	96 63.2%	70 46.1%	38 25%	38 25%	26 17.1%	12 7.9%	1 0.7%
Venezuela (1.2)	20 18.9%	40 37.7%	46 43.4%		80 75.5%	60 56.6%	48 45.3%	61 57.5%	32 30.2%	14 13.2%	1 0.9%
Colombia (2.25)	27 11.5%	83 35.5%	96 41%	80 34.2%		124 53.0%	83 35.5%	81 34.6%	50 21.4%	19 8.1%	1 0.4%
Ecuador (7.72)	**18** **9.1%**	**59** **29.8%**	**70** **35.4%**	**60** **30.3%**	**124** **62.6%**		**93** **47%**	**71** **35.9%**	**58** **29.3%**	**22** **11.1%**	**1** **0.5%**
Peru (1.48)	14 7.4%	33 17.5%	38 20.1%	48 25.4%	83 43.9%	93 49.2%		85 45%	74 39.2%	24 12.7%	11 5.8%
Brazil (0.52)	15 3.4%	35 8.0%	38 8.7%	61 13.9%	81 18.5%	71 16.0%	85 19.4%		76 17.3%	61 13.9%	1 0.2%
Bolivia (1.35)	10 6.8%	22 15.1%	26 17.8%	32 21.9%	50 34.2%	58 39.7%	74 50.7%	76 52.1%		50 34.2%	2 1.4%
Argentina (0.6)	8 4.8%	12 7.3%	12 7.3%	14 8.5%	19 11.5%	22 13.3%	24 14.5%	61 37%	50 30.3%		39 23.6%
Chile (1.42)	0 0%	1 0.9%	1 0.9%	1 0.9%	1 0.9%	1 0.9%	11 10.4%	1 0.9%	2 1.9%	39 36.8%	

Materials and methods

Horse fly diversity in Ecuador compared to other Neotropical countries

In order to catalogue all Ecuadorian Tabanidae species, we confirmed the presence of each species in all available publications on Neotropical Tabanidae. We also visited the collections of C-JB, MEPN and QCAZ (see Appendix 3 for the acronyms). A total of 2,893 Ecuadorian horsefly specimens were identified to species level. Such identifications were made using original descriptions, generic revisions and/or specific keys. Identification of MEPN and QCAZ material followed the methodology detailed in Cárdenas (2007). Briefly, it consists of following keys and available original descriptions as well as comparisons with type-specimen illustrations and identified material from museums (e.g. INPA). Morphological measurements were also taken into account when available in literature. Also, comparisons with CAS and MCZ type-materials available online were done in order to confirm the identification of some species. Pictures of type specimens were also sent by curators of foreign museums for evaluation. Frontal and divergence indexes, body and wing lengths of some new records are abbreviated FI (Frontal Index), DI (Divergence Index), BL (Body Length) and WL (Wing Lenght). C-JB identifications were made by Jaime Buestán.

For comparing Ecuadorian tabanids fauna with other Neotropical countries, we took account new taxonomic descriptions and rearrangements, checklists and reports, published since the last catalogue of Neotropical Tabanidae by Fairchild & Burger (1994) (see Appendix 1 for a complete reference list). In total, two genera, one subgenus and 50 species have been described since 1994. In addition, nine species have been synonimized, one has been revalidated, and two were transferred to related genera. Our analyses are thus based on 1214 valid Neotropical species. The number of species of Tabanidae in each country (see tab. 1 and fig. 3), was therefore based on the Fairchild & Burger's (1994) catalogue and subsequent publications on the Neotropical fauna. In the case of Chile, the scoring of valid species was complemented by the catalogue by Coscarón & González (1991). When the presence of a species in a country was dubious in Fairchild & Burger's catalogue (e.g. "?Brazil") the information was discarded unless the presence of the species was confirmed by subsequent publications. For example the presence of *Fidena schildi* in Brazil, questioned in the Fairchild & Burger (1994) catalogue was confirmed by Henriques (1995). Fairchild & Burger (1994) described the distribution of widely-distributed taxa using geographical ranges (e.g. *Dichelacera fasciata* distribution: Nicaragua to Ecuador). In such cases, we included every country intersected by an imaginary parsimonical line between the two cited localities and tried to confirm the presence of species in the hypothetical range. The number of species *per* country presented in this work is strictly based on species-level identifications and reports available until September 2009. Finally, we calculated every country-specific diversity density of Tabanidae by dividing the total number of species by the corresponding land area of each country in km^2.

Horsefly distribution and ecological niche modelling

To characterize the potential distributions (approximation of the fundamental niche) of selected horse fly species in Ecuador, we compiled presence data (realized niche) from voucher specimens collected in the past two decades and deposited in Ecuadorian collections, and bibliographic records. We selected three species to be modeled based on the number of available records (n ≥ 20, see Hernandez *et al.* 2006), and ease and certainty of identification. These species were *Chrysops varians* var. *tardus* (n = 30), *Dicladocera macula* (n = 24), and *Fidena rhinophora* (n = 22) (see Appendix AS 4 and AS 5 for complete localities records and gazetteer). *Chrysops varians* var. *tardus* is a widely distributed species in Neotropical lowlands and midlands from Panama to southern Brazil including Trinidad, Paraguay, Bolivia, Guyana, Colombia, Ecuador and Peru (Fairchild & Burger 1994). Manrique-Saide *et al.* (2001) also reported this species from Mexico (Campeche and Yucatán States). *Dicladocera macula* is a relatively common species in the Andean countries. Its distributional range covers cool wet highlands of Venezuela, Colombia, Ecuador, Peru and Bolivia (Wilkerson 1979; Fairchild & Burger 1994). *Fidena rhinophora* has been reported from Mexico to eastern Venezuela and Peru (Fairchild & Burger 1994) in areas with high rainfall (between 600–1800 m in Panama, Fairchild 1986).

Niche-based modelling was realized using MAXENT (version 3.2.1), a maximum entropy machine learning package freely available online (http://www.cs.princeton.edu/~schapire/maxent/) (Phillips *et al.* 2006; Phillips & Dudik 2008). MAXENT has been tested in a wide range of climatic regions and demonstrated to perform well compared to other modelling techniques in predicting potential distribution using small sample presence-only occurrences (Elith *et al.* 2006; Hernandez *et al.* 2006). Likewise, Pearson *et al.* (2007) found positive and significant results with as few as 5 occurrence points under the MAXENT model using a Jackknife validation approach. Georeferencing of all horsefly species first consisted in dividing geographical information into nine categories (Wieczorek *et al.* 2004). Specimens falling into the categories (1) "dubious", (2) "can not be located", and (3) "demonstrably inaccurate" were eliminated. Remaining geographical information (falling into categories 4–9, Wieczorek *et al.* 2004) were checked using various available gazetteers (IGM 1978–1982, 1982–1996; QCAZ Herpetological section gazetteer; Falling Rain Genomics 2006) or by consulting original collectors whenever possible. The georeferencing process used digital maps and GIS software with WGS84 datum. Following the "point radius method" proposed by Wieczorek *et al.* (2004) we calculated the uncertainity (error) associated to every georeferenced locality. "Point radius method" consisted in taking each locality as a circular space of probabilities and a radius to describe the maximum distance from a fixed point (georeferenced locality) within which the actual locality is expected to occur (Wieczorek *et al.* 2004). We assumed an error of 0 Km. for all the localities georeferenced using a GPS in the field (not for collections older than 2004).

Nineteen continuous climate and elevation variables (available online at http://www.worldclim.org/current.htm, Hijmans *et al.* 2005; spatial resolution ~1 km × 1 km) were used to examine the potential distribution of the three selected species in Ecuador (X: –81.009156, –75.193084; Y: –5.012689, 1.456729). Original climate and topographic grid files were converted to ASCII raster files using DIVA-GIS v. 5.4. Georeferenced localities *per* species were transformed to the UTM coordinate system to minimize imprecision. Every map was the result of the analysis of all of the data. For evaluation purposes, we randomly selected 75% of localities as training data and the

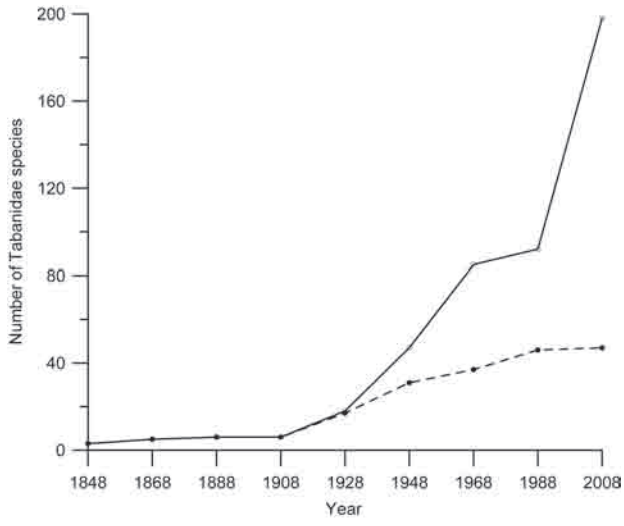

Figure 1
Descriptions (dashed line) and addition of new records (solid line) of horse flies species from Ecuador since 1848.

remaining 25% were used for testing model results. Models were validated using receiver operating characteristic (ROC) analysis, which evaluates model performance independently of arbitrary thresholds at which presence of the species might be accepted (Pearce & Boyce 2006). The ROC analysis assesses model performance by plotting the proportion of presence points correctly predicted vs. the proportion of absences correctly predicted across all possible thresholds. Good model performance is characterized by large areas under this curve (AUC) (Elith *et al.* 2006). AUC values ranges from 0 to 1 where 1 indicates perfect discrimination, and 0.5 random discrimination. Values below 0.5 indicate that models are worse than a random prediction therefore, results under 0.5 may not be taken into account (Elith *et al.* 2006). To avoid sample auto-correlation, we used the "remove duplicate presence records" option. Regularization multiplier, maximum number of iterations, convergence threshold, and maximum number of background points (pseudo-absences), were set by default. For threshold selection we chose the "equal training sensitivity and specificity" threshold (Liu *et al.* 2005). A jackknife test was then performed with all data to estimate the weight of each environmental variable in the model. Finally, based on test

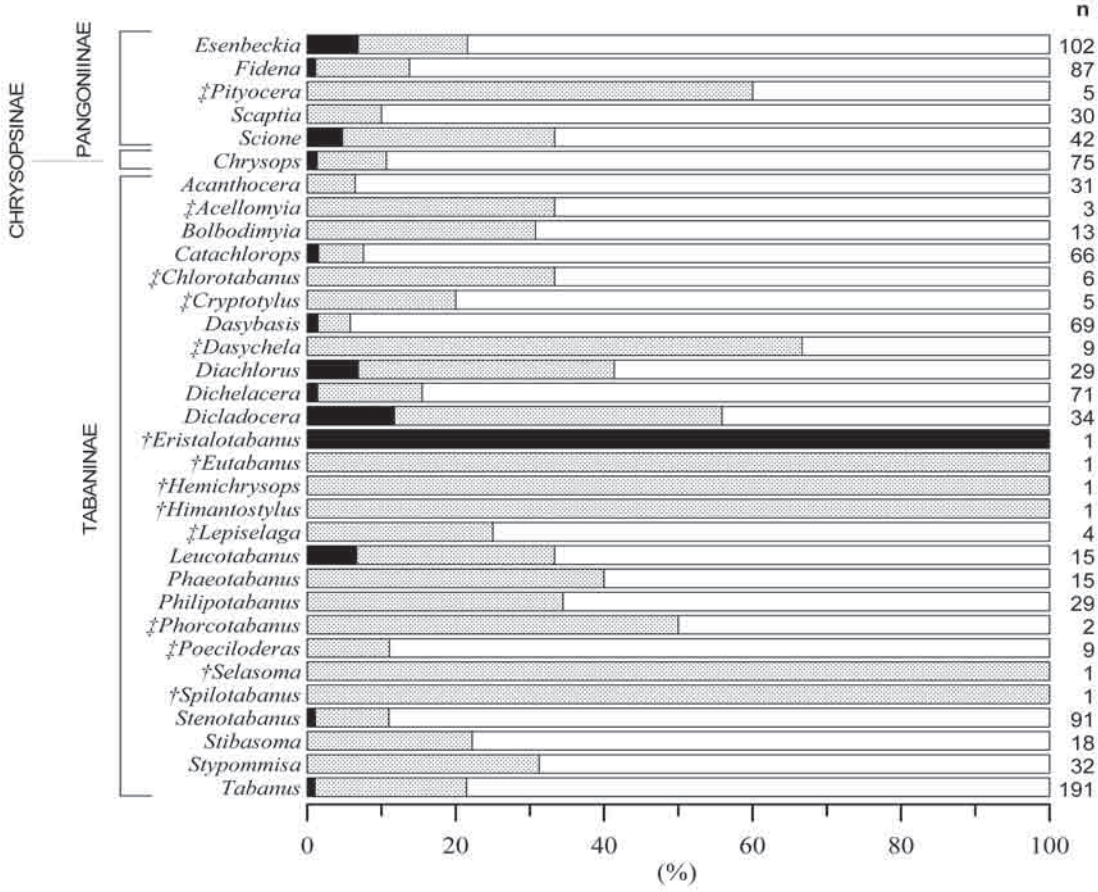

Figure 2
Richness of endemic (solid boxes) and native species (dotted boxes) within Ecuadorian genera (empty boxes) in the Neotropics. *n* corresponds to the number of described Neotropical species *per* genera. Names denoted by † are monotypic. An ‡ symbol is assigned to taxa with specific richness (r) $2 \leq r < 10$. Total number of analyzed species N = 1089.

results, we compared raster maps of variable contributors with the obtained distribution models of each species in order to infer intraspecific climatic and habitat preferences.

Results

A historical review of the Ecuadorian tabanid fauna

The evolution of tabanid descriptions in Ecuador showed in Figure 1, represents the accumulation of valid species described and/or recorded from Ecuador since 1848. Our work lists a total of 198 Tabanidae species from Ecuador. Since late 1920´s, the number of documented Tabanid species has been based mostly on collection surveys rather than on descriptions of Ecuadorian fauna, which clearly reflects the poor systematic research from Ecuadorian entomologists within this group. Since 1920, two periods characterize the temporal trend of horsefly species description in Ecuador (fig. 1, solid line). The first period (1928–1988) mainly nourished by the works of Kröber (1934), Campos (1952), Fairchild & León (1957), Patrick & Hays (1968), Fairchild (1971) and Buestán (1980) show a 4-fold increase in Tabanid species descriptions since 1920´s. During the second period (1988–2008) the 1980's knowledge on Tabanid fauna was duplicated in only two decades. Species lists presented in Fairchild & Burger (1994), Cárdenas & Vieira (2005), Buestán *et al*. (2007) and the present work, all contributed to the exponential description of Ecuadorian horse flies species during the last two decades.

Diversity of Ecuadorian horse flies

We registered a total of 198 tabanid species with 2 subspecies and 5 varieties for Ecuador. Species belonged to 33 genera, 5 tribes and 3 subfamilies (Appendix 2) and represented 16.3% of the current Neotropical tabanofauna. Around 2.1% of Neotropical species are endemic to Ecuador (12.6% of its tabanofauna) with *Diachlorus*, *Dicladocera*, *Eristalotabanus* (monotypic), *Esenbeckia,* and *Leucotabanus* as the most representative genera (fig. 2). Despite its limited size, Ecuador is the richest country in number of tabanid species in the Neotropics after Brazil, Colombia, and Mexico (fig. 3) and has the highest density of species diversity *per* unit area after Panama and Costa Rica (tab. 1).

We report for the first time in Ecuador the presence of six species: **(1)** *Hemichrysops fascipennis* collected from north-western Ecuador (western foothill forest); the specimen fits very well with the Wilkerson (1979) and Fairchild (1986) descriptions, and INBio plates (Burger *et al*. 2002). **(2)** Two females of *Chrysops bulbicornis*, sampled from eastern lowlands (Amazonia, amazonian tropical rain forest), in agreement with Lutz's (1911) original description, figured structures, and with Coscarón (1979)'s key, descrip-

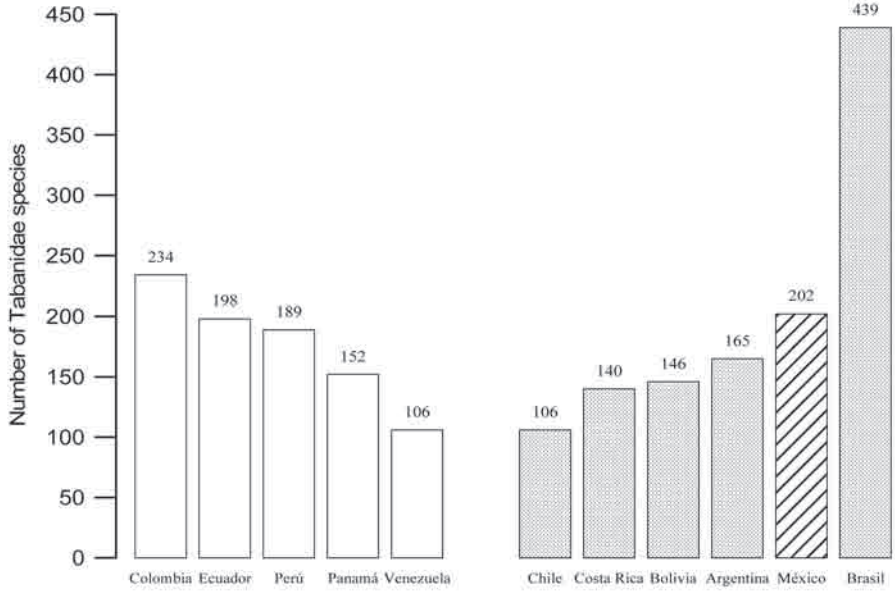

Figure 3
Number of catalogued species *per* country in the Neotropics. Empty boxes are assigned to countries that share biogeographical provinces with Ecuador; dotted boxes are assigned to countries that share biogeographical sub-regions with Ecuador; slashed boxes correspond to countries that share regional biota with Ecuador. Biogeographical categories follow Morrone (2001, 2006).

tion and figures. **(3)** *Stenotabanus penai* specimens collected from north-western lowlands (Costa, deciduous forest) in agreement with the key in Chainey *et al*. (1999) (structure and coloration), figures, and morphological dimensions ($\bar{x}$ FI = 3; $\bar{x}$ WL = 7.47 mm; $\bar{x}$ BL = 8.09 mm; N = 12). **(4)** One specimen of *Diachlorus scutellatus*, eastern Ecuador (Amazonia, amazonian tropical rain forest) was identified following Macquart´s original description provided by Lutz (1913), and Wilkerson & Fairchild's (1982) key. **(5)** *Philipotabanus porteri*, from 6 specimens collected in north-western Ecuador (Costa, chocoan tropical forest), identified using Fairchild´s (1975) key, original description, figures, and online images of the holotype

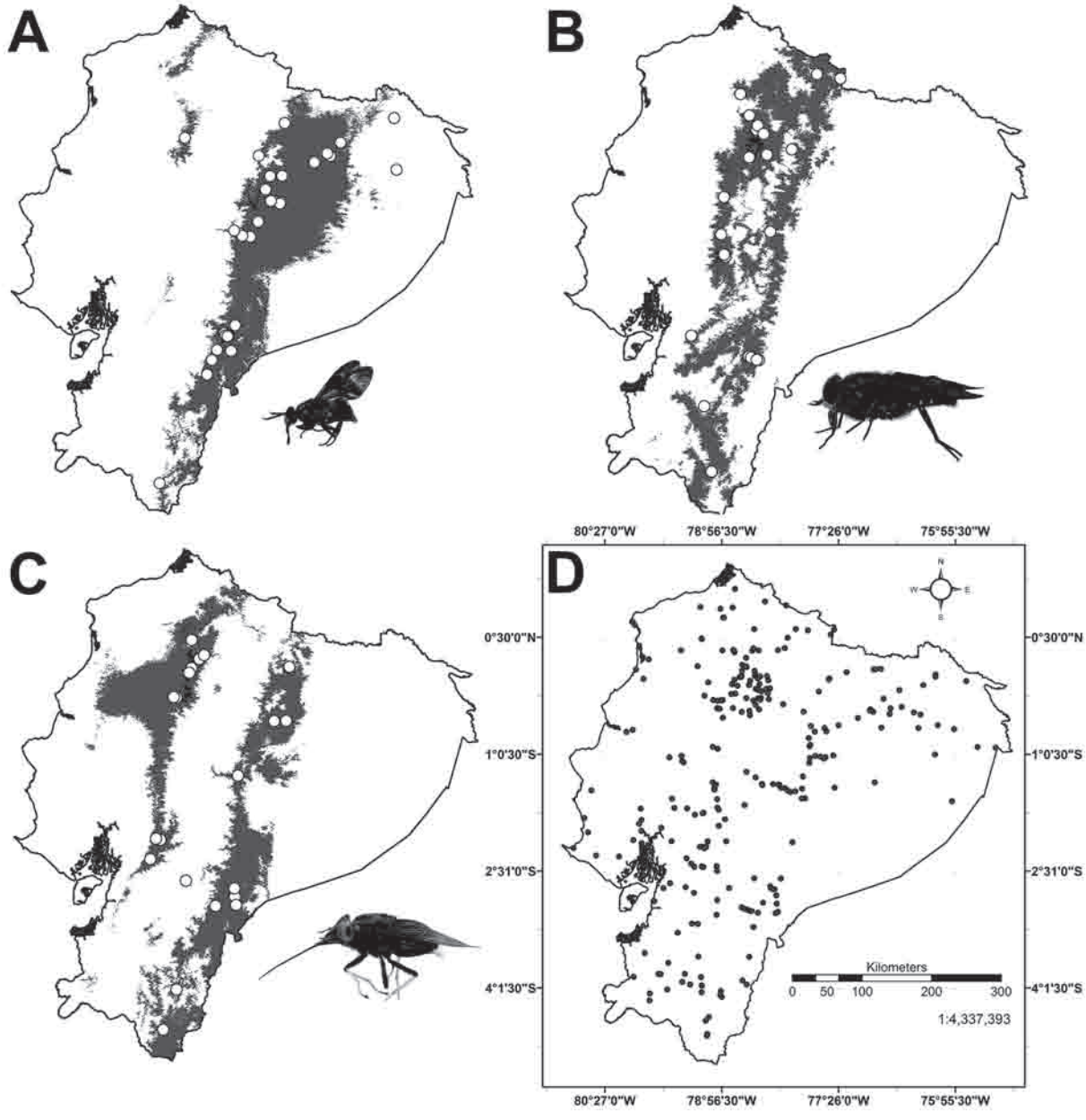

Figure 4
Distribution models of three species of Ecuadorian horse flies. Black areas correspond to potential distribution modeled with >85% probability of occurrence (>75% for *Dicladocera macula*). Grey areas correspond to "equal training sensitivity and specificity" threshold which is different for each species. White dots correspond to collecting localities. **A,** *Chrysops varians* var. *tardus* (AUC=0.947; threshold: 22.5%); **B,** *Dicladocera macula* (AUC = 0.971; threshold: 30.8%); **C,** *Fidena rhinophora* (AUC = 0.958; threshold: 26.31%); **D,** General Ecuadorian Tabanidae collections.

deposited in MCZ ($\bar{x}$ FI = 4.06; $\bar{x}$ DI = 1.2; $\bar{x}$ WL = 9.03 mm; $\bar{x}$ BL = 9.88 mm; N = 6). **(6)** One female of *Phaeotabanus prasiniventris* (collected in alcohol, lighter colours), from north-eastern Ecuador (Amazonia, amazonian tropical rain forest), identified by K. M. Bayless, agrees with structures and wing patterns of two INPA females specimens of the same species (det. by A. L. Henriques) from P.N. Jau, Rio Jau, Igarapé Miratucu, Brazil.

Ecuadorian tabanid fauna compared to other Neotropical countries

The Ecuadorian tabanofauna is predominantly shared with Colombia (62.6%), Peru (47%), Panama (35.4%) and Venezuela (30.3%), with which Ecuador shares biogeographic provinces (tab. 1). 35.9% of Ecuadorian Tabanofauna is in common with Brazil which shares the Amazonian biogeographic sub-region with Ecuador (Morrone 2006). Chile has a singular tabanid fauna, sharing no species with Mexico, 10.9% with Peru and 36.7% with Argentina reflecting the high endemism (around 53.8%) of this country. Similarly, Mexico shares 21.3% and 18.8% with Costa Rica and Panama, respectively (tab. 1). This confirms a gradient of specific richness and singularity, with lower diversity and higher singularity of tabanid fauna in southern and northern temperate and subtropical countries. The tabanid fauna of Andean countries showed higher degree of resemblance (see the percent of species shared between Venezuela, Colombia, Ecuador, Perú and Bolivia, tab. 1).

Comparisons of diversity densities in Neotropical countries (tab. 1) rank Ecuador as one of the most diverse territories *per* unit area (7.7 species *per* 10,000 km^2). Costa Rica and Panama are by far, the most diverse countries in proportion to their size (27.6 and 20 species *per* 10,000 km^2 respectively). Regardless of the great number of species and the relatively high number of ecosystems, Brazil has the lowest specific density in Latin America (0.52 species *per* 10,000 km^2), followed by Argentina and Mexico (0.6 and 1.1 species *per* 10,000 km^2, respectively).

Ecological niche modelling distribution of three Tabanid species

Chrysops varians var. *tardus* Wiedemann 1828

Most specimens of *C. varians* from Ecuadorian collections and in the literature were reported from amazonian tropical rainforests and eastern foothill and montane forests in a relatively large altitudinal range (200–1900 m) with only one record in a western montane forest (Río Guajalito Scientific Station, Santo Domingo Prov.). Modelled potential distribution for > 85% probability values of suitable habitat (maximum rate prediction = 91.67%) corresponds to central and southern eastern Andean slopes in amazonian and foothills-montane forests at elevations between 600 and 1300 m (fig. 4A, black regions). The MAXENT "equal training sensitivity and specificity" cumulative threshold calculation assume presences of *C. varians* to areas over 22.5 % of presence probability (fig. 4A, grey

Table 2. Contribution of environmental variables to horse fly species distribution models. Analyses are based on MAXENT parameters. The highest values are in bold.

Horse fly species	Environmental variables (only the most representative)	contribution (%)	Jackknife analysis of regularized model gain (%)	
			if isolated	if omitted (gain decrease)
Chrysops varians (Total model gain: 1.61)	- precipitation driest month	**28.4**	~ 27.9	~ 0
	- mean temperature wettest quarter	**22.5**	**~ 48.8**	~ 0
	- annual mean temperature	**12.5**	~ 34.2	~ 0
	- precipitation seasonality	**12.4**	~ 38.5	**~ 18.8**
	- altitude	4	**~ 40.6**	~ 3.1
	- mean temperature warmest quarter	0	**~ 40.6**	~ 0.6
Dicladocera macula (Total model gain: 1.82)	- altitude	**69.4**	**~ 83.3**	~ 0
	- mean temperature warmest quarter	7.3	**~ 85**	~ 0
	- max. temperature warmest month	3.3	**~ 86.1**	~ 0
	- annual mean temperature	1.5	**~ 85**	~ 0
	- min. temperature coldest month	1.2	**~ 80.6**	~ 0.4
	- mean temperature driest quarter	0.9	**~ 80.6**	~ 0
	- mean temperature coldest quarter	0	**~ 85**	~ 0
	- mean temperature wettest quarter	0	**~ 80.6**	~ 0
Fidena rhinophora (Total model gain: 1.59)	- altitude	**31.2**	**~ 55.3**	**~ 5.7**
	- precipitation wettest quarter	**14.9**	~ 9.4	~ 0
	- precipitation seasonality	**11.8**	~ 22	**~ 7.6**
	- temperature annual range	8.6	~ 9.3	**~ 8.8**

zones, p < 0.001). Precipitation of the driest month, mean temperature of the wettest quarter, annual mean temperature and precipitation seasonality predicted 28.4%, 22.5%, 12.5%, and 12.4% of the distribution model, respectively (tab. 2). Jackknife analysis revealed that mean temperature of the wettest quarter, followed by altitude and mean temperature of the warmest quarter, explained most of model variation when isolated (48.8%, 40.6%, and 40.6% respectively). AUC values ranged from 0.947 to 0.922 (using 75% and 25% of data, respectively), indicating a good discrimination of species presence/absence.

***Dicladocera macula* (Macquart 1846)**

In Ecuador *D. macula* has been recorded between 1600–3400 m on both sides of the Andean cordillera within eastern and western montane forests, paramo and Andean shrubs, which was confirmed by our niche model analysis (fig. 4B). The MAXENT "equal training sensitivity and specificity" cumulative threshold calculation assumed presences in areas over 30.8% of presence probability (fig. 4B, grey zones, p < 0.001). Maximum rate of prediction was of 78.35%. However, based on the MAXENT default output graphic and > 75% predictions, we identified two areas of higher suitable habitat corresponding to western montane forest bioregions (fig. 4B, black regions).The analysis of environmental variable contributions estimated that 69.4% of the model prediction was related to altitude and temperature variables (tab. 2). Further Jackknife analyses (tab. 2) revealed an important contribution of the maximum temperature of the warmest month by itself (~ 86.1%). The omission of any of these variables had a negative repercussion on the gain of the model. AUC values ranged from 0.971, to 0.923 (using 75% and 25% of data respectively), indicating a good discrimination of species presence/absence.

***Fidena rhinophora* (Bellardi 1859)**

In Ecuador *F. rhinophora* has been recorded between 500–2500 m in chocoan tropical rainforests, Andean shrubs and western/eastern montane and foothills forests. Niche modelling analyses showed a moderately specific potential distribution of the species in montane forests of Andean slopes on both sides of the cordillera, which however had the highest distribution probability (fig. 4C). Potential distribution analysis of >85% probability values of suitable habitat (maximum rate prediction of 93.61%) corresponded to north-western Ecuador, through tropical rainforests to montane forests (fig. 4C, black regions). The MAXENT "equal training sensitivity and specificity" cumulative threshold calculation assumed presences of *F. rhinophora* in areas over 26.31% of presence probabilities (fig. 4C, grey zones, p < 0.001). The relative estimates of environmental variable contributions pointed to altitude, wettest quarter, and seasonality precipitation as the most important variables, explaining 31.2%, 14.9%, and 11.8% of the model variance, respectively. Consistently, Jackknife analysis showed that altitude presented the most important information, and that annual temperature range, precipitation seasonality, and altitude, significantly reduced model gain when omitted (~ 8.8%, ~ 7.6% and ~ 5.7%, respectively). AUC values ranged from 0.958 to 0.96 (using 75% and 25% of data, respectively), indicating a good discrimination of species presence/absence.

Discussion

Ecuadorian horsefly diversity

Despite the low number of studies on the Ecuadorian tabanid fauna, compared to Panama (Fairchild 1986) and Costa Rica (Burger *et al*. 2002), our review revealed a high density of species diversity *per* unit area for the country (tab. 1). This result agrees with species densities reported for other families of Ecuadorian insects (Dangles *et al.*, this issue for a thorough review) as well as other groups such as amphibians (Ron *et al*. in press) and vascular plants (Jørgensen & León-Yánez 1999).

Diachlorus, *Esenbeckia* (*Esenbeckia*) and *Leucotabanus,* which are Andean and sub-Andean genera, are relatively specialized within their tribes (Fairchild 1969b), and are represented by high rates of endemicity (fig. 2). These genera are possibly representing an altitudinal "niche evolution" outcome related to the Andes uplift (based in a Wiens & Donoghue (2004) species diversification altitudinal view). Their endemism might also be a consequence of adaptive radiation pushed by recent vicariance processes (Hughes & Eastwood 2006; Ribas *et al*. 2007; Garzione *et al*. 2008) as it has been proved for other groups of insects (Brühl 1997) although this has to be confirmed by historical biogeographic studies based on strong phylogenies. This should partly explain the high rate of endemism of the Andean genus, *Dicladocera*, as well as the probable recent diversification of monotypic genus *Eristalotabanus* (Fairchild 1969b) (fig. 2).

The overall relatively low rate of Ecuadorian species endemism (2.06% of Neotropical species, fig. 2.) can be explained by the low sampling effort and the scarcity of taxonomical studies on Diptera in the country (Donoso *et al.* this issue). This assumption is supported by the disproportion between recorded

species and the relatively low number of Ecuadorian new species descriptions (fig. 1): new descriptions are mostly published by foreign entomologists with sampling areas clustered around Quito (fig. 4D). There is an evident lack of surveys in many biogeographical zones such as in the dry shrubs of southern amazonian and the north-central chocoan tropical rainforests. Buestán *et al.* (2007) presented a list of about ten "new" species neither confirmed nor described, illustrating the poor knowledge of the extant fauna in Ecuador and its potential higher endemism. It should also be noted that nearly all Ecuadorian collections represent understorey fauna, for what canopy surveys might provide many surprises.

Tabanid diversity in the Neotropics and its relation with Ecuadorian fauna

Morrone´s (2006) biogeographic areas for Latin America and the Caribbean Islands presented a good classification of the biogeographical distribution of tabanid species (tab. 1). The Ecuadorian provinces of Chocó, Cauca, Western Ecuador, Napo and North Andean Paramo shared with Colombia, and Tumbes-Piura, Napo, and North Andean Paramo shared with Peru could explain the high number of Ecuadorian tabanid species in common with the two countries. Furthermore 35.5% of the Ecuadorian tabanofauna was in common with Brazil (Amazonian subregion) whose biogeographical provinces of Varzea, Ucayali and Yungas are probably the most influential for the distribution of equatorial amazonian tropical rainforest biota.

Consistent with Morrone (2006), Chile has served as a refuge for "ancestral" biota such as the genera *Veprius* and *Protodasyapha*. It also shared genera such as *Dasybasis*, *Pseudotabanus* and *Scaptia* with the Austral Kingdom and presented an overlap of Neotropical and Andean taxa like *Esenbeckia* subgenus *Astomyia* and *Palassomyia* (Fairchild 1969b; Burger 1999). Mackerras (1961) suggested that the "modern" west-pacific tabanid fauna might have evolved from temperate Antarctica, southern Africa and Holarctic regions with dispersal to subtropical and tropical regions, where an extraordinary radiation took place. The "primitive" genus *Dasybasis* might be an example of such radiation after migrations from Patagonia northward through the Andean chain (Fairchild 1969b; González 1999, Morrone 2006). The absence of species in common between the Mexican and Chilean tabanid fauna reflects the geographic and climatic isolation of Chile, as asserted by Fairchild (1969b) and Morrone (2006). The apparent low diversity of tabanid fauna of Venezuela, known as a megadiverse country with an area 3.5 times Ecuadorian territory, is likely to be due to the absence of studies on this family.

Niche modelling

To our knowledge, this study is the first to use niche modelling analyses to study horse fly distribution. Our aim was to illustrate possible distributions of selected species restricted to the Ecuadorian territory, rather than trying to find their "exact" suitable habitat (fundamental niche). We are aware that for better results, even at the country level, it is necessary to work with more distribution data (collecting localities), especially from other countries. Another limitation of our modelling approach is that most specimens were collected during the periods of greater horse fly abundance (e.g. Cárdenas 2007), generally during the optimal months of population abundance during the dry season (Buestán 1980; Desquesnes *et al*. 2005; Oliveira *et al*. 2007). Museum collections are likely to best represent horse fly optimal habitats. Tabanid presence in less optimal habitats may therefore be underestimated; in few cases horse fly peak abundances have for example been reported at the beginning or within the rainy season (Barros 2001; Velásquez de Ríos et al. 2004). Our results illustrated more essentially the regions that have similar environmental conditions to where the species are known to occur rather than predicting actual limits to their distributional range (Pearson *et al*. 2007). Furthermore, nothing is known about the responses of tabanids to other environmental variables such as deforestation, presence of cattle or climate change. Additional physiological and phenological studies are therefore necessary to describe present (and future) horse fly distribution ranges in a more accurate way. For example, mechanistic niche modelling would allow incorporating the functional traits of organisms and model its distribution, beginning from its physiological responses and constraints to spatial data, into a more natural fundamental niche (as described by Kearney & Porter 2009). Our study should therefore be considered as a first step towards more detailed studies on the biogeography and the macroecology of this group of flies.

Altitude was one of the most discriminant variables to explain species distribution, contributing to 69.4% and 31.2% of model predictions for *D. macula* and *F. rhinophora*, respectively. According to Körner's (2007) explanations on how altitude relates to many other environmental variables it was no surprising to find such results. For example, the author enumerates some general and relevant altitude-related characteristics that affect species distribution, among them, the reduced atmospheric temperature at higher altitudes,

which has strong implications for ambient humidity. As an illustration of this importance, the variables that best explained *D. macula* distribution were all altitudinal-thermal related (tab. 2). Further Jackknife analysis showed that maximum temperature of the warmest month explained most of model gain. Körner (2007) also explained that precipitation, wind velocity and seasonality may greatly differ from one region to

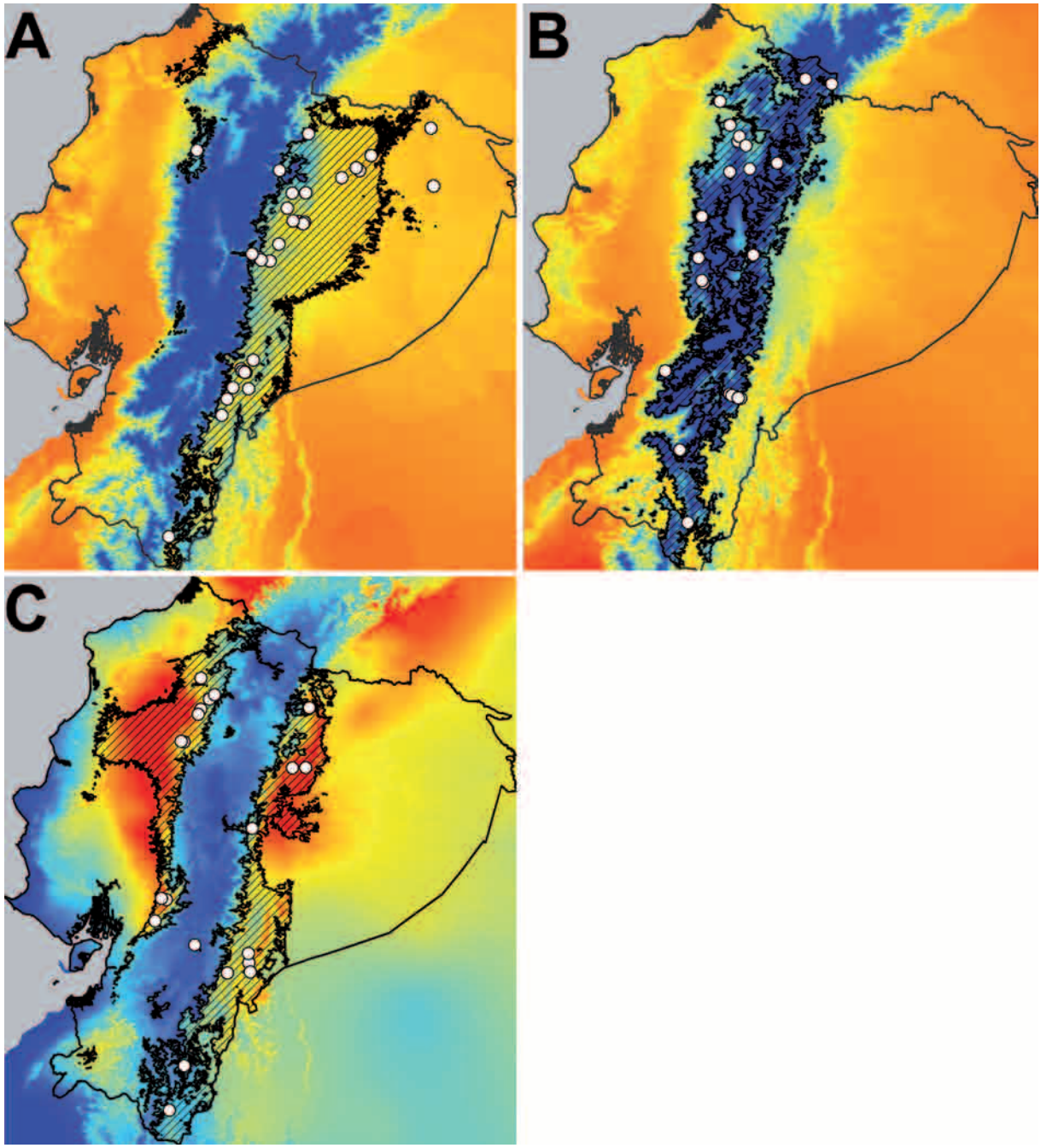

Figure 5
Distribution models of three species of Ecuadorian horse flies (hashed area) superposed to key environmental factors (colour gradient scale, ~ 1 km × 1 km WorldClim layers, Hijmans *et al.* 2005, where red colour corresponds to higher values and blue colour to lower values). **A,** *Chrysops varians* var. *tardus* and mean temperature of the wettest quarter; **B,** *Dicladocera macula* and maximum temperature of the warmest month; **C,** *Fidena rhinophora* and precipitation of the wettest quarter.

another. However, the author shows a global tendency where precipitation in temperate latitudes for example, tends to increase with the increasing of altitude, while in Equatorial latitudes precipitation tends to diminish. This phenomenon is particularly true for Ecuador (fig. 5C, precipitation of the wettest quarter). According to Körner (2007), precipitation, wind velocity and seasonality are not altitudinal-related because gradients can go in any direction depending on local topography and climatic conditions, but they may affect species distribution due to intraspecific adaptations to such conditions at precise sites and periods of the year. This probable intraspecific adaptation seems to be well illustrated by *F. rhinophora* potential distribution (fig. 4C and 5C), for which precipitation is probably one of the most important driving variables (tab. 2).

To futher investigate the role of environmental variables on the distribution of the three horse fly species we compared the modeled distribution of the species and the raster map of the most important variables explaining its distribution (fig. 5). We found that *D. macula* prefered habitat with medium to low values of maximum annual temperatures (fig. 5B). A similar pattern was found when comparing its distribution with the mean temperature of the warmest and coldest quarter variables (results not shown), which probably represent the developing and dormancy seasons for this species, respectively. This would suggest that the contribution of the altitudinal variable is mainly explained by low temperature values. A comparison of *F. rhinophora* distribution with precipitation of the wettest quarter showed that the probabilities of finding *F. rhinophora* were greater within medium to high precipitation values during the three wettest months of the year (Fig. 5C). This coincides with Fairchild (1986) who states that Panamanian specimens were distributed in areas of heavy rainfall. Finally, the distribution of *C. varians*, which was mainly explained by variables dependent on both precipitation and temperature, was preferentially limited to areas of medium to high temperature and precipitation values, with low annual variations (fig. 5A). The altitude contribution estimated by the Jackknife analysis should therefore be considered as an effect of the thermal characteristic of lowlands rainforests. All this suggest that the three modeled species are highly adapted to the altitude they inhabit and therefore to all of the characteristics described by Körner (2007), explaining why altitude contributed to all models in such a high proportion.

The possible presence of the modeled species abroad the actual collecting sites are not astonishing. The three species are wide distributed in Neotropics (Fairchild & Burger 1994) and seemed to be restricted to specific climatic variables. Horse flies hold a strong thoracic flight muscular system (Bonhag 1949) and are among the speediest flying insects of the world (up to 40 m/s for large species such as *macula* or *rhinophora*). This would allow them to fly long distances in relatively short time (2.4 km in one-two days, see Cooksey & Wright 1987) what could explain its apparently strong dispersal capacities.

Conclusions

A taxonomic school of Ecuadorian Tabanidae researchers is indispensable in order to document the family´s complex diversity. Collaboration with foreigners programs and institutions (e. g. INPA and Partnerships for Enhancing Expertise in Taxonomy, Tabanidae PEET program, Bayless *et al.* 2008) must improve Neotropical and Ecuadorian taxonomical knowledge of the Tabanidae. Likewise, further ecological research on the tabanid fauna is necessary to understand the role and functionality within ecosystems. Macro-ecological modelling analyses for example, may help to answer both biogeographic and evolutionary questions, basic information for conservation analyses and governmental policy decision-making.

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Appendix 1.

Bibliographic references of taxonomic and geographic publications since the last catalogue of Neotropical Tabanidae published by Fairchild & Burger (1994).

Lists are chronologically ordered.

Genus or Subgenus descriptions. Chainey & Hall (1996); Burger (1999); González (1999).

Species descriptions. Henriques (1993); Barros & Gorayeb (1995); Henriques & Rafael (1995); Chainey & Hall (1996); González & Henry (1996); Henriques & Gorayeb (1997); Burger (1999); Chainey *et al.* (1999); González (1999); Goodwin (1999); Henriques & Rafael (1999); González (2000); Coscarón (2001); Burger (2002); González (2004a); González (2004b); Rafael & Ferreira (2004); Limeira-de-Oliveira & Rafael (2005); González (2006a); Gorayeb & Barros (2006); Henriques (2006); Limeira-de-Oliveira (2008); Limeira-de-Oliveira *et al*. (2009).

Other taxonomical descriptions such as immature stages, unknown adults, type and rare specimens redescriptions and/or ultrastructure body parts descriptions. Henriques & Rafael (1995); Burger (1996); Coscarón *et al.* (1996); Coscarón *et al.* (1998); González (1998); Bermúdez & Bermúdez (1999); Burger (1999); Coscarón (1999); Coscarón *et al.* (1999); Coscarón (2000); Coscarón (2001); Coscarón & González (2001); González (2001); Burger (2002); Coscarón (2002); Coscarón & Iide (2003); González & Sanhueza (2003); González (2004c); González & Flores (2004); González *et al.* (2004); Rafael & Ferreira (2004); González (2006b); Godoi & Rafael (2007); González (2007); Krolow & Henriques (2008).

Taxonomical rearrangements. Henriques & Rafael (1995); Chainey *et al.* (1999); González (1999).

Checklists and occurrence reports. Henriques & Gorayeb (1993); Chainey *et al.* (1994); Henriques (1995); Chainey & Hall (1996); Henriques & Rafael (1999); Coscarón (2000); Coscarón (2001); Manrique-Saide *et al.* (2001); Burger *et al.* (2002); Tiape Gómez *et al.* (2004); Cárdenas & Vieira (2005); Buestán *et al*. (2007); Krolow *et al.* (2007); Turcatel *et al.* (2007).

Appendix 2.

Catalogue of Ecuadorian species of Tabanidae.

This catalogue is based on Fairchild & Burger (1994) classification and new taxonomical rearrangements listed in Table 1. Specimens reported for the first time for Ecuador are marked with *.

We do not include the next list of species apparently wrongly labeled as present in Ecuador due to possible nomenclatural-taxonomical confusions, misidentifications, uncertainities, and lack of voucher specimens as stated by Fairchild & León (1986) and other publications: **(1)** *Esenbeckia vulpes* cited by Campos (1952) from San Eduardo, Azogues (Cañar? - Guayas? prov.), **(2)** *Tabanus lineola* cited by Campos (1952) from Guayaquil, El Salado, Durán, Bucay, (Guayas prov.), San Rafael (Guayas prov.?), Azogues (Cañar prov.), **(3)** *Tabanus trilineatus* cited by Campos (1952) from Guayaquil, El Salado, Durán, (Guayas prov.), San Eduardo (Cañar? - Guayas? prov.). **(4)** *Catachlorops castanea* cited by Bigot (1892) *in* Fairchild & León (1986) from Santa Inés (Pichincha prov.). **(5)** *Dasychela limbativena* cited by Kröber (1940) *in* Fairchild & León (1986) from Ecuador, Cordillera. **(6)** *Tabanus subruber* cited by Surcouf (1919) from Santo Domingo de los Colorados (Santo Domingo prov.). **(7)** *Catachlorops nigripalpis* cited by von Röder (1886) in Fairchild & León (1986) from Río Cinto, Mindo (Pichincha prov.). **(8)** *Esenbeckia subvaria* cited by Buestán *et al.* (2007) from Cumbe (Azuay prov.); this specimen deposited in CAS collection is not well preserved and Wilkerson & Fairchild (1983) found great differences from Venezuelan type; Fairchild & Burger (1994) did not record this species to the country. **(9)** *Fidena atripes* cited by Kröber (1933) *in* Fairchild & León (1986) is apparently misidentified *sensu* the authors who had never seen any other specimen belonging to that species. **(10)** *Fidena basilaris* cited by von Röder (1886) in Fairchild & León (1986) and then by Buestán *et al.* (2007) from Río Cinto, Mindo (Pichincha prov.) is not well preserved and there is a confusion at generic level (*Esenbeckia*?). **(11)** *Scione claripennis* from "Sta. Inez, Ecuador" cited by Kröber (1930) *in* Fairchild (1942), Fairchild & León (1986), and Buestán *et al*. (2007); Fairchild & Burger (1994) stated this specimen as *costaricana*, but they did not include it in Ecuador. We have never seen voucher specimens of any of both species. **(12)** *Scione fulva* from "Azogues", cited by Campos (1952), has never been seen by entomologists. **(13)** A single specimen of *Fidena mattogrossensis* from "Napo, Archidona" is not preserved in BMNH as stated by Kröber (1933) in Fairchild & León (1986). **(14)** The only *Chrysops laetus* voucher specimen from "Baeza, Napo-Pastaza province" seen by Fairchild & Léon (1986) is currently lost. **(15)** *Stenotabanus maculipennis* Kröber 1914 is an invalid name cited in Fairchild & Léon (1986); we believe they referred to Bolivian *Stypommisa furva* (= *maculipennis*) Kröber 1929, however voucher specimen is lost. **(16)** "*Esenbeckia arcuata* (Williston) 1895" has been reported by Buestán *et al.* (2007), by error.

Subfamily Pangoniinae

Tribe Pangoniini

Genus *Esenbeckia* Rondani

Esenbeckia (*Esenbeckia*) *accincta* Wilkerson & Fairchild 1983
Esenbeckia (*Esenbeckia*) *balzapambana* Enderlein 1925
Esenbeckia (*Esenbeckia*) *dressleri* Wilkerson & Fairchild 1983
Esenbeckia (*Esenbeckia*) *laticlava* Wilkerson & Fairchild 1983
Esenbeckia (*Esenbeckia*) *melanogaster* Lutz & Castro 1935
Esenbeckia (*Esenbeckia*) *parishi* (Hine 1920)
Esenbeckia (*Esenbeckia*) *prasiniventris* (Macquart 1846)
Esenbeckia (*Esenbeckia*) *reinburgi* Surcouf 1919

Esenbeckia (*Esenbeckia*) *testaceiventris* (Macquart 1848)
Esenbeckia (*Esenbeckia*) *tigrina* Wilkerson 1979
Esenbeckia (*Esenbeckia*) *translucens* (Macquart 1846)
Esenbeckia (*Esenbeckia*) *xanthoskela* Wilkerson & Fairchild 1983
Esenbeckia (*Proboscoides*) *ecuadorensis* Lutz & Castro 1935
Esenbeckia (*Proboscoides*) *geminorum* Fairchild & Wilkerson 1981
Esenbeckia (*Proboscoides*) *schlingeri* Philip 1960

Tribe Scionini

Genus *Scaptia* Walker
Scaptia (*Scaptia*) *aureopygia* Phlip 1969
Scaptia (*Scaptia*) *rubriventris* (Kröber 1930)
Scaptia (*Scaptia*) *sublata* Philip 1969

Genus *Fidena* Walker
Fidena (*Fidena*) *aureopygia* Kröber 1931
Fidena (*Fidena*) *auribarba* (Enderlein 1925)
Fidena (*Fidena*) *castanea* (Perty 1833)
Fidena (*Fidena*) *castaneiventris* Kröber 1934
Fidena (*Fidena*) *eriomeroides* (Lutz 1909)
Fidena (*Fidena*) *flavipennis* Kröber 1931
Fidena (*Fidena*) *laterina* (Rondani 1850)
Fidena (*Fidena*) *ochrapogon* Wilkerson 1979
Fidena (*Fidena*) *pallidula* Kröber 1933
Fidena (*Fidena*) *rhinophora* (Bellardi 1859)
Fidena (*Fidena*) *zonalis* Kröber 1931

Genus *Scione* Walker
Scione albifasciata (Macquart 1846)
Scione bilineata Philip 1969
Scione brevibeccus Wilkerson 1979
Scione brevistriga Enderlein 1925
Scione costaricana Szilády 1926
Scione equatoriensis Surcouf 1919
Scione equivexans Wilkerson 1979
Scione flavescens (Enderlein 1930)
Scione flavohirta Ricardo 1902
Scione maculipennis (Schiner 1868)
Scione obscurefemorata Kröber 1930
Scione strigata (Enderlein 1925)

Genus *Pityocera* Giglio-Tos
Pityocera (*Pityocera*) *festae* Giglio-Tos 1896
Pityocera (*Elaphella*) *cervus* (Wiedemann 1828)
Pityocera (*Pseudelaphella*) *nana* (Walker 1850)

Subfamily Chrysopsinae

Tribe Chrysopsini

Genus *Chrysops* Meigen
**Chrysops bulbicornis* Lutz 1911
Chrysops ecuadorensis Lutz 1909
Chrysops flavipennis Kröber 1925
Chrysops latitibialis Kröber 1926
Chrysops leucospilus Wiedemann 1828
Chrysops varians var. *tardus* Wiedemann 1828
Chrysops variegatus (DeGeer 1776)

Subfamily Tabaninae

Tribe Diachlorini

Genus *Acellomyia* González
Acellomyia lauta (Hine 1920)

Genus *Dasybasis* Macquart
Dasybasis (*Dasybasis*) *excelsior* Fairchild 1956
Dasybasis (*Dasybasis*) *montium* (Surcouf 1919)
Dasybasis (*Dasybasis*) *schineri* (Kröber 1931)

Genus *Hemichrysops* Kröber
**Hemichrysops fascipennis* Kröber 1930

Genus *Stenotabanus* Lutz
Stenotabanus (*Aegialomyia*) *aberrans* Philip 1966
Stenotabanus (*Aegialomyia*) *bruesi* (Hine 1920)
Stenotabanus (*Stenotabanus*) *albilinearis* Phlip 1960
Stenotabanus (*Stenotabanus*) *detersus* (Walker 1850)
Stenotabanus (*Stenotabanus*) *incipiens* (Walker 1860)
Stenotabanus (*Stenotabanus*) *obscurus* Kröber 1929
Stenotabanus (*Stenotabanus*) *obscurus* var. *flavofemoratus* Kröber 1929
**Stenotabanus* (*Stenotabanus*) *penai* Chainey 1999
Stenotabanus (*Stenotabanus*) *peruviensis* Kröber 1929
Stenotabanus (*Stenotabanus*) *wilkersoni* Chainey 1999

Genus *Himantostylus* Lutz
Himantostylus intermedius Lutz 1913

Genus *Diachlorus* Osten Sacken
Diachlorus anduzei Stone 1944
Diachlorus bimaculatus (Wiedemann 1828)
Diachlorus curvipes (Fabricius 1805)
Diachlorus fuscistigma Lutz 1913
Diachlorus habecki Wilkerson & Fairchild 1982
Diachlorus jobbinsi Fairchild 1942
Diachlorus leucotibialis Wilkerson & Fairchild 1982
Diachlorus nuneztovari Fairchild & Ortiz 1955
**Diachlorus scutellatus* (Macquart 1838)
Diachlorus trevori Wilkerson & Fairchild 1982

Genus *Bolbodimyia* Bigot
Bolbodimyia bicolor Bigot 1892
Bolbodimyia celeroides Stone 1954
Bolbodimyia erythrocephala (Bigot 1892)
Bolbodimyia nigra Stone 1934

Genus *Selasoma* Macquart
Selasoma tibiale (Fabricius 1805)

Genus *Chlorotabanus* Lutz
Chlorotabanus inanis (Fabricius 1787)
Chlorotabanus mexicanus (L. 1758)

Genus *Phaeotabanus* Lutz
Phaeotabanus cajennensis (Fabricius 1787)
Phaeotabanus fervens (L. 1758)

Phaeotabanus nigriflavus (Kröber 1930)
Phaeotabanus phaeopterus Fairchild 1964
**Phaeotabanus prasiniventris* (Kröber 1929)
Phaeotabanus serenus (Kröber 1931)

Genus *Spilotabanus* Fairchild

Spilotabanus multiguttatus (Kröber 1930)

Genus *Eutabanus* Kröber

Eutabanus pictus Kröber 1930

Genus *Acanthocera* Macquart

Acanthocera (*Acanthocera*) *marginalis* Walker 1854
Acanthocera (*Querbetia*) *chaineyi* Fairchild & Burger 1994

Genus *Dichelacera* Macquart

Dichelacera (*Dichelacera*) *chocoensis* Fairchild & Philip 1960
Dichelacera (*Dichelacera*) *fasciata* Walker 1850
Dichelacera (*Dichelacera*) *marginata* Macquart 1847
Dichelacera (*Dichelacera*) *regina* Fairchild 1940
Dichelacera (*Dichelacera*) *rubrofemorata* Burger 1999
Dichelacera (*Dichelacera*) *submarginata* Lutz 1915
Dichelacera (*Dichelacera*) *villavoensis* Fairchild & Philip 1960
Dichelacera (*Idiochelacera*) *subcallosa* Fairchild & Philip 1960
Dichelacera (*Desmatochelacera*) *albitibialis* Burger 1999
Dichelacera (*Desmatochelacera*) *transposita* Walker 1854

Genus *Catachlorops* Lutz

Catachlorops (*Amphichlorops*) *vespertinus* (Bequaert & Renjifo-Salcedo 1946)
Catachlorops (*Psarochlorops*) *difficilis* (Kröber 1931)
Catachlorops (*Psarochlorops) ecuadoriensis* (Enderlein 1925)
Catachlorops (*Psalidia*) *fulmineus* var. *ocellatus* Enderlein 1925

Genus *Dasychela* Enderlein

Dasychela (*Dasychela*) *amazonensis* (Barretto 1946)
Dasychela (*Dasychela*) *badia* (Kröber 1931)
Dasychela (*Dasychela*) *fulvicornis* (Kröber 1931)
Dasychela (*Dasychela*) *ocellus* (Walker 1848)
Dasychela (*Dasychela*) *peruviana* (Bigot 1892)
Dasychela (*Triceratomyia*) *macintyrei* (Bequaert 1937)

Genus *Eristalotabanus* Kröber

Eristalotabanus violaceus Kröber 1931

Genus *Dicladocera* Lutz

Dicladocera argenteomaculata Wilkerson 1979
Dicladocera basirufa (Walker 1850)
Dicladocera bellicosa (Brèthes 1910)
Dicladocera clara (Schiner 1868)
Dicladocera distomacula Wilkerson 1979
Dicladocera exilicorne Fairchild 1958
Dicladocera hirsuta Wilkerson 1979
Dicladocera macula (Macquart 1846)
Dicladocera minos (Schiner 1868)
Dicladocera ?*neosubmacula* Kröber 1931
Dicladocera nigrocoerulea (Rondani 1850)
Dicladocera ornatipenne (Kröber 1931)
Dicladocera pruinosa Wilkerson 1979
Dicladocera riveti (Surcouf 1919)
Dicladocera tribonophora Fairchild 1958

Genus *Stibasoma* Schiner

Stibasoma (*Stibasoma*) *flaviventre* (Macquart 1848)
Stibasoma (*Stibasoma*) *fulvohirtum* (Wiedemann 1828)
Stibasoma (*Stibasoma*) *panamensis* Curran 1934
Stibasoma (*Rhabdotylus*) *venenata* (Osten Sacken 1886)

Genus *Cryptotylus* Lutz

Cryptotylus unicolor (Wiedemann 1828)

Genus *Philipotabanus* Fairchild

Philipotabanus (*Philipotabanus*) *magnificus* (Kröber 1934)
Philipotabanus (*Philipotabanus*) *nigrinubilus* (Fairchild 1953)
Philipotabanus (*Philipotabanus*) *pallidetinctus* (Kröber 1930)
Philipotabanus (*Philipotabanus*) *pterographicus* (Fairchild 1943)
Philipotabanus (*Philipotabanus*) *tenuifasciatus* (Kröber 1930)
Philipotabanus (*Mimotabanus*) *opimus* Fairchild 1975
**Philipotabanus* (*Mimotabanus*) *porteri* Fairchild 1975
Philipotabanus (*Melasmatabanus*) *criton* (Kröber 1934)
Philipotabanus (*Melasmatabanus*) *fascipennis* ssp. *ecuadoriensis* (Kröber 1930)
Philipotabanus (*Melasmatabanus*) *nigripennis* Wilkerson 1979

Genus *Stypommisa* Enderlein

Stypommisa anoriensis Fairchild & Wilkerson 1986
Stypommisa captiroptera (Kröber 1930)
Stypommisa changena Fairchild 1986
Stypommisa flavescens (Kröber 1930)
Stypommisa glandicolor (Lutz 1912)
Stypommisa hypographa (Kröber 1930)
Stypommisa hypographa ssp. *neofurva* Philip 1969
Stypommisa maruccii (Fairchild 1947)
Stypommisa modica (Hine 1920)
Stypommisa pequeniensis (Fairchild 1942)
Stypommisa venosa (Bigot 1892)

Genus *Leucotabanus* Lutz

Leucotabanus albovarius (Walker 1854)
Leucotabanus cornelianus Fairchild 1985
Leucotabanus exaestuans (L. 1758)
Leucotabanus weyrauchi Fairchild 1951

Genus *Lepiselaga* Macquart

Lepiselaga (*Lepiselaga*) *crassipes* (Fabricius 1805)

Tribe Tabanini

Genus *Poeciloderas* Lutz

Poeciloderas quadripunctatus (Fabricius 1805)

Genus *Phorcotabanus* Fairchild

Phorcotabanus cinereus (Wiedemann 1821)

Genus *Tabanus* L.

Tabanus albocirculus Hine 1907
Tabanus aniptus Fairchild 1976
Tabanus antarcticus L. 1758
Tabanus argentivittatus Fairchild 1976
Tabanus cicur Fairchild 1942
Tabanus claripennis (Bigot 1892)
Tabanus colombensis Macquart 1846
Tabanus cyclopus Philip 1961

Tabanus discifer Walker 1850
Tabanus discus Wiedemann 1828
Tabanus eldridgei Fairchild 1973
Tabanus guyanensis Macquart 1846
Tabanus hirtitibia Walker 1850
Tabanus importunus Wiedemann 1828
Tabanus macquarti Schiner 1868
Tabanus nereus Fairchild 1943
Tabanus occidentalis L. 1758
Tabanus occidentalis var. *dorsovittatus* Macquart 1855
Tabanus occidentalis var. *modestus* Wiedemann 1828
Tabanus pachypalpus (Bigot 1892)
Tabanus pellucidus Fabricius 1805
Tabanus perplexus Walker 1850
Tabanus peruvianus Macquart 1848
Tabanus piceiventris Rondani 1848
Tabanus platycerus Fairchild 1976
Tabanus pseudoculus Fairchild 1942
Tabanus pungens Wiedemann 1828
Tabanus restrepoensis Fairchild 1942
Tabanus rixator Fairchild 1943
Tabanus rubiginipennis Macquart 1846
Tabanus rubripes Macquart 1838
Tabanus sannio Fairchild 1956
Tabanus secundus Walker 1848
Tabanus sorbillans Wiedemann 1828
Tabanus surifer Fairchild 1964
Tabanus thiemeanus (Enderlein 1925)
Tabanus unimaculus Kröber 1934
Tabanus unistriatus Hine 1906
Tabanus vittiger Thomson 1869
Tabanus xuthopogon Fairchild 1984

Appendix 3.

Acronyms of reference collections

AMNH: American Museum of Natural History, New York, USA; **AUEM:** Auburn University, Entomology Museum, Alabama, USA; **BMNH:** British Museum of Natural History, London, UK; **C-JB:** Jaime Buestán Personal Collection, Guayaquil, Ecuador; **CAS:** California Academy of Sciences, San Francisco, USA; **CBP:** Cornelius Becker Philip Personal Collection, Hamilton, USA; **CUIC:** Cornell University Insect Collection, Ithaca, USA; **FIOC:** Fundação Instituto Oswaldo Cruz Entomology Collection, Rio de Janeiro, Brazil; **FSCA:** Florida State Collection of Arthropods, Gainesville, USA; **INPA:** Instituto Nacional de Pesquisas da Amazônia-Coleção Sistemática da Entomologia, Manaus, Brazil; **LACM:** Natural History Museum of Los Angeles County, Los Angeles, USA; **MCZ:** Harvard University Museum of Comparative Zoology, Cambridge, USA; **MEPN:** Museo de la Escuela Politécnica Nacional, Quito, Ecuador; **MLPA:** Universidad Nacional de La Plata-Museo de la Plata, La Plata, Argentina; **MLUH:** Martin-Luther-Universität, Wissenschaftsbereich Zoologie, Halle, Germany; **MNHN:** Muséum National d'Histoire Naturelle, Paris, France; **MPEG:** Museu Paraense Emílio Goeldi, Belém, Brazil; **MTD:** Museum für Tierkunde, Dresden, Germany; **OSUC:** Ohio State University Collection, Columbus, USA; **MZPW:** Warsaw Museum of the Institute of Zoology, Warsaw, Poland; **NHRS:** Naturhistoriska riksmuseet, Stockholm, Sweden; **QCAZ:** Quito Catholic University Zoology Museum, Quito, Ecuador; **UMMZ:** University of Michigan Museum of Zoology, Ann Arbor, USA; **USNM:** Smithsonian National Museum of Natural History, Washington, USA; **ZMHB** (=**ZMFHU**): Berlin Museum für Naturkunde der Humboldt-Universität, Berlin, Germany; **ZMUH**: Universität von Hamburg Zoologisches Institut und Zoologisches Museum, Hamburg, Germany.

On line appendices.

Appendix 4. Complete catalogue of Ecuadorian species of Tabanidae.

Appendix 5. Gazetteer of known localities of Ecuadorian specimens of Tabanidae.

Appendix 4.

Complete catalogue of Ecuadorian species of Tabanidae.

We present a full list of known species localities distribution. We omitted specimens labels information unless they are reported for the first time for Ecuador (marked with *). Acronyms of reference collections are detailed in Appendix 3. A gazetteer of known localities is provided in Appendix 4. Type-localities have been underlined.

SUBFAMILY PANGONIINAE

Tribe Pangoniini

Esenbeckia (*Esenbeckia*) *accincta* Wilkerson & Fairchild 1983
PICHINCHA: Quito (Carretas) (FSCA *in* Fairchild & Burger 1994); Pifo (C-JB). GUAYAS: Vía a Balao Chico (CUIC *sensu* Fairchild & Burger 1994).

Esenbeckia (*Esenbeckia*) *balzapambana* Enderlein 1925
BOLIVAR: Río Cristal (Balzapamba), Km 7 Vía Bucay-Chillanes (C-JB); Balzapamba (ZMFHU *in* Fairchild & Burger 1994). CHIMBORAZO: Río Sacramento, Buenos Aires-5 Km O de Cumandá (C-JB). IMBABURA: Peñaherrera (Wilkerson & Fairchild 1983). LOJA: Quebrada Chipiango (C-JB).

Esenbeckia (*Esenbeckia*) *dressleri* Wilkerson & Fairchild 1983
SANTO DOMINGO: "Santo Domingo to Chiriboga" (FSCA *in* Wilkerson & Fairchild 1983).

Esenbeckia (*Esenbeckia*) *laticlava* Wilkerson & Fairchild 1983
GUAYAS: "20 mi West of Guayaquil" (CAS, CUIC *in* Fairchild & Burger 1994).

Esenbeckia (*Esenbeckia*) *melanogaster* Lutz & Castro 1935
LOJA: San Vicente (C-JB).

Esenbeckia (*Esenbeckia*) *parishi* (Hine 1920)
CHIMBORAZO: Río Sacramento (C-JB). EL ORO: Bosque Puyango (C-JB). LOJA: Catacocha, Quebrada Chipiango (C-JB). LOS RÍOS: EBFD Jauneche (C-JB). "Ecuador" as locality datum (OSUC *in* Fairchild & Burger 1994).

Esenbeckia (*Esenbeckia*) *prasiniventris* (Macquart 1846)
LOJA: Sta Rufina (QCAZ).

Esenbeckia (*Esenbeckia*) *reinburgi* Surcouf 1919
CHIMBORAZO: Riobamba (Campos 1952). LOJA: Catacocha, San Vicente (C-JB). LOJA: Loja (in Fairchild & Burger 1994). PICHINCHA: Quito (MNHN *in* Surcouf 1919); Machachi (Campos 1952).

Esenbeckia (*Esenbeckia*) *testaceiventris* (Macquart 1848)
AZUAY: Río Zaracay (C-JB). COTOPAXI: 4 Km al Este de la Esperanza, La Gaviota (C-JB); San Fco. de las Pampas (QCAZ); Calupiña (C-JB) (QCAZ). IMBABURA: Los Cedros (EC), Los Cedros E1:T,T1 (R.B., B.P.), Los Cedros E2:T, T1, T2 (R.B., B.P.), Los Cedros E3:T2, T3 (R.B., B.P.) (QCAZ); Azabí

(Intag) (Wilkerson & Fairchild 1983). LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Arenillas (C-JB). PICHINCHA: Mindo (QCAZ); Hda (Eco) Bomboli (C-JB); Palmeras (QCAZ) (C-JB); Via Quito-Chiriboga (Wilkerson & Fairchild 1983); Nanegal (Fairchild & León 1986); Quito (BMNH *in* Fairchild & Burger 1994). SANTO DOMINGO: E.C. Río Guajalito (QCAZ), Via Santo Domingo-Chiriboga (Wilkerson & Fairchild 1983). ZAMORA CHINCHIPE: Zamora (Fairchild & León 1986).

Esenbeckia (*Esenbeckia*) *tigrina* Wilkerson 1979
COTOPAXI: San Fco. De las Pampas (QCAZ). CHIMBORAZO: Río Sacramento (C-JB). SANTA ELENA: 2.6 Km de "Dos Mangas" (C-JB). LOJA: Quebrada Chipiango (C-JB). LOS RÍOS: EBFD Jauneche (C-JB).

Esenbeckia (*Esenbeckia*) *translucens* (Macquart 1846)
ESMERALDAS: Kumanii Lodge, Kumanii Lodge T, T1,T2,T3, E.C. Río Canandé (Reserva - Jocotoco), E.C. Río Canandé T (Reserva - Jocotoco) (QCAZ); Playa de Oro (Río Santiago), Hda (Eco) Bomboli (C-JB). IMBABURA: Intag (Fraichild & León 1986). MANABÍ: Río Mache (C-JB). SANTO DOMINGO: Santo Domingo (Fraichild & León 1986).

Esenbeckia (*Esenbeckia*) *xanthoskela* Wilkerson & Fairchild 1983
MORONA SANTIAGO: Cerro Chuark Wihp, Coangos (C-JB). NAPO: Río Hollín (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ); E. C. Tiputini USFQ (TBS) (QCAZ) (MEPN). SUCUMBÍOS: Lumbaqui (QCAZ).

Esenbeckia (*Proboscoides*) *ecuadorensis* Lutz & Castro 1935
CAÑAR: Cochancay (El chorro; El Chorro, Cochancay), Manuel J.Calle (C-JB). GUAYAS: Naranjal (FIOC *in* Lutz & Castro 1935); "20 mi West of Guayaquil" (CAS *in* Philip 1961); Hda. San Joaquín (San Joaquín) (QCAZ); Vía a Balao Chico, Balao-Hacienda Santa Rita (C-JB). LOS RÍOS: "Near Quevedo" (UMMZ *in* Philip 1960). SUCUMBÍOS: Limoncocha (AUEM *in* Patrick & Hays 1968).

Esenbeckia (*Proboscoides*) *geminorum* Fairchild & Wilkerson 1981
SANTA ELENA: Colonche (QCAZ) (C-JB) (FSCA *in* Fairchild & Wilkerson 1981); Zapotal (C-JB).

Esenbeckia (*Proboscoides*) *schlingeri* Philip 1960
NAPO: Río Umbuni (C-JB).

Tribe Scionini

Scaptia (*Scaptia*) *aureopygia* Phlip 1969
IMBABURA: Los Cedros E2:T, Los Cedros E3:T2(R.B., B.P.) (QCAZ).
MORONA SANTIAGO: Arenillas (C-JB).

Scaptia (*Scaptia*) *rubriventris* (Kröber 1930)
MORONA SANTIAGO: Arenillas (C-JB).

Scaptia (*Scaptia*) *sublata* Philip 1969
MORONA SANTIAGO: Arenillas (C-JB).

Fidena (*Fidena*) *aureopygia* Kröber 1931

BOLIVAR: La Moya (C-JB). CAÑAR: La Carbonería (QCAZ). CHIMBORAZO: Quebrada Bodega Pamba, Río Pangor (C-JB). IMBABURA: Atuntaqui (QCAZ). NAPO: Río Hollín. PICHINCHA: Quito (P. Metropolitano), Quito, Cumbayá, Vía Mindo, Fald. Pichincha, Pululahua, Moraspungo, Palmeras, El Tingo, Yanacocha-Reserva (Pastizal arbolado y BMA) (QCAZ); Conococto, Quito, San Antonio (Volcán Pululahua), Yaruquí (C-JB). SUCUMBÍOS: El Reventador (QCAZ).

Fidena (*Fidena*) *auribarba* (Enderlein 1925)
ESMERALDAS: E.C. Río Canandé T, T3 (Reserva - Jocotoco) (QCAZ). MORONA SANTIAGO: Río Pau Grande (Tarapoa) (C-JB).

Fidena (*Fidena*) *castanea* (Perty 1833)
NAPO:Pozo Daimi, Río Umbuni (C-JB). ORELLANA: Coca (C-JB). SUCUMBÍOS: Shushufindi, Río Aguarico (C-JB).

Fidena (*Fidena*) *castaneiventris* Kröber 1934
PICHINCHA: Casitagua (MNHN *in* Surcouf 1919), Valle de los Chillos (Fairchild & León 1986).

Fidena (*Fidena*) *eriomeroides* (Lutz 1909)
NAPO: Río Hollín, Misahuallí (QCAZ) MORONA SANTIAGO: Cord. del Cóndor Río Coangos-Río Tsuirin (QCAZ). ORELLANA: Ávila Viejo (QCAZ), Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ) (C-JB). PASTAZA: Villano (QCAZ).

Fidena (*Fidena*) *flavipennis* Kröber 1931
ESMERALDAS: Caimito (estero salado mangle) (QCAZ). MANABÍ: Río de Mache (C-JB).

Fidena (*Fidena*) *laterina* (Rondani 1850)
NAPO: Pozo Daimi (QCAZ); Limoncocha (C-JB), Río Napo (*in* Fairchild & Burger 1994). ORELLANA: Est. Chiruisla T, Est. Río Huiririma (QCAZ); Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ) (C-JB); E. C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Villano (QCAZ).

Fidena (*Fidena*) *ochrapogon* Wilkerson 1979
AZUAY: Cuenca (Wilkerson 1979); Río Zaracay (C-JB). CHIMBORAZO: Quebrada Bodega Pamba (C-JB).

Fidena (*Fidena*) *pallidula* Kröber 1933
NAPO: Zatzayacu (Fairchild & León 1986).

Fidena (*Fidena*) *rhinophora* (Bellardi 1859)
CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (QCAZ) (C-JB); Azogues (Azoguez) (Campos 1952). COTOPAXI: San Fco. de las Pampas (QCAZ) (C-JB); B. I. Otonga (El Corcovado) (QCAZ). GUAYAS: Hda. San Joaquín (San Joaquín), Chilcales (Río Chilcales, M. J. Calles) (C-JB). IMBABURA: Los Cedros (EC) (R.B., B.P.) (QCAZ). MORONA SANTIAGO: Indanza, Puerto Yuquianza, Río Pau Grande (Tarapoa), Coangos (C-JB). NAPO: Cascada San Rafael (QCAZ) (C-JB); Río Hollín, Km 6 Vía Narupa - Coca, Vía Loreto-Coca 20.7 Km (Este de Tena) (C-JB). PICHINCHA: Nanegalito, Maquipucuna (QCAZ); Mindo (QCAZ)

(C-JB); Río del Cinto (Mindo) (Fairchild & León 1986). SUCUMBÍOS: El Reventador (QCAZ). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Río Bombuscara, Río Valladolid (C-JB).

Fidena (*Fidena*) *zonalis* Kröber 1931
"Ecuador" as locality datum (Fairchild & Burger 1994).

Scione albifasciata (Macquart 1846)
LOJA: Mamanuma (QCAZ); Cord. Sabanilla (C-JB). MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas (C-JB). NAPO: Santa Bárbara de Sucumbíos (Fairchild & León 1986). SUCUMBÍOS: La Fama (QCAZ).

Scione bilineata Philip 1969
MORONA SANTIAGO: "E. Ecuador; Limón" (AMNH, CBP *in* Philip 1969).

Scione brevibeccus Wilkerson 1979
IMBABURA: Los Cedros E3:T, T1,T2 (R.B., B.P.) (QCAZ). LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Arenillas (C-JB).

Scione brevistriga Enderlein 1925
TUNGURAHUA: Baños (Fairchild & León 1986).

Scione costaricana Szilády 1926
"Santa Inez, Ecuador" as locality datum (Kröber 1930 *in* Fairchild 1942 as *claripennis*). Not taken account by Fairchild & Burger (1994).

Scione equatoriensis Surcouf 1919
AZUAY: Maylas (C-JB). CAÑAR: Azogues (Azoguez) (Campos 1952). IMBABURA: Pinular (MNHN *in* Scurcouf 1919). MANABÍ: Río Mache (C-JB); Chone (Fairchild & León 1986). PICHINCHA: Quito (Carretas), Pifo 9 Km al este, San Antonio (Volcán Pululahua) (C-JB), Casitagua (MNHN *in* Surcouf 1919). TUNGURAHUA: Ambato (Campos 1952).

Scione equivexans Wilkerson 1979
MORONA SANTIAGO: Potrerillo, Arenillas (C-JB). PICHINCHA: Volcán Pichincha (QCAZ); Quito, Conocoto (QCAZ) (C-JB).

Scione flavescens (Enderlein 1930)
PICHINCHA: Santa Inés (Wilkerson 1979). "Ecuador" as type locality in Fairchild & Burger (1994).

Scione flavohirta Ricardo 1902
AZUAY: Maylas, Río Zaracay, Miguir, Huasipamba (Guasipamba) (C-JB); Valle de Azuay (MLPA *in* Coscarón 2000). BOLIVAR: La Moya, Cerro Pumín (C-JB). MORONA SANTIAGO: Potrerillo (C-JB).

Scione maculipennis (Schiner 1868)
MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas (C-JB).

Scione obscurefemorata Kröber 1930
AZUAY: Maylas (C-JB). IMBABURA: Nangulví (Fairchild & León 1986). LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas,

San Vicente (Limite Azuay prov.), Potrerillo (C-JB). TUNGURAHUA: Llanganates (C-JB).

Scione strigata (Enderlein 1925)
PICHINCHA: Hda (Eco) Bomboli (C-JB); Santa Inéz (Kröber 1930 *in* Fairchild 1942)

Pityocera (*Pityocera*) *festae* Giglio-Tos 1896
ESMERALDAS: Kumanii Lodge, Kumanii Lodge T1 (QCAZ); Playa de Oro (Río Santiago (C-JB). SANTO DOMINGO: Santo Domingo (Fairchild & León 1986).

Pityocera (*Elaphella*) *cervus* (Wiedemann 1828)
NAPO: Río Umbuni (C-JB). SUCUMBÍOS: Limoncocha (AUEM *in* Patrick & Hays 1968). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ). PASTAZA: Villano, Villano (Tarangaro) (QCAZ).

Pityocera (*Pseudelaphella*) *nana* (Walker 1850)
GUAYAS: San Eduardo (Guayaquil - El Salado) (Campos 1952).

SUBFAMILY CHRYSOPSINAE

Tribe Chrysopsini

**Chrysops bulbicornis* Lutz 1911
ECUADOR, ORELLANA: Vía Coca - Loreto Km 26, 300m., 00º29’42’’S 77º08’00’’W, 21.VII.2005, J.M. Vieira Leg., 1£, R. Cárdenas Det. (II.2008), QCAZI14816; Dayuma, 290m., 22.III.1996, G. Piedra Leg., 1£, R. Cárdenas det. (II.2008), QCAZI44715. Both specimens deposited at QCAZ Museum of Zoology.

Chrysops ecuadorensis Lutz 1909
ORELLANA: Chiruisla T1 (QCAZ); PASTAZA: Curaray (San Antonio de Curaray) (Fairchild & León 1986); Lorocachi (QCAZ).

Chrysops flavipennis Kröber 1925
“Ecuador, Santa Inez” as locality datum (ZMHB *in* Fairchild & Burger 1994). ZAMORA CHINCHIPE: Zamora (Fairchild & León 1986).

Chrysops latitibialis Kröber 1926
“Ecuador, Litoral”as locality datum (MPEG *in* Henriques & Gorayeb 1993) and “Ecuador” as locality datum (INPA *in* Henriques 1995).

Chrysops leucospilus Wiedemann 1828
ORELLANA: Est. Chiruisla T3 (QCAZ). LOJA: Cola (Kröber 1925 *in* Fairchild & León 1986).

Chrysops varians var. *tardus* Wiedemann 1828
MORONA SANTIAGO: 6.6 Km N vía Limón - Macas, Logroño (QCAZ); Indanza (QCAZ) (C-JB); Kalaglas, Méndez, San Luis de El Hacho, Puerto Yuquianza, Patuca, Unión Río Upano-Paute (C-JB). NAPO: Cascada San Rafael, Archidona, Misahuallí, Río Hollín, Aliñahui (cabañas), Jatún Sacha, Jumandi, Joya de los Sachas (QCAZ); Baeza, Río Umbuni, Km 6 Vía Narupa - Coca (C-JB). ORELLANA: Coca, Vía Coca - Loreto Km 26 (QCAZ); Est. Exp. Napo (C-JB); E.

C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Mera, Puyo (El) (QCAZ); Santa Clara, Shell-Mera (C-JB). SANTO DOMINGO: E. C. Río Guajalito (QCAZ). SUCUMBÍOS: Santa Cecilia (AUEM *in* Patrick & Hays 1968), R. P. F. Cuyabeno (C-JB). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Río Valladolid (C-JB).

Chrysops variegatus (DeGeer 1776)

CHIMBORAZO: Buenos Aires (C-JB). EL ORO: Limón Playas-Sta. Rosa (C-JB). ESMERALDAS: E.C. Río Canandé (Reserva - Jocotoco) (QCAZ). GUAYAS: San Carlos, Hda. San Joaquín (San Joaquín) (C-JB). LOS RÍOS: Peniel - Quevedo (QCAZ); EBFD Jauneche, Quevedo (C-JB). SANTO DOMINGO: E. Santo Domingo (QCAZ) (C-JB). SUCUMBÍOS: R. P. F. Cuyabeno (C-JB).

SUBFAMILY TABANINAE

Tribe Diachlorini

Acellomyia lauta (Hine 1920)

AZUAY: Cumbe (González 1999). SUCUMBÍOS: El Reventador (QCAZ).

Dasybasis (*Dasybasis*) *excelsior* Fairchild 1956

CHIMBORAZO: Danas (Fairchild & León 1986). LOJA: Catacocha (C-JB).

Dasybasis (*Dasybasis*) *montium* (Surcouf 1919)

AZUAY: Maylas, Río Zaracay, Miguir (C-JB); Cumbe (Coscarón & Philip 1967). BOLIVAR: Salinas (QCAZ) (C-JB); Cerro Pumín, La Moya (C-JB). CAÑAR: Río Yanacachi (C-JB). CHIMBORAZO: Quebrada Bodega Pamba (C-JB). COTOPAXI: Rumiñahui faldas volcán (QCAZ). LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: San Vicente (Limite Azuay prov.), Arenillas (C-JB). PICHINCHA: Casitagua (MNHN *in* Surcouf 1919); R.B. Yanacocha, Yanacocha-Reserva (Pastizal arbolado y BMA), Lloa (QCAZ); Pifo, Hda (Eco) Bomboli (C-JB);. TUNGURAHUA: Llanganates (C-JB).

Dasybasis (*Dasybasis*) *schineri* (Kröber 1931)

AZUAY: Maylas, Río Zaracay, Miguir (C-JB); Cumbe (Coscarón & Philip 1967). BOLIVAR: Cerro Pumín (C-JB). CAÑAR. Río Yanacachi (C-JB). IMBABURA: Machetes (Fairchild & León 1986). MORONA SANTIAGO: San Vicente (Limite Azuay prov.) (C-JB).

**Hemichrysops fascipennis* Kröber 1930

ECUADOR, IMBABURA, 10 Km W Santa Rosa, 700m., 00º19’51’’N 78º55’55’’W, 21-25.VII.2008, D. Chávez Leg., 1£, R. Cárdenas Det. (VIII.2008). Ojos bicolores en vida, verde abajo y negro arriba. QCAZI44767. Deposited at QCAZ Museum of Zoology.

Stenotabanus (*Aegialomyia*) *aberrans* Philip 1966

SANTA ELENA: Santa Elena (CAS *in* Fairchild & Burger 1994).

Stenotabanus (*Aegialomyia*) *bruesi* (Hine 1920)

BOLIVAR: Río Cristal (Balzapamba) (C-JB). CHIMBORAZO: Buenos Aires (C-JB). LOJA: Quebrada Chipiango, Río Catamayo (C-JB). MANABÍ: Julcuy, Río Mache (C-JB).

Stenotabanus (*Stenotabanus*) *albilinearis* Phlip 1960
MORONA SANTIAGO: San Luis de El Hacho (C-JB). NAPO: Río Umbuni (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ). PASTAZA: Shell-Mera (C-JB). TUNGURAHUA: El Topo (C-JB).

Stenotabanus (*Stenotabanus*) *detersus* (Walker 1850)
CHIMBORAZO: Río Sacramento (C-JB). LOJA: San Vicente (C-JB). MORONA SANTIAGO: Kalaglas, Indanza, Arenillas (C-JB). SANTO DOMINGO: Mindo, Alluriquín (C-JB).

Stenotabanus (*Stenotabanus*) *incipiens* (Walker 1860)
ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (C-JB).

Stenotabanus (*Stenotabanus*) *obscurus* Kröber 1929
MORONA SANTIAGO: Puerto Yuquianza (C-JB). NAPO: Río Hollín (QCAZ); Río Umbuni, Km 6 Vía Narupa - Coca, Cocodrilo (C-JB). PAZTASA: Shell-Mera (C-JB). TUNGURAHUA: El Topo (QCAZ) (C-JB). ZAMORA CHINCHIPE: Río Bombuscara, Río Valladolid (C-JB).

Stenotabanus (*Stenotabanus*) *obscurus* var. *flavofemoratus* Kröber 1929
NAPO: Río Hollín (QCAZ).

**Stenotabanus* (*Stenotabanus*) *penai* Chainey 1999
ECUADOR, ESMERALDAS: Caimito, 5m., 00º42’07.26’’N 80º05’50.82’’W, 06.IV.2007, R. Cárdenas Leg., 11££, R. Cárdenas Det. (IX.2008). Dos líneas verdes transversales en ojos. QCAZI44703, QCAZ44704, QCAZI44706–QCAZI44714; Caimito, 50m., 00º41’56.88’’N 80º05’34.02’’W, 07.IV.2007, R. Cárdenas Leg., 1£, R. Cárdenas Det. (IX.2008). QCAZI44704. Deposited at QCAZ Museum of Zoology.

Stenotabanus (*Stenotabanus*) *peruviensis* Kröber 1929
SUCUMBÍOS: “Santa Cecilia” (AUEM *in* Patrick & Hays 1968). “Ecuador” as locality datum *in* Fairchild & Burger 1994 (as *pallidicornis*).

Stenotabanus (*Stenotabanus*) *wilkersoni* Chainey 1999
ESMERALDAS: Playa de Oro (Río Santiago) (C-JB).

Himantostylus intermedius Lutz 1913
From “Panama to Bolivia” in Fairchild & Burger (1994).

Diachlorus anduzei Stone 1944
SUCUMBÍOS: Limoncocha (Wilkerson & Fairchild 1982).

Diachlorus bimaculatus (Wiedemann 1828)
LOJA: La Toma (Fairchild & León 1986). MORONA SANTIAGO: Mayaico (Fairchild & León 1986). ORELLANA: Nuevo Rocafuerte (Fairchild & León 1986). PASTAZA: Curaray (San Antonio de) (Fairchild & León 1986). SUCUMBÍOS: Santa Cecilia (AUEM *in* Patrick & Hays 1968). ZAMORA CHINCHIPE: Río Nangaritza, Zamora (Fairchild & León 1986).

Diachlorus curvipes (Fabricius 1805)
ESMERALDAS: Playa de Oro (Río Santiago) (C-JB). NAPO: Río Umbuni (C-JB).

ORELLANA: Est. Chiruisla T1,T2, Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ); Coca (C-JB). PASTAZA: Shell (QCAZ), Shell-Mera (C-JB).

Diachlorus fuscistigma Lutz 1913
"Ecuador" as locality datum (Henriques & Rafael 1999).

Diachlorus habecki Wilkerson & Fairchild 1982
SUCUMBÍOS: R. P. F. Cuyabeno (C-JB); Limoncocha (Playaco river) (FSCA *in* Wilkerson & Fairchild 1982).

Diachlorus jobbinsi Fairchild 1942
ESMERALDAS: Limones (Fairchild & León 1986).

Diachlorus leucotibialis Wilkerson & Fairchild 1982
ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ); E. C. Tiputini USFQ (TBS) (MEPN); Primavera (La) (FSCA *in* Wilkerson & Fairchild 1982).

Diachlorus nuneztovari Fairchild & Ortiz 1955
ORELLANA: Est. Chiruisla T (QCAZ). SUCUMBÍOS: Sacha Lodge (QCAZ). "East of Ecuador" as locality datum in Fairchild & Burger (1994).

**Diachlorus scutellatus* (Macquart 1838)
ECUADOR, ORELLANA, Est. Chiruisla T, 204m., 00º41'09''S 75º56'27''W, 25.II.2006, R. Cárdenas Leg., 1£, R. Cárdenas Det. (III.2006). QCAZI36299. Deposited at QCAZ Museum of Zoology.

Diachlorus trevori Wilkerson & Fairchild 1982
SUCUMBÍOS: Limoncocha (Playaco river) (FSCA *in* Wilkerson & Fairchild 1982).

Bolbodimyia bicolor Bigot 1892
IMBABURA: Los Cedros E1:T,T1 (R.B., B.P.) (QCAZ). MANABÍ: Río Mache (C-JB).

Bolbodimyia celeroides Stone 1954
IMBABURA: Los Cedros (EC) (R.B., B.P.) (QCAZ). MORONA SANTIAGO: Unión Río Upano-Paute, Puerto Yuquianza (C-JB). NAPO: Aliñahui (cabañas) (QCAZ).

Bolbodimyia erythrocephala (Bigot 1892)
ESMERALDAS: Playa de Oro (Río Santiago) (C-JB).

Bolbodimyia nigra Stone 1934
BOLIVAR: Km 7 Vía Bucay - Chillanes (C-JB). GUAYAS: Guayaquil (USNM *in* Stone 1934). NAPO: Cascada San Rafael (QCAZ).

Selasoma tibiale (Fabricius 1805)
From "Mexico (Oaxaca) to n. Argentina" *in* Fairchild & Burger (1994).

Chlorotabanus inanis (Fabricius 1787)
ESMERALDAS: Kumanii Lodge, Kumanii Lodge T, T2 (QCAZ). GUAYAS: Hda. Santa Rita (Balao) (C-JB). NAPO: Aliñahui (cabañas) (QCAZ); Río Napo, Río

Umbuni, Misahuallí, Juturi (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE), Est. Chiruisla T (QCAZ); Est. Exp. Napo (C-JB); E. C. Tiputini USFQ (TBS) (MEPN). SANTO DOMINGO: Santo Domingo (C-JB). SUCUMBÍOS: Lago Agrio (QCAZ) (C-JB), Limoncocha (AUEM *in* Patrick & Hays 1968).

Chlorotabanus mexicanus (L. 1758)

ESMERALDAS: Quinindé, San Francisco (Muisne), Mayronga (La) (QCAZ); Alto Cayapa (C-JB); San Lorenzo (QCAZ) (C-JB). GUAYAS: Balao Chico, Hda. Santa Rita (Balao), Bucay (1 Km NO Cumandá), El Empalme (C-JB). LOS RÍOS: Hda. Clementina, Pichilingue, EPFD Jauneche (C-JB).

Phaeotabanus cajennensis (Fabricius 1787)

ORELLANA: Est. Exp. Napo (C-JB); Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Phaeotabanus fervens (L. 1758)

From "Venezuela to Argentina" *in* Fairchild & Burger (1994).

Phaeotabanus nigriflavus (Kröber 1930)

ORELLANA: Est. Río Huiririma, Coca (C-JB). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Phaeotabanus phaeopterus Fairchild 1964

PICHINCHA: Tandapi (Manuel Cornejo Astorga) (C-JB).

**Phaeotabanus prasiniventris* (Kröber 1929)

ECUADOR, SUCUMBÍOS, Nueva Loja, 450m., 00º05'00''N 76º52'00''W, 11.IV.2007, J. Prado Leg., 1£, K. M. Bayless Det. (2009). QCAZI36347. Deposited at QCAZ Museum of Zoology.

Phaeotabanus serenus (Kröber 1931)

NAPO: Río Umbuni (C-JB). MORONA SANTIAGO: Puerto Yuquianza (C-JB).

Spilotabanus multiguttatus (Kröber 1930)

COTOPAXI: Vía Salcedo-Tena (QCAZ). LOJA: Vía Zamora Puerto, P. N. Podocarpus (QCAZ); Cord. Sabanilla (C-JB). MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas, Potrerillo (C-JB); San Vicente (QCAZ) (C-JB). NAPO: La Alegría (C-JB). PICHINCHA: R. B. Yanacocha. (QCAZ). SUCUMBÍOS: Vía La Bonita - La Fama (QCAZ). TUNGURAHUA: Runtún (C-JB).

Eutabanus pictus Kröber 1930

"Ecuador" as locality datum *in* Fairchild & Burger (1994).

Acanthocera (*Acanthocera*) *marginalis* Walker 1854

NAPO: Río Umbuni, Jatún Sacha (C-JB). ORELLANA: Bloque 31, Estación Huiririma, Yasuní (SC - Res. Sta. - EC - PUCE), (QCAZ). MORONA SANTIAGO: Puerto Yuquianza (C-JB).

Acanthocera (*Querbetia*) *chaineyi* Fairchild & Burger 1994

NAPO: Río Umbuni (C-JB).

Dichelacera (*Dichelacera*) *chocoensis* Fairchild & Philip 1960

ESMERALDAS: Playa de Oro (Río Santiago) (C-JB). GUAYAS: Balao Chico (C-JB); Hda. San Joaquín (San Joaquín) (C-JB) (QCAZ). MANABÍ: Río Mache (C-JB).

Dichelacera (*Dichelacera*) *fasciata* Walker 1850

ESMERALDAS: Kumanii Lodge, Kumanii Lodge T, T1, T2, T3, E.C. Río Canandé T, T1, T3 (Reserva - Jocotoco) (QCAZ); Playa de Oro (Río Santiago) (C-JB). MANABÍ: Río Mache (C-JB). NAPO: Latas (Misahuallí) (QCAZ); Río Umbuni (C-JB). SANTO DOMINGO: Santo Domingo (C-JB) (Fairchild & León 1986). ZAMORA CHINCHIPE: Río Valladolid (C-JB).

Dichelacera (*Dichelacera*) *marginata* Macquart 1847

ESMERALDAS: Alto Cayapa (C-JB). MANABÍ: Palmar (C-JB). NAPO: Río Umbuni, Jatún Sacha (C-JB). ORELLANA: Coca, Payamino, Est. Exp. Napo (C-JB). PASTAZA: Villano (Tarangaro, Kurintza) (QCAZ); Shell-Mera (C-JB). SUCUMBÍOS: Limoncocha (C-JB), Santa Cecilia (AUEM *in* Patrick & Hays 1968).

Dichelacera (*Dichelacera*) *regina* Fairchild 1940

From "Honduras to Ecuador" *in* Wilkerson (1979) and Burger & Fairchild (1994).

Dichelacera (*Dichelacera*) *rubrofemorata* Burger 1999

NAPO: Misahuallí (QCAZ), Latas (Misahuallí) (FSCA *in* Burger 1999); La Selva (E. of Limoncocha) (FSCA *in* Burger 1999). ORELLANA: Coca (FSCA *in* Burger 1999). PASTAZA: Villano (QCAZ). SUCUMBÍOS: Sacha Lodge (LACM *in* Burger 1999), Limoncocha, 8 Km W Lago Agrio (FSCA *in* Burger 1999).

Dichelacera (*Dichelacera*) *submarginata* Lutz 1915

CAÑAR: Chilcales (Río Chilcales, M. J. Calles), Joyapal (Joyapal - Cochancay), Cochancay (El chorro; El Chorro, Cochancay) (C-JB). MORONA SANTIAGO: Río Pau Grande (Tarapoa) (QCAZ), Unión Río Upano-Paute (C-JB). NAPO: Vía Puyo-Tena, Río Umbuni (C-JB). ORELLANA: E. C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Santa Clara (C-JB); Puyo C. E. Fátima (MEPN). SANTO DOMINGO: Tinalandia(C-JB). SUCUMBÍOS: R. P. F. Cuyabeno (QCAZ) (C-JB). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Palanda (C-JB).

Dichelacera (*Dichelacera*) *villavoensis* Fairchild & Philip 1960

MORONA SANTIAGO: Puerto Yuquianza (C-JB). NAPO: Misahuallí (QCAZ); Río Umbuni, Jatún Sacha (C-JB). SUCUMBÍOS: R. P. F. Cuyabeno (C-JB). TUNGURAHUA: El Topo (C-JB).

Dichelacera (*Idiochelacera*) *subcallosa* Fairchild & Philip 1960

GUAYAS: Hda. San Joaquín (San Joaquín) (QCAZ).

Dichelacera (*Desmatochelacera*) *albitibialis* Burger 1999

NAPO: Misahuallí (QCAZ); Río Umbuni, Jatún Sacha (C-JB). MORONA SANTIAGO: Puerto Yuquianza (C-JB). PASTAZA: Villano (Tarangaro, Kurintza), Shell (LACM *in* Burger 1999).

Dichelacera (*Desmatochelacera*) *transposita* Walker 1854

BOLIVAR: Km 7 Vía Bucay - Chillanes (C-JB). ESMERALDAS: Playa de Oro (Río Santiago) (C-JB). NAPO: Daimi (QCAZ).

Catachlorops (*Amphichlorops*) *vespertinus* (Bequaert & Renjifo-Salcedo 1946)
MORONA SANTIAGO: Puerto Yuquianza (C-JB). PASTAZA: Abitagua (Fairchild & León 1986). TUNGURAHUA: El Topo (QCAZ) (C-JB); Baños (Fairchild & León 1986). ZAMORA CHINCHIPE: Río Bombuscara, El Pangui (C-JB); Zamora (Fairchild & León 1986).

Catachlorops (*Psarochlorops*) *difficilis* (Kröber 1931)
ORELLANA: Est. Chiruisla T1, T2, T3 (QCAZ). SUCUMBÍOS (PASTAZA in error): Limoncocha (MPEG *in* Henriques & Gorayeb 1993).

Catachlorops (*Psarochlorops) ecuadoriensis* (Enderlein 1925)
MORONA SANTIAGO: Puerto Yuquianza (C-JB). NAPO: Baeza (*in* Fairchild 1966), Río Hollín, Cascada San Rafael, Vía Jondachi-Loreto Río Hollín, Hollín-Loreto (QCAZ); El Salado, Cocodrilo (C-JB); Campanacocha (QCAZ) (C-JB); Baeza, Boyayaco (Panyagacu) (Fairchild & León 1986). PASTAZA: Shell, Puyo (El) (C-JB). PICHINCHA: Santa Inéz (ZMHB *in* Fairchild & Burger 1994). SANTO DOMINGO: Santo Domingo (Fairchild & León 1986). TUNGURAHUA: El Topo, Río Negro (C-JB).

Catachlorops (*Psalidia*) *fulmineus* var. *ocellatus* Enderlein 1925
ESMERALDAS: Kumanii Lodge T2, T3, E.C. Río Canandé T (Reserva - Jocotoco) (QCAZ); Playa de Oro (Río Santiago) (C-JB).

Dasychela (*Dasychela*) *amazonensis* (Barretto 1946)
ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ); E. C. Tiputini USFQ (TBS) (MEPN).

Dasychela (*Dasychela*) *badia* (Kröber 1931)
BOLIVAR: Guaranda (Fairchild & León 1986). IMBABURA: Azabí (Intag) (Wilkerson & Fairchild 1983)

Dasychela (*Dasychela*) *fulvicornis* (Kröber 1931)
PICHINCHA: Santa Inez (Kröber 1931a). TUNGURAHUA: Baños (Kröber 1931a).

Dasychela (*Dasychela*) *ocellus* (Walker 1848)
COTOPAXI: San Fco. de las Pampas (C-JB). IMBABURA: Los Cedros (EC) (R.B., B.P.), Los Cedros E2:T, T2 (R.B., B.P.), Los Cedros E3:T1, T2, (R.B., B.P.) , García Moreno, 10 Km W Santa Rosa (QCAZ). MANABÍ: Chone (Fairchild & León 1986). PICHINCHA: Quito (Fairchild & León 1986).

Dasychela (*Dasychela*) *peruviana* (Bigot 1892)
IMBABURA: Peñaherrera (Fairchild & León 1986). PICHINCHA: Mindo (Nambillo) (QCAZ); Mindo (C-JB). TUNGURAGUA: Baños (Fairchild & León 1986).

Dasychela (*Triceratomyia*) *macintyrei* (Bequaert 1937)
NAPO: Latas (Misahuallí), Misahuallí (QCAZ); Río Napo – Jatun Yacu (MCZ *in*

Fairchild & Burger 1994), Río Umbuni (C-JB); Bloque 16 Yasuní (MEPN). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ). PASTAZA: Villano (QCAZ).

Eristalotabanus violaceus Kröber 1931

AZUAY: Maylas (C-JB), Pucay-W Cordillere (ZMUH *in* Chainey 1986). BOLIVAR: Arrayán, carretera Salinas a Arrayán (Burger 1999). CAÑAR: Río Yanacachi (C-JB). LOJA: (Loja locality?) (QCAZ); Cord. Sabanilla (C-JB). MORONA SANTIAGO: San Vicente (Limite Azuay prov.), Potrerillo (C-JB). PICHINCHA: Yanacocha-Reserva (Pastizal arbolado y BMA) (QCAZ); Hda (Eco) Bomboli (C-JB). TUNGURAHUA: Patate (QCAZ); Runtún (C-JB); Baños (BMNH *in* Chainey 1986).

Dicladocera argenteomaculata Wilkerson 1979

CHIMBORAZO: Río Sacramento (C-JB). IMBABURA: Los Cedros (EC) (R.B., B.P.), Los Cedros E1:T, T1, T2 (R.B., B.P.) (QCAZ). PICHINCHA: Cabecera Río Pachijal (7.3 Km S Nanegalito), Mindo (QCAZ).

Dicladocera basirufa (Walker 1850)

LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Arenillas (C-JB).

Dicladocera bellicosa (Brèthes 1910)

AZUAY: Guarumales (Guarumales-Paute) (QCAZ) (C-JB).

Dicladocera clara (Schiner 1868)

CHIMBORAZO: Río Sacramento (C-JB). COTOPAXI: San Fco. de las Pampas (QCAZ); El Tingo (C-JB). IMBABURA: Los Cedros E1:T1, T2 (R.B., B.P.) (QCAZ). MORONA SANTIAGO: Tinajillas (QCAZ), Arenillas (C-JB).

Dicladocera distomacula Wilkerson 1979

LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas (C-JB). TUNGURAHUA: Runtún (C-JB).

Dicladocera exilicorne Fairchild 1958

COTOPAXI: B. I. Otonga (El Corcovado) (C-JB). IMBABURA: Machetes (Fairchild 1958, MCZ *in* Fairchild & Burger 1994). PICHINCHA: Palmeras (QCAZ); Cordero (C-JB).

Dicladocera hirsuta Wilkerson 1979

AZUAY: Maylas (C-JB). MORONA SANTIAGO: Loja (QCAZ); Potrerillo, San Vicente (C-JB).

Dicladocera macula (Macquart 1846)

AZUAY: Maylas, Río Zaracay (C-JB). BOLIVAR: Totoras (QCAZ); Santiago, Cerro Pumín (C-JB). CARCHI: San Gabriel (Surcouf 1919). COTOPAXI: Pilaló (C-JB). IMBABURA: Los Cedros E3:T1 (R.B., B.P.) (QCAZ). LOJA: Saraguro (QCAZ); Cord. Sabanilla (C-JB); PN Podocarpus (Cajanuma) (MEPN). MORONA SANTIAGO: Arenillas, Potrerillo, San Vicente (Limite Azuay prov.), Tinajillas (C-JB). NAPO: Papallacta (QCAZ); La Alegría (C-JB). PICHINCHA: Nanegalito, Yanacocha-Reserva (300m Sur del PC) (QCAZ); Nono, Quito (C-JB); Pasochoa (QCAZ) (C-JB); Hda (Eco) Bomboli (C-JB). SUCUMBÍOS: Vía La Bonita - La

Fama (QCAZ). TUNGURAHUA: Runtún (C-JB).

Dicladocera minos (Schiner 1868)
TUNGURAHUA: Baños (Fairchild & León 1986).

Dicladocera ?*neosubmacula* Kröber 1931
See discussion of its status in Fairchild & Burger (1994). CAÑAR: *in* Kröber (1931a). GUAYAS: Bucay (Kröber 1931a). PICHINCHA: Río del Cinto (Mindo) (Kröber 1931a).

Dicladocera nigrocoerulea (Rondani 1850)
COTOPAXI: La Esperanza (C-JB). LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas, Potrerillo (C-JB). TUNGURAHUA: Runtún (C-JB).

Dicladocera ornatipenne (Kröber 1931)
From "Ecuador" in Kröber (1931b) (MTD); LOJA: *in* Fairchild & Burger (1994).

Dicladocera pruinosa Wilkerson 1979
IMBABURA: Los Cedros E2:T, T1 (R.B., B.P.), Los Cedros E3:T2, T3 (R.B., B.P.) (QCAZ). LOJA: San Vicente, Card. Sabanilla (C-BJ). MORONA SANTIAGO: Tinajillas (QCAZ); Arenillas (C-JB). NAPO: Cocodrilo (C-JB).

Dicladocera riveti (Surcouf 1919)
PICHINCHA: Mindo (QCAZ); "Faldas del Volcán Corazón-Oeste" (Surcouf 1919). SANTO DOMINGO: Santo Domingo (Surcouf 1919). GUAYAS: "Chemin entre Guanasilla et San Nicolás" (MNHN *in* Surcouf 1919).

Dicladocera tribonophora Fairchild 1958
"Río Blanco-Oriente" (TUNGURAHUA?, MCZ *in* Fairchild 1958). CHIMBORAZO: Río Sacramento (QCAZ) (C-JB). IMBABURA: Nangulví (FSCA *in* Fairchild 1958). PICHINCHA: Bellavista (Reserva Biológica, Ecológica-Est. Científica) (QCAZ).

Stibasoma (*Stibasoma*) *flaviventre* (Macquart 1848)
ESMERALDAS: Kumanii Lodge T2 (QCAZ).

Stibasoma (*Stibasoma*) *fulvohirtum* (Wiedemann 1828)
SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Stibasoma (*Stibasoma*) *panamensis* Curran 1934
From "Honduras to Ecuador" in Burger & Fairchild (1994). ESMERALDAS: Quinindé (QCAZ).

Stibasoma (*Rhabdotylus*) *venenata* (Osten Sacken 1886)
BOLIVAR: Río Cristal (Balzapamba), Km 7 Vía Bucay - Chillanes (C-JB). EL ORO: Río Calera (C-JB). NAPO: Río Hollín (QCAZ). PICHINCHA: Palmeras, Puerto Quito, Km Vía Nanegalito R. Maquip., Nanegalito, Maquipucuna, Río Umachaca, Aloag-Sto. Domingo Km 40 (QCAZ); Río Cambugán (MEPN); Mindo (QCAZ) (MEPN).

Cryptotylus unicolor (Wiedemann 1828)

ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE), Est. Chiruisla T (QCAZ). SUCUMBÍOS: Limoncocha (AUEM *in* Patrick & Hays 1968).

Philipotabanus (*Philipotabanus*) *magnificus* (Kröber 1934)

BOLIVAR: Balzapamba, Km 7 Vía Bucay - Chillanes (C-JB). CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (QCAZ); Joyapal (Joyapal - Cochancay), Chilcales (Río Chilcales, M. J. Calles) (C-JB). ESMERALDAS: Kumanii Lodge T1, T2, T3, E.C. Río Canandé (Reserva - Jocotoco), E.C. Río Canandé T, T3 (Reserva - Jocotoco), Caimito (estero salado mangle) (QCAZ); Playa de Oro (Río Santiago) (C-JB); Alto Cayapa (Fairchild & León 1986). GUAYAS: Balao Chico, Hda. San Joaquín (San Joaquín) (C-JB); Guayaquil (Fairchild & León 1986). IMBABURA: 10 Km W Santa Rosa (QCAZ). LOJA: Loja, Vía Catamayo (QCAZ). MANABÍ: Río Mache (C-JB). PICHINCHA: Chiriboga (QCAZ). PICHINCHA?: "Pucay-Santo Domingo" (Holotype lost *in* Fairchild & Burger 1994). SANTO DOMINGO: La Unión del Toachi, Otongachi (QCAZ); Santo Domingo (Fairchild & León 1986). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Philipotabanus (*Philipotabanus*) *nigrinubilus* (Fairchild 1953)

CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (C-JB). ESMERALDAS: E.C. Río Canandé (Reserva - Jocotoco) (QCAZ); Playa de Oro (Río Santiago) (C-JB).

Philipotabanus (*Philipotabanus*) *pallidetinctus* (Kröber 1930)

"Ecuador as locality datum" in Fairchild & Burger (1994).

Philipotabanus (*Philipotabanus*) *pterographicus* (Fairchild 1943)

CHIMBORAZO: Río Sacramento (C-JB). GUAYAS: Hda. San Joaquín (San Joaquín) (QCAZ).

Philipotabanus (*Philipotabanus*) *tenuifasciatus* (Kröber 1930)

MORONA SANTIAGO: Puerto Yuquianza, Río Pau Grande (Tarapoa) (C-JB). NAPO: Misahuallí, Aliñahui (cabañas) (QCAZ); Jatún Sacha, Río Umbuni (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ). "East of Ecuador as locality datum" in Fairchild & Burger (1994) and Henriques (2006). C-JB specimens as *P. nigrinubilus* in Cárdenas & Vieira (2005). PASTAZA: Villano, Villano (Tarangaro) (QCAZ).

Philipotabanus (*Mimotabanus*) *opimus* Fairchild 1975

BOLIVAR: Balzapamba (Fairchild 1975a).

**Philipotabanus* (*Mimotabanus*) *porteri* Fairchild 1975

ECUADOR, ESMERALDAS, Kumanii Lodge: 59m., 00º45'23''N 78º55'01,4''W, 14.IV.2006, 15.IV.2006, R. Cárdenas Leg., 2♀♀, R. Cárdenas Det. (III.2007), QCAZI35819, QCAZI35815; 38m., 00º45'19,8''N 78º55'06''W, 14.IV.2006, R. Cárdenas Leg., 2♀♀, R. Cárdenas Det. (III.2007), QCAZI35814, QCAZI35816; 41m., 00º45'14''N 78º55'15''W, 14.IV.2006, R. Cárdenas Leg., 1♀, R. Cárdenas Det. (III.2007), QCAZI35817; 69m., 00º45'21,9''N 78º54'59,4''W, 14.IV.2006, R. Cárdenas Leg., 1♀, R. Cárdenas Det. (III.2007), QCAZI35818. All specimens deposited at QCAZ Museum of Zoology.

Philipotabanus (*Melasmatabanus*) *criton* (Kröber 1934)
From "e. Ecuador" in Fairchild & Burger (1994)

Philipotabanus (*Melasmatabanus*) *fascipennis* ssp. *ecuadoriensis* (Kröber 1930)
AZUAY: Cordillera-Pucay (Holotype lost? MLUH *in* Fairchild & Burger 1994). BOLIVAR: Balzapamba (MZPW *in* Fairchild 1975b). EL ORO: Zaruma-Machala (L. L. Pechuman collection, *in* CUIC?, Fairchild 1975b). PICHINCHA: Mindo (QCAZ). SANTO DOMINGO: Otongachi, Unión del Toachi (QCAZ).

Philipotabanus (*Melasmatabanus*) *nigripennis* Wilkerson 1979
From "Ecuador" and "Ecuador e. of Andes" as locality data in Wilkerson (1979) and Fairchild & Burger (1994) respectively.

Stypommisa anoriensis Fairchild & Wilkerson 1986
ZAMORA CHINCHIPE: Río Bombuscara (C-JB).

Stypommisa captiroptera (Kröber 1930)
ESMERALDAS: Kumanii Lodge (QCAZ). MANABÍ: Río Mache (C-JB). NAPO: Río Umbuni (C-JB); Río Hollín (QCAZ). PASTAZA: Shell-Mera (C-JB). PICHINCHA: Quito (Fairchild & Wilkerson 1986). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Stypommisa changena Fairchild 1986
CARCHI: Cabecera del Río Baboso (C-JB). PICHINCHA: Mindo (C-JB).

Stypommisa flavescens (Kröber 1930)
AZUAY: Guarumales (Guarumales-Paute) (C-JB). PASTAZA: 17.2 Km SE Puyo (Fairchild & Wilkerson 1986). PICHINCHA: Sta. Inéz (MZPW *in* Fairchild 1975b). ZAMORA CHINCHIPE: 12 Km S Zamora (Fairchild & Wilkerson 1986).

Stypommisa glandicolor (Lutz 1912)
CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (C-JB).

Stypommisa hypographa (Kröber 1930)
TUNGURAHUA: El Topo (C-JB). NAPO: Río Umbuni, Km 6 Vía Narupa - Coca (C-JB).

Stypommisa hypographa ssp. *neofurva* Philip 1969
From "Ecuador, no further data (L. Leon)" in Fairchild & Wilkerson (1986).

Stypommisa maruccii (Fairchild 1947)
From "Nicaragua to Ecuador" in Fairchild & Wilkerson (1986) and confirmed by Fairchild & Burger (1994).

Stypommisa modica (Hine 1920)
MORONA SANTIAGO: Unión Río Upano-Paute, Río Pau Grande (Tarapoa), Yunkumas-Centro Shua (C-JB). NAPO: Río Hollín (QCAZ); Río Umbuni (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ) PASTAZA: Río Liquino (QCAZ). SANTO DOMINGO: E. C. Río Guajalito (QCAZ). SUCUMBÍOS: "Santa Cecilia" (AUEM *in* Patrick & Hays 1968).

Stypommisa pequeniensis (Fairchild 1942)

ESMERALDAS: Playa de Oro (Río Santiago) (C-JB). GUAYAS: Hda. San Joaquín (San Joaquín) (C-JB). MORONA SANTIAGO: Puerto Yuquianza, Río Yananas (C-JB). NAPO: Latas (Misahuallí), Misahuallí (QCAZ); Río Umbuni, Jatún Sacha, Km 6 Vía Narupa - Coca, Cocodrilo (C-JB). ORELLANA: Est. Exp. Napo (C-JB). PASTAZA: Villano (Tarangaro) (QCAZ); Shell-Mera (C-JB). SUCUMBÍOS: "Santa Cecilia" (AUEM *in* Patrick & Hays 1968).

Stypommisa venosa (Bigot 1892)

CAÑAR: Javín (C-JB). CHIMBORAZO: Río Sacramento (QCAZ)(C-JB). COTOPAXI: San Fco. de las Pampas (C-JB). NAPO: Río Hollín (C-JB). PASTAZA: Shell-Mera (C-JB). PICHINCHA: Quito, Palmeras (C-JB). TUNGURAHUA: Patate (C-JB).

Leucotabanus albovarius (Walker 1854)

NAPO: Latas (Misahuallí) (QCAZ); Río Umbuni (C-JB). ORELLANA: E. C. Yasuní (QCAZ) ; Est. Exp. Napo (C-JB); E. C. Tiputini USFQ (TBS) (MEPN).

Leucotabanus cornelianus Fairchild 1985

SANTO DOMINGO: "Río Mulaute 15 Km NE Sto. Domingo" (CUIC *in* Fairchild 1985).

Leucotabanus exaestuans (L. 1758)

ESMERALDAS: Mayronga (La), Kumanii Lodge (QCAZ). GUAYAS: Hda. Santa Rita (Balao), Hda. San Joaquín (San Joaquín) (C-JB). LOS RÍOS: EBFD Jauneche (C-JB). MANABÍ: Pedernales (QCAZ); Río Mache (C-JB). MORONA SANTIAGO: Puerto Yuquianza (C-JB). NAPO: Aliñahui (cabañas) (QCAZ); Río Umbuni, Misahuallí (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ), Coca (QCAZ) (C-JB); Est. Exp. Napo (C-JB); E. C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Villano (QCAZ). SUCUMBÍOS: El Eno (QCAZ); Limoncocha, Santa Cecilia (AUEM *in* Patrick & Hays 1968).

Leucotabanus weyrauchi Fairchild 1951

MORONA SANTIAGO: Río Yananás (C-JB). NAPO: Misahuallí (C-JB). ZAMORA CHINCHIPE: Río Bombuscara (C-JB); Zamora (MCZ *in* Fairchild & Burger 1994).

Lepiselaga (*Lepiselaga*) *crassipes* (Fabricius 1805)

GUAYAS: Nobol (QCAZ) (C-JB); Hda. Santa Rita (Balao), San Carlos, Cerecita (C-JB). LOS RÍOS: EBPFD- Jauneche (C-JB). ORELLANA: Primavera (La) (QCAZ); Est. Exp. Napo (C-JB). SUCUMBÍOS: Limoncocha (AUEM *in* Patrick & Hays 1968).

Tribe Tabanini

Poeciloderas quadripunctatus (Fabricius 1805)

AZUAY: Huasipamba (Guasipamba) (C-JB). BOLIVAR: Río Cristal (Balzapamba) (C-JB). CHIMBORAZO: Río Sacramento (C-JB). ESMERALDAS: Mayronga (La) (QCAZ). GUAYAS: Hda. San Joaquín (San Joaquín) (C-JB). LOJA: Loja locality? (QCAZ); San Vicente (C-JB). MORANA SANTIAGO: Puerto Yuquianza (C-JB). NAPO: Río Hollín, Aliñahui (cabañas) (QCAZ); Río Umbuni, Km 6 Vía

Narupa - Coca (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ), Est. Exp. Napo (C-JB); E. C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Shell-Mera (C-JB). SUCUMBÍOS: "Santa Cecilia" (AUEM *in* Patrick & Hays 1968). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Río Bombuscara, Río Valladolid (C-JB).

Phorcotabanus cinereus (Wiedemann 1821)
From "Ecuador" as locality datum in Fairchild & Burger (1994).

Tabanus albocirculus Hine 1907
ESMERALDAS: Kumanii Lodge (QCAZ); Playa de Oro (Río Santiago) (C-JB). GUAYAS: Balao Chico (QCAZ); Hda. Santa Rita (Balao), Hda. La María-25 Km N Guayaquil (C-JB). LOS RÍOS: EBFD Jauneche, Hda. Clementina (C-JB).

Tabanus aniptus Fairchild 1976
From "Ecuador" as locality datum in Wilkerson (1979).

Tabanus antarcticus L. 1758
GUAYAS: Reserva Churute (C-JB).

Tabanus argentivittatus Fairchild 1976
NAPO: Archidona, Jatún Sacha, Río Umbuni (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE), Est. Chiruisla T (QCAZ). PASTAZA: Diez de Agosto (C-JB).

Tabanus cicur Fairchild 1942
NAPO: Latas (Misahuallí) (QCAZ); Río Umbuni (C-JB). ORELLANA: Est. Exp. Napo (C-JB). PASTAZA: Shell-Mera (C-JB).

Tabanus claripennis (Bigot 1892)
PICHINCHA: Santa Inez (Fairchild 1942).

Tabanus colombensis Macquart 1846
CAÑAR: Cochancay (El chorro; El Chorro, Cochancay), La Troncal (C-JB). CHIMBORAZO: Buenos Aires, Río Sacramento (C-JB). GUAYAS: Balao Chico, Hda. Santa Rita (Balao), Hda. La María-25 Km N Guayaquil, Milagro, Nobol, Hda. San Joaquín (San Joaquín) (C-JB). LOJA: Quebrada Chipiango, Río Catamayo (C-JB). LOS RÍOS: Hda. Clementina, Pichilingue (C-JB). MANABÍ: Julcuy (C-JB). NAPO: Río Umbuni (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (C-JB). PASTAZA: Shell-Mera (C-JB). SANTA ELENA: 2.6 Km de "Dos Mangas" (C-JB). SANTO DOMINGO: Santo Domingo (C-JB).

Tabanus cyclopus Philip 1961
GUAYAS: "20 mi West of Guayaquil" (CAS *in* Philip 1961).

Tabanus discifer Walker 1850
ORELLANA: Est. Chiruisla T, Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ); Nuevo Rocafuerte (Fairchild & León 1986). PASTAZA: Lorocachi (QCAZ). PASTAZA: Villano (QCAZ). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Tabanus discus Wiedemann 1828

ORELLANA: Est. Exp. Napo (C-JB).

Tabanus eldridgei Fairchild 1973
ESMERALDAS: Esmeraldas (Fairchild 1973).

Tabanus guyanensis Macquart 1846
ORELLANA: Est. Exp. Napo (C-JB); "Nuevo Rocafuerte" (Fairchild & León 1986). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968 and Fairchild 1984).

Tabanus hirtitibia Walker 1850
MORONA SANTIAGO: Río Yananás, Río Pau Grande (Tarapoa), Puerto Yuquianza (C-JB). NAPO: Cascada San Rafael, Cercanías Río Aguarico, Misahuallí, Latas (Misahuallí) (QCAZ), Río Umbuni, Jatún Sacha, Cocodrilo, Km 6 Vía Narupa - Coca (C-JB). ORELLANA: Coca, Pozo Ishpingo (QCAZ). PASTAZA: Puyo, Villano (Tarangaro) (QCAZ); Santa Clara, Shell-Mera (C-JB). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968). Shushufindi (QCAZ). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Río Bombuscara, Río Valladolid (C-JB).

Tabanus importunus Wiedemann 1828
From "Panama to Brazil" in Fairchild & Burger (1994).

Tabanus macquarti Schiner 1868
MORONA SANTIAGO: Río Yananás, Puerto Yuquianza (C-JB). NAPO: Misahuallí (QCAZ); Río Umbuni, Jatún Sacha (C-JB). ORELLANA: Est. Exp. Napo (C-JB). PASTAZA: Santa Clara, Shell-Mera (C-JB). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968). ZAMORA CHINCHIPE: Río Bombuscara (C-JB).

Tabanus nereus Fairchild 1943
GUAYAS: Guayaquil (Fairchild 1973); "Ecuador in coastal mangrove habitats" (Fairchild 1983).

Tabanus occidentalis L. 1758
BOLIVAR: Río Cristal (Balzapamba) (C-JB). CHMBORAZO: Río Sacramento (C-JB). EL ORO: Buenos Aires, Los Rosales de Machay (C-JB). ESMERALDAS: Playa de Oro (Río Santiago). GUAYAS: Daule, La Toma, Guayaquil, Guayaquil (Cerro Blanco), Hda. San Joaquín (San Joaquín). LOJA: Quebrada Chipiango, San Vicente (C-JB). LOS RÍOS: EBFD Jauneche (C-JB). MANABÍ: Río Mache (C-JB). MORONA SANTIAGO: Indanza, Río Pau Grande (Tarapoa), Puerto Yuquianza. NAPO: Archidona, Jatun Sacha, Km. 6 Vía Narupa-Coca, Río Umbuni (C-JB). ORELLANA: Coca, Est. Exp. Napo (C-JB); E. C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Costa Azul, Santa Clara, Shell-Mera (C-JB). PICHINCHA: Mindo (C-JB). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Río Valladolid (C-JB).

Tabanus occidentalis var. *dorsovittatus* Macquart 1855
CARCHI: Maldonado (QCAZ). NAPO: Río Hollín (QCAZ). ORELLANA: Coca,

Yasuní (SC - Res. Sta. - EC - PUCE), Taracoa (QCAZ). PASTAZA: Lorocachi, Villano (QCAZ). PICHINCHA: Puerto Quito (QCAZ). SANTO DOMINGO: Santo Domingo (QCAZ). SUCUMBÍOS: Tarapoa (QCAZ).

Tabanus occidentalis var. *modestus* Wiedemann 1828

BOLIVAR: Río Cristal (Balzapamba) (C-JB). CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (C-JB). CHIMBORAZO: Río Sacramento (C-JB). COTOPAXI: San Fco. de las Pampas (QCAZ). ESMERALDAS: Kumanii Lodge (QCAZ); Playa de Oro (Río Santiago) (C-JB). GUAYAS: Hda. San Joaquín (San Joaquín) (C-JB). LOJA: Virgen del Cisne, Quebrada Chipiango (C-JB). MORONA SANTIAGO: Río Pau Grande (Tarapoa), Puerto Yuquianza (C-JB).NAPO: Río Umbuni (C-JB). ORELLANA: Taracoa, Est. Chiruisla T, Vía Coca - Loreto Km 26, Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ); Est. Exp. Napo (C-JB). PASTAZA: Villano (Tarangaro, Kurintza) (QCAZ); Santa Clara, Shell-Mera, Diez de Agosto (C-JB). SANTO DOMINGO: Unión del Toachi (QCAZ); Tandapi (Manuel Cornejo Astorga), Mindo (C-JB). SUCUMBÍOS: R. P. F. Cuyabeno (QCAZ).

Tabanus pachypalpus (Bigot 1892)

PICHINCHA: Mindo (Fairchild & León 1986). ZAMORA CHINCHIPE: Zamora (Fairchild & León 1986).

Tabanus pellucidus Fabricius 1805

ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (C-JB). PASTAZA: Puyo (C-JB). SUCUMBÍOS: R. P. F. Cuyabeno, Limoncocha (C-JB).

Tabanus perplexus Walker 1850

IMBABURA: Azabí (Intag), Nangulví (Fairchild & León 1986). ORELLANA: Nuevo Rocafuerte (Fairchild & León 1986).

Tabanus peruvianus Macquart 1848

IMBABURA: Nangulví, “Cord. Intag” (Fairchild & León 1986). PICHINCHA: Quito (BMNH *in* Macquart 1848).

Tabanus piceiventris Rondani 1848

NAPO: Aliñahui (cabañas), (QCAZ); Río Umbuni (C-JB). ORELLANA: Est. Chiruisla T, Yasuní (SC - Res. Sta. - EC - PUCE), PNY Yasuní Bloque 31 Pozo petrolero PSCA 2, Río Yasuní Línea 10 y Sub base Bloque 31, Coca-Primavera (QCAZ); Coca (C-JB). PASTAZA: Villano (Tarangaro, Kurintza) (QCAZ). SUCUMBÍOS: R. P. F. Cuyabeno (QCAZ) (C-JB); Limoncocha, Tarapoa (C-JB).

Tabanus platycerus Fairchild 1976

NAPO: Río Umbuni, Misahuallí (C-JB). ORELLANA: Est. Chiruisla T (QCAZ); E. C. Tiputini USFQ (TBS) (MEPN). PASTAZA: Santa Clara, Shell-Mera (C-JB).

Tabanus pseudoculus Fairchild 1942

MORONA SANTIAGO: Unión Río Upano-Paute, Puerto Yuquianza, Río Pau Grande (Tarapoa) (C-JB). NAPO: Río Umbuni, Jatún Sacha (C-JB). ORELLANA: Yasuní (SC - Res. Sta. - EC - PUCE) (QCAZ)

Tabanus pungens Wiedemann 1828

AZUAY: Yunguilla (QCAZ). CAÑAR: Cochancay (El chorro; El Chorro, Cochancay), La Troncal (C-JB). CHIMBORAZO: Buenos Aires, Río Sacramento (C-JB). ESMERALDAS: Quinindé (QCAZ) (C-JB). GUAYAS: Guayaquil (QCAZ) (C-JB); Balao Chico, Cerecita, Guayaquil (Cerro Azul), Hda. Santa Rita (Balao), Hda. La María 25 Km N Guayaquil, Milagro, Nobol, Samborondón, San Carlos, San Eduardo (Guayaquil - El Salado), Hda. San Joaquín (San Joaquín), Santa Lucía (C-JB). IMBABURA: "Nangulví-Cord. Intag" (Fairchild & León 1986). LOJA: San Vicente (C-JB). LOS RÍOS: Hda. Clemencita, Mt. Pichincha, Pichilingue (C-JB). MANABÍ: Julcuy, Río Mache (C-JB). NAPO: Río Umbuni (C-JB). PASTAZA: Shell-Mera (C-JB). SANTA ELENA: 2.6 Km de "Dos Mangas", Colonche (C-JB).

Tabanus restrepoensis Fairchild 1942
NAPO: Río Umbuni, Jatún Sacha (C-JB).

Tabanus rixator Fairchild 1943
ESMERALDAS: Esmeraldas, Limones (Fairchild & León 1986)

Tabanus rubiginipennis Macquart 1846
LOJA: Cord. Sabanilla (C-JB). MORONA SANTIAGO: Arenillas, Potrerillo (C-JB). NAPO: Km 6 Vía Narupa - Coca, Cocodrilo (C-JB). PASTAZA: Shell-Mera (C-JB). TUNGURAHUA: El Topo, Runtún (C-JB).

Tabanus rubripes Macquart 1838
From "Panama to Paraguay" in Fairchild & Burger (1994).

Tabanus sannio Fairchild 1956
SUCUMBÍOS: "Santa Cecilia" (AUEM *in* Patrick & Hays 1968), Shushufindi (C-JB).

Tabanus secundus Walker 1848
CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (C-JB). GUAYAS: Hda. San Joaquín (San Joaquín) (C-JB). LOS RÍOS: EBFD Jauneche (C-JB). LOJA: Virgen del Cisne (C-JB). MORONA SANTIAGO: Indanza, Río Yananás, Puerto Yuquianza (C-JB). NAPO: Río Umbuni, Km 6 Vía Narupa - Coca, Cocodrilo (C-JB). ORELLANA: Est. Chiruisla T (QCAZ); Est. Exp. Napo (C-JB). PASTAZA: Shell (QCAZ); Diez de Agosto, Puyo, Nuevo Mundo, Santa Clara (C-JB). PICHINCHA: Mindo (C-JB). TUNGURAHUA: El Topo (C-JB). ZAMORA CHINCHIPE: Río Valladolid (C-JB).

Tabanus sorbillans Wiedemann 1828
ORELLANA: Est. Chiruisla T3 (QCAZ); Est. Exp. Napo, Yasuní (SC - Res. Sta. - EC - PUCE) (C-JB). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968).

Tabanus surifer Fairchild 1964

ESMERALDAS: Playa de Oro (Río Santiago) (C-JB).

Tabanus thiemeanus (Enderlein 1925)
CAÑAR: Cochancay (El chorro; El Chorro, Cochancay) (QCAZ). IMBABURA:

Los Cedros (EC) (R.B., B.P.), Los Cedros E1:T, T1, T2 (R.B., B.P.), Los Cedros E2:T, T1, T2 (R.B., B.P.), Los Cedros E2-E3 (R.B., B.P.) (QCAZ). PASTAZA: Puyo (QCAZ). SUCUMBÍOS: "Limoncocha" (AUEM *in* Patrick & Hays 1968), R. P. F. Cuyabeno (QCAZ).

Tabanus unimaculus Kröber 1934

From "Ecuador" as locality datum in Fairchild & Burger (1994).

Tabanus unistriatus Hine 1906

ESMERALDAS: E.C. Río Canandé T, T1, T3 (Reserva - Jocotoco), Kumanii Lodge T, T1, T2 (QCAZ); Playa de Oro (Río Santiago) (C-JB). GUAYAS: Hda. San Joaquín (San Joaquín) (C-JB). MANABÍ: Río Mache (C-JB).

Tabanus vittiger Thomson 1869

GALÁPAGOS: "Galápagos Islands" (NHRS *in* Fairchild & Burger 1994), Santa Cruz-Playa (QCAZ) (C-JB), Isla San Cristóbal, Puerto Ayora (QCAZ).

Tabanus xuthopogon Fairchild 1984

NAPO: Río Umbuni, Misahuallí (C-JB). ORELLANA: Est. Exp. Napo, Yasuní (SC - Res. Sta. - EC - PUCE) (C-JB). SUCUMBÍOS: "Alrededores de Limoncocha", Limoncocha (Playaco river) (Fairchild 1984) and (MPEG) *in* Henriques & Gorayeb (1993).

Appendix 5.

Gazetteer of known localities of Ecuadorian specimens of Tabanidae.

Georeferenced error (mean ± SD) = 2.85 ± 4.07 Km. Datum: WGS84; coordinates system: decimal degrees.

Locality	Province	Altitude (m)	Longitude	Latitude	Error (Km)
10 Km W Santa Rosa	IMBABURA	700	-78.93194	0.33083	0
12 Km S Zamora	ZAMORA CHINCHIPE	1200	-78.94139	-4.14300	14.707
17,2 Km SE Puyo	PASTAZA	1000	-77.86400	-1.57900	19.807
2.6 Km de "Dos Mangas"	SANTA ELENA	60	-80.71556	-1.83333	5.78
6,6 Km N vía Limón - Macas	MORONA SANTIAGO	1013	-78.40701	-2.92665	9.636
8 Km W Lago Agrio	SUCUMBÍOS	311	-76.97900	0.08500	10.58
Abitagua	PASTAZA	1200	-78.17639	-1.44306	1.974
Aliñahui (cabañas)	NAPO	410	-77.60194	-1.04861	0
Alluriquín	SANTO DOMINGO	750	-78.99347	-0.32031	1.875
Aloag	PICHINCHA	2900	-78.58333	-0.45139	1.841
Alto Cayapa	ESMERALDAS	11	-78.95833	0.86667	2.215
Amaguaña	PICHINCHA	2620	-78.50389	-0.37278	4.167
Ambato	TUNGURAHUA	2540	-78.62250	-1.23667	8.369
Archidona	NAPO	600	-77.80683	-0.90627	3.624
Arenillas	MORONA SANTIAGO	2200	-78.61389	-3.01556	3.135
Arrayán, carretera Salinas a Arrayán	BOLIVAR	3600	-79.05889	-1.37194	1.977
Atuntaqui	IMBABURA	2500	-78.21402	0.33311	2.479
Ávila Viejo	ORELLANA	750	-77.43278	-0.63639	0
Azabí (Intag)	IMBABURA	2200	-78.46532	0.32986	1.581
Azogues (Azoguez)	CAÑAR	2520	-78.84500	-2.73667	1.612
B. I. Otonga (El Corcovado)	COTOPAXI	2000	-79.00020	-0.41673	2.68
Baeza	NAPO	1900	-77.88500	-0.46000	1.579
Balao Chico	GUAYAS	30	-79.69444	-2.73833	1.583
Balzapamba (Balzpambana)	BOLIVAR	750	-79.17600	-1.76600	1.874
Baños	TUNGURAHUA	1843	-78.42333	-1.39444	1.857
Bellavista (Reserva Biológica)	PICHINCHA	2200	-78.70833	-0.01278	0
Bellavista (Reserva Ecológica-Est. Científica)	PICHINCHA	2287	-78.68794	-0.01083	0
Bosque Puyango	LOJA	300	-80.07905	-3.88281	2.255
Boyayaco (Panyagacu)	NAPO	980	-77.81667	-0.80000	1.813
Bucay (1 Km NO Cumandá)	GUAYAS	300	-79.14100	-2.20200	1.648

Buenos Aires	CHIMBORAZO	300	-79.19528	-2.20361	2.689
Buenos Aires, 5 Km O de Cumandá	CHIMBORAZO	300	-79.19528	-2.20361	6.59
Cabecera del Río Baboso	CARCHI	1500	-78.38200	0.96100	10.069
Cabecera Río Pachijal (7,3 Km S Nanegalito)	PICHINCHA	2050	-78.68389	-0.00028	1.581
Caimito (estero salado mangle)	ESMERALDAS	5	-80.09722	0.70194	0
Caimito (ladera)	ESMERALDAS	50	-80.09278	0.69889	0
Calacalí	PICHINCHA	2800	-78.51111	0.00083	1.761
Calupiña	COTOPAXI	1500	-78.92583	-0.53833	1.588
Campanacocha	NAPO	350	-77.50167	-1.02500	4.674
Casitagua	PICHINCHA	3500	-78.47667	-0.03000	1.655
Catacocha	LOJA	1930	-79.64677	-4.04661	1.632
Cerecita	GUAYAS	20	-80.26694	-2.33000	1.606
Cerro Pumín	BOLIVAR	3400	-79.03556	-1.44028	2.346
Cerro Toledo	LOJA	3484	-79.10861	-4.40139	1.601
Chachimbiro	IMBABURA	1600	-78.08910	0.49465	0
Chilcales (Río Chilcales, M. J. Calles)	CAÑAR	680	-79.22333	-2.20667	1.824
Chiriboga	PICHINCHA	1900	-78.76500	-0.22833	1.898
Chone	MANABÍ	20	-80.09167	-0.69444	7.269
Coangos	MORONA SANTIAGO	670	-78.21406	-3.04337	2.507
Coca	ORELLANA	260	-76.98333	-0.46250	1.683
Cochancay (El chorro; El Chorro, Cochancay)	CAÑAR	500	-79.29444	-2.46389	1.735
Cocodrilo	NAPO	1700	-77.78944	-0.64583	1.746
Cola	LOJA	1320	-79.86957	-4.09771	1.62
Colonche	SANTA ELENA	8	-80.66750	-2.01750	2.326
Conocoto	PICHINCHA	2530	-78.47444	-0.29028	10.169
Cord. Sabanilla	LOJA	2700	-79.15000	-4.44889	1.774
Costa Azul	PASTAZA	490	-77.81021	-1.12151	1.753
Cuenca	AZUAY	2527	-79.00111	-2.89278	12.868
Cumbayá	PICHINCHA	2400	-78.42667	-0.19806	6.969
Cumbe	AZUAY	2700	-79.00889	-3.08361	1.874
Curaray (San Antonio de)	PASTAZA	310	-76.96667	-1.37361	30.469
Cuyabeno (Reserva de Producción Faunística)	SUCUMBÍOS	200	-76.18028	0.01806	4.818
Danas	CHIMBORAZO	3300	-78.88333	-2.13333	2.301
Daule	GUAYAS	20	-79.97722	-1.85722	4.216
Dayuma	ORELLANA	260	-76.87910	-0.66658	1.616
Diez de Agosto	PASTAZA	1000	-77.90341	-1.45410	2.003
E. C. Río Guajalito	SANTO DOMINGO	1800	-78.81670	-0.23330	2.18

E. C. Tiputini USFQ (TBS)	ORELLANA	240	-76.14944	-0.63639	1.739
E. Santo Domingo	SANTO DOMINGO	600	-79.16222	-0.25333	1.681
E.C. Río Canandé (Reserva - Jocotoco)	ESMERALDAS	389	-79.20111	0.48472	0
E.C. Río Canandé T (Reserva - Jocotoco)	ESMERALDAS	400	-79.19694	0.47917	0
E.C. Río Canandé T1 (Reserva - Jocotoco)	ESMERALDAS	400	-79.19833	0.47833	0
E.C. Río Canandé T3 (Reserva - Jocotoco)	ESMERALDAS	400	-79.19750	0.47889	0
EBFD Jauneche	LOS RIOS	50	-79.58333	-1.58333	2.967
El Empalme	GUAYAS	60	-79.61667	-1.05000	2.075
El Eno	SUCUMBIOS	293	-76.87846	-0.06635	0.64
El Pangui	ZAMORA CHINCHIPE	800	-78.58651	-3.62449	1.817
El Reventador	SUCUMBÍOS	1700	-77.55000	-0.03333	2.904
El Salado	NAPO	1280	-77.68846	-0.20097	1.862
El Salado	GUAYAS	6	-79.90556	-2.21722	2.535
El Tingo	PICHINCHA	2600	-78.43426	-0.28276	1.882
El Tingo	COTOPAXI	1400	-79.05659	-0.91474	1.595
El Topo	TUNGURAHUA	1245	-78.19444	-1.40833	1.909
Est. Chiruisla T	ORELLANA	204	-75.94083	-0.68583	0
Est. Chiruisla T1	ORELLANA	204	-75.94167	-0.68583	0
Est. Chiruisla T2	ORELLANA	204	-75.94208	-0.68528	0
Est. Chiruisla T3	ORELLANA	204	-75.94250	-0.68500	0
Est. Exp. Napo	ORELLANA	250	-77.02167	-0.43083	3.408
Est. Río Huiririma	ORELLANA	220	-75.78400	-0.06610	5.214
García Moreno	IMBABURA	1420	-78.62624	0.23415	1.671
Guaranda	BOLIVAR	3670	-79.00000	-1.59056	1.661
Guarumales (Guarumales-Paute)	AZUAY	1860	-78.52252	-2.61065	4.017
Guayaquil	GUAYAS	5	-79.89361	-2.19861	31.568
Guayaquil (Cerro Azul)	GUAYAS	230	-79.97528	-2.15611	3.993
Guayaquil (Cerro Blanco)	GUAYAS	240	-80.08333	-2.11667	3.735
Guayllabamba	PICHINCHA	2140	-78.34028	-0.05556	2.985
Hda (Eco) Bomboli	PICHINCHA	3000	-78.68167	-0.46361	0
Hda. Clementina	LOS RIOS	20	-79.38750	-1.71028	1.593
Hda. La Julia	LOS RIOS	9	-79.55166	-1.70334	1.642
Hda. San Joaquín (San Joaquín)	GUAYAS	290	-79.16667	-2.22222	1.632
Hda. Santa Rita (Balao)	GUAYAS	30	-79.81250	-2.90667	2.167
Huasipamba (Guasipamba)	AZUAY	2879	-79.32673	-3.19655	0
Ibarra	IMBABURA	2200	-78.12635	0.36035	9.269
Indanza	MORONA SANTIAGO	1220	-78.47397	-3.05550	1.874

Inga	PICHINCHA	2700	-78.33333	-0.30000	1.654
Jatún Sacha	NAPO	400	-77.61667	-1.06667	1.825
Javín	CAÑAR	1500	-79.17876	-2.46756	1.728
Jerusalén	PICHINCHA	2280	-78.35667	0.00056	0
Joya de los Sachas	NAPO	270	-76.85255	-0.29296	1.824
Joyapal (Joyapal - Cochancay)	CAÑAR	700	-79.19722	-2.45694	1.584
Julcuy	MANABÍ	300	-80.62406	-1.47559	2.669
Jumandi	NAPO	620	-77.79694	-0.88833	1.698
Kalaglas	MORONA SANTIAGO	1350	-78.53194	-3.24000	1.873
Km 6 Vía Narupa - Coca	NAPO	1300	-77.74100	-0.71800	1.619
Km 7 Vía Bucay - Chillanes	BOLIVAR	850	-79.12250	-2.13444	10.007
Km 9 Vía Bucay - Chillanes	BOLIVAR	300	-79.12250	-2.13444	12.002
Kumanii Lodge	ESMERALDAS	43	-78.92083	0.75389	0
Kumanii Lodge T	ESMERALDAS	38	-78.91833	0.75550	0
Kumanii Lodge T1	ESMERALDAS	59	-78.91706	0.75639	0
Kumanii Lodge T2	ESMERALDAS	69	-78.91650	0.75608	0
Kumanii Lodge T3	ESMERALDAS	95	-78.91389	0.75556	0
La Carbonería	CAÑAR	2850	-79.00299	-2.51707	1.836
La Fama	SUCUMBÍOS	2120	-77.48956	0.59914	0.5303
La Moya	BOLIVAR	3350	-79.03556	-1.46639	1.817
La Sabana (200m de Bachillero)	MANABÍ	4	-80.17111	-0.72222	0
La Selva (E. of Limoncocha)	NAPO	235	-76.37349	-0.49839	0
La Toma	GUAYAS	100	-79.97917	-1.99778	1.815
La Toma	LOJA	1360	-79.35000	-3.98278	1.66
La Troncal	CAÑAR	150	-79.33611	-2.42222	1.697
Lago Agrio	SUCUMBÍOS	300	-76.88778	0.09278	10.669
Latas (Misahuallí)	NAPO	500	-77.73306	-1.03278	1.985
Limón Playas, Sta. Rosa	EL ORO	170	-79.93567	-3.57567	1.902
Limoncocha	SUCUMBÍOS	300	-76.61667	-0.40000	10.969
Limones	ESMERALDAS	15	-78.77167	1.12333	1.636
Lloa	PICHINCHA	3060	-78.5757	-0.24791	0
Logroño	MORONA SANTIAGO	625	-78.17833	-2.61500	1.644
Loja	LOJA	2060	-79.19861	-4.00000	10.567
Loja, Vía Catamayo	LOJA	2064	-79.19944	-3.99583	10.567
Lorocachi	PASTAZA	220	-75.96667	-1.61639	1.969
Los Cedros (EC) (R.B., B.P.)	IMBABURA	1350	-78.77938	0.30879	0
Los Cedros E1:T (R.B., B.P.)	IMBABURA	1180	-78.77750	0.30528	0
Los Cedros E1:T1 (R.B., B.P.)	IMBABURA	1180	-78.77722	0.30528	0
Los Cedros E1:T2 (R.B., B.P.)	IMBABURA	1180	-78.77694	0.30528	0

Los Cedros E2:T (R.B., B.P.)	IMBABURA	1680	-78.78111	0.32167	0
Los Cedros E2:T1 (R.B., B.P.)	IMBABURA	1680	-78.78111	0.32139	0
Los Cedros E2:T3 (R.B., B.P.)	IMBABURA	1680	-78.78111	0.32194	0
Los Cedros E3:T (R.B., B.P.)	IMBABURA	2180	-78.79194	0.33778	0
Los Cedros E3:T1 (R.B., B.P.)	IMBABURA	2180	-78.79194	0.33750	0
Los Cedros E3:T2 (R.B., B.P.)	IMBABURA	2180	-78.79194	0.33722	0
Los Cedros E3:T3 (R.B., B.P.)	IMBABURA	2180	-78.79194	0.33778	0
Los Cedros E2-E3 (R.B., B.P.)	IMBABURA	1920	-78.78676	0.32959	0
Lumbaqui	SUCUMBÍOS	480	-77.32939	0.04922	1.875
Machachi	PICHINCHA	2900	-78.57722	-0.50694	3.361
Machay	TUNGURAHUA	1650	-78.27982	-1.39622	1.913
Maldonado	CARCHI	1580	-78.10833	0.91083	2.091
Mamanuma	LOJA	2400	-79.20833	-3.88778	3.381
Mangahuanta (Mangaguanta)	PICHINCHA	2400	-78.36833	-0.16833	1.895
Manuel J. Calle	CAÑAR	50	-79.39522	-2.35322	1.874
Maquipucuna	PICHINCHA	1600	-78.62160	0.11531	2.378
Mayaico	MORONA SANTIAGO	1000	-78.61972	-3.98333	3.447
Maylas	AZUAY	3000	-78.68306	-2.98806	1.994
Mayronga (La)	ESMERALDAS	100	-79.21722	0.89083	2.162
Méndez	MORONA SANTIAGO	420	-78.31536	-2.71452	1.874
Mera	PASTAZA	1170	-78.11861	-1.45000	2.302
Miguir	AZUAY	3560	-79.30056	-2.79917	1.606
Milagro	GUAYAS	13	-79.58833	-2.13139	7.269
Mindo	PICHINCHA	1250	-78.77806	-0.05000	1.947
Mindo (Nambillo)	PICHINCHA	1880	-78.73833	-0.12500	7.469
Misahuallí	NAPO	400	-77.66528	-1.04139	2.373
Montalvo	LOS RIOS	70	-79.28611	-1.78972	2.793
Moraspungo	PICHINCHA	2915	-78.51000	0.03167	1.814
Nanegal	PICHINCHA	1100	-78.67667	0.14333	1.769
Nanegalito	PICHINCHA	1630	-78.68056	0.06667	2.376
Nangulví	IMBABURA	1390	-78.54691	0.32789	0
Naranjal	GUAYAS	30	-79.60833	-2.67500	3.377
Nobol	GUAYAS	10	-80.00861	-1.90778	1.709
Nono	PICHINCHA	2700	-78.57421	-0.06114	1.875
Nueva Loja	SUCUMBÍOS	300	-76.88505	0.09143	6.2
Nuevo Mundo	PASTAZA	850	-77.90714	-1.58083	2.222
Nuevo Rocafuerte	ORELLANA	265	-75.40417	-0.92500	1.752
Otongachi	SANTO DOMINGO	960	-78.94800	-0.31667	1.994

Palanda	ZAMORA CHINCHIPE	1044	-79.13233	-4.64367	1.607
Palmar	MANABÍ	114	-79.95150	-0.03835	1.602
Palmeras	PICHINCHA	1000	-78.92861	-0.30833	1.653
Papallacta	NAPO	3300	-78.14648	-0.36516	2.061
Pasochoa	PICHINCHA	3350	-78.45861	-0.43083	1.875
Patate	TUNGURAHUA	2000	-78.50417	-1.30889	3.719
Patuca	MORONA SANTIAGO	720	-78.25998	-2.75302	1.874
Payamino	NAPO	270	-77.02800	-0.44700	1.886
Pedernales	MANABI	5	-80.05000	0.08306	2.247
Peñaherrera	IMBABURA	1750	-78.53139	0.35750	1.594
Peniel - Quevedo	LOS RÍOS	40	-79.45000	-1.10000	2.57
Pichilingue	LOS RIOS	73	-79.46028	-1.03167	2.33
Pifo	PICHINCHA	2550	-78.34444	-0.22250	3.447
Pilaló	COTOPAXI	2560	-78.99202	-0.94028	1.875
Playa de Oro (Río Santiago)	ESMERALDAS	70	-78.80000	0.88333	2.365
PN Podocarpus (Cajanuma)	LOJA	2450	-79.20000	-4.08333	1.856
Potrerillo	MORONA SANTIAGO	3230	-78.65444	-3.00333	2.318
Pozo Daimi	NAPO	250	-76.18600	-1.01400	1.61
Pozo Ishpingo	ORELLANA	240	-75.63639	-0.91639	5.14
Primavera (La)	ORELLANA	270	-76.76111	-0.41806	7.569
Pucay	AZUAY	2220	-79.25000	-3.20000	2.502
Puerto Ayora	GALÁPAGOS	30	-90.31286	-0.74313	2.67
Puerto Quito	PICHINCHA	180	-79.25242	0.12618	2.586
Puerto Yuquianza	MORONA SANTIAGO	920	-78.23028	-2.93944	1.756
Pululahua	PICHINCHA	2100	-78.51708	0.06685	1.692
Puyo (El)	PASTAZA	950	-77.99111	-1.48861	5.129
Quebrada Bodega Pamba	CHIMBORAZO	3200	-78.89861	-1.84944	2.232
Quebrada Chipiango	LOJA	750	-79.72972	-3.84750	1.968
Quevedo	LOS RIOS	54	-79.46167	-1.03167	6.769
Quinindé	ESMERALDAS	80	-79.46667	0.33306	3.655
Quito	PICHINCHA	2800	-78.50000	-0.16667	38.069
Quito (Carretas)	PICHINCHA	3680	-78.45167	-0.10333	3.292
Quito (El Batán)	PICHINCHA	2800	-78.46879	-0.16903	3.622
Quito (P. Metropolitano)	PICHINCHA	2960	-78.46417	-0.18376	3.392
R. B. Yanacocha	PICHINCHA	3521	-78.5847	-0.11155	0
R. P. F. Cuyabeno	SUCUMBÍOS	200	-76.18169	-0.00976	1.909
Reserva Churute	GUAYAS	7	-79.72000	-2.48000	6.433
Río Bombuscara	ZAMORA CHINCHIPE	980	-78.96056	-4.11361	1.799

Río Calera	EL ORO	300	-79.63100	-3.70300	1.601
Río Catamayo	LOJA	660	-79.87222	-4.18917	1.677
Río Cristal (Balzapamba)	BOLIVAR	810	-79.18778	-1.77333	2.208
Río del Cinto (Mindo)	PICHINCHA	1500	-78.80694	-0.10778	2.158
Río Hollín	NAPO	1100	-77.59040	-0.71502	2.079
Río Liquino	PASTAZA	475	-77.48444	-1.44222	0
Río Mache	MANABÍ	5	-79.88472	0.21500	1.654
Río Mulaute 15 Km NE Sto. Domingo	SANTO DOMINGO	480	-79.11600	-0.08200	1.59
Río Nangaritza	ZAMORA CHINCHIPE	950	-78.67389	-3.92944	1.877
Río Napo (not *Fidena laterina*)	NAPO	450	-77.80278	-1.05833	1.661
Río Negro	TUNGURAHUA	1300	-78.20722	-1.40278	1.777
Río Pangor	CHIMBORAZO	2085	-78.97900	-1.93333	1.824
Río Pau Grande (Tarapoa)	MORONA SANTIAGO	720	-78.23556	-2.83278	2.099
Río Pucuno	NAPO	1250	-77.61400	-0.67191	2.003
Río Sacramento	CHIMBORAZO	1150	-78.02800	-2.14600	1.696
Rio Tendales	AZUAY	880	-79.51018	-3.31285	0
Río Umachaca	PICHINCHA	1300	-78.62700	0.12600	1.629
Río Umbuni	NAPO	460	-77.73167	-1.03194	1.679
Río Valladolid	ZAMORA CHINCHIPE	1100	-79.12861	-4.62111	2.115
Río Yanacachi	CAÑAR	2700	-79.00750	-2.45444	1.626
Río Zaracay	AZUAY	2400	-79.40917	-2.72556	1.663
Riobamba	CHIMBORAZO	2796	-78.64583	-1.66667	10.369
Rumiñahui faldas volcán	COTOPAXI	1820	-78.52167	0.60500	0
Runtún	TUNGURAHUA	2270	-78.41600	-1.40700	2.55
Sacha Lodge	SUCUMBÍOS	230	-76.45938	-0.47081	2.319
Salinas	BOLIVAR	3500	-79.01611	-1.40222	1.874
Samborondón	GUAYAS	20	-79.72306	-1.95889	2.901
San Antonio (Volcán Pululahua)	PICHINCHA	2430	-78.44444	-0.00694	4.058
San Carlos	LOS RÍOS	60	-79.43333	-1.11667	2.612
San Eduardo (Guayaquil - El Salado)	GUAYAS	10	-79.89444	-2.19583	1.894
San Fco. de las Pampas	COTOPAXI	1500	-78.96806	-0.42333	1.875
San Francisco (Muisne)	ESMERALDAS	50	-80.06278	0.65583	1.875
San Gabriel	CARCHI	2842	-77.82798	0.58947	4.14
San Isidro	CARCHI	3050	-77.98691	0.60404	1.875
San Juan	PICHINCHA	2900	-78.62361	-0.28500	2.429
San Lorenzo	ESMERALDAS	5	-78.83522	1.28698	3.756
San Lorenzo (La Boca 16m)	ESMERALDAS	5	-78.83500	1.29139	3.756

San Luis de El Hacho	MORONA SANTIAGO	500	-78.30000	-2.74167	2.433
San Rafael	PICHINCHA	2500	-78.44194	-0.30583	1.649
Cascada San Rafael	NAPO	1500	-77.55833	-0.04556	2.32
San Vicente (Limite Azuay prov.)	MORONA SANTIAGO	2770	-78.58333	-3.03056	3.559
San Vicente	LOJA	1750	-79.44972	-3.94944	2.056
Santa Cecilia	SUCUMBÍOS	317	-76.95419	0.08539	1.692
Santa Clara	PASTAZA	500	-77.89167	-1.29722	2.2
Santa Cruz-Playa	GALÁPAGOS	0	-90.41639	-0.75611	1.157
Santa Elena	SANTA ELENA	10	-80.85611	-2.22167	5.64
Santa Lucía	GUAYAS	30	-79.98639	-1.71306	2.863
Santiago	BOLIVAR	2500	-78.99735	-1.69758	2.25
Santo Domingo (Sto. Domingo)	SANTO DOMINGO	600	-79.17269	-0.25441	6.455
Saraguro	LOJA	2520	-79.24333	-3.62167	2.163
Shell	PASTAZA	1000	-78.05670	-1.49805	2.949
Shell-Mera	PASTAZA	1000	-78.09214	-1.47791	2.863
Shushufindi	SUCUMBÍOS	260	-76.64650	-0.18278	4.248
Sta Rufina	LOJA	850	-79.75968	-3.84648	1.873
Tandapi (Manuel Cornejo Astorga)	PICHINCHA	1470	-78.79667	-0.41444	1.875
Taracoa	ORELLANA	260	-76.77274	-0.49018	1.6
Tarapoa	SUCUMBÍOS	230	-76.33753	-0.11617	2
Tinajillas	MORONA SANTIAGO	2915	-78.55667	-3.03333	2.549
Tinalandia	SANTO DOMINGO	850	-79.05000	-0.30944	1.736
Totoras	BOLIVAR	2800	-78.98058	-1.72553	2.942
Unión del Toachi	SANTO DOMINGO	850	-78.95441	-0.31383	1.686
Unión Río Upano-Paute	MORONA SANTIAGO	420	-78.27500	-2.75300	1.569
Valle de los Chillos	PICHINCHA	2900	-78.53333	-0.31667	1.766
Vía a Balao Chico	GUAYAS	30	-79.69444	-2.73833	1.713
Vía Coca - Loreto Km 26	ORELLANA	300	-77.18304	-0.54295	1.652
Vía La Bonita - La Fama	SUCUMBÍOS	2200	-77.53333	0.53333	2.261
Villano	PASTAZA	552	-77.67812	-1.42180	0
Villano (Kurintza)	PASTAZA	350	-77.51308	-1.50630	0
Villano (Tarangaro)	PASTAZA	340	-77.38208	-1.39552	0
Virgen del Cisne	LOJA	2250	-79.41690	-3.84603	1.873
Yanacocha-Reserva (300m Sur del PC)	PICHINCHA	3520	-78.58442	-0.11309	0
Yanacocha-Reserva (Pastizal arbolado y BMA)	PICHINCHA	3530	-78.58989	-0.11715	0
Yaruquí	PICHINCHA	2570	-78.31667	-0.15806	2.924

Yasuní (SC - Res. Sta. - EC - PUCE)	ORELLANA	250	-76.40050	-0.67131	2.026
Yunkumas, Centro Shuar	MORONA SANTIAGO	1150	-78.24639	-3.06250	3.75
Zamora	ZAMORA CHINCHIPE	970	-78.95226	-4.06643	3.89
Zapotal	SANTA ELENA	30	-80.56335	-2.31770	1.673

The following localities could not be georeferenced because of uncertainity of the data or lack of voucher material

Cercanías Río Aguarico	NAPO
Cerro Chuark Wihp	MORONA SANTIAGO
Chemin entre Guanasilla et San Nicolás	GUAYAS
Coca-Primavera	ORELLANA
Cord. del Cóndor Río Coangos-Río Tsuirin	MORONA SANTIAGO
Cordillera Pucay	AZUAY
Hda. La María 25 Km N Guayaquil	GUAYAS
Hda. La María-25 Km N Guayaquil	GUAYAS
Isla San Cristóbal	GALÁPAGOS
Juturi	NAPO
Limoncocha (Playaco river)	SUCUMBÍOS
Llanganates	TUNGURAHUA
Loja	MORONA SANTIAGO?
Los Rosales de Machay	CHIMBORAZO
Machetes	IMBABURA
Peñaherrera	IMBABURA
Pifo 9 Km al este	PICHINCHA
Pinular (Pinnlar, Pinullar)	IMBABURA
Plataforma Villano	PASTAZA
PNY Yasuní Bloque 31 Pozo petrolero PSCA 2	ORELLANA
Pucay-W Cordillere	AZUAY
Pucay-Santo Domingo	PICHINCHA?
Río Napo (*Fidena laterina*)	NAPO?
Río Napo - Jatun Yacu	NAPO
Río Yananás	MORONA SANTIAGO
Río Yasuní Línea 10 y Sub base Bloque 31	ORELLANA
San Carlos	GUAYAS
Santa Bárbara de Sucumbíos	NAPO
Santa Inés	PICHINCHA
Santa Inéz	PICHINCHA

Santo Domingo to Chiriboga	SANTO DOMINGO
Valle de Azuay	AZUAY
Vía Loreto-Coca 20.7 Km (Este de Tena)	NAPO
Vía Puyo-Tena	NAPO
Volcán Pichincha	PICHINCHA
Yunguilla	AZUAY
Zaruma-Machala	EL ORO