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Abundance and Distribution of Flies Affecting Domestic Animals Including Chickens in Ethiopia: A Review

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Abstract: Many dipterian flies are potential vectors of dreadful diseases. The present review focuses on abundance and distribution of dipterian flies in Ethiopia. Ten families of dipterian flies namely Culicidae (Mosquitoes), Ceratopogonidae (Biting midges), Psychodidae (Sandflies), Simuliidae (Black-flies), Tabanidae (Horse-flies), Muscidae (House-flies), Glossinidae (Tsetse-flies), Calliphoridae (Blow-flies), Oestridae (Bot-flies and others), Hippoboscidae (Louse-flies and forest ked) are found in Ethiopia. There is occurrence of six *Stomoxys* species namely *S. calcitrans*, *S. sitiens*, *S. niger, S. ochrosoma, S. inornatus* and *S. taeniatus* and four tsetse species namely *G.m. submorsitans*, *G. pallidipes*, *G. tachinoides* and *G.f. fuscipes* are found in Ethiopia. Mosquitoes and house-flies are cosmopolitan everywhere in the world including Ethiopia. In Hippoboscidae (Louse-flies and forest ked), *Melophagus ovinus* species is common which reduces production and productivity of sheep. Species of *Phlebotomus* and *Lutzomyia* sand flies are notorious as transmitters of species of *Leishmania* protozoa that cause visceral and cutaneous leishmaniasis in domestic animals and also humans. In Biting midges, *C. imicola* is widely distributed across most sub Saharan African countries except some Central African countries namely Democratic Republic of Congo, Equatorial Guinea, Gabon and Republic of Congo.

Key words: Abundance · Animals · Disease Distribution · Dipterian Flies · Ethiopia

INTRODUCTION

The order Dipteria of the class Insecta includes commonly called true flies or two winged flies. Dipteria is one of the most diverse insect orders, which is estimated 2, 40, 000 species including mosquitoes, gnats, midges, black flies, sand flies, house flies etc [1].

Although about 1, 20, 000 to 1, 50, 000 have been described [2]. This number of species is based primarily on figures extracted from' Bio-Systematic Database of World Diptera' [3]. There are about 86, 000 species of flies other than mosquitoes [4].

Families and genera of dipteran flies are many individual species. Prominent examples are provided from the many species Class Insecta, Order Diptera (two-winged flies), suborder Nematocera (Family Culicidae (Mosquitoes), Family Ceratopogonidae (Biting midges), Family Psychodidae (Sandflies), Family Simuliidae (Black flies). Suborder Brachycera (Family Tabanidae (Horse-flies), Family Muscidae (House-flies and others), Family Glossinidae (Tsetse-flies), Family Calliphoridae (Blow-flies), Family Oestridae (Bot-flies and others), Family Hippoboscidae (Louse-flies) [5].

Flies are abundant and are found in almost all terrestrial habitats in the world except Antartica they colonize beaches to low tide level and high on mountains. More than 150, 000 have been formally described and the actual species diversity is much greater, with the flies from many parts of the world are yet to be studied extensively [6]. The suborder Nematocera are estimated to be a total of about 19, 000species of dipteria in Europe in the Nearctic region, 20, 000 Afrotropical region, 23, 000 in the oriental region and 19, 000 in the Australasia region while most species have restricted distribution, a few like the house fly (*Musca domestica*) are cosmopolitan [7].

Although, the mouth parts of flies are of the sucking type, individuals show considerable variation in structure. Many flies are of great economic importance, some bloodsuckers are serious pests of humans and animals. These insects, along with many scavenging flies,

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important vectors of disease. Many species of flies of the two-winged type, Order Diptera, such as mosquitoes, horse-flies, blow-flies and warble-flies, cause direct parasitic disease to domestic animals and transmit organisms that cause diseases. These infestations and infections cause distress to companion animals and in livestock industry the financial costs of these diseases are high these problems occur wherever domestic animals are reared [8].

In Ethiopia, there is paucity of well documented information on the distribution of fly species and their population density. In spite of the aforementioned prevailing situation and the presence of a number of animal diseases which could be transmitted by the fly. So, the objectives of this review are;

- To provide an overview of abundance and distribution of flies from a veterinary perspective and some of the flies which cause the disease of chickens.
- To provide an overview of the disease-causing relationships between these flies and their host animals.

Overview of Abundance and Distribution of Veterinary Importance Flies in Ethiopia

***Stomoxys* Species (Stable Fly):** The *Stomoxys* flies are as large as *Musca domestica* and they are also called the biting house flies because of their morphology, color and their living habitat associated with human and livestock. The genus *Stomoxys* contains about 18 recognized species. Among them 17 have a tropical distribution and *Stomoxys calcitrans* known is the most important and cosmopolitan species [9]. *Stomoxys calcitrans* is commonly called the stable fly, barn fly, biting house fly, dog fly, or power mower fly [10]. Unlike most members of the family Muscidae, *Stomoxys calcitrans* ('sharp mouth' + 'kicking') and others of its genus suck blood from mammals. Now found worldwide, the species is considered to be of Eurasian origin [11].

As its name suggests, the stable fly is abundant in and around where cattle are kept. Its maggots are often seen in the rotting manure near cattle and poultry [12]. In Ethiopia, according to Mekonnen *et al.* [13], There are occurrence of six *Stomoxys* species namely *S. calcitrans*, *S. sitiens*, *S. niger, S. ochrosoma, S. inornatus* and *S. taeniatus* in Ethiopia. All the six species of stable fly were found in all three agro ecological Zones in the research conducted in Fentale, Bishoftu and Sebeta. The occurrence of *S. calcitrans, S. sitiens, S. taeniatus* and *S. niger* was also reported by Sinshaw *et al.* [14], in his research conducted in three districts bordering Lake Tana of Ethiopia. According to, (30) in a survey of ectoparasite of cattle in Harar and Dire Dawa Districts, there are 6 species of stable flies *S. calcitrans*, *S. sitiens*, *S. niger*, *S. varipes, S. bilineata and S. brunnipes*.

Among the *Stomoxys* fly species trapped in Ethiopia, *S. calcitrans* was confirmed to be the most abundant in all agro climate locations followed to *S. niger*. The population density of *S. ochrosoma* was particularly higher in lowland agro climate, followed by the highland as compared with its occurrence in mid land agro climate Zone. Also the population density of *S. sitiens* was exceptionally high in lowland zone next to *S. calcitrans*.

The period in which *Stomoxys* flies mostly occurs in abundant in Ethiopia are from August to September, the end of long rainy season [15]. High fly population density starts to build up from the month of June and the peak populations were confirmed to occur in August and September which was a mirror reflection with the long rainy season in all agro climate Zones. The reason for high fly population density of flies in the rainy seasons is that rainfall is one factor responsible for breeding of these flies thus flies lay their eggs during rainy season, hatch their egg and finally increase their number.

Some of the reported parasites and diseases for which the stable fly might be a vector include *Trypanosoma evansi* (the agent of Surra), *Trypanosoma brucei*, Brucellosis, Equine infectious anemia, African horse sickness (AHS) and Fowl pox. *S. calcitrans* is also reported to be a vector of *Bacillus anthracis*, the causative agent of anthrax [16].

Table 1: *Stomoxys* flies collected between January, 2010 and December 2011 and the variation of theseason

Months	Highland (sebeta)	Mid-land (Bishoftu)	Lowlands (Fantale)
January	17	11	85
February	16	60	107
March	3	1	1
April	10	2	2
May	16	2	1
June	92	139	3
July	294	260	54
Augusta	1056	1582	1166
September-	1160	1702	429
October	332	136	196
November	261	102	227
December	56	7	65

Family Glossinidae (Tsetse Fly): Tsetse flies are blood sucking flies of the genus *Glossina* that belong to the family glossinidae. They occur only in tropical Africa and they are important as vectors of African trypanosomosis in both animals and man [17].

The tsetse genus is generally split into three groups of species based on a combination of distributional, behavioral, molecular and morphological characteristics. The genus includes:

- The 'savannah' flies: (subgenus *morsitans*, occasionally named *Glossina* (*Glossina austen*, *Glossina morsitans*, *Glossina pallidipes*, *Glossina swynnertoni*),
- The 'forest' flies: (subgenus *fusca*, previously named *Austenia (Glossina fusca fusca*, *Glossina fuscipleuris*, *Glossina frezili*, *Glossina hanington*, *Glossina longipennis*, *Glossina medicorum*, *Glossina nashi*, *Glossina nigrofusca nigrofusca*, *Glossina severini*, *Glossina schwetzi*, *Glossina tabaniformis*, *Glossina vanhoofi*)
- The 'riverine' and 'lacustrine' flies: (subgenus *Palpalis*, previously named *Nemorhina*) (*Glossina caliginea*, *Glossina fuscipes, Glossina fuscipes fuscipes*, *Glossina fuscipes martinii*, *Glossina fuscipes quanzensis*, *Glossina pallicera pallicera*, *Glossina pallicera newsteadi*, *Glossina palpalis palpalis*, *Glossina palpalis gambiensis*, *Glossina tachinoides*).

The tsetse fly lives in nearly 10, 000, 000 square kilometers (4, 000, 000 sq m) in sub-Saharan Africa (mostly wet tropical forest) and many parts of this large area is fertile land that is left uncultivated—also-called green desert not used by humans and cattle. Most of the 37 countries infested with tsetse are poor, debt-ridden and underdeveloped. Of the 39 tsetse-infested countries, 32 are low-income, food-deficit countries, 29 are least developed countries and 30 are among the 40 most heavily indebted poor countries. Only 45 million cattle, of 172 million present in sub-Saharan Africa, are kept in tsetse-infested areas but are often forced into fragile ecosystems like highlands or the semiarid Sahel zone, which increases overgrazing and over use of land for food production [18].

The tsetse flies only live in regions where the average annual temperature is above 20°C of which 25°C is the optimum temperature for their survival. Tsetse flies pass most of their time at rest in shaded places in forested areas and the preferred sites are the lower woody parts of vegetations, many of them hide in holes in the trunks of trees and between roots. They search for food only for very short periods during the day. The flies often rest close to food sources [19]. Common risk areas where animals and people are likely to be bitten by tsetse flies are on forest trails near water collection points in forest and in vegetation close to bathing and water collection sites along the banks of rivers [20].

There are many ecological factors which influence the distribution of tsetse flies, of which temperature, rainfalland vegetation type are the most important ones limiting their distribution [21]. Very cold and hot temperatures are not favorable for their activities as well as infective rates. The mortality rate is very high at temperatures exceeding 30 to 32°C .Their distribution is limited by low rain fall and they are highly populated in the regions receiving more than 1000 mm rain fall [22]. Vegetation is also another most important ecological factor. Their habitat is situated in the areas where forest is dense, bushy lands and savanna grass lands which protect them from disasters due to sun light and wind [23].

In Ethiopia, tsetse fly is found to be widespread covering most parts of the western and southwestern parts of the country. More than 140, 000 km2 fertile agricultural land which is roughly 12% of the country's landmass is found to be a suitable habitat for tsetse fly. This area is long known to be the major tsetse and trypanosomosis belt in Ethiopia [24]. The area is one of the wettest and agriculturally productive parts of the country. Estimates made decades ago reported that 180, 000-220, 000 km^2 land in the western and southwestern parts of the country to be suitable for tsetse. The estimated suitable area in the current study is lower than the estimate made decades ago.

G. m. submorsitans is the most populous Glossina species and widely distributed in western, north western and South-western Ethiopia. *G. pallidipes* is the second species which has the most widespread habitat suitability range covering an area of 59, 687 km2 followed by G. *f. fuscipes* and *G. tachinoides* which have a potentially suitable area of 52, 692 km2 and 44, 417 km^2, respectively.*G. pallidipes* has highly suitable area in Gambella and SNNPR. This species has also some patchy suitable areas in Benshangul Gumuz region. Hemajority of Gambella and the central SNNPR are suitable for *G. f. fuscipes*. This species has also some patchy suitability foci in Benshangul Gumuz and western Oromia. The highly suitable area for *G. tachinoides* was found in western Oromia, Gambella and Benshangul Gumuz regions. *G. tachinoides* has also some patchy suitable areas in SNNPR [25].

Ethiopia has a long history of tsetse infestation. Four tsetse species namely *G.m. submorsitans*, *G. pallidipes*, *G. tachinoides* and *G.f. fuscipes* are found [26]. There are reports of the presence of *G. longipennis* but this species is not one of the major tsetse fly species in Ethiopia.

The tsetse are important as vectors of African trypanosomosis and the tsetse-vectored trypanosomosis affects various vertebrate species including humans, antelopes, bovine cattle, camels, horses, sheep, goats and pigs. These diseases are caused by several different trypanosome species that may also survive in wild animals such as crocodiles and monitor lizards. The diseases have different distributions across the African continent, so are transmitted by different species. This table summarizes this information [27].

Family Hippoboscidea (Ked and Forest Fly): Hippoboscidae, the louse flies or keds, are obligate parasite of mammals and birds. In this family, the winged species can fly at least reasonably well, though others with vestigial or no wings are flightless and highly apomorphic. As usual in their superfamily Hippoboscoidea, most of the larval development takes place within the mother's body and pupation occurs almost immediately [28].

The sheep ked, *Melophagus ovinus*, is a reddish-brown hairyfly that resembles tick. This wingless fly is about 4 to 6mm long and has small head, is a fly from family hippoboscidae. They are blood feeding parasites of sheep. Sheep keds live their whole lives in the wool of the sheep and most commonly found on the neck, shoulder and underbelly of the host animal [29].

In Ethiopia, sheepked (*Melophagus ovinus*) which is wingless dipterian flies of family hippoboscidae affects the production and productivity of sheep. However the prevalence and distribution of sheep ked are scarce, the overall prevalence in different parts of the country is 6.7% in Tigray, 3% in Bahirdar, 20.1% in Gondar, 32.5% in Kombolcha, 16. 4% in Central and 14.2% in Southern Ethiopia [30].

Sheep ked causes Irritation and biting-stress. Damage to skin results in poor quality of leather when they are processed, a condition known as cockle. Sheep-keds transmit the bacterium *Eperythrozoon ovis* to sheep and this infection may cause fever and anemia. They also transmit *Trypanosoma melophagium*, but this protozoan seems non-pathogenic. Louse fly damage birds at once as bloodsuckers and as vectors of pathogenic organism of different nature [31].

Family Cullicidae (Mosquitoes): Mosquitoes are members of a family of nematocerid flies: the Culicidae (from the Latin *culex*, genitive *culicis*, meaning "midge" or "gnat"). Mosquitoes have been classified into 112 genera, some of the more common of which appear below.Over 3, 500 species of mosquitoes have thus far been described in the scientific literature [32].

List of Mosquito Genera:

Aedeomyia Borachinda Johnbelkinia Lutzia Malaya
Aedes Haemagogus *Kimia Mansonia Maorigoeldia*
Anopheles Heizmannia Limatus Mimomyia Onirion
Armigeres Hodgesia Opifex Orthopodomyia Psorophora
Ayurakitia Isostomyia Runchomyia Sabethes Shannoniana
Topomyia Toxorhynchites Trichoprosopon Tripteroides Udaya
Uranotaenia Verrallina Wyeomyia

Mosquitoes are cosmopolitan (world-wide): they are in every land region except Antarcticaand a few islands with polar or subpolar climates. Iceland is such an island, being essentially free of mosquitoes. The absence of mosquitoes from Iceland and similar regions are probably because of quirks of their climate, which differs in some respects from mainland regions [33].

In warm and humid tropical regions, some mosquito species are active for the entire year, but in temperate and cold regions they hibernate or enter diapause. Arctic or subarctic mosquitoes, like some other arctic midges in families such as Simuliidae and Ceratopogonidae may be active for only a few weeks annually as melt-water pools form on the permafrost. During that time, though, they emerge in huge numbers in some regions and may take up to 300 ml of blood per day from each animal in a caribou herd [34].

Mosquito-borne diseases are currently most prevalent in East Africa, Latin America, Southeast Asia and India; however, emergence of vector-borne diseases in Europe has recently been observed In order for a mosquito to transmit a disease to the host there must be favorable conditions, referred to as *transmission seasonality*. Seasonal factors that impact the prevalence of mosquitoes and mosquito-borne diseases are primarily humidity, temperature and precipitation [35].

Family Tabanidae (Horse Fly): Biting flies of the family Tabanidae (Order Diptera) are of both medical and veterinary importance because the females of most

species are blood feeders that can transmit various pathogens to hosts as they feed on animals and humans. Pathogens transmitted by Tabanidae include bacteria, protozoa, helminths and viruses [36]. Moreover, because of their stout mouthparts, tabanids inflict painful bites while feeding, which affect livestock production as the animals are distracted from feeding, resulting in reduced growth rates, weight gain, reduced milk production and reduced drought resistance, among others.

Horse-flies are found worldwide, except for the Polar Regions, but they are absent from some islands such as Greenland, Icelandand Hawaii. Thegenera *Tabanus*, *Chrysops* and *Haematopota* all occur in temperate, subtropical and tropical locations, but *Haematopota* is absent from Australia and South America. Horse-flies mostly occur in warm areas with suitable moist locations for breeding, but also occupy a wide range of habitats from deserts to alpine meadows. They are found from sea level to at least 3, 300 m (10, 800 ft) [37].

Horseflies are known to be potential vectors of anthrax, worms and trypanosomes. Some species, such as *Tabanus bovinus*, prefer bovine animals and are less harmful to humans. The genus contains hundreds of species and many species groups [38]. Female horse-flies can transfer blood-borne diseases from one animal to another through their feeding habit. In areas where diseases occur, they have been known to carry equine infectious anemia virus, some trypanosomes, the filarial worm, anthrax among cattle and sheep and tularemia. They can reduce growth rates in cattle and lower the milk output of cows if suitable shelters are not provided [39].

Blood loss is a common problem in some animals when large flies are abundant. Some animals have been known to lose up to 300 ml (11 imp fl oz10 US fl oz) of blood in a single day to tabanid flies, a loss which can weaken or even kill them. Anecdotal reports of horse-fly bites leading to fatal anaphylaxis in humans have been made, an extremely rare occurrence [40].

Family Oestridae (Bot-Flies and Warble-Flies): Botflies, also known as warble flies, heel flies and gadflies, are a family of flies technically known as the Oestridae. Their larvae are internal parasites of mammals, some species growing in the host's flesh and others within the gut. Their lifecycles vary greatly according to species, but the larvae of all species are internal parasites of mammals. Largely according to species, they also are known variously as warble flies, heel flies and gadflies. The larvae of some species grow in the flesh of their hosts, while others grow within the hosts' alimentary tracts [41]. Oestrid fly are widely distributed on the world. In Ethiopia, there is paucity of information on the occurrence, prevalence, larval burden and associated pathological lesion of larvae of oestried flies. Moreover, farm animals are kept on the pasture throughout all months of the year and the climatic conditions are very conducive for the development and survival of infective stages of many parasites. Few previous investigators have recorded prevalence from 66.7% to 90.9% in sheep and goats in different parts of the country [42].

Myiasis can be caused by larvae burrowing into the skin (or tissue lining) of the host animal. Mature larvae drop from the host and complete the pupal stage in soil. The equine botflies present seasonal difficulties to equestrian care takers, as they lay eggs on the insides of horses' front legs, on the cannon bone and knees and sometimes on the throat or nose, depending on the species.

In cattle, the lesions caused by these flies can become infected by *Mannheimia granulomatis*, a bacterium that causes lechiguana, characterized by rapid-growing, hard lumps beneath the skin of the animal. Without antibiotics, an affected animal will die within 3-11 months [43].

Family Psychodidae (Sand Flies): The Phlebotominae are a subfamily of the family Psychodidae. In several countries, their common name is sand fly; but that name is also applied to other flies known as sandflies.

The Phlebotominae include many genera of blood sucking (hamatophegos)flies, primary vectors of leishmaniasis, bartonellosis and pappataci fever. In the New World, leishmaniasis is spread by sand flies in the genus *Lutzomyia*, which commonly live in caves, where their main hosts are bats. In the Old World, sand flies in the genus *Phlebotomus* spread leishmaniasis.

In feeding on blood, the flies use their mouthparts to start the host bleeding. They then suck up the exposed blood. Like practically all blood-feeding parasites, they inject biochemical that inhibit blood clotting, plus some that stimulate host mast cells to produce histamine; this distends capillary vessels, thereby promoting blood flow.One blood meal can support the production of about 100 eggs. Females lay their eggs in humid soil rich in organic matter [44].

Phlebotomine females and only females, suck blood from various mammals, reptiles and birds. Some species are selective, whereas others bite any suitable host they find. Some species can produce one clutch of eggs before their first blood meal; such females are said to

practiceautogenously or partly autogenously reproduction. Other species need a blood meal before they can produce any eggs at all; they are said to practice an autogenous reproduction. As far as is known, all species need a blood meal for every following clutch of eggs. Proteins and other nutrients in the blood they eat enable the female to produce the proteins and fats necessary for them to produce eggs after using up their bodily food stores [45].

Phlebotomine sand flies can be found between the latitudes 50°N and 40°S, but are absent from New Zealand and the Pacific Island[46]. In Ethiopia, so far 22 species of sand flies have been reported. The sand fly *Phlebotomus orientalis* is the main sand fly in Sudan and Northern Ethiopia where it is frequently associated with *acacia seyal* and *Balanitesaegyptica* wood lands growing in black cotton soils. *P.orientalis* is lowland species but in Ethiopia it is also found in altitudes up to 2000m. In the more southerly visceral leishmaniasis foci, *P. orientalis, P. martini and P. celiae* have been implicated as vectors of *L. donovani* [47].

Species of *Phlebotomus* and *Lutzomyia* sandflies are notorious as transmitters of species of *Leishmania* protozoa that cause visceral and cutaneous leishmaniasis in domestic animals and also humans. Dogs become infected with *Leishmania infantum* and *L. tropica*; the infection can slowly develop into a multi-organ stage with fatal consequences [48]. Cutaneous leishmaniasis, a disease transmitted by sandflies, in North Africa; *Leishmania infantum* = green, *Leishmania major* = blue, *Leishmania tropica* = red. Leishmaniasis, a disease caused by several species of the genus Leishmania, is transmitted by various sandflies. *Leishmania donovani* causes spiking fevers, hepatosplenomegaly and pancytopenia. It can be diagnosed through microscopic review by visualizing amastigotes in containing macrophages and is treatable with sodium stibogluconate [49].

Family Muscidae (House Fly): The house fly is probably the insect with widest distribution in the world. It is largely associated with humans and has accompanied them around the globe. It is present in the arctic, as well as in tropics, where it is abundant. It is present in all populated parts of Europe, Asia, Africa, Australasia and the Americans [50].

Flies can spread diseases because they feed freely on human food and filthy matter alike. The fly picks up disease-causing organisms while crawling and feeding.

Those that stick to the outside surfaces of the fly may survive for only a few hours, but those that are ingested with the food may survive in the fly's crop or gut for several days. Transmission takes place when the fly makes contact with people or their food. Most of the diseases can also be contracted more directly through contaminated food, water, air, hands and person-to-person contact. This reduces the relative importance of flies as carriers of disease.

The diseases that flies can transmit include enteric infections (such as dysentery, diarrhea, typhoid, cholera and certain helminth infections), eye infections (such as trachoma and epidemic conjunctivitis) and poliomyelitis andcertainskin infections (suchas yaws, cutaneous diphtheria, some mycoses and leprosy) [51].

Family Simulidae (Black Flies): The simulidea, commonly known as black flies constitute the family simulidae (dipteria, nematocera). Not all of them are black; some neo tropical species are even predominantly yellow or orange in color.They are stout bodied, small (mostly 2 -6 mm long) flies with high arched mesothorax and short broad and transparent wings.The mouth parts of the female are adapted for blood-sucking but male flies do not bite. Generally black flies are absent from areas devoid of running water such as pola regions and deserts. Regarding members of the complex from East Africa, recently revealed the presence of eight distinct taxa from central and northern Tanzania [52].

Black flies are cosmopolitan in distribution being found almost anywhere if there are suitable rivers and streams for the developmental stages. The outlets of ponds and lakes are also suitable habitats for filter feeding larvae of Simulium [53]. Black flies affect man and his domestic animals both by their bites and as intermediate hosts of parasites [54]. In both tropical and non-tropical areas of the world simuliids can cause a very serious biting problem, since their bites can be painful. Severe biting stress when they seasonally swarm near running water. Severe anaphylaxis may develop rapidly in previously sensitized hosts, potentially leading to death of cattle. *Simulium* black-flies transmit to *Leucocytozoon* protozoa poultry. They also transmit *Onchocerca* nematode worms to cattle causing bovine onchocerciasis [55].

Family Ceratopogonidae (Biting Midges): Typical genera are *Culicoides* and *Leptoconops* (the term "midge" is also used for dipteran flies that are harmless to domestic

animals such as those also known as lake-flies (Chironomidae). Among biting midges, *Culicoides imicola* is one of the most widespread in the world. *C. imicola*is cosmopolitan midge species and have been reported from various geographic areas of the world spanning in its distribution from South Africa to Southern Europe and from southern USA to Southern China. The distribution of *C. imicola* is mainly constrained by climatic factors [56]. Climatic factors particularly temperature and rainfall can promote, enhance or even break critical parts of the life cycle for a given species. Solar radiation, wind speed and water vapour pressure have also been reported to influence the pressure of different insect species [57].

C. imicola is widely distributed across most sub Saharan African countries except some central African countries namely Democratic Republic of Congo, Equatorial Guinea, Gabon and Republic of Congo. Habitat suitability of *C.imicola* was also predicted along Mediterranean coast extending from Morocco to Egypt. Areas to be highly suitable are found in Southern, Southeastern and the horn of Africa.

Severe biting stress to cattle, sheep and horses is caused. Horses suffer from a cutaneous hypersensitivity reaction called sweet-itch, or Queensland-itch that is caused by antigenic components of saliva of biting midges.Poultry may be severely afflicted with biting stress. Species such as *Culicoides imicola* and *Culicoides variipennis* transmit bluetongue virus between sheep and cattle and they transmit African horse sickness virus between horses and other equids. *Culicoides* midges transmit *Leucocytozoon* protozoa to poultry (birds) [58].

CONCLUSION AND RECCOMENDATION

Flies that have veterinary importance were proved to be widely distributed in Ethiopia. These flies were confirmed to be evident throughout the country with some variations among the different ecologies. The list of the fly species is not complete. With the evolving environment and climate change, there is a need for more intensive survey to trap and register different species of flies not recorded. The presence of high density of these flies poses a health risk and rise concerns about the protection of animals in the country. Based on the above conclusion the following recommendation are forwarded,

- To establish the status of the flies of veterinary importance and the disease in Ethiopia, extensive entomological and parasitological surveys should be carried out in the country.
- Further investigations to elucidate the animal health significance in the area.
- Need to implement strict fly control to minimize or eliminate the risk of animal disease which could be carried by these flies.

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