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# *Review on: Abundance and Distiribution of Flies Affecting Domestic Animals Including Chickens in Ethiopia*

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## *Summary*

*Order dipteria of class Insect is of immense importance for animal health. Many dipterian flies are potential vectors of dreadful diseases.The present review fulfills the need and focus on abundance and distribution of dipterian flies in Ethiopia. Ten families of dipterian flies 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. Horse-flies are blood sucking and found worldwide, except for the Polar Regions.*

*Lutzomyia sandflies are notorious as transmitters of skin and visceral leishmaniasis in humans and domestic animals.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.*

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## Introduction

The order dipteria of class insect includes commonly called true flies or two winged flies. Dipteria is one of the most diverse insect orders, which is estimated 2,40,000species 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. There are several families of insect flies (two-winged flies) and many species of dipteran flies. Examples are given from the many insect families and species of these flies [5,6].

Worldwide, flies are abundant and found in almost every terrestrial habitat except Antartica. they colonize beaches to low tide level and high on mountains. There are more than 150,000 species described formally, and the actual variety of species is much more diverse.There are still many flies from many parts of the world to study extensively [7]. There are around 19,000 species of dipteria in Europe under the Nematocera suborder,Nearctic regions receive 20,000 students, Afrotropical regions 23,000, oriental regions 23,000, and western regions 19,000 Many species in the australasia region have restricted distributions, but a few, such as the house fly (Musca domestica), are cosmopolitan [8]. 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, 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 [9].

In Ethiopia, there is paucity of well documented information on the distribution of fly species and their populationdensity. 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 flying insects from a veterinary perspective

- To provide an overview of abundance and distribution of flies andFlying insects from a veterinary perspective and some of the flies which couse the disease of chickens.
- To provide an overview of those diseases which caused by the fly's relationships with its host.

## 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 Stomatoxis calcitrans is frequently referred to as the stable fly, barn fly, biting house fly, dog fly, and power mower fly [10,11]. The species of Stomoxys calcitrans ('sharp mouth' with 'kicking') and other members of the family Muscidae ingest human blood. The species, which is found worldwide, belongs to the genus Eurasiana [12].

There are a lot of stable flies in or around cattle barns, as their name suggests.Its maggots are often found in rotting manure near livestock and poultry [13]. In Ethiopia, according to, There are occurrence of six Stomoxys species namely S. calcitrans, S. sitiens, S. niger, S. ochrosoma, S. inornatus and S. taeniatus in Ethiopia [14]. 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. nigerwas also reported by, in his research conducted in three districts bordering Lake Tana of Ethiopia [15]. According to, in a survey of ectoparasite of cattle in Harar and Dire Dawa Districts, there are 6species of stable flies S. calcitrans, S. sitiens, S. niger, S.varipes, S.bilineata and S. brunnipes [16].

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 [14].

The period in which Stomoxys flies mostly occurs in abundant in Ethiopia are from August to September, the end of long rainy season [17]. 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. There was also slight increase in fly population density in February when the relative moisture raised in this month [14]. 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 [17].

In addition to Trypanosoma evansi, there are many parasites and diseases for which stable flies may act as vectors.Among these are Trypanosoma brucei, Brucellosis, Equine infectious anemia, African horse sickness (AHS), and Fowl poxMany researchers have reported that Bacillus anthracis, the cause of anthrax, is found in calcitrans [18].

**Table 1:** Stomoxys Flies Collected between January, 2010 and December 2011 and the Variation of the Season.

| Months | High land (Sebeta) | Mid land (Debre Zeit) | Low land (Fentele) |
|---|---|---|---|
| January | 17 | | 85 |
| February | 16 | 6 | 107 |
| March | 3 | 1 | 1 |
| April | 10 | 2 | 2 |
| May | 16 | 2 | 1 |
| June | 92 | 139 | 3 |
| July | 294 | 260 | 54 |
| August | 1056 | 1582 | 1166 |
| September | 1160 | 1702 | 429 |
| October | 332 | 136 | 196 |
| November | 2 | 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 [19]. They occur only in tropical Africa, and they are important as vectors of African trypanosomosis in both animals and man [19].

- Based on a combination of distributional, behavioral, molecular and morphological characteristics, the Tsetse genus can be divided into three groups of specie. Savannah flies: (genus Morsitans, often designated Glossina (Glossina austen, Glossina morsitans, Glossina pallidipes, Glossina swynnertoni).
- The 'forest' flies:
- The 'riverine' and 'lacustrine' flies:

The tsetse fly lives in nearly 10,000,000 square kilometers (4,000,000 sq m) in sub-Saharan Africa and many parts of fertile land that is left uncultivated Most of the 37 countries infested by tsetse are poor and underdeveloped. Thirty-two of the 39 tsetse-infested countries are low-income countries with food shortages. Among the 39 countries, 29 are the least developed, and 30 are among the 40 most heavily indebted poor countries. Of the 32 food-deficit countries, 32 are low-income countries.

Only 45 million of the 172 million cattle in sub-Saharan Africa are kept in tsetse-infested areas. However, they are often forced into fragile ecosystems like highlands or semi-arid regions in the Sahel zone, which increases overgrazing and overuse of land for food production [20].

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 [19]. 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 [9]. 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 [21].

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 [22]. 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 [21]. Their distribution is limited by low rain fall, and they are highly populated in the regions receiving more than 1000 mm rain fall [23]. 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 [24].

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 [25]. The area is one of the wettest and agriculturally productive parts of the country. Estimates made decades ago reported that 180, 000 - 220, 000 km2 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 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, 27]. There are reports of the presence of G. longipennis but this species is not one of the major tsetse fly species in Ethiopia [26].

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 km2, respectively.G. pallidipes has highly suitable area in Gambella and SNNPR. This species has also some patchy suitable areas in Benshangul Gumuz region. he majority 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 [26].

The tsetse are important as vectors of African trypanosomosis and the tsetse-vectored trypanosomosis affects Humans, antelopes, bovine cattle, camels, horses, sheep, goats, and pigs are among the vertebrate species living in the regionA number of trypanosome species can cause these diseases, which may also be transmitted by wild animals including crocodiles and lizardsIn addition to different disease distributions on the continent, different species transmit the diseases.

**Table 2:** Glosina Spp.,Spp.Affected, Distribution and Diseascoused by Vectors

| Disease | Species affected | Trypanosoma agents | Distribution | Glossina vectors |
|---|---|---|---|---|
| Sleeping sickness — chronic form | Humans | T. brucei, gambiense | Western Africa | G. palpalis<br>G. tachinoides<br>G. fuscipes<br>G. morsitans |
| Sleeping sickness — acute form | Humans | T. brucei, rhodesiense | Eastern Africa | G. morsitans<br>G. swynnertoni<br>G. pallidipes<br>G. fuscipes |
| Nagana — acute form | antelope<br>cattle<br>camels<br>horses | T. brucei | Africa | G. morsitans<br>G. swynnertoni<br>G. pallidipes<br>G. palpalis<br>G. tachinoides<br>G. fuscipes |
| Nagana — chronic form | cattle<br>camels<br>horses | T. congolense | Africa | G. palpalis<br>G. morsitans<br>G. austeni<br>G. swynnertoni<br>G. pallidipes<br>G. longipalpis<br>G. tachinoides<br>G. brevipalpis |
| Nagana — acute form | domestic pigs<br>cattle<br>camels<br>horses | T. simiae | Africa | G. palpalis<br>G. fuscipes<br>G. morsitans<br>G. tachinoides<br>G. longipalpis<br>G. fusca<br>G. tabaniformis<br>G. brevipalpis<br>G. vanhoofi<br>G. austeni |
| Nagana — acute form | cattle<br>camels<br>horses | T. vivax | Africa | G. morsitans<br>G. palpalis<br>G. tachinoides<br>G. swynnertoni<br>G. pallidipes<br>G. austeni<br>G. vanhoofi<br>G. longipalpis |

| | | | | |
|---|---|---|---|---|
| Surra — chronic form | Domestic pigs warthog (Phacochoerus aethiopicus) forest hogs (Hylochoerus spp.) | T. suis | Africa | G. palpalis<br>G. fuscipes<br>G. morsitans<br>G. tachinoides<br>G. longipalpis<br>G. fusca<br>G. tabaniformis<br>G. brevipalpis<br>G. vanhoofi<br>G. austeni |

### Family Hippoboscidea (Ked and Forest Fly)

Hippoboscidae are obligate parasites of mammals and birds, including louse flies and keds. Most of the winged species in this family can fly at least reasonably well, but those with vestigial or no wings are flightless and highly apomorphic. Typical of their superfamily Hippoboscoidea, most larval development occurs inside the mother; pupation follows almost immediately [28].

A fly from the family hippoboscidae, this wingless fly is about 4 to 6mm long and has a small headIt is most commonly found on the neck, shoulder, and underbelly of the sheep where sheep keds live their whole lives [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 Leather deteriorates because of skin damage during processing, a condition called cocklingSheep-keds can transmit the bacterium Eperythrozoon ovis to sheep, causing fever and anemia as a resultIn addition, they transmit Trypanosoma melophagium, but this protozoan is not pathogenic. Louse fly damage birds at once as bloodsuckers and as vectors of pathogenic organism of different nature [31].

### Family Cullicidae (Mosquitoes)

In the class of nematocerid flies called Culicidae, mosquitoes fall under the genus culex (meaning "midge" or "gnat"); this represents the family of insects known as Culicidae.. There are currently more than 3,500 mosquito species described in the scientific literature [32]. Mosquitoes are classified into 112 genera with some of the more common appearing below.

Mosquitoes are cosmopolitan (exist on every continent except Antarctica) The absence of mosquitoes from Iceland and similar regions may be due to some differences in their climate from mainland regions [33].

Some mosquito species can remain active throughout the year in warm and humid tropical areas, but in temperate and cold regions, they hibernate or enter diapauseArctic or subarctic mosquitoes may be active for only a few weeks annually when melt-water pools form on permafrost as melt-water pools form on the permafrost. However, they emerge in great numbers during that time in some regions and may take up to 300 ml of blood per day from each animal in a herd [34].

There have been recent reports of vector-borne diseases emerging in Europe as well as East Africa, Latin America, and Southeast Asia The season of transmission is a critical factor in determining the chances of a mosquito transmitting a disease to a host [35]. Among the seasonal factors that affect the prevalence of mosquitoes and mosquito-borne diseases are humidity, temperature, and precipitation [36].

### 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 [37]. Moreover, because of their stout mouthparts, tabanids inflict pain¬ful 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. The bite site may also predispose the animal to secondary infections, resulting in loss of hide quality (Yagi, 1968). They can be found throughout the world except in the Polar Regions. However, they do not occur on some islands, including Greenland, Iceland, and Hawaii.Thegenera Tabanus, Chrysops, and Haematopota are all found in temperate, subtropical, and tropical regions, but Haematopota is absent from Australia and South AmericaAt least 3,300 m (10,800 ft) above sea level they are found [38]. They are mainly found in warm, humid areas with suitable breeding habitats for horse flies, but they also inhabit deserts and alpine meadows.

A large number of species and species groups exist within the genus. It is possible for female horseflies to transmit diseases to other animals through their feeding habits[39]. Horses have been known to carry equine infectious anemia virus, some trypanosomes, filarial worms, anthrax among cattle and sheep, and tularemia in areas where diseases occurIn the absence of suitable shelters, they can reduce cattle growth and lower milk production [40].

During the summer time when large flies are in abundance, some animals suffer from blood loss.Anecdotal reports of horse-fly bites causing fatal anaphylaxis in humans have been reported [41].

### Family Oestridae (Bot-Flies and Warble-Flies)

A botfly, also known as a warble fly, a heel fly, or a gadfly, belongs to the Oestridae family of flies. Larvae of certain species grow in host flesh while others grow inside the gut of mammals. Despite the vast differences in life cycles among species, all larvae are parasites of mammals. In some species, the larvae grow in the flesh of their hosts, while in others, they grow within the digestive tracts of their hosts [33].

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].

Pupation takes place in soil after the larvae drop from the hostThe parasites are parasites, not disease-causing agents [33]. In addition to their eggs being laid on horses' insides, their larvae may also be found inside the joints of their front legs, inside their cannon bones, and on their knees, as well as on their throats and noses depending on the species [43].

The lesions caused by these flies can become infected by Mannheimia granulomatis, a bacteria that causes lechiguana, characterized by rapid-growing, hard lumps beneath the skin of the animal.

### 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 Phlebotomine females, and only females, suck blood from various mammals, reptiles and birds [44]. 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].

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 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 [47]. 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 [48].

Leishmania spp. infect domestic animals and humans as well as being vectors of parasitic organisms, including Phlebotomus and Lutzomyia sandflies Cutaneous leishmaniasis is an infectious disease that is transmitted by sandflies; Leishmania infantum is green, Leishmania major is blue, and Leishmania tropica is red [49]. Sandflies carry various species of the genus Leishmania, which causes leishmaniasis. The cause of spikes is Leishmania donovani fevers, hepatosplenomegaly, and pancytopeniaUpon microscopic review, amastigotes within macrophages may be observed and diagnosed. is treatable with sodium stibogluconate [50, 51].

## Family Muscidae (House Fly)

Humans have largely been associated with it, as it has accompanied them around the globeThe virus is found in all populated parts of Europe, Asia, Africa, Australasia, and the United States [52].

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), poliomyelitis andcertainskin infections (such as yaws, cutaneous diphtheria, some mycoses and leprosy) [53].

## 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 [54].

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 [55]. Generally black flies are absent from areas devoid of running water such as polar regions and deserts Regarding members of the complex from East Africa, recently Procunier and Muro (1993) revealed the presence of eight distinct taxa from central and northern Tanzania [54]. Black flies affect man and his domestic animals both by their bites and as intermediate hosts of parasites [56]. In both tropical and non-tropical areas of the world simuliids can cause a very serious biting problem, since their bites can be painful. Leucocytozoon

protozoa are transmitted by Simulium blackflies. Swarming near running water during the season causes severe biting stress. In addition, they transmit Onchocerca nematode worms to cattle, causing bovine onchocerciasis [57].

### Family Ceratopogonidae (Biting Midges)

Genera typical of the midge family are Culicoides and Leptoconops (the term "midge" can also be applied to dipteran flies 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 [58].

C. imicolais 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 [58]. 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 [59].

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 [26].

Horses suffer from a cutaneous hypersensitivity reaction called sweet-itch, or Queensland-itch, which is caused by antigenic components of biting midges' saliva. There are species such as Culicoides imicola and Culicoides variipennis that transmit bluetongue virus to sheep and cattle, as well as African horse sLeucocytozoon protozoa infect poultry (birds) when carried by Curicoides midges [60]. Ickness virus to horses and other equidsLeucocytozoon protozoa infect poultry (birds) when carried by Curicoides midges [60].

### Conclusion and Reccomendation

Flies that have veterinary importance were proved to be widely distributed Ethiopia. These flies were confirmed to be evident throughout the country with somevariations 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 ofthese flies poses a health risk and rise concerns about theprotection 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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