CHAPTER ONE
INTRODUCTION

) Background:

Cattle, colloquially referred to as cows (*Bos* sp.*)* are domesticated ungulates a member of the subfamily Bovine of the family Bovidae. They are raised as livestock for meat (called beef and veal), dairy products (milk products), leather and draft animals (pulling carts, ploughs etc.). In some countries like India & Nepal they are honored in religious ceremonies and revered. It is estimated that there are 1.3 billion cattle in the world today (Shrestha, 1983). Regarding Nepal agriculture dominates the economy of Nepal with livestock revenues accounting for 30% of the Agriculture Gross Domestic Product (AGDP). Nepal has strong animal agriculture with 14% of the national gross domestic product desired from livestock. More than 90% of the farmers in rural areas supplement their income by the sale of products from domestic animals.

Cow *(Bos* sp.*)* the national animal of Nepal has many significances. It is a domestic animal rared in Nepal by farmers since Junga Bahadur Rana's regime. Hindu worship cow in the form of goddess Laxmi. In Hinduism the cow is a symbol of wealth, strength, abundance, selfless giving and a full earthly life. According to Vedic scripture they are to be treated with the same respect as "one's mother because of milk they provide." The cow is my mother. The bull is my sire". In ancient rural India every household has a few cows which provided a constant supply of milk and a few bulls that helped as draft animals. Many Hindus fell that at least it was economically wise to keep cattle for their milk rather than consume their flesh for one single meal (Boitani and Bartoli, 1990).

According to "Gandhiji "The cow means the entire sub-human world extending man's sympathesis beyond his own species. The cow is the best giver of plenty. Not only did she give milk, but she also made agriculture possible. The cow is a poem of pity; one reads pity in the gentle animal. She is the second mother to millions of mankind. Protection of cow means protection of the whole dumb creation of god.

Present status shows the world cattle population is estimated to be about 995,838,000 head. India is the national with the largest number of cattle, about 281,7000,000 or 28.29% of the world cattle population followed by Brazil 18%, China 14%, USA 10%, EU 8%, Agrantina 6%, Australia 3%, South Africa 1.42%, Canada 1.5% and rests others (Thenius, 1990).

Cattle today are the basis of multibillion dollar industry worldwide. The international trade in beef for 2000 was over $30 billion and represented only 23% of world beef production (Clay, 2004). The production of milk which is also made into cheese, butter, yogurt and other dairy products is comparable in economic size to beef production and provides an important part of the food supply for many of the world's people. Cattle hides used for leather to make shoes and clothing are another widespread product. Cattle remain broadly used as draft animals in many developing countries such as India.

Cattle is both a plural and a mass noun, but there is no singular equivalent as 'three cattle' or 'some cattle'. Cattle raised for human consumption are called "beef cattle" within the beef cattle industry in parts of the USA, the term "beef" (plural beeves) is still used in its archaic sense to refer to an animal of either gender . Cows of cestain breeds that are kept for the milk they give are called "dairy cows" or 'milch cows". The gestation period for a cow is nine months. A new born calf weighs 25 – 45 Kg.

Cattle especially when kept on enormous feedlots such as this one-have been named as contributing factor inthe rise in green house gas emissions. A 400-page United Nations report fromthe food and Agriculture Organization (FAO) states that cattle farming is "responsible for 18% of green house gases.

) Species of Cattle :

Cattle were originally identified by Carolous Linnaeus as three separate species. These wre *Bos taurus*, the European cattle including similar types from Africa & Asia, *Bos indicus* the Zebu, and the extinct *Bos primigemius* the auroachs. The auroachs is ancestral to both Zebu & European cattle. More recently these three have increasingly been grouped as one species (They, 2003).

Locally in our community three species viz, local, jersey & Holestein has been reared since long.

Livestock farming is an integral part of Nepalese agriculture in national economy. Cattle farming covers maximum percent of livestock farming.

Diseases leading to suboptimal production or death can have a major economic effect on a community reliant on cattle. Helminthic diseases are the most occurring diseases to cause economic loss in the livestock farming. Nematodes, trematodes & Cestodes are mostly found in cattle (Annual Report, 1999/2000).

) Research site – A brief Profile

Nepal is an underdeveloped country with richest biodiversity due to its unique geographical position. It is surrounded by China at the North and India at the East-West and South. It is located 80° 4" in the east to 88° 12" in west longitude and 22° 22" in north to 30° 27" south latitude. It has 75 districts and 14 zones and five development regions as administrative divisions. The country is divided into three regions viz, the terai region, the hilly region and the Himalayan region. Jhapa district lies in easternmost terai region of Nepal.

Research site "Anarmani VDC 2" lies under Jhapa district of Mechi zone. The climate over there is hot and humid. It is under eastern development region. The district is surrounded by Darjeeling district (India) in the east and Galgalia (India) in the south. In the north lies Illam district and Morang in the west.

The very research site 'Anarmani VDC 2' lies near the Birtamod city on the way to Chandragadi (Headquarter of Jhapa district). Anarmani VDC stands at an elevation of approximately 113 m from the sea level. The village is surrounded by VDC's like Charpane, Garamuni, Sanischare, Duwagadi etc.

Ethnically, Chhetri, Brahman, Satar, Rajbanshi, Mechae, Chandhari, Tamang, Limbu, Rai, Magar etc lives in the VDC. the main profession is agriculture. Every house rares cattle and buffalo which supports the economic condition by milk and milk products. The bulls are used to plough the field and to pull cart.

) Statement of the Problem

Anarmani VDC is purely a village where 90% of the total population directly depends upon agriculture. Therefore livestock plays an important component of farming system and this contribute significantly to food and economic security in the district. Cattle contribute approx 65% of the milk production.

The cattle grazes in marshy forest nearby which favours parasitic infection. Among the parasitic infection locally called "NAMLE" infects more of the cattle and buffaloes. Besides Namle (called liverfluke) other parasites also infects the cattle. (source – Village animal hospital)

) Parasites & Parasitism

Parasitology is essentially a branch of biology, ecology, economic zoology & medical zoology providing us knowledge about structure & life cycle of the parasites, etiology, epidemiology origin of infection and transmission, risk factors economic importance, pathogenesis, clinical findings and pathology diagonisis ever treatments and control that can be applied in our daily life.

Parasitism a heterogenetic association can be considered as an ecological relationship between two populations of same or different species in macromolecular contact and "genetic dependences" with each other of which one the parasite, lives and feeds temporarily or permanently, either in or on the body of the other large organisms called the hosts to get nourishment & shelters. The parasites are biologically, economically, ecologically, physiologically & metabolically closely connected with their hosts throughout their life-span, where the hosts resists by producing antibodies and become adopted or tolerated to the parasitic presence. The word "Parasite has been derived from the Greek words (Gr. Para besides, situs – food) meaning eating in addition to food (Parija, 1990).

Endoparasites are those organisms living within their hosts, in the gut, body cavity, liver, lungs, gall bladder and blood or within the internal cavities, tissues or cell of the host. Such forms nearly always live a completely parasitic existence. Since they totally depend upon their host, endoparasitism is also referred to as infection.

Fasciola sp., *Trichostronglus* sp., *Schistosoma* sp. for examples are typical endoparasites.

Infection with gastrointestinal nematodes is regarded as one of the important factor causing productivity loss (Shrestha 1994). The most important and widely prevalent nematodes are *Ostertagia* sp., *Trichostrongylus* sp., *Cooperia* sp., *Oesophagostomum* sp. etc. These nematodes in the small intestine may cause severe damage to the intestinal mucous membrane. *Toxocara* sp., *Dictyocaulus* sp. has the worldwide distribution and the prevalence is higher in cattle & buffaloes (Karki, 2005).

Cestodes found in gut and acquired by eating contaminated food or water found to be largely affecting the ruminants. This group comprises the genera *Moniezia* sp. which are cosmopolitan in distribution and *Taenia* sp. which are commonly found in the rumen of the domesticated and wild carnivores They have reported from Asia and Africa (Karki, 2005).

Trematodes commonly known as flukes often live in the bile duct or small intestine and may also affect the lungs. Their eggs are passed with the faeces of the host. Some are ingested but some burrow into the skin after hatching for access. Trematodes especially include *Fasciola* sp, *Schistosoma* sp. & *Paramphistomum* sp. (Shah and Agrawal, 1990).

Fascioliasis is a well known parasite of herbivorous animal. It has worldwide distribution on the animal reservoir host. A large variety of animals such as cattle, buffaloes show infection rate that varies from 70% to 90% in some areas. The different local names of these diseases, such as Namle, Matey, Lew etc. in different regions are proof of its continued existence for many yrs. in the animal population of the country.

Infection of domestic ruminants with *Fasciola hepatica* and *F. gigantica* causes significant loss estimated at over US$ 2000 million per year to the agriculture sector worldwide with over 600 million animals affected (Hansen, 1994).

The economic loss due to fascioliasis in Nepal was estimated to be Rs. 14.2 crore (Lohani & Rasaili, 1995). The prevalence of fascioliasis ranging between 50% to

90% has been reported in cattle. In addition fascioliasis is now recognized as an emerging human disease.

Cestode *Moniezia* sp. in ruminants of the cattle causes infectious by ingesting herbage contaminating mites carrying the infective stage of the parasite. Heavy infections cause poor growth and diarrhea in lambs.

Taenia saginata usually called cow or buffalo tapeworm has two hosts viz., Definitive host man and intermediate host cow or cattle. It is also called beef tapeworm. The worms (segments) passes out alongwith the faeces of human being and when ingested by cattle, infects them on reaching alimentary canal of the host, the eggs hatch out and liberated, they penetrate the gut wall and enter mesenteric lymphatics and finally reaches circulation. Then they invade the muscular tissue and undergo further development.

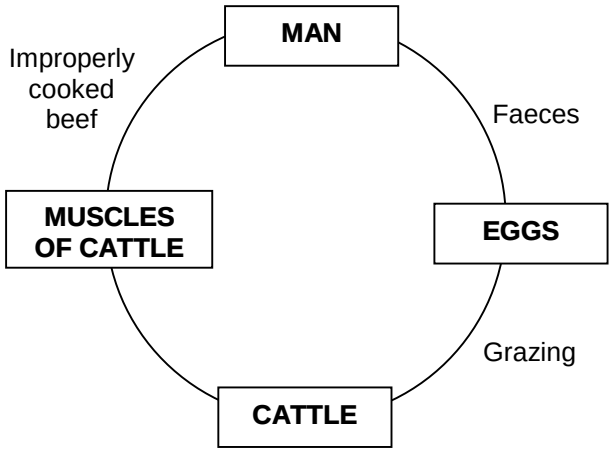

Fig. 1 : Lifecycle of *Taenia saginata*

The pathogenic effects of gastrointestinal parasites may be sub-clinical or clinical. Young animals are most susceptible. The effect of these parasites is strongly dependent on the number of parasites and nutritional status of the animal they are infecting. The clinical sign comprise of weight loss, reduced food intake, diarrhoea and reduced yield. Severe blood and protein loss intro abomasums and intestine due to damage caused by the parasite often results in Oedema in the submandibular region. Some nematode species especially *Haemonchus* sp. is most pathogenic among blood sucker and infectious with large no of this parasite often results in severe anaemia in the host.

The important species of snail involved in the transmission of fascioliasis vary in their geographical distribution in the world Man and herbivorous animals (cattle) acquire infection by the ingestion of moist and raw aquatic plants such as water, grass harbouring infective metacereacriae. The metacercariae mature to become adult worms and lay eggs which are passed in the faeces. On coming in contact with water, they mature and invade the moluscan host, the freshwater snail. The mature cercariae emerge out of the snail and encysted on aquatic grasses, plants and develop into metacererariae which is the infective stage of the parasite.

Fasciola hepatica and *Fasciola gigantica* have similar inhabit the bile ducts of final hosts (cattle). The parasite produces eggs which are expelled with the bile into the intestine and shed in the faeces as, Eggs | Free swimming miracidium | Cercariae | Metacercariae | Adults.

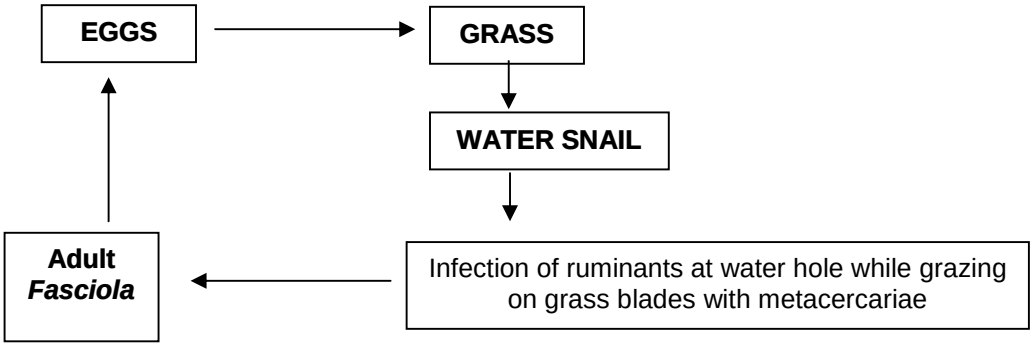

Fig. 2: Life-cycle of *Fasicola* sp.

Trichostrongyliasis is an infection of the gastro-intestinal tract of herbivorous animals and man is the accidental host, caused by the member of the germs *Trichostrongylus* sp. The infection is acquired by the ingestion of contaminated vegetables or drinks with the third stage larvae. Strongyloidiasis is an intestinal infection of man caused by the peretration of the skin by the filariform larvae of *Strongylodies stercoralis* . Toxocariasis in human as widely distributed throughout the world in both temperate and tropical countries. Man acquires infection accidently by the ingestion of larvae of this nematode in the inadequately cooked food of paratenic host (Williams, 1999).

Previous study at Lumle Agricultural Research centre (LARC) has identified the diseases prevalence by mainly affected by the availability of Khet and, paddy cultivation and permanent water sources, rather than altitude (Joshi, 1988). Rice straw which is the major feed for livestock during winter months has been reported as

the potential source of infection for fascioliasis (Joshi, 1987 & Mahato, 1993). Green grasses from near permanent water sources or water lodging areas in Monsoon are another potential source of *Fasciola* infection. Therefore in the Nepalese hills, the major risk period of *Fasciola* infection is during post monsoon and winter months.

Dicrocoelium spp. was first reported by Mukhia in 2007 buffaloes where prevalence rate was found upto 29.61%

Schistosoma spp. are the only trematodes that live in the blood stream of warm blooded hosts. The blood stream is rich in glucose and amino acids. So along with the plasma and blood cells, it represents an environment which is suitable for egg producing trematodes. *Schistosoma* spp. causes diseases called schistosomiasis or Bilharziasis and is the main helminth diseases. The infections are often manifest by acute intestinal signs, the muscosa of the intestine is severally damaged and the animal develops profuse bloody diarrhea, dehydration and loss of appetite. Not only cattle, over 200 million people are infected in at least 75 countries with 500 million or more people exposed to infection. (Arcari, 2000). Most of the species like *Schistosoma spindalia, S. japonicum* & *S. bovis* has been reported among buffaloes from Surkhet district (Ghimire, 1987). In Satungal, Kathmandu prevalence rate of *Schistosoma* sp. was found about. 9% (Mukhia, 2007).

Regarding gastro-intestinal roundworms of cattle, *Trichostrongylus* sp., Hookworms, *Ascaris* sp., *Strongyloides* sp., *Toxocara* sp. are the common occurrence. Female roundworms lay microscopic eggs that pass in the manure of cattle. Within few days the larva hatches from the egg. The larva pass via second and third stage. They infect the pasture. Cattle becomes infected when grazes on contaminated pasture. The larva mature in the intestine, mate and begins sheding eggs. Adult roundworms can cause anaemia, diarrhoea,poor growth and even death.

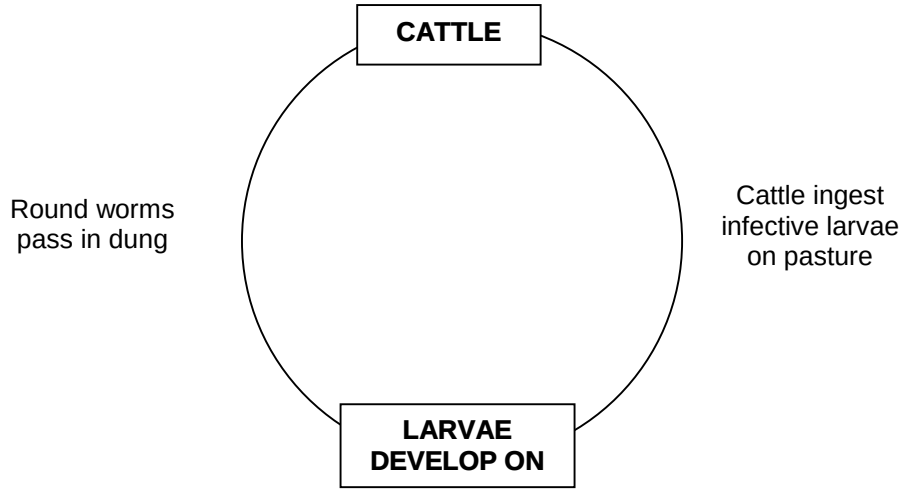

Fig. 3: Life-cycle of gastrointestinal roundworms in general

Table 1: Parasites and their host with location of infection

S.N	Parasite	Definitive host	Location
a.	*Trichostrongylus* sp.	cattle, sheep, goat, man, pig & horse	small intestine, abomasum & omasum
b.	*Schistosoma* sp.	cattle, buffalo & goat	Mesenteric veins
c.	*Dipylidium* sp.	Man, cattle, dog & cat	small intestine
d.	*Toxocara vitulorum*	Buffalo, cattle, calves	small intestine
e.	*Fasciola* sp.	Sheep, goat, cattle, dog, cat & man	liver, lungs, bile duct & kidney

Source: Chandler, ASA.C.

J Significance of the study

People are unaware about the pathogenicity of helminthes to the cattle and results decrease in dairy products. In the study "an effort has been made to identify the prevalence of different helminth parasites. Scanty work has been done previously in Nepal.

Moreover the present study may help to the future investigator to advance their knowledge. The present study throws light on different problems found by public and butcher notifying the burden of infection of the trematode. The next step to be considered are the most practical economic way by which goal can be achieved. Continuous research is vitally important.

CHAPTER TWO

OBJECTIVES

Parasitic infection is a major problem in domestic animal. Cattle are infected mostly by helminthes like liverfluke, blood fluke etc. which directly or indirectly hampers livestock & its products. So the proposed study deals on intestinal parasitic diseases causing economic losses to the farmers.

⁾ General Objectives

To study the intestinal helminth parasites of cattle of 'Anarmani VDC 02' of Jhapa district.

⁾ Specific Objectives

- To identify helminth parasites up to genus level
- To determine the prevalence of trematodes, cestodes and nematodes.
- To determine the prevalence of helminthes
    a. Sex – wise
    b. age – wise &
    c. season – wise
- To develop the recommendation for further planning regarding the control of helminth parasites in cattle.

⁾ Hypothesis

H_0 = The prevalence of three different classes of helminthes is same.

H_1 = The prevalence of three different classes of helminthes is different.

CHAPTER THREE
JUSTIFICATION

Yearly many cattle have been dying due to parasitic infections, hence the economic status of the people have been deteorating to some extent. According to recent data 31.05% of the world total population of cattle have been dying due to parasitic infections only. So, this is no exception to Nepal and Jhapa district too.

Study on endoparasites of cattle in my own village (Anarmani VDC 2) has not been done yet. Hence the study may be very useful to the presence of parasites & to check the probable and occasional death of cattle by parasites which in turn aids for the longivity of cattle's life. To save the species, for the sake of people which in turn help to uplifts the economic condition of the public, the research is done.

This study will provide some baseline information to reduce the unexpected mortalities and production loss and alleviate the income of the rural communities of similar agri-ecozone.

CHAPTER FOUR

LIMITATIONS OF THE STUDY

Research studies face many problems, so obviously have limitations to the study. The present study no doubt, bears the following limitations.

- This academic study has been carried out for the partial fulfillment of the requirements for the Master's Degree in Zoology at Tribhuvan University, Kathmandu, Nepal.
- The time for this study was also limited and carried out within two seasons only.
- The research has limitations regarding finance and time constrains. The minimum percentage of the total cattle of selected houses of the studied area is taken as key informant for the study.
- Due to the lack of sophisticated instruments the identification of parasites was done upto genus level only.

CHAPTER FIVE

LITERATURE REVIEW

Before 17th Century, knowledge of parasitology was limited to ectoparasites like lice & flies and few internal parasites like roundworms, pinworms and tapeworms.

Linnaeus gave another view about these internal parasites that they originated from accidentally swallowed free living organisms. However this belief was erased in the later half of the 17th century by Franscisco Redei, the grandfather of parasitology. He demonstrated development of maggots from eggs of flies. He also proved that Ascariasis had males and females and produced eggs. At the same time, Leeuwenhoek perfected microscope and discovered protozoan parasites.

Parasitic zoonoses are distributed worldwide and constitute an important group of diseases affecting both the human and animals. Many of the parasitic zoonoses poroduce significant mortality and morbidity in the human and are responsible for the major economic loss by affecting the animal health. Most of the papers have been presented and published largely after the outbreak of helminthic diseases among human and animals (Pandey, 1998). Literature exist in helminth parasites as the diseases continued to survive with new threats. Major research effects that have been directed towards helminth parasites, the portions of the work and reports related to the epidemiology of helminth parasites have been mentioned here.

) Global Context

In 1379, Bride de was the first to describe trematode *Fasciola*.

In 1758, Linnaeus first reported the genus *Ascaris*.

In 1818, Rudolphi was the first to report *Dicrocoelium*.

In 1851, Bilharz was the first to demonstrate the adult worm of *Schistosoma* in mesenteric veins of a man in Cairo.

In 1873, Schendier first reported Nemathelminthes.

In 1876, Lewis and Mc Connell were the first to describe trematode *Amphistome* from the caecum of an Indian patient.

In 1880, Claus reported about platyhelminthes.

In 1907, Sambon first pointed out that the egg belong to a new separate species and named it as *Schistosoma mansoni*.

In 1917, Bhasker first reported *Taenia* sp. infection in man from India in the emigrant populations of Nagapathnam and Dindigul in tamil Nadu. Subsequently, studies was based on the routine microscopic examination of the faeces.

In 1926, Chandler initially recognized *Schistosoma* sp. as a parasite of man and claimed the eggs of this parasite from human faces.

In 1938, Bhalerao was the first to predict occurance of Schistosomiasis in India.

In 1952 Beaner *et al.*, first recognized human Toxocariasis who found the *larva* of *Toxocara canis* the dog roundworm, in the liver and lung tissues of three children in New Orleans. (USA).

Blamire *et al.*, (1970) through the 1960, the condemnation rate for fascioliasis in adult cattle in England and wales ranged between 22% and 35%. It then fell steadily from 20% in 1970 to 6% in 1978 (Blamire *et al.*, 1980). In 1978, the rate for fascioliasis in England and wales was 5.6% (MAFF, 1979) and in 1980 6.5% (MAFF, 1980)

Kenneth T. Lameta (1981), of the 330 cattle, *Fasciola* spp was found in 3.64%. *F. gigantica* was recovered in 3.03% of the 330 cattles. *F. hepatica* was found only in mixed infetion with *F gigantica* in 0.60% of cattle.

Banglapedia (1988). *Schistosoma spindalis* and *S. indicium* was prevalent among cattle all over Bengladesh. Mostly, adult cattle above 3 years of age were severely affected upto 25% incidenee. *S. nasalis* was widespread among cattles and buffaloes all over the country. Its occurance was very high (60%) and was very common in the southern districts of Bangladesh.

Anwar and Gill, (1990) reported prevalence of schistosomes of veterinary importance in Pakistan & India. A total of 20,000 examined animals from different localities of

Punjab province of Pakistan, 13% cattle and buffaloes infected with *S. indicum* and *S. spindalis*.

WHO (1993) reported *Schistosoma* sp. in about 25% of cow, water buffalo, dog and pigs in Philippines.

WHO (1993) in China 40 species of wild and domestic animals have been found naturally infected with *S. japonicum.* The main animal reservoirs are cattle, buffalo, pig and dogs.

Iassan *et al.,* (2000) conducted a study on prevalence dynamics of fascioliasis versus other gastro-intestinal helmiothes in both buffaloes and cattle in Eliza Governorate. They collected 1042 buffaloes and cattle faeceal samples. Their coprological examination revealed that 16.46% of the examined buffaloes and 10.35% cattle respectively were harbouring *Fasciola* sp. with the help of faecal test they found 2.07% of the examined animals has *Fasciola* sp. and 2.5% helminth eggs in their faeces. The helminthes included mainly other gastro-intestinal parasites such as *Paramphistomum* sp. & *Moniezia* spp. Monthly and seasonal prevalence of parasites investigated the spring season was the most favourable one for infection with predominant one for infection.

Lezeriuc *et al.,* (2002) between 1995 and 2001, 28, 878 cattle were slaughtered in their abattoir at Baean, Romania. During this period 2,220 cattle were diagnosed with Fascioliasis and 5,120 cattle with Dicrocoeliasis. The prevalence of parasitic infections in cattle was higher in 2001 compared to 1995, especially in the case of bovine fascioliasis which increased from 4.-0 – 14% and bovine Dicrocoeliasis which increased from 3.8 – 37.1%.

Mondal *et al.,* (2002) conducted a study of gastrointestinal helminthes in livestock grazing in grassland of Bangladesh. They released two cow calves and two goats in a grassland used for communal grazing of livestock. After slaughtering of the tracer animals, their gastrointestinal examination revealed six species of trematode and one cestode. The nematode species were *Haemonchus controtus, Trichostrongylus axei, Oesophagostomum* sp, *Trichuris* sp. and *Bumostomum* sp. The cestode was one of the genus *Moniezia*. with this study, grasslands are thought to be one of the main sources of gastrointestinal parasitic diseases of livestock in Bangladesh.

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Yadav *et al.,* (2003) reported the prevalence rate of fascioliasis high in terai region of India followed by hills and plains respectively. Buffaloes were the most susceptible hosts followed by cattle & sheep.

Bory (2003) Prevalence of liver fluke in buffaloes and beef cattle slaughtered at VISSAN. The infection in buffaloes and beef cattle were 14.83% and 22.92% respectively. *F. gigantica* infected both buffaloes and cattle where *F. hepatica* infected only buffaloes.

Basu *et al.,* (2003) reported *Fasciola hepatica* and *F. gigantica* to be the major parasites involved, and causing economic losses to livestock in *E.* Africa. *F. hepatica* has shown to be the most important fluke species in Ethiopian livestocks with distribution over 3 quarters of the nation except in the arid north-east and east of the country. The distribution of *F. gigantica* was mainly localize the western humid zone of the country. The prevalence of bowine fasioliasis has shown range from 11.05% to 81%. A rough estimate of the economic loss due to fascioliasis in bovine is about 3560 million billion per year.

Swai *et al.,* (2004) Surveyed the prevalence of gastro intestinal (GI) parasite in grazing cattle in pastoral farming area during the period of March 2004. Data were gathered from 17 herds / farms with a total of 90 cattle in five wards of Ngorongoro district. Trematode infections were found in 56.6% of the cattle. Most farms (94%) had trematode infections. Trematode infections were influenced by level of tick infections and the location of farm.

Yadav *et al.,* (2005) reported the highest incidence of gastrointestinal nematodiasis in goats followed by buffalo and cattle in India. *Haemonchus, Trichostrongylus,*

Bunostomum sp., *Oesphagostomum* and *strongyloides* sp. were the main parasites recovered from the intestine of sheep, goats and buffaloes.

Bricarello, P.A. *et al.,* (2007) did field study on nematode resistance in Nelore-breed cattle. The study reaveled that Nelore cattle with different degrees of resistance to natural infections by gastrointestinal rematodes.

Seek, M.T. and C.T. Ba (2007) reported *Carmyerius marchandi* a new species of trematode, a parasite of cattle in Senagal.

Schweizer, G. *et al.,* (2007) studied the prevalence of *Fasciola hepatica* detected by real time TaqMan PCR in populations from 70 Swiss farm cattle husbandary.

Marcos *et al.,* (2007) pointed *Fasciola* hepatica infection in cattle. They showed 75% prevalence by *Fasciola hepatica*.

Nath, R (2007) pointed out Haemato – Biochemical changes in cattle with Paramphistomiasis. In the investigation the alternations in the haemato – biochemical parameters in spontaneous cases of paramphostomiasis in cattle are studied.

Jimenez, A.E. *et al.,* (2007) reported Dynamics of infections with gastrointestinal parasites and *Dictyocaulus viriparus* in dairy and beef cattle from costa Rica. The most prevalent gastrointestinal parasites detected on both farms (dairy cattle & beef cattle) were *Eimeria* spp (94.7%, 93.7%), *Strongyloides* (75%, 81.4%), *Moniezia* sp. (4.8%, 9.1%), *Trichuris* sp. (9.3%, 13.2%), *Toxocara* sp. (0.0%, 1.8%) *cooperia* sp. (30%, 30.7%), *Haemonchus* sp. (57%, 66%) and *Oesophagostomum* sp. (10.8%, 1.8%)

Ravindran *et al.,* (2007) reported the prevalence of visceral Schistomiasis among domestic ruminants including cattle. They found 57.3% cattle, 50% buffaloes and 4.7% goats infected with *Schostosoma* sp. in weyanand, South India.

Fahrion, A.S.; *et al.,* (2008) reported patent *Toxocara canis* infections in previously exposed and in helminth free dogs after infection with low numbers of embryonated eggs and shows the prevalence rate of 18.18 percent.

PHIULBEY *et al.,* (2008) reported Meningo encephalitis and other conditions associated with *Histophilus ovis* infection in sheep. *H. Ovis* was isolated from 29

sheep in 20 flocks and 2 artificial insemination (Al) centres in southern New South Wales in 1984-1990.

Rocha *et al.,* (March 2008) reported the prevalence of intestinal nematode after alternate sheep and cattle grazing in pasture in Brazil.

Mendes, E.A. *et al.,* (2008) Reported development of *Fasciola hepatica* in *Lymneae columella* infected with miricidia derived from cattle and marmoset infection. *Fasciola hepatica* released in cattle faeces were significanty bigger than those released in marmoset faeces.

Moses, O.O, *et al.,* (2008) reported the presence of *Histophilus somni* in Nigerian dairy cattle. They showed infection in Holstein-Friesian dairy cattle with prevalence of 0.4% and 50% respectively.

) In Context of Nepal

The Preliminary work on parasitic diseases of farm livestock in Nepal initiated during 1970 – 72 under a Swiss associated project. Surveys on common parasitic diseases were undertaken in the Kathmandu valley and in few other districts representing hills, terai and high mountains (Singh *et al.,* 1973). This study determined the prevalence of parasitic diseases and carried out the identification of nematode parasites, snail species and some ectoparasites. Following these study prevalence of parasitic diseases were carried out by other workers in different parts of the country but most of these studies were limited to the examination of dung samples for liverfluke in buffaloes and cattle (commonly).

Inglis, W.G. & Ogden, C.G. (1925) worked on some *Strongyloides* (nematodes) from mammals in east Nepal with some other parasitic nematodes.

Malakar, S.B. (1965) reported about some helminth parasites from domestic animals. These were *Fasciola hepatica* from cow & goat.

Lolani and Jaeckle (1981 – 82) conducted a study to identify *Fasciola* spp. in Palpa. Livestocks specimens were collected from five slaughtering places ofTansen in the last week of July and beginning of August 1981. Identification was done by Hoeming Institute of Parasitology, university of Bema and results were mixed infectious with Predominance and *Fasciola gigantica*.

Dhakal, I.P. & Nepali, D.B. (1983) reported liverfluke infection of cattle & buffaloes.

Ghimire (1987) conducted a study on incidence of common diseases of cattle and buffaloes in Surkhet district. The endoparasitic infections recorded were Fascioliasis, Toxocariasis, Paramphistmiasis, internal Schistosomiasis and Monienziasis.

Dhakal and Kharel (1988) analysed the hospital cases at Chitwan veterinary hospital and reported the incidence of liverfluke in sheep and goats to be 26% and 58% and incidence of nematodes to be 14% and 5% respectively.

Mahato (1993) reported *Fasciola* prevalence of 57.9% in buffalo in the hills and 4.3% in the terai.

Acharya (1996) conducted a study on efficacy of tricholoendarole and exyclozanide against fascioliasis of lactating buffaloes and cattle. The study was conducted between january 1996 and March 1996. Of the 317 lactating cow and buffaloes examined 21.6% cows and 30% buffaloes were positive for *Fasciola* sp. infection. However, buffaloes did not response in either treatment groups as effectively as cows.

Shrestha & Joshi (1997) carried out a study to evaluate the effectiveness of a strategic drenching against fascioliasis in cattle in the western hills of Nepal. Faecal samples were collected at monthly intervals and were examined by standard sedimentation method for the presence of *Fasciola* eggs. The strategic drenching reduced the overall infection in treated animals.

Regmi *et al.,* (1999) conducted a study to know the Fasciolasis prevalence in Thuladihi VDC of Sanjyha district. Coprological examination reavealed that 67.66% buffalo and 62.10% cattle were affected with Fascioliasis.

Sharma (1998 – 99) conducted a study on parasitic infection in animals of Panchthar district, facioliasis was found in 40.12%

Nirmal (2000) conducted a study of major diseases of goats in far western region Nepal. In the study 71% cases were found at parasitic diseases, among which 54.6% due to *Strongyloides* and 61% due to coccidians.

Pandey, Mahato & Gupta (2002) suited prevalence of *Fasciola* infection in *Lymnea* snails and buffaloes in Devbhumi Baluwa VDC of Kavre district. The infection rate in rice field was found 1.67% springs 1.40% and in irrigation channels 0.99%

CVL (2002/2003) conducted a study on the prevalence and diressity of *Fasciola* spp in buffaloes in area of Kathmandu valley. 92 faecal samples of buffaloes were analysed, where 56 (61%) were found positive for *Fasciola* spp.

Adhikari *et al.,* (2003) conducted a study on the prevalence and diversity of *Fasciola* sp. in buffaloes and cattle in areas of Kathmandu valley from 23 April 2003 to 30 June 2003. The prevalence of *Fasciola* sp. was found to be 36% and 61% in cattle & buffaloes respectively. Other parasites were also found during the study which includes 48% *Paramphistomum* sp. in cattle.

Maharjan, K.P. (2004) reported the presence of *Ascaris* sp. (13.46%), *Trichuris* sp. (1.92%) and *Strongyloides* sp. (0.32%) in children of Kirtipur Area with respect to their socio-cultural and socio economic status.

Mishra, D.R. (2003) studied on blood parasites of domestic animals in Makawanpur district of Nepal. He reported 32.9% positive cases out of 240 total samples.

Mukhia G. (2007) conducted a study and reported 90.90% samples positive for trematodes in buffaloes of Satungal VDC, Kathmandu. *Schistosoma* sp. was found in 46.94% followed by *Fasciola* spp. 32.6% and *Dicrocoelium* sp. 20.61%.

Parajuli (2007) studied intestinal helminth parasite of goat (*Capra hircus*) and found 181 (81.53%) positive semples among 222 total samples from Khasibazar of Kalanki, Kathmandu.

Gurung B. (2007) conducted a study on the prevalence of eggs of three trematodes genera *Fasciola* sp., *Dicrocoelium* spp and *Schistosoma* spp in buffaloes of Satungal Slaughter house in Satungal Kathmandu during the period of December 2006 – January 2007. A total of 210 stool samples were collected during the study period and found overall helminth prevalence 61.90%. The buffaloes were infected by *Fasciola* sp. (38.57%) & *Schistosoma* spp (28.10%).

CHAPTER SIX

MATERIALS & METHODS

) Study Area

Nepal is one of the richest countries in terms of biodiversity, due to its unique geographical position and latitudinal variation. Geographically, it is 80° 4" to 88° 12" East longitude and 26° 22" to 30° 27" North latitude. It is an independent, sovereign and landlocked country bordered by China to the North and India to the East South and West. It is approximately 885 Km in length and its mean width is 193 Km width a total land area of 1,47,181 Sq. Km.

The research field "Anarmani VDC 2" lies in Jhapa district, which lies at the eastern most part of Nepal. The field VDC is surrounded by VDCs like Duwagadi in east, Charpane in the west, Garamami in South and Sanischare in the north. It lies near Birtamode town. It lies just south to the Mahendra Highway. It also touches the road to Chandragadi (Headquarter of Jhapa district). The research field lies at the height of 113 meter from the sea level.

The study is carried out for the prevalence of intestinal helminth parasites of cattle sex-wise, age-wise and season wise. The dung samples were collected from the field and brought to central veterinary laboratory, Tripureshwor for laboratory diagnosis.

) Sample size & sampling technique

A total sample of 200 numbers of dung samples were taken. It was collected from ward no 2 of Anarmani VDC (Jhapa). 200 samples were collected within two seasons viz., winter and summer. 100 samples were collected in winter and 100 samples in summer.

To ensure better condition during samples collection the following precautions were taken:

a. The fresh dung samples were taken.

b. The samples were collected in airtight container to prevent desiccation.

c. 3 – 4 drops of 10% formalin were used to fix dung samples in case of fresh samples.

d. 5% formalin was used to preserve the samples as preservatives in case of preserved samples.

e. The samples were thoroughly mix with chemicals to prevent fungal growth.

f. The samples were kept in refrigerator.

g. Sampling was done randomly.

⁾ Instrumentation

The study design is based under laboratory examination

⁾ Laboratory Tools

- Plastic bags	- Slides	- Centrifuge Machine
- Gloves	- Cobersleeves	- Pipettee
- Plastic bottles	- Beaker	- Volumetric flask
- Microscope	- Cotton	- Tea strainer
- Refrigerator	- Cellotape	- Test Tube

⁾ Chemicals Required

- 10% Formalin
- 5% Potassium dichromate ($K_2Cr_2O_7$)
- Sodium chloride solution
- Zinc chloride solution
- Methylene blue

⁾ Dung Examination

The dung samples were collected and brought to laboratory in preservatives ($K_2Cr_2O_7$) and formalin, and refrigerated. The stool samples were examined by sedimentation technique.

) Sedimentation Technique

The technique is used for the detection of trematode eggs. It provides good results as the eggs of trematodes is bit heavier than the other eggs and deposited at the bottom. (Veterinary Lab Techniques, 2003).

) Method

3 gm of dung samples was taken in a beaker, 42 ml of water was added and grinded highly with the help of motor & pistle. The sample was filtered with a tea strainer and the filtered sample was poured in a plastic test tube. The tube was taken out and the upper water was removed with the help of a pipette. Zinc sulphate solution was filled in the tube and again centrifuged at 1000 rpm for 5 mins. A drop of deposited materials was taken out from the test tube with the pipette and placed on the slide, add drop of methylene blue into it and examined under the microscope at 4X and 10X.

) Study Period

Lab examination of the samples was done during the month of July and August 2008.

) Key for trematodes, cestodes & Numatodes

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CHAPTER SEVEN

RESULTS

Among 200 samples collected from Anarmani VDC 2 of Jhapa, 100 samples were collected in winter season and 100 samples in summer season.

Out of total samples 151 (75.5%) samples are found positive and 49 (24.5%) samples negative.

Altogether 27 genera of helminthes were observed including eggs, larvae. The number of cestodes, trematodes and nematodes are shown below in table 2.

The eggs of different genera of helminthes were identified according to their characters and morphology.

Study had been done under different headings. The prevalence of intestinal helminthes parasites of cattle are as,

(i) Class-wise prevalence of helminthes in general
(ii) Season-wise prevalence of helminthes
(iii) Sex-wise prevalence of helminthes
(iv) Age-wise prevalence of helminthes
(v) General prevalence of helminthes parasites in cattle
(vi) Identification of eggs of helminthes in brief
(vii) Single and multiple infection.

Among 151 positive samples, 55.55% genera were Nematodes, 33.33% genera were Trematodes & 11.11% genera were Cestodes. Numerically,

Namatodes = 15 genera (Total number of nematodes observed = 797)
Trematodes = 9 genera (Total number of trematodes observed = 377)
Cestodes = 3 genera (Total Number of castodes observed = 163)

The prevalence of three different classes of helminth parasites results stiatically as ($\Re^2$ = 466.82, P < 0.05, d.f. = 2) |

) Classwise Prevalence

Table 2 : Class-wise prevalence of helminth parasite

S.N.	Classes	Sl. No.	Helminth Genera Identified
A	NEMATODES	1.	*Trichostrongylus* sp.
		2.	*Chabertia* sp.
		3.	*Strongyloides* sp.
		4.	*Toxocasa* sp.
		5.	*Ostertagia* sp.
		6.	*Trichonema* sp.
		7.	*Bunostomum* sp.
		8.	*Dictyocaulus* sp.
		9.	*Ancylostoma* sp.
		10.	*Haemonchus* sp.
		11.	*Ascaris* sp.
		12.	*Trichuris* sp.
		13.	*Cooperia* sp.
		14.	*Capillaria* sp.
		15.	*Oesophagostorum* sp.
B	CESTODES	1.	*Moniezia* sp.
		2.	*Dipylidium* sp.
		3.	*Taenia* sp.
C.	TREMATODES	1.	*Dicrocoelium* sp.
		2.	*Fasciola* sp.
		3.	*Paramphistomum* sp.
		4.	*Gastrothlylax* sp.
		5.	*Skrjabinema* sp.
		6.	*Histophilus* sp.
		7.	*Fischoederius* sp.
		8.	*Schistosoma* sp.
		9.	*Ornithobilharzia* sp.

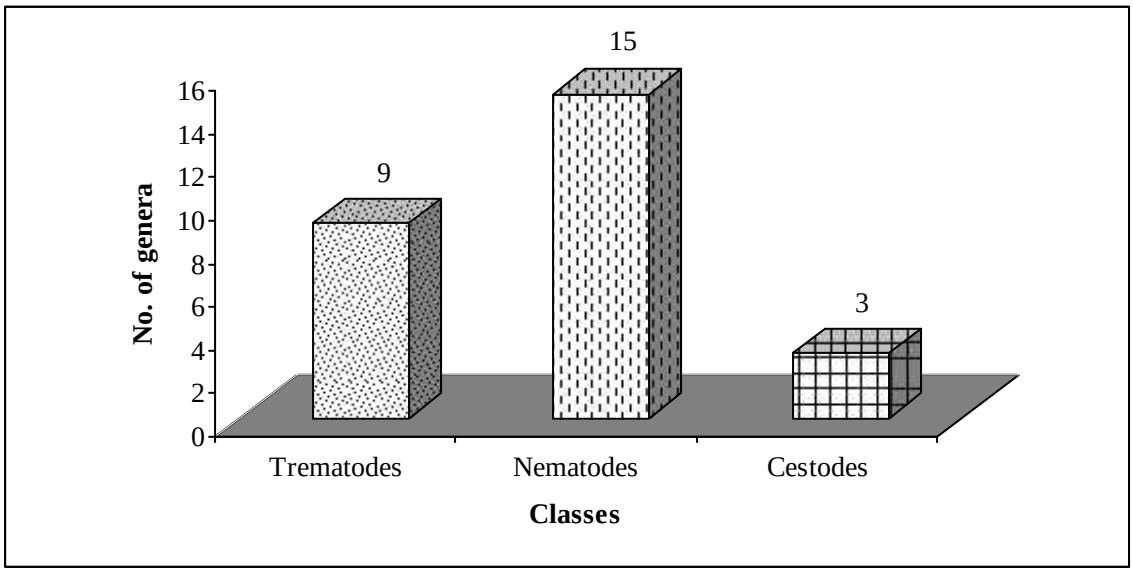

Fig. 4: Classwise Prevalence of Helminths

The result of study indicates that maximum infection was found by nematode group which is 55.55% followed by Trematodes 33.33% and then by cestodes 11.11%. Among three classes *Trichostrongylus* sp. from nematodes, *Dicrocoelium* sp. from trematodes and *Dypillydium* sp from cestodes have dominate the groups.

) Seasonwise Prevalence

Table 3:Prevalence of helminth parasites in summer season

S.N.	Parasites	Percentage
1.	*Fasciola* sp.	1.26%
2.	*Moniezia sp.*	0.82%
3.	*Schistosoma sp.*	2.7%
4.	*Ancylostoma sp.*	0.54%
5.	*Dipylidium sp.*	35.75%
6.	*Ostertagia sp.*	0.27%
7.	*Dictyocaulus sp.*	0.68%
8.	*Trichostrongylus sp.*	26.57%
9.	*Dicrocoelium sp.*	12.32%
10.	*Histophilus sp.*	1.36%
11.	*Chabertia sp.*	1.78%
12.	*Strongylus* sp.	1.50%
13.	*Haemonchus sp.*	0.54%

14.	*Skrjabinema sp.*	0.41%
15.	*Toxocara sp.*	3.42%
16.	*Ascaris sp.*	0.95%
17.	*Gastrothylax sp.*	1.23%
18.	*Paramphistomum sp.*	1.50%
19.	*Ornithobilhazia sp.*	0.41%

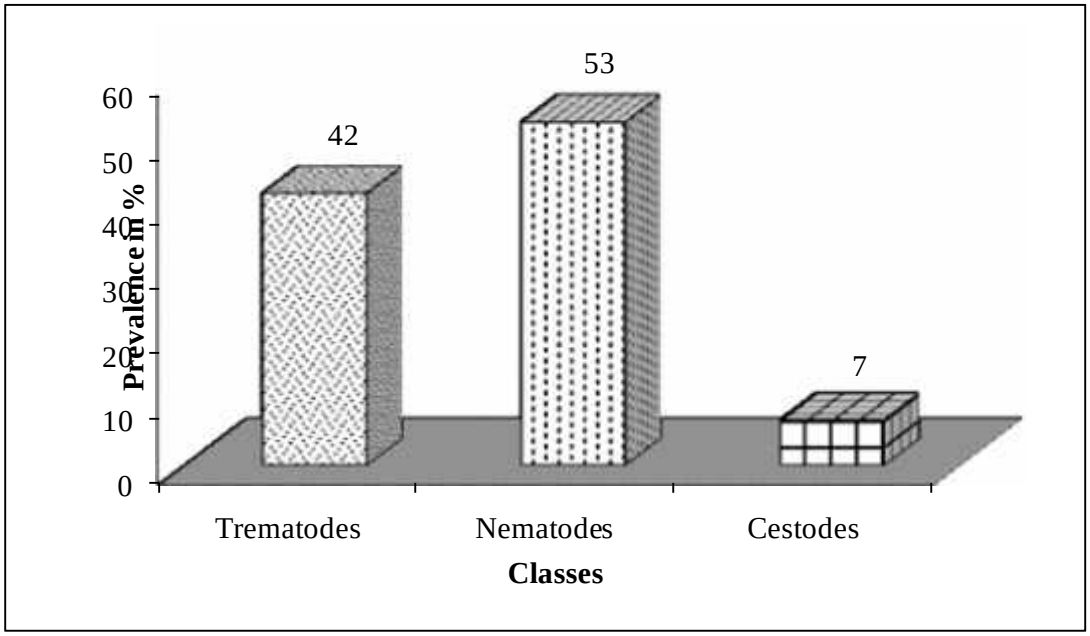

Fig.5: Prevalence of nematodes, cestodes & trematods in summer season

In summer season maximum number of parasites belongs to class nematodes followed by trematodes & cestodes (52.63%), (42.1%) & (5.26%) respectively.

Among 19 genera *Dipylidium* sp. was found in maximum number which was followed by *Trichostrongylus* sp.

Table 4: Prevalence of Helminth Parasites in Winter season

S.N.	Parasites	Percentage
1.	*Trichostrogylus* sp.	36.5%
2.	*Schistosoma* sp.	7.1%
3.	*Dicrocoelium* sp.	8%
4.	*Chabertia* sp.	1.7%
5.	*Ornithobilharzia* sp.	6%
6.	*Histophilus* sp.	6.28%

7.	*Toxocara* sp.	2.5%
8.	*Fasciola* sp.	10%
9.	*Gastrothylax* sp.	2.28%
10.	*Paramphistomum* sp.	3.42%
11.	*Ostertagia* sp.	1.42%
12.	*Bunostomum* sp.	3.14%
13.	*Oesophagostomum* sp.	1.42%
14.	*Dictyocaulus* sp.	1.14%
15.	*Trichonema* sp.	0.85%
16.	*Ascaris* sp.	0.57%
17.	*Haemonchus* sp.	0.58%
18.	*Moneiza* sp.	1.42%
19.	*Skrjabinema* sp.	0.28%
20.	*Dipylidium* sp.	0.85%
21.	*Trichuris* sp.	0.85%
22.	*Ancylostoma* sp.	0.85%
23.	*Cooperia* sp.	0.28%
24.	*Fischoederius* sp.	0.28%
25.	*Capillaria* sp.	1.14%
26.	*Taenia* sp.	0.57

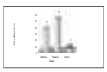

Fig. 6:

Prevalence of helminthes in winter season.

The parasites were found in higher no in nematodes, i.e. 53.84% and lowest 11.53% in cestodes. In comparison to summer season here in winter season, maximum infection was found by *Fasciola* sp. and *Trichostrongylus* sp.

) Sexwise Prevalence

Table 5 : Prevalence of helminth parasites in males hosts

S.N.	Parasites	Percentage
1.	*Trichostrongylus* sp.	15.97%
2.	*Fasciola* sp.	11.5%
3.	*Trichuris* sp.	0.31%
4.	*Ascaris* sp.	1.27%
5.	*Dictyocaulus* sp.	2.55%
6.	*Cooperia* sp.	0.63%
7.	*Haemonchus* sp.	0.95%
8.	*Strongylus* sp.	5.11%
9.	*Trichonema* sp.	0.31%
10.	*Schistosoma* sp.	3.51%
11.	*Ornithobilharzia* sp.	0.63%
12.	*Bunostomum* sp.	0.31%
13.	*Ostertagia* sp.	1.27%
14.	*Histophilus* sp.	2.55%
15.	*Toxocara* sp.	3.83%
16.	*Chabertia* sp.	3.83%
17.	*Dicrocoelium* sp.	20.44
18.	*Oesophagostomum* sp.	0.63%
19.	*Paramphistomum* sp.	1.96%
20.	*Gastrothylax* sp.	2.55%
21.	*Skrjabinema* sp.	0.63%
22.	*Moniezia* sp.	1.27%
23.	*Dipylidium* sp.	16.61%
24.	*Histophilus* sp.	1.27%

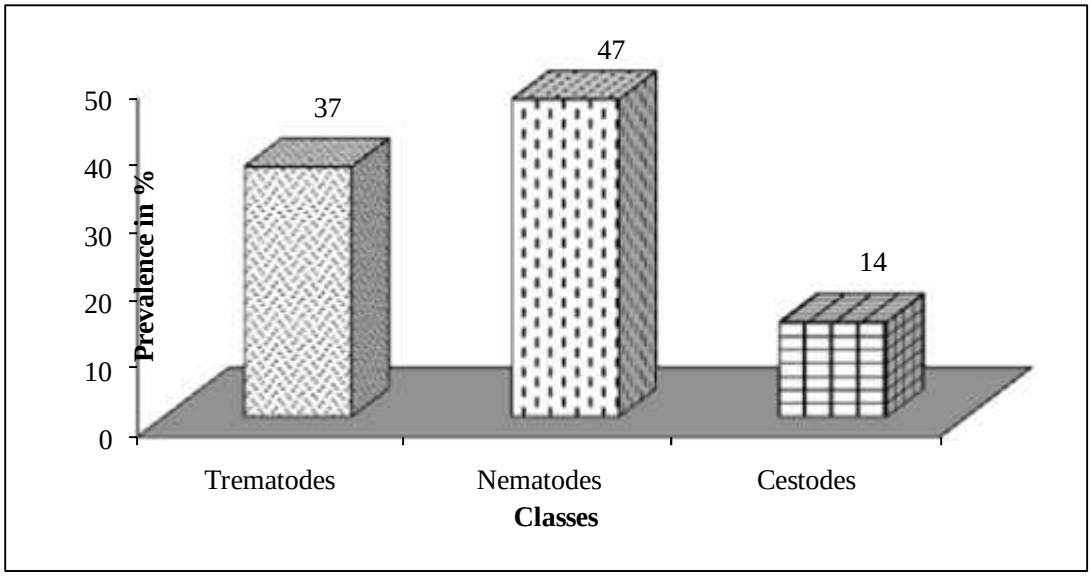

Fig. 7 : Prevalence of helminthes parasites in male hosts.

In case of males maximum infection was observed by *Dicrocoelium* sp. (20.44%) followed by *Dipylidium* sp. (16.61%). Regarding different classes, nematoes were found in maximum number followed by trematodes and cestodes.

Table 5 : Prevalence of helminth parasites in female hosts.

S.N.	Parasites	Percentage
1.	*Trichostrongylus* sp.	33.94%
2.	*Fasciola* sp.	6.37%
3.	*Trichuris* sp.	0.24%
4.	*Ascaris* sp.	1.34%
5.	*Dictyocaulus* sp.	0.36%
6.	*Haemonchus* sp.	0.49%
7.	*Strongylus* sp.	1.22%
8.	*Trichonema* sp.	0.24%
9.	*Schistosoma* sp.	4.16%
10.	*Ornithobilharzia* sp.	2.69%
11.	*Bunostomum* sp.	1.22%
12.	*Ostertagia* sp.	0.36%
13.	*Histophilus* sp.	2.45%
14.	*Toxocara* sp.	2.69%
15.	*Chabertia* sp.	0.85%
16.	*Dicrocoelium* sp.	6.615
17.	*Oesophagostomum* sp.	0.36%
18.	*Paramphistomum* sp.	2.08%

19.	*Gastrothylax* sp.	1.10%
20.	*Dipylidium* sp.	25.98%
21.	*Ancylostoma* sp.	0.49%
22.	*Fischoederius* sp.	0.12%
23.	*Capillaria* sp.	0.49%
24.	*Taenia* sp.	0.24%
25.	*Moniezia* sp.	0.61%
26.	*Skrjabinema* sp.	0.24%

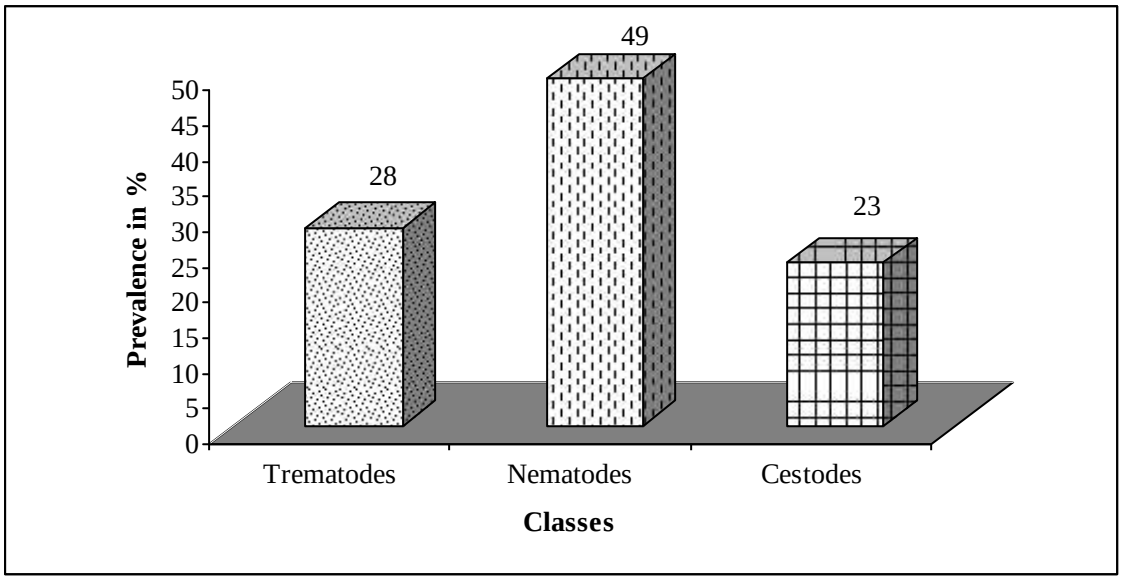

Fig. 8: Classwise Prevalence in Female hosts

Females were infected by the genus *Trichostrongylus* sp. (33.94%) with maximum intensity followed by *Dipylidium* sp. (25.98%). Maximum no. of nematodes were observed and then trematodes followed by cestodes in descending order. The no. of infecting genus differs in males and females. Males by 24 nos. of genera and females by 26 nos. of genera.

) Age-wise prevalence

The ages of the host animal was categorised into 5 categories viz. (0 – 2) yrs. (2 – 4) yrs, (4 – 6) yrs., (6 – 8) yrs. and (8 – 12) yrs. The data were observed for each group for each genus. For every group the dominant parasitic genera were noted below as whichever parasite have maximum infection in particular group, is tabulated below for different seasons comparatively.

Table 6: Comparision of dominant helminth parasites between the same age groups of two seasons viz, summer & winter.

Sl.No.	Age-group	Dominant Parasitic genera	
		Winter	**Summer**
1.	(0 – 2) yrs.	*Dicrocoelium* sp.	*Dicrocoelium* sp.
2.	(2 – 4) yrs.	*Fasciola* sp. + *Toxocara* sp.	*Dipylidium* sp.
3.	(4 – 6) yrs.	*Trichostrongylus* sp.	*Trichostrongylus* sp.
4.	(6 – 8) yrs.	*Schistosoma* sp.	*Strongylus* sp.
5.	(8 – 12) yrs.	*Histophilus* sp., *Strongyloides* sp. & *Ostertagia* sp.	*Trichonema* sp., *Schistosoma* sp. & *Paramphistomum* sp.

Significant difference was found between the similar age-group in three age groups and no difference was found in two age groups. Infection by *Fasciola* sp., *Trichostrongylus* sp., *Strongyloides* sp. & *Schistosoma* sp. were found in maximum no in winter. Similarly *Dipylidium* sp., *Trichostrongylus* sp., *Dicrocoelium* sp., *Strongyloides* sp., *Trichonema* sp. and *Schistosoma* sp. were found in summer season.

Other parasites were also found in both seasons but in negligible amount in comparison to the above tabulated parasites. *Dicrocoelium* sp. and *Trichostrongylus* sp. was found in both the seasons. Maximum infection was found with multiple parasites at the old aged host cattle of age group (8 – 12) yrs. Among all dominant parasites, trematodes were more than nematodes than cestodes. Here less numbered parasites were not considered as they have negligible infection.

) General Prevalence of Helminth Parasites in cattle

There were 200 no of samples collected from the field. Out of it, 151 samples were found positive i.e. 75.5% and 49 samples i.e. 24.5% negative. All the samples were collected from Anarmani VDC 2 of Jhapa district within 2 seasons viz, winter (100 samples) and summer (100 samples).

With the help of sedimentation technique by the guidence from the lab assistant of CVL Tripureshwor, the samples were examined. Therefore the general prevalence rate of helminth parasites in cattle was found to be 75.50%

Among those 151 (75.5%) positive samples, altogether 27 different genera of helminth parasites were observed during lab examination. There were 15 no. of nematodes, 09 no. of trematodes and 03 no of cestodes observed.

Altogether 1337 parasites were counted from 151 positive samples which comprises of 27 different genera. Among them 377 trematodes, 797 nematodes and 163 cestodes were counted.

The following table shows the prevalence of nematodes in number and percentage.

Table 8: Prevalence of Nematode in cattle

Sl. No.	Name of Genera	Total No. of Nematodes	Total no. of Genus	Percentage
1.	*Trichostrongylus* sp.	797	316	39.64%
2.	*Chabertia* sp.	797	34	4.26%
3.	*Strongyloides* sp.	797	104	13.04%
4.	*Toxocara* sp.	797	66	8.26%
5.	*Ostertagia* sp.	797	55	6.90%
6.	*Trichonema* sp.	797	86	10.79%
7.	*Bunostomum* sp.	797	11	1.38%
8.	*Dictyocaulus* sp.	797	18	2.25%
9.	*Ancylostoma* sp.	797	12	1.58%
10.	*Haemonchus* sp.	797	49	6.14%
11.	*Ascaris* sp.	797	12	1.58%
12.	*Trichuris* sp.	797	24	3.16%
13.	*Cooperia* sp.	797	1	0.26%
14.	*Capillaria* sp.	797	4	0.50%
15.	*Oesophagostomum* sp.	797	5	0.62%

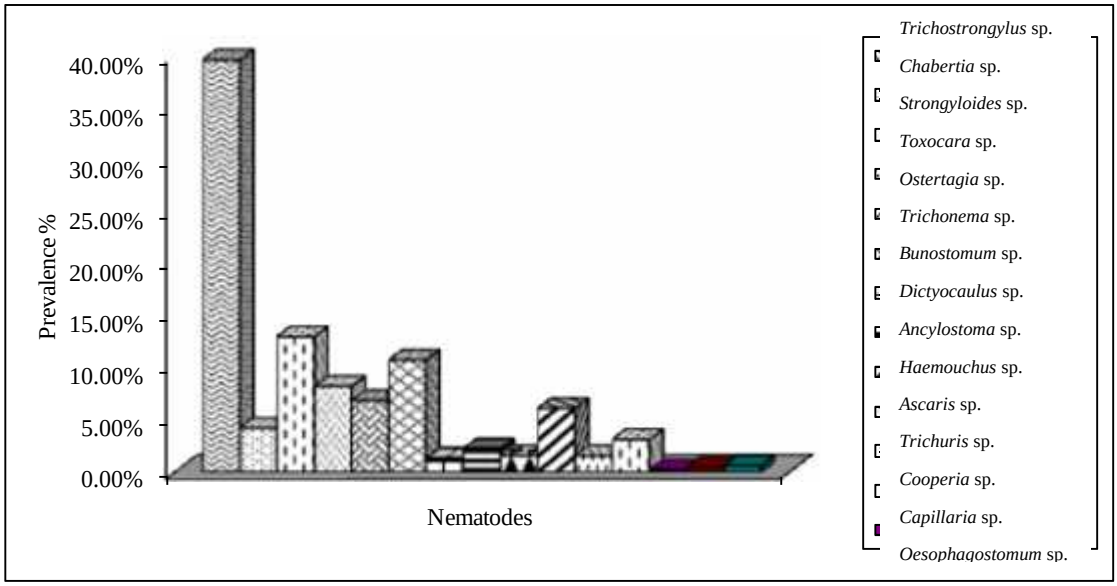

Fig. 9: Prevalence of nematodes in cattles

Among Nematodes, *Trichostrongylus* sp. (39.64%) occupies the maximum space. *Strongyloides* sp. (13.04%) occupies the second position in number. Altogether 15 genera and 797 no. of nematodes were observed. Only one *Cooperia* sp. (0.26%) was observed.

Table 9: Prevalence of Trematode Cattle

Sl. No.	Name of Genera	Total no of Trematodes	Total No. of genus	%
1.	*Dicrocoelium* sp.	377	72	19.09
2.	*Fasciola* sp.	377	82	21.75
3.	*Paramphistomum* sp.	377	55	14.58
4.	*Gastrothylax* sp.	377	17	4.50
5.	*Skrjabinema* sp.	377	33	8.75
6.	*Schistosoma* sp.	377	72	19.09.
7.	*Histophilus* sp.	377	30	7.95
8.	*Fischoederius* sp.	377	1	0.26
9.	*Ornithobilhabiza* sp.	377	15	3.97

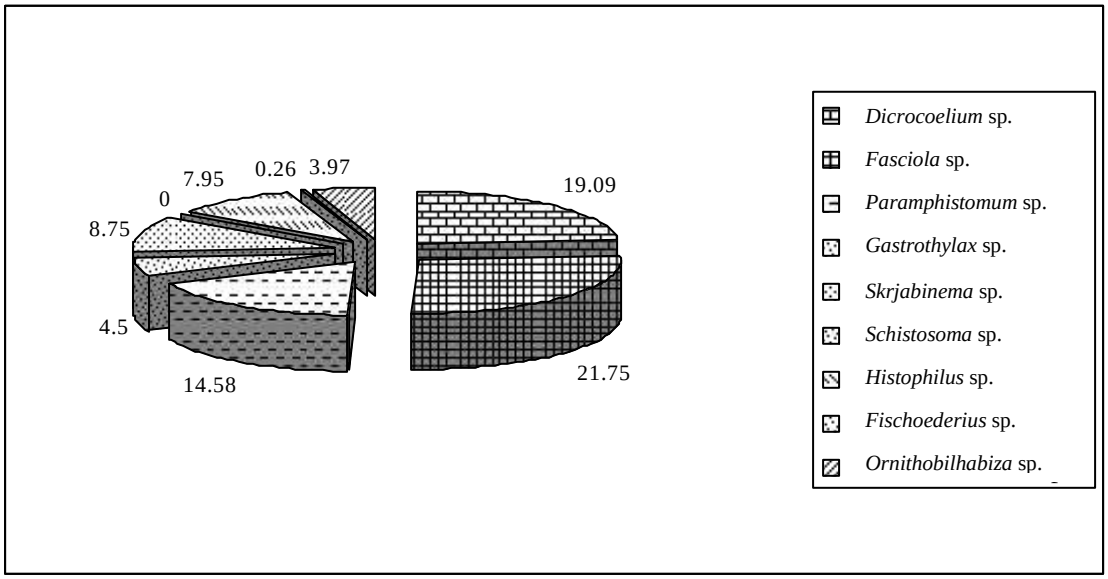

Fig. 10: Prevalence of Trematode genera in cattle

Maximum number of *Fasciola* sp. (21.75%) were observed out of 9 genera of trematodes. Altogether 377 no. of trematodes parasites wre observed. Infection by *Dicrocoelium* sp. was also observed by 19.09 percent. A single genus *Fischoederius* sp. (0.26%) was observed.

Table 10: Prevalence of Castode Genera in cattle

Sl. No.	Name of Genera	Total no. of cestodes	Total No. of genus	Percentage
1.	*Moniezia* sp.	163	52	31.90
2.	*Dipylidium* sp	163	109	66.87
3.	*Taenia* sp.	163	02	1.22

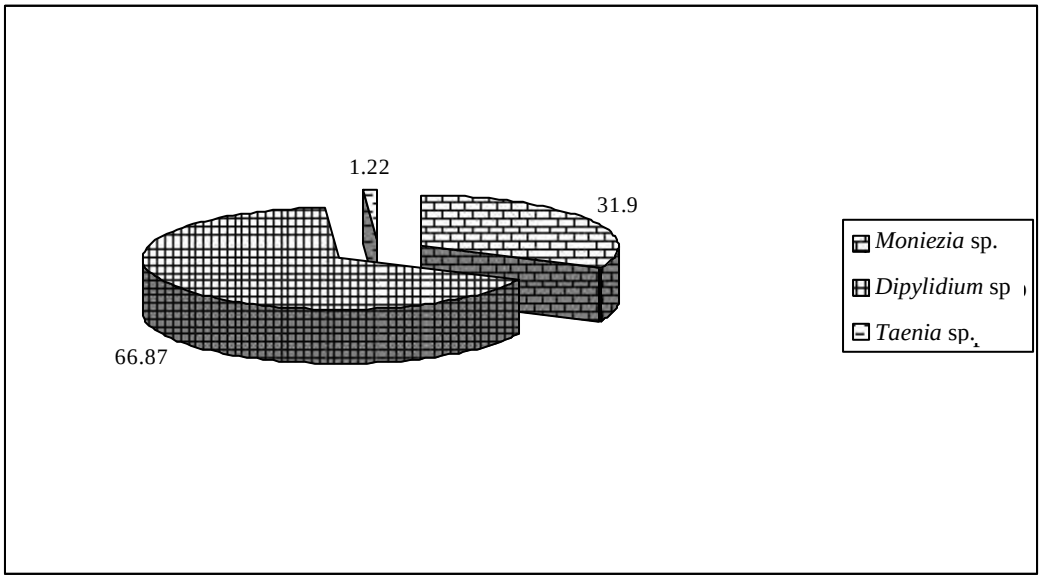

Fig. 11: Prevalence of Cestode Genera in Cattle

There were altogether O3 no. of Cestodes genera observed among which 163 cestode parasites were present. 66.87 percent of *Dipylidium* sp., 31.90 percent of *Moniezia* sp. and 1.22 percent *Taenia* sp. were observed. In comparison with nematodes and trematodes, cestodes were only O3 in number out of 163 total no. of parasites.

) Identification of eggs of helminthes in brief

NEMATODES

) *Trichostrongylus* sp.

Family : Trichostrongyloidae

Genus : *Trichostrongylus* sp.

Description of Eggs

Eggs are 79 – 92 um by 32 – 49 um in size, oval and bilaterally symmetrical, sheel has a thin and transparent outer chitinous layer and a thin inner lipoidal layer embryonic mass multisegmented and varies from 16 – 32 in number.

Discussion

- In 2003, Thakur reported *Trichostrongylus* sp. in pigs from eastern hills of Nepal.

- In 2003, Rabin, Joshi & Chhetri reported *Trichostrongylus* sp. in Yaks from Chandanbari, Langtang.

- In 1999, Acharya reported *Trichostrongylus* sp. in sheep and goat of IAAS livestock farm.

- In 1997, Joshi reported *Trichostrongylus* sp. from cattle and goat from western hills of Nepal.

- In 1992 Mainali reported *Trichostrongylus* sp. from Lulu Cattle

❯ ***Strongyloides* sp.**

Family - Strongylidae

Genus - *Strongyloides* sp

Description of Eggs

Eggs are 40 – 64 by 20 – 40 um in size, ellipsoidal, thin shelled, embryonated when laid.

Discussion :

- In 2003, Rabin *et al.*, reported *Strongyloides* spp in horses from Langtang.

- In 2002-03, Adhikari, Shrestha and Shrestha reported 10 percent *Strongyloides* sp. among buffaloes from areas of Kathmandu valley.

- In 1999 Acharya reported *Strongyloides* sp from goat & sheep of IAAS livestock farm Chitwan

- In 1997 Joshi reported *Strongyloides* sp. papillous from goat and sheep of western hills of Nepal.

- In 1911, Ransom reported *Strongyloides* sp. from the small intestine of sheep, goat and cattle.

❯ ***Chabertia* sp.**

Family - Trichonematidae

Genus - *Chabertia* sp.

Description of Eggs:

Eggs are 90–105 by 52–55 um in size, oval shaped, laid in morula stage.

Discussion :

- In 2007, Mukhiya reported *Chabertia* sp. infection 0.38 percent among buffaloes brought to Satungal, for slaughter purposes.
- In 1999, Acharya reported *Chabertia* sp in sheep and goat of IAAS livestock farm.
- In 1997, Joshi reported *Chabertia* sp. in sheep and goat from western hills of Nepal.
- In 1970, Gmelin reported *Chabertia* sp. from the colon of sheep cattle and other suminants.

) ***Toxocara* sp.**

Family - Ascaridae

Gemus - *Toxocara* sp.

Description of Eggs.

Eggs are 75 – 95 um by 60 – 75 ll in size, sub-globular and have finely pitted albuminous layer, occasionally two celled.

Discussion

- In 1987 Ghimire reported *Toxocara* sp. in cattle, buffaloes and goats from Surkhet district.
- In 1982 ADPCD reported *Toxocara* sp. in dog and cat from Kathmandu.
- In 1970, singh reported *Toxocara leonine* from leopard.
- In 1970, Singh reported *Toxocara canis* from dogs.
- In 1782, Goere reported *T. vitulorum* from the small intestine of cattle and buffalo.

- ***Ortertagia* sp.**

  Family - Trichostrongylidae

  Genus - *Ostestagia* sp.

Description of Eggs:

Eggs are 80 – 100 by 40 – 50 gm in size, elliptical in shape, contain fully developed larva within laid.

Discussion

- In 2006, Dhital reported *Ostertagia* sp. in goats of IAAS livestock farm and Manglapur VDC 2 Chitwan
- In 1999, Acharya reported *Ostestagia* sp. in sheep and goat of IAAS livestock farm.
- In 1982, ADPCD reported *Ostestagia* sp. in Pig, cattle and buffaloes from Kathmandu
- In 1907, Ransom reported *Ostertagia* sp. from the abomasums and small intestine of sheep, cattle and other ruminants.

- ***Bunostomum* sp.**

  Family - Necatorinae

  Genus - *Bunostomum* sp.

Description of Egg.

Eggs are 79 – 106 by 47 – 50 um in size, elliptical, have blunt ends and clearly pigmented embryonic cells.

Discussion

- In 2006, Dhital reported *Bunostomum* sp. from goats of IAAS livestock farm and Mangalpur VDC 2, Chitwan
- In 2007, Parajuli reported the prevalence of *Bunostomum* sp. from the goats brought to Khasibazar, Kalanki (Kathmandu) for slaughter purpose.

- In 1996, Dhakal, Jha and Basnet reported *Bunostomum* sp. from goats of Pathivara VDC, Sankuwashava.

- In 1808, Rudolphi reported *Bunostomum* sp. in the small intestine of sheep & goats.

❯ ***Dictyocaulus* sp.**

Family - Dictyocaulidae

Genus - *Dictyocaulus* sp.

Description of Egg :

Eggs are 82 – 88um by 33 – 30um in size, ellipsoidal, contain fully developed larva when laid or first stage larva may pass.

Discussion

- In 2007 Mukhiya reported *Dictyocaulus* sp. infection 0.76% in buffaloes brought to Satungal for slaughter purpose.

- In 1982, ADPCD reported *Dictyocaulus* sp. in goat and sheep from Kathmandu.

- In 1809, Rudolphi reported *Dictyocanlus* sp. from the bronchi of sheep, goat and wild numinants.

❯ ***Haemonchus* sp.**

Family - Trichostrongylidae

Genus - *Haemonchus* sp.

Description of Egg :

Eggs are 70 – 85 um by 41 – 48 um in size, embryo 16 – 32 celled when laid.

Discussion :

- In 2007, Parajuli, L studied and reported the prevalence of *Haemonchus* sp. in the intestine of goats brought to Khasibazar for slaughter purpose.
- In 1999, Acharya reported *Haemonchus* sp in sheep and goats of IAAS livestock farm from each Central Lab. Tripureshwar .
- In 1973, Singh *et al.*, reported *Haemonchus* sp. in cattle, sheep & buffalo from Kathmandu.
- In 1967 – 92, Mainali reported *Haemonchus* sp. from Lulu cattle.

❯ ***Ascaris* sp.**

Family - Ascaridae
Genus - *Ascaris* sp.

Description of Eggs.

Eggs are 40 – 90 um in diameter, sub-globular, laid in morulla stage.

Discussion :

- In 2003, Karki reported *A. lumbricoides* in magar community, Palpa
- In 2000, Shrestha reported *A. lumbricoides* 35.7% from 10 yrs old children in Kathmandu and Bhaktapur.
- In 1998 – 98, Sharma reported *Ascaris* sp. 43.69% in animals from Panchthar district.
- In 1982, ADPCD reported *Ascaris* sp. in buffaloes and Chauri from Kathmandu.

❯ **Hookworm**

Family - Ancylostomatidae
Genus - *Ancylostoma* sp.

Description of Eggs:

Eggs are 125 – 195 by 60 – 92 um in size. They are eight celled when laid.

- ***Trichuris* sp.**

  Family - Trichuridae

  Genus - *Trichuris* sp.

Description of the Eggs:

Eggs are 70 – 80 by 30 42 um in size, brown in colour contain unsegmented embryo, barrel shaped with transparent plug at either pole.

Discussion :

- In 2003, Thakur reported *Trichuris* sp. in pigs from eastern hills of Nepal.
- In 1997, Joshi reported *Trichuris* sp. in goat and sheep from western hills of Nepal.
- In 1981, IFP and PCP reported *Trichuris trichura* in cattle.
- In 1970, Singh reported *Trichuris globulosa* in goat from Kathmandu.
- In 1965, Sharma reported *Trichuris trichura* in human from Bhaktapur.
- In 1795, Abildgaard reported *T. ovis* from the caccum of sheep, cattle and other ruminants.

- ***Cooperia* sp.**

  Family - Trichostrongylidae

  Genus - *Cooperia* sp.

Description of Eggs :

Eggs are 70 – 82 | 35 – 41 um in size, their sides are parallel and have less than 16 pale yellow blastomeres when laid.

- ***Capillaria* sp.**

Family - Capillaridae

Genus - *Capillaria* sp.

Description of Eggs:

Eggs are 30 – 63 um in size, barrel shaped, contain unsegmented embryo, colourless shell.

Discussion

- In 1967 – 92, Mainali reported *Capillaria* sp. from Lulu cattle.
- In 2005, Manandhar reported *Capillaria* sp. in stray dogs of Kathmandu.
- In 1800, Zeder reported *Capillaria* sp. from the small intestive of dog & cattle.

❯ ***Oesophagostomum* sp.**

Family - Trichonematidae

Genus - *Oesophagostomum* sp.

Description of the Eggs.

Eggs are 70 – 76 um by 36 – 40 um in size, strongyle like.

Discussion

- In 2007, Parajuli reported *Oesophagostomum* sp. from the goats brought to Khasibazar for slaughter purposes.
- In 2006 Dhital reported O*esophagostoumum* sp. from goats of IAAS livestock from and Manglaour VDC 2, Chitwan
- In 1982 ADPCD reported *Oesophagostomum* sp. in pig, cattle and buffalo from Kathmandu.
- In 1803, Rudolphi reported *O. radiatum* from the colour of cattle and water buffalo.

CESTODES

- ***Moniezia* sp.**

  Family - Anoplocephalidae

  Genus - *Moniezia* sp.

Description of Eggs:

Eggs are 56 – 67 um in diameter, triangular globular or quadrangular in shape, contain a well developed pyriform apparatus.

Discussion

- In 2007, Mukhiya reported *Moniezia* sp. infection 12.21 percent among buffaloes brought to Satungal for slaughter purpose.
- In 2001, Parajuli reported *Moniezia* sp. infection in goats of Khashibazar Kalanki brought for slaughter purpose.
- In 1987, Ghimire reported *Moniezia* sp. in cattle, buffaloes & goats from Surkhet district.
- In 1989, Gupta first reported *Moniezia* from goat.
- In 1979 Moniez reported *M. benedeni* from the cattle.
- In 1981 ADPCD, reported *Moniezia* sp from calves and sheep.
- In 1810 Rudolphi reported *M. expansa* from the small intestine of sheep, cattle and other ruminants.

- ***Dipylidium* sp.**

  Family - Dipylidiidae

  Genus - *Dipylidium* sp.

Description of Eggs :

Eggs are 25 – 50 um in diameter, 4 – 20 globular eggs per capsule.

Discussion :

- In 2006, Ravichandran reported prevalence of *Dipylidium* sp. in street drogs of Tamilnaidu India.

- In 1842, Gross, J. reported *Dipylidium* sp. in goats and sheep of Canada.

❯ ***Taenia* sp.**

Family - Tenidae

Genus - *Taenia* sp.

Description of Eggs

Eggs are 24 – 41 um in diameter, spherical in shape, brown to dark-yellow in colour, thick shelled and contain an onchosphere.

Discussion

- In 2005 Manandhar reported *Taenia* sp 12.8% from stray dogs of Kathmandu.

- In 2003, Karki reported *Taenia* sp. 46.15% in Magar community of Barangdi VDC Palpa.

- In 2003, Parajuli reported *Taenia* sp 1.98% from human female and 1.63% in human male.

- In 2002, Ghimire reported *Taenia* sp. 1.42% in human from Kathmandu.

- In 1758, Linnaeus reported *Taenia solium* in the small intestine of man.

TREMATODES

❯ ***Dirocoelium* sp.**

Family - Dicrocoelidae

Genus - *Dicrocoelium* sp.

Description of Eggs:

Eggs are 36 – 45 by 23 – 30 um in size, dark brown in colour, opercerlated, usually with a flattened side, contains miracidium when passed in the faeces.

Discussion

- In 2007, Karki, reported *Dicrocoelium* sp. in elephants of Nepal.
- In 2007, Mukhia reported *Dicrocoelium* sp. in buffaloes of Nepal.
- In 2007 Gurung, B. studied the prevalence of *Dicrocelium* sp. in Buffaloes of Satungal.
- In 1997 – 2003, Thomas, R.G. reported *Dicrocoelium* spp. in Columbus monkey of Uganda.
- In 1996, Jithendran and Bhatta reported *D. dendricum* in sheep and goats in hilly areas of India.
- In 1899, Looss reported *D. lancaetum* from the bile duct of the sheep, goat cattle.

❯ ***Fasciola* sp.**

Family - Fasciolidae
Genus - *Fasciola* sp

Description of Eggs:

Eggs are 130 – 197 by 63 – 104 um in size, oval shaped, yellowish in colour, consists of embryonic mass and shell, operculum usually indistinct.

Discussion :

- In 2007, Mukhia reported *Fasciola* infection 32 – 06 percent among buffaloes brought to Satungal for slangther purpose.
- In 2007, Gurung reported 38.57% *Fasciola* sp. infection out of 61.90% trematodes.

- In 2006, Jaiswal reported *Fasciola* infection 56.02% in buffalo, 49.36 percent in cattle and 31.25 prevent in goat.

- In 2002-03, Adhikari, Shrestha and Shrestha reported *Fasciola* sp in cattle and buffaloes in Kathmandu valley.

- In 1967 – 92 Mainali, reported *Fasciola* spp from Lulu cattle.

- In 2001 – 2007, Michigan DNR wildlife disease laboratorty reported *Fasciola magna* in deer in peninsula.

- In 1980, Fredrick and Reece reported *Fasciola hepatica* in cow in Solomon Island.

- In 1758, Linnaeus, reported *F. hepatica* from the bile ducts of the sheep and other ruminants.

- ***Schistosoma* sp.**

  Family - Schistosomitidae

  Genus - *Schistosoma* sp.

Description of Eggs:

Eggs are 200 um by 70 – 90 um in size, spindle shaped, flattened at one side, greatly elongated with straight slender terminal spine.

Discussion

- In 2007, Gurung reported that 28.1% *Schistosoma* sp. infection in buffaloes of Satungal brought for slaughter purpose.

- In 2007, Mukhia reported *Schistosoma* spp in buffaloes of Kathmandu valley.

- In 2007, Karki reported *Schistosoma* spp in buffaloes of Nepal.

- In 1993, WHO reported *Schistosoma* spp in cow, water buffalo & dog and pigs in phillipines.

- In 1993, WHO reported 40 species of wild and domestic animals have been found infected with *S. japonicum* in China.

- In 1954 S.R. Roa reported *Schistosoma* sp. in elephants in Bombay state. India.

- In 1876, Sonsino reported *S. bovis* from the portal and mesentesic viens of cattle & sheep.

- In 1851, Bilharz reported the adult worm of *Schistosoma* in mesenteric viens of a man in Cairo.

❯ ***Paramphistomum* sp.**

Family - Paramphistomum

Genus - *Paramphistomum* sp

Description of Eggs.

Eggs are 114 – 176 by 73 – 100 um in size, oval in shape, whitish to transparent in colour with distinct operculum knob-like thickening at the acetabular end of shell, embryonic cells distinct.

Discussion :

- In 2006, Jaisawal reported 38.09% paramphistomiasis in ruminants from Janakpur district.

- In 2002-03, Adhikari, Shrestha and Shrestha reported 43 percent *Paramphistomum* sp in cattle from areas of Kathmandu valley.

- In 1998 – 99, Sharma reported *Paramphistomum* sp. 16.20% in animals from Panchthar district.

- In 1982, ADPLD reported *Paramphistomum* sp in cattle and buffaloes from Kathmandu

- In 1967-92, Parajuli reported *Paramphistomum* sp 35.13% in buffaloes from Surkhet district.

- In 1790, Zeder reported *Paramphistomum oni* from the caecum of Indian patient.

- ***Gastrothylax* sp.**

  Family - Gastrothylacidae

  Genus - *Gastrothylax* sp.

Description of Eggs.

Eggs are 115 – 135 um by 66 – 70 um in size, distinct operculum, embryonic cells.

Discussion

- In 1847, Creplin reported *Gastrothylax* sp. crumenifer from the rumen of sheep, cattle and buffalo.
- In 1970, Singh reported *Gastrothylax* sp. compresses in buffalo from Kathmandu
- In 1973, Singh *et al.*, first reported *Gastrothylax* sp.

- ***Skrjabinema* sp**

Description of Eggs.

Eggs are bean shaped in appreance, eggs are fully embryonated.

Discussion

- In 1915, Skrjabin reported *Skrjabinema ovis* from the sheep and goat.
- In 1997, Joshi reported *Skrjabinema ovis* in goat from western hills of Nepal.

- ***Fischoederius* sp**

  Family - Gastrothylacidae

  Genus - *Fischoederius* sp.

Description of Eggs

Eggs are 125 – 152 um by 65 – 75 um in size, elliptical in shape, distinct acetubulum.

Discussion

- In 1883, Poirier reported *Fischoederius* sp. from the rumen of cattle.
- In 1973, Singh *et al.*, reported *Fischoederius* sp. elongates from goat intestine.

- ***Ornithobilharzia* sp.**

Description of Eggs.

Eggs are 72 – 77 um by 18 – 26 um in size, terminal spine, short appendage at the other end.

Discussion :

- In 1913, Skrjabin reported *Ornithobilharzia* sp. from the mesenteric viens of sheep & cattle.

- ***Histophilus* sp.**

Discussion

Recently in 11 March 2008 Moses, O. O. *et al.,* first reported the genus *Histophilus Somni* in Nigerian dairy cattle. Available from ":National Veterinary Research Institute, Vom, Plateau State, Nigeria.

Symptoms in cattle.

Clinical signs of severe bronchopneumonia, including anorexia, coughing, nasal discharge, dyspnoea, distenision of the neek, lethargy, recumbency, lambness, preceding collapse and death were observed among a herd of Holstein-Friesian dairy cattle. The out break occurred over a 30 day period and attack and case-fatality rate were 0.4% and 50% respectively. Histophiliasis in cattle was confirmed for the first time in Nigeria.

- In 10th March 2008, Australian veterinary Journal (vol **68**, Issue – 12, Pages 387 – 398) reported presence of *Histophilus ovis* in sheep.

Histophilus ovis was isolated from 29 sheep in 20 flocks and 2 artificial insemination centres in southern New Southwales in 1984 – 90. Similar symptoms as in cattle was observed in lambs also.

) Single and Multiple infections

In the present study, out 151 (75.5%) positive samples, 14% (21) samples were found to have single infection. Among positive samples with single infection the highest samples were due to *Histophilus* sp. *Trichostrongylus* sp. *Bunostomum* sp. etc. Rest 86% were found with multiple infections. The remaining 86% (130) samples have infections with 2 – 6 different genera. The highest intensity was noted by *Trichostrongylus* sp.

Approximately 3 gm. of sample was taken during the lab examination. Within single sample approximately. 50 nos. parasites belonging to single genus was counted.

CHAPTER EIGHT
DISCUSSION AND CONCLUSION

The aim of the study was to investigate the Prevalence of **"Intestinal Helminth Parasites in Cattle."** The dung samples were collected from "**Anarmani VDC 2"** of Jhapa district. The samples were collected within two seasons winter and summer 100 each, so the total samples collected were 200 in number. Out of 200 samples, 151 (75.5%) were found positive and rest 49 samples (24.5%) negative. In general 55.55% nematodes, 33.33% trematodes and 11.11% cestodes were found during the lab study period.

Among 1337 parasites observed comprising of 27 different genera, 797 (59.61%) nematodes, 377 (28.19%) trematodes and 163 (12.19%) cestodes were counted.

Trematode genera *Histophilus* sp. was observed for the first time in Nepal, among, buffaloes, goats, cattle & sheep. It was not reported by any past researchers in Nepal in above mentioned hosts.

The genera (*Histophilus somni pneumonia)* was reported by Moses, O.O *et al.,* (2008) in Nigerian dairy cattle. The present study shows 2.24% prevalence of *Histophilus* sp. in general.

Among nematodes, *Trichostrongylus* sp. *Chabertia* sp. *Strongyloides* sp. *Toxocara* sp. *Ostertagia* sp., *Trichonema* sp., *Bunostomum* sp., *Dictyocaulus* sp. *Ancylostoma* sp., *Haemonchus* sp., *Ascaris* sp. *Trichuris* sp., *Capillaria* sp. & *Oesophagostomum* sp. were found which were 15 in numbers.

In trematodes, *Dicroecoelium* sp., *Fasciola* sp., *Paramphistomum* sp., *Gastrothylax* sp., *Skrijabinema* sp. *Schistosoma* sp., *Histophilus* sp., *Fischoederius* sp. and *Ornithobilharzia* sp. were found which were 09 in numbers.

Cestodes comprises *Taenia* sp., *Moniezia* sp. and *Dipylidium* sp. They were 03 in numbers.

The research work was done under different headings viz., Sex-wise, Age-wise, Season-wise, Class-wise and general prevalence of intestinal helminth parasites in cattle.

In season-wise prevalence, prevalence of 42.10% trematodes, 52.63% nematodes and 5.26% cestodes was concluded within 19 different genera. In summer season. Among these highest prevalence was found by *Dipylidium* sp. (35.75) comparing with winter season 11.53% cestodes, 34.61% trematodes and 53.54% nematodes were observed. The maximum prevalence was by *Trichostrongylus* sp. (36.5%) infection among 26 genera.

The sex wise Prevalence goes like this, females were attacked by more no. of parasites comparing to the males. Regarding prevalence between males and females class wise, the percentages of trematodes, cestodes and nematodes were as follows : Male : female = 37% : 47% nematodes, 45% : 26% trematodes and 18% : 26% cestodes.

Similarly in age-wise prevalence, the different age groups were categorized viz – (0–2) yrs, (2–4) yrs. (4–6) yrs. (6–8) yrs and (8–12)yrs. The dominating parasites for each age group were recorded as (0-2) yrs by trematode *Dicrocoelium* sp. (2-4)yrs, by *Fasciola* sp. and *Dipylidium* sp. in winter and summer season respectively. (4 – 6) yrs of age-group was dominated by *Trichostrongylus* sp. a nematode. *Schistosoma* sp. and *Strongyloides* sp. a trematode and nematode respectively occupied the dominant space in (6 – 8) yrs of age group. Lastly multiple infection with three genera both trematode and nematode was recorded in old aged cattle. the category comprises (8-12)yrs of ages.

There are many other parasites which have negligible infection which were not noticeable in highest amount. They were by Hookworm (0.89%), *Ascaris* sp. (0.89%), *Trichuris* sp. (1.78%), *Cooperia* sp. (0.674%), *Capillaria (0.29%), oesophagostomum* sp. (0.37%), *Dictyocaulus* sp. (1.34%) & *Bunostomum* sp. (0.52%) among nematodes.

Similarly negligible genera consists of *Gastrothylax* sp. (1.27%), *Fischoederius* sp. (0.074%) and *Ornithobilharzia* sp. (1.12%). Among cestodes *Taenia* sp. shows 0.14% infection.

Among the positive samples 14 percent of the positive samples were found with single infection and rest 86 percent with multiple infections.

Due to the lack of sophisticated equipments in the lab during my lab study period the identification of parasites was possible up to the genus level. No species and subspecies have been identified.

Issan *et al.*, (2000) conducted a study on prevalence dynamics of fascioliasis versus other gastro-intestinal helminthes is both in buffaloes and cattle in Giza Governorate. They show 10.35% prevalence in cattle which is approximately similar to the present study. The helminthes included mainly other G.I. parasites such as *Paramphistomum* sp. and *Moniezia* sp.

In 2004, Yadav *et al.*, reported the helminth parasites which are similar to the present study. They reported the highest incidence of G.I. nematodes in buffaloes and cattle, viz *Haemonchus* sp. *Trichostrongylus* sp. *Bunostomum* sp. *Oesophagostomum* sp. and *Strongyloides* etc.

Moses, O.O *et al.*, (2008) shows 50% prevalence by *Histophilus somni preumonia* in Holstein-Friesian dairy cattle in Nigeria. It shows vast difference in Prevalence with the present study.

The prevalence of helminth parasites in buffaloes was found to be 83.96% in buffaloes brought to Satungal for slaughter purpose (Mukhia, G, 2007). the main helminthes were *Schistosoma* spp. 46.94%, *Fasciola* sp. 32.6%, *Dicrocoelim* spp 20.61% *Paramphistomum* spp 15.64% *Moniezia* spp 12.21%, *Toxocasa* spp. 22.90%, *Ascaris* sp. 6.87% etc. … It shows slight difference in prevalence with the present study.

As one group of parasite increases in number the other group decreases as per Australian veterinary journal, that is how the difference in type and no. of parasites was observed among different age groups and seasons. It is due to the presence of intermediate hosts at different seasons for different parasites.

In the present study the number of parasites among three classes, nematodes, trematodes and cestodes differed significantly. Statically **[¡ $^2_{(cal)}$ = 466.82 and ¡ $^2_{(tab)}$**

= 5.99, 2 d.f., P < 0.05]. This result rejected the hypothesis of the study as tabulated value is < calculated value. So the prevalence of different three classes of helminthes viz., Nematodes, Trematodes and cestodes was not same. In the study the prevalence differed in different age, sex and seasons as the intermediate hosts differs for all different genus for different seasons. Regarding the multiple infections in old aged cattle, might be the reason that resistance against diseases decreases at older age.

CHAPTER NINE
RECOMMENDATIONS

- Strategic antihelminthic treatment should be applied to eliminate the parasite from the host.
- Animal slaughter and meat inspection act should be implemented for better quality and disease free meat in those countries where cattle are slaughtered.
- The programmes for awareness about meat borne disease and zoonotic disease to the public and butcher should be developed.
- Clean and safe grazing ground should be use for the cattle.
- Parasite free fodder, water and grasses should be provided to the cattle.
- Cattle shed should be little bit far from the human habitation.
- Seasonal pasture contamination with seasonal pasture load need to be assured.
- Supplementary diagnostic technique for parasite load need to be assured.

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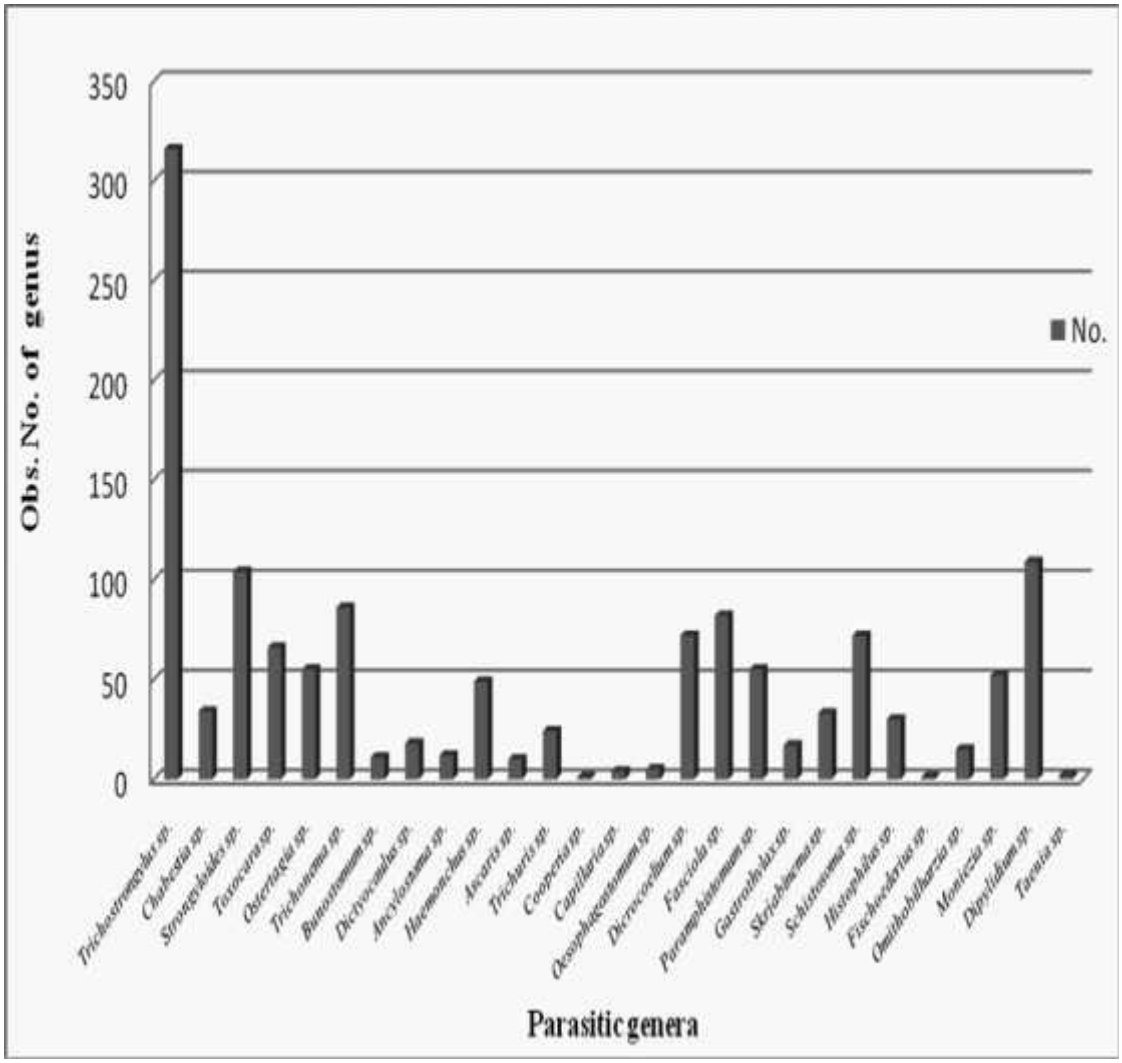
ANNEX

Number and percentages of observed Nematodes, Trematodes and Cestodes in general.

S.N	Parasitic genera	Obs. No. of genus	%
1.	*Trichostrongylus* sp.	316	23.65
2.	*Chabertia* sp.	34	2.54
3.	*Strongyloides* sp.	104	7.77
4.	*Toxocara* sp.	66	4.93
5.	*Ostertagia* sp.	55	4.11
6.	*Trichonema* sp.	86	6.43
7.	*Bunostomum* sp.	11	0.82
8.	*Dictyocaulus* sp.	18	1.34
9.	*Ancylostoma* sp.	12	0.89
10.	*Haemonchus* sp.	49	3.66
11.	*Ascaris* sp.	10	0.89
12.	*Trichuris* sp.	24	1.78
13.	*Cooperia* sp.	1	0.074
14.	*Capillaria* sp.	4	0.29
15.	*Oesophagostomum* sp.	5	0.37
16.	*Dicrocoelium* sp.	72	5.38
17.	*Fasciola* sp.	82	6.13
18.	*Paramphistomum* sp.	55	4.11
19.	*Gastrothylax* sp.	17	1.27
20.	*Skrjabinema* sp.	33	2.46
21.	*Schistosoma* sp.	72	5.38
22.	*Histophilus* sp.	30	2.24
23.	*Fischoederius* sp.	1	0.074
24.	*Ornithobilharzia* sp.	15	1.12
25.	*Moniezia* sp.	52	3.88
26.	*Dipylidium* sp.	109	8.15
27.	*Taenia* sp.	2	0.14
Total:		**1337**	**100**


Obs. No. of genus
350
300
250
200
150
100
50
0
No.
Trichostrongylus sp.
Chabertia sp.
Strongyloides sp.
Toxocara sp.
Oesertagia sp.
Trichonema sp.
Bunostomum sp.
Dictyocaulus sp.
Ancylostoma sp.
Haemonchus sp.
Ascaris sp.
Trichuris sp.
Cooperia sp.
Capillaria sp.
Oesophagostomum sp.
Dicrocoelium sp.
Fasciola sp.
Paramphistomum sp.
Gastrothylax sp.
Strigea sp.
Schistosoma sp.
Histophilus sp.
Fischoederius sp.
Omithobilharzia sp.
Moniezia sp.
Dipylidium sp.
Taenia sp.
Parasitic genera