

CHAPTER I

1. INTRODUCTION

Nepal is a small Himalayan agricultural country (26°21' – 30° 27' N, 80°40' – 88°12' E) with a total area of 147,181 sq.km and has plain Terai area in the South, and hills, valleys and Himalayas in the North (Anonymous, 1975). It is rich in insect fauna, primarily due to its climatic variation. This helps a lot in the maintenance of agricultural and ecological systems in the country.

Dung beetles have great role in agriculture, therefore, the taxonomic work on these beetles from Dhanusha district (26°35'- 27°5' N, 85°52' – 86°20' E, alt 61m – 610m) has been selected in the present study. This district with a total area of approximately 1219 sq. km is situated in the South- East region of the country (Map 1). Around this district there are Siraha on the East, Mahottari on the West, Sindhuli on the North and Bihar (India) on the South. North-South length of this district is about 48 km and East-West width is about 42 km. Climate here is Torpical to Sub-tropical with an average temperature between 19.3°C to 33.3°C and average rainfall is 1480 ml per year. The district has three regions: Churia hills or Siwaliks (305- 610m); Bhabhar zone (152- 305m) and Terai plain (61- 152m) (Anonymous, 1975).

Dhanusha on the basis of physiography, climate, forest, crop-lands, pastures, grasslands, etc. was divided into different collection sites for study purpose. Being an agricultural district, the farmers here domesticate animals for agricultural purposes and many people live in the rural areas, so the dungs and excreta are abundant which serve as food for the dung beetles. Ecological conditions of the district and availability of sufficient food favour the reproduction and growth of the dung beetles. Although Dhanusha is rich in insect fauna but taxonomic studies in all groups of insects are neglected. Being their great agricultural importance of these beetles many taxonomic works were attempted in other countries but no attention were paid till date from Dhanusha, so comprehensive work on this group was needed.

The beetles are economically important in terms of environmental pollution as well acting as scavengers. Besides feeding on excrements of various animals they use the carrion, decaying fungi or other vegetable matters as well and bury them deep into the

soil for feeding their young and themselves. In addition, the excrements remaining on the soil surface gradually dissolve in soil, so act as nutrients to the growing crops and speed up the efficiency of nutrient recycle, increase porosity as well as water holding capacity of the soil as quoted by Oppenheimer (1977) and Gordon and Oppenheimer (1975). These combined activities of dung beetles, therefore, result in increased plant growth and yield, so these beetles have an important role in the terrestrial ecosystem. In a tropical environment this behaviour of dung beetles is immensely important as it saves thousands of tons of valuable plant nutrients from being swept away by the rain water. Thus, as noted by many authors that the dung beetles form an important link in the transformation and recycling of energy resources in a terrestrial ecosystem [Sewak and Yadva (1991); Chatterjee and Biswas (2000); Biswas and Chatterjee (1987)].

The dung beetles (Scarabaeidae: Coprinae) are smaller to larger (2 to 23mm) robust, almost always shiny black, usually rounded or oval and rather convex insects feeding exclusively including larvae on dungs of different mammalian species. They have widely separated middle coxae, invisible or small scutellum, exposed pygidium and hind tibia with only one spur. Many species have spines and horns on head and prothorax. Their frontoclypeus is expanded to cover the mouth-parts; mandibles are lamelliform, usually membranous with only the sclerotized outer edge. Antennae are eight or nine-segmented, club is three-segmented and abdomen is with six visible sternites; fore-tarsi are sometimes lacking. Their larvae have a pronounced hump at the middle of thorax on dorsal surface and tarsal claws are minute or absent. They are most often nocturnal but some are diurnal. The beetles are widely distributed and found almost all over the world, but more common in Tropics than in the Temperate region.

1.1. Rationale and justification of the study

Insect fauna like the dung beetles helps a lot in the maintenance of agricultural and ecological systems in the country. Taxonomic study on dung-beetles furnishes useful ecological information which is the first step in the conservation of insects. Ecological conditions of Dhanusha district and availability of sufficient food favour the reproduction and growth of the dung beetles. The present study was undertaken to explore localities and distribution of different species of dung beetles in various

habitats so as to make a comprehensive taxonomic study of the group in the district. Different district localities were extensively and intensively surveyed at different seasons (2001 to 2005) to obtain the records of dung beetles, their foods and habits, etc. Detail biological information regarding their food preferences, seasonal abundance and other aspects of the group were also included in the work. Next, easy keys have been presented for quick identification of the different genera of these beetles of this district and their check-list from Nepal has also been prepared. Descriptions of important genera and species based on certain morphological features including male genitalia are also considered in identification.

1.2. Characters of taxonomic importance

1.2.1. Head (Pl. I, Figs. 1,7): Head is large and shovel-like. It has always a broad and flat upper surface, suitable for shovelling the food materials.

1.2.2. Clypeus (Pl. I, Fig. 1): Clypeus is well developed. It overhangs the mouth in front and is supplemented at sides by flat lateral lobes, which are here called as ocular lobes. Junction between ocular lobes and clypeus is always marked by a suture or ridge, and they may be produced forward as sharp anterior teeth or continuous with the clypeal margin. Shape of clypeus varies very greatly, and its front margin may be rounded, straight, excised, or produced into one, two, three, or four teeth or lobes (Pl. XI, Figs. 1, 2, 4, 5).

It is also liable to differ in shape according to sex, and either the clypeal margin, ridge separating clypeus and forehead, or the posterior margin of head may give rise in male to horns or horn-like outgrowths.

Junction of clypeus with forehead is usually marked by a carina, long or short, or this may be more or less obliterated. Surface-sculpture of two regions very frequently differs, and is stronger and closer upon clypeus than upon the forehead.

Eyes are externally traversed by ocular lobes and are divided into two portions, upper and lower, which may be almost, though never quite, completely separated. Larger part is always beneath, and the upper part is often reduced to a very narrow and

inconspicuous strip enclosed between the ocular lobe and posterior part of the head (Pl. I, Figs. 1, 7)

1.2.3. Antennae (Pl. I, Figs. 1, 4): Antennae are small and very short. They remain attached close to the front edge of the lower portion of eye, and can be laid back in a groove between the eye and mouth, so that they are concealed beneath the head when not in use. They are only eight or nine segmented. First segment or scape is long; 2nd is small and globular; third rather longer; the next two or three exceedingly short and compact; and the last three form a small club. Club forming segments differ to some extent in their shape and relation to one another, but are always short; occasionally the first of the three forms a hollow cup into which the two succeeding segments can be withdrawn, but more commonly the segments are alike, and simply placed side by side. Antennae are alike in two sexes, which is, perhaps, the evidence of equal activity of the two sexes.

1.2.4. Mouth-parts: Mouth- parts are adapted for soft nature of food.

1.2.5. Labrum (Pl. I, Fig. 2): Labrum is a thin membrane lying close to the roof of the mouth and is covered with short spines, which are curiously arranged.

1.2.6. Mandibles (Pl. I, Fig. 3): Mandibles are not adapted for biting. Basal part of mandible is hard and chitinous, and a very hard rounded process upon one exactly fits a corresponding hollowed process upon the other, constituting the masticatory apparatus. Terminal part of mandible is reduced to a thin translucent membrane, more or less rounded at the end, where it carries a rather coarse brush or pad of long hairs. Two opposed surfaces bear fine transverse grinding ridges, produced at the inner end into a comb composed of perfectly regular hard teeth set very close together. Inner edge of mandible is finely fringed with very close short hairs, forming a continuation of the terminal brush, but generally abruptly demarcated from it.

1.2.7. Maxillae (Pl. I, Fig. 5): Maxillae are without teeth and are incapable of biting. They have at their extremity two flesh lobes which are closely covered with short hairs and carry externally a rather long four- jointed palpus, with a slender and pointed terminal joint. The outer lobe may be small and narrow (*Scarabaeus* L.), or large, transverse, and rather semicircular in shape (*Onthophagus* Latr.).

1.2.8. Labium (Pl. I Fig. 6): Labium shows more disposition to differ in different genera than the other organs of mouth. It is generally covered with very long stiff bristles, which render it difficult to discover its precise form. Ligula is very soft, composed of two widely separated lobes, and a hard mentum, sometimes it may be bilobed and varies considerably in shape. Labial palpi are peculiar, generally also very bristly and of flattened shape, the two basal joints sometimes very much dilated, last joint sometimes extremely minute and generally much smaller than those preceding it, sausage shaped, and free from the bristles clothing the others.

1.2.9. Prothorax (Pl. I, Fig. 1): Head fits closely into the prothorax.. Occasionally the thorax has well-marked hind angles, but usually the lateral margin meets the basal margin without forming a distinct angle.

1.2.10. Scutellum: A peculiar feature of subfamily Coprinae is the usual absence of a scutellum or exposed part of the mesonotum. When present, as in *Oniticellus* Serv., *Drepanocerus* Kirby, *Onitis* F., and *Chironitis* Lansb., the scutellum is very small, and in by far the majority of species it is entirely wanting.

1.2.11. Elytra (Pl. I, Fig. 1): Elytra are well developed and generally curve gently round the body at the sides, but they may be sharply bent under, forming epipleural folds. Occasionally they do not completely cover the sides, which are visible from above, as in *Oniticellus* Serv. (Pl. XX, Figs. 1, 2, 4, 5, Pl. XXI, Figs. 1, 2). In *Gymnopleurus* Illig. (Pl. III, Figs. 1, 2, 4, Pl. IV Figs. 1, 2), the sides of the elytra are deeply excised behind the shoulders, exposing the sides of the body beneath. This seems to be a means of facilitating instant flight by allowing the wings to be slipped out rapidly. Each elytron bears usually six complete dorsal striae; a seventh, which is incomplete at the base and begins below the shoulder prominence, is generally present, and in addition to these there may be one or two generally incomplete, lateral striae. The epipleural carina, if present, is usually close to either 7th or 8th stria, and may efface it.

Elytral striae may be of simple grooves or of double lines forming shallow but not very narrow furrows with a fine raised margin on each side. They may be interrupted by small punctures or large annular punctures or short transverse strokes. Elytra may be smooth, beset with punctures of various sizes or may be granular. Ground surface

may be smooth or more commonly microgranular imparting opaque appearance. The region in between the elytral striae is known as strial interval, the place next to elytral suture is called sutural interval.

1.2.12. Prosternum (Pl. I, Fig. 8): Prosternum is little developed, the front coxal cavities being always close together and divided only by a thin septum. Coxae project far from their sockets, and usually remain in contact with one another, or almost so. Usually prosternum is not produced in front or behind, but an extension or thickening occurs behind the coxae in *Oniticellus* Serv.

Sides of the prothorax may be divided beneath by an oblique ridge, which extends from the margin of the coxal cavity to the outer margin, and in some species of *Onthophagus* Latr. and *Copris* Geoffroy the anterior division lying beneath the front angles is hollowed.

1.2.13. Mesosternum (Pl. I, Fig. 9): Mesosternum is short and is fused with the metasternum, junction being usually indicated by a fine ridge, which may be straight or curved or angular.

1.2.14. Metasternum (Pl. I, Fig. 9): Metasternum is divided by the peculiar position of the middle coxal cavities into three portions, viz. metasternal shield in the middle and metasternal sides at both sides.

1.2.15. Legs (Pl. I, Figs. 10, 11, 12): Legs have great muscular power, more especially the front pair, which are the essential digging implements. These are always short, except in the males of certain species. In those genera which consist of ball-rolling species, the four posterior legs are long. The femora show little variation, but may present one or more teeth at their lower edges.

Front tibia is provided upon its outer edge with strong teeth, generally four in number, but occasionally only three (*Gymnopleurus* Illig. and certain species of other genera), and above the teeth, and sometimes also between them, the edge may be finely serrate. Tibiae are comparatively short, increasing in thickness from base to extremity, where they are the widest, and so well fitted for shovelling away the materials excavated by the forelegs. All the tibiae bear terminal spurs, two each upon the

middle pair and one upon each of the others, except in *Scarabaeus* L. and *Gymnopleurus* Illig., where all are single-spurred. In these two genera the spurs are completely soldered with the tibiae to give a firmer hold in the operation of rolling. Tibiae generally bear stiff hairs or bristles at their extremities and along the inner and outer edges, and in *Scarabaeus* L. there are close and conspicuous fringes, sometimes four in number, upon the hind legs.

1.2.16. Tarsi (Pl. I, Fig. 10, 11, 12): Front tarsi throughout the Coprinae are of rather feeble development, and in two of the genera, viz. *Scarabaeus* L. and *Onitis* F., they are absent in the mature insect. In the genus *Chironitis* Lansb. the front tarsi are absent in males but present in females. In ball-rolling genera, *Scarabaeus* L., *Gymnopleurus* Illig. and *Sisyphus* Latr., tarsi are simple and filiform, and, except in *Sisyphus* Latr. where the first joint is much longer than others, the first four joints are nearly equal. In most of the other genera middle and hind tarsi are a little flattened, and taper from base to extremity. Basal joint is long, second is shorter than first but longer than third, third longer than fourth, and the fifth is slender. Inner edges of the joints are closely fringed, and the outer edges less closely fringed.

Claws are small, simple and symmetrical, pulvillus is absent, but the end of the claw-joint sometimes extends between their bases, and the extension may form a sharp spine, as in *Catharsius* Hope.

1.2.17. Abdomen (Pl. I, Fig. 9): Elongation of metasternum has corresponding effect on the shortening of abdomen, and even in long-bodied genus like *Oniticellus* Serv., abdomen is relatively short. It consists of six externally visible sternites which are very closely attached and are capable of little or no movement except at the base. The last abdominal tergite, the pygidium, is always large and exposed, and may be vertical or inclined a little inwards. Along each side of abdomen, a line coinciding with the outer edges of the elytra, is usually present and except in few cases, this line is continued along the pygidium and is called as basal ridge of pygidium. In a species of *Onthophagus* Latr. (*O. tarandus* F.) the ridge is absent.

Abdominal spiracles are placed in the connecting membranes between the tergites.

1.2.18. Wings: In Coprinae wings are well developed. They locate their food-material by scent and in general they are strong and ready fliers. Certain genera (*Gymnopleurus* Illg., *Oniticellus* Serv.)(Pl. III, Figs.1,2; Pl IV Figs.1,2; Pl XX, Figs. 1,2,4,5; and Pl. XXI, Figs. 1,2), instead of having the elytra bent round the sides of the body in the usual way, have the lateral part reduced to facilitate the instant slipping out of the wings for flight and their immediate sheathing on alighting.

1.3. Horns and secondary sexual characters

Coprinae exhibit a number and variety of horns and similar outgrowths called as armatures, which help in distinguishing the male sex. These are peculiar for the multitude of small, even tiny, forms in which curious and varied armatures are found.

Such armatures sometimes occur in the females also but with few exceptions, they are most highly developed in males, and in most cases the female is either quite without or has only slight vestiges of them.

In males of various species of the Coprid genus *Sisyphus* Latr., teeth or spines may appear on the hind femora, middle femora and tibiae, or in some cases on the trochanters of hind legs. Genus *Onitis* F. also has teeth on legs generally the middle pair, but sometimes on the hind femora also. Genus *Chironitis* Lansb. bears a remarkable process on the prosternum behind the front legs, and in this genus another very remarkable sex-difference is the presence of front tarsi in the females only. Terminal spur of front tibia is also liable to a special development in some male Coprinae. In *Gymnopleurus* Illg. this is often bifid. In *Onthophagus pactolus* F., it is straight in males and bent in females.

Frequent difference between the two sexes is also found in the front legs, especially in the tibiae. In female these are short and broad with strong external teeth set close together but in the male of many species, particularly in the genera *Onitis* F. and *Onthophagus* Latr., these limbs are more or less elongate with the teeth shorter and more blunt and set at a distance from one another. Tibia usually also acquires a strong curvature.

Another frequent difference between the sexes of the Coprinae is in the form of the head. This like, the front legs, is an important digging equipment in the female. It is more or less spade-like, usually roughened upon the upper surface, and bearing one, two, or three strong transverse ridges. In males clypeus is often smoother and the ridges may be absent, feeble, or produced into horns.

In *Onthophagus mopsus* F. (Pl. XVIII, Figs. 6, 8), head of male bears an extremely long and slender thread-like horn, arising in front of the eyes and curving backward, sometimes extending beyond the hinder margin of pronotum.

Horn/s may be present on thorax instead of head, or both head and thorax may display them. Thoracic horns are no less varied than those of head. Like cephalic horns, the thoracic horns may be directed forward, backward, or upward. In *Drepanocerus setosus* Wied. (Pl. XXII, Figs. 1, 2) the male carries a single horn on thorax arising behind and pointing forward and forked at the end.

For the consideration of the significance of sexual dimorphism the features peculiar to the female sex are not less important than those distinctive of male. In *Oniticellus pallipes* F. (Pl. XX, Figs. 1, 2) there is a small horn on the head, not in male. Occurrence of a horn peculiar to female is very exceptional. It is less exceptional to find the female bearing a horn of a kind different from that of male. In *Onthophagus sagittarius* F. the female (Pl. XVIII, Figs. 2, 5) has a short erect horn on the head and another directed forward on thorax, while the male (Pl. XVIII, Fig. 1, 4) has neither but carries a pair of short lateral horns on its head.

In a certain species both sexes have identical armatures. *Onthophagus bonasus* F. (Pl. XVI, Figs. 1, 2, 4) closely resembles *Onthophagus catta* F. (Pl. XV, Figs. 7, 8). Both species have a pair of long, backwardly directed cephalic horns, but in *O. catta* F. these are peculiar to male and in *O. bonasus* F. they are possessed by both sexes. *Onthophagus tarandus* F. (Pl. XIV Figs 1,2,3) is remarkable for elaborate armature, common to both sexes alike. It consists of a pair of widely diverging sharp horns on head and a broadly-forked median horn and pair of lateral spikes on thorax.

1.4. Colouration

Coprinae are not as a whole a brightly coloured group. Many of the genera including some of the most important, such as *Copris* Geoffroy, *Catharsius* Hope, and *Heliocopris* Burm., are almost entirely black, so black is the predominant hue. Many of ball-rolling species are entirely black and others exhibit brilliant metallic colours. Genera like *Onthophagus* Latr. and *Phalops* Er. include both brilliant forms suggesting warning colouration and others of dirty-brown tints evidently serving for concealment. *Onthophagus pactolus* F. (Pl. XIV, Figs. 4, 5) is very conspicuously coloured species. On the other hand, dull sombrely coloured form like *Oniticellus spinipes* Roth and those with indefinite patterns in neutral shades like *Oniticellus pallipes* F. seem designed to harmonize closely with their environment. Occasionally the sides of thorax remain pale to a greater or less extent when the middle is dark but the pigmentation of elytra is a much more complicated & gradual process and colour-pattern is almost confined to them. Pigmentation begins by appearance of an inconstant mottling confined to the punctures as in *Onthophagus rectecornutus* Lansb.

In many of the black forms of which the genus *Onthophagus* Latr. contains so many, a slight metallic lustre, sometimes very faint indeed, may appear in certain parts especially on the head.

1.5. Male genitalia (Pl. IA, Fig. 1)

It is one of the most important structure and is of great taxonomic importance due to its constant nature of structure. So, the modern taxonomy of dung beetles is mainly based on it. It is formed by the modification of posterior abdominal segments and hence it consists of so called "Phallic Organs"(Snodgrass, 1935). The 9th abdominal segment in Coprinae as well is greatly modified to form the genital chamber into which the genitalia are suspended when at rest.

The male genitalia of dung beetles consist of various sclerotized and membranous parts arranged around the terminal portion of the ejaculatory duct as follows:

a) Phallobase (Pb). It is proximal, long, hollow, highly sclerotized structure, forming complete ring above the parameres and aedeagus, and opens apically by wide

orifice into which the ejaculatory ducts enter. At rest the phallobase contains aedeagus and parameres.

- b) Paramere (Pm).** It is a paired structure and is derived from the phallic lobes. These are in continuation with the phallobase and are highly sclerotized, lateral appendages, which act like claspers during copulation.
- c) Aedeagus (Aed).** It is also known as phallus (Snodgrass, 1935) and is a strong, symmetrical, sclerotized median tube and functions as the main copulatory organ. It has an aedeagal apodeme on dorsal side for the attachment of muscles which act like lever for the movement of endophallus.
- d) Endophallus (End).** It is a muscular internal structure situated inside the phallobase; it becomes everted into the female gonopore during coitus. Thus, it is the functional intromittent organ.

The ring shaped phallobase and tubular aedeagus of male genitalia of all the recorded genera of Coprinae in the present study showed a closer resemblance with each other while the structures of parameres and endophallus are greatly different at both generic and species level. Parameres are elongated and bristilized in *Heliocopris*, elongated and bristleless in *Catharsius*, pointed and bristleless in *Onitis*, pointed and bristilized in *Copris*, smaller and bristilized or bristleless in *Onthophagus* and very small and bristleless in *Oniticellus*. The endophallus was observed broadened apically and narrow proximally in *Heliocopris* and *Catharsius*, bristilized sole shaped in *Copris*, H or Y-shaped in *Onitis*, broadened apically in *Oniticellus* and varying shaped in *Onthophagus* and *Gymnopleurus*.

Thus, the evidence of male genitalia of dung beetles confirms the independent status in Scarabaeidae.

1.6. Female genitalia

External genital organs are absent in the female Scarabaeidae, so no taxonomic values.

1.7. Classification

Arrow (1910) considered Lamellicornia as Super-family and divided it into three families, viz. Scarabaeidae, Passalidae and Lucanidae. The Scarabaeidae is again divided into two groups– Pleurosticti and Laparosticti. Group Pleurosticti is characterized by having the posterior spiracles situated in the dorsal part of chitinous ventral segments and include primarily the plant feeders and chafers. This group is divided into four Subfamilies–Cetoniinae, Dynastinae, Rutelinae and Melolonthinae. Group Laparosticti is characterized by having the abdominal spiracles situated in a line on the membrane between sternites and tergites, and are dung feeders and scavengers. This group is divided into eight Sub-families–Ochadaeinae, Geotrupinae, Orphinae, Hybosorinae, Chironinae, Troginae, Aphodiinae and Coprinae.

Arrow (1931) in "The Fauna of British India" including Ceylon and Burma' Part III (Coprinae) divided the Subfamily Coprinae into four divisions - Scarabaeini, Sisyphini, Coprini and Panelini. Richards and Davies (1977) on the other hand included the Subfamilies Cetoniinae, Dynastinae, Melolonthinae, Rutelinae, Aphodiinae and Scarabaeinae in Scarabaeidae but Trogidae, Acanthoceridae and Geotrupidae are given separate status of independent families.

Balthasar (1963) in his monograph on "Palaeartic and Oriental Scarabaeidae" considered Scarabaeoidea as a Superfamily under which Scarabaeidae and Aphodiidae have been dealt as separate families. Then Scarabaeidae is divided into two subfamilies, viz. Scarabaeinae and Coprinae. Further Subfamily Scarabaeinae is divided into six tribes, viz. Eucraniini, Scarabaeini, Gymnopleurini, Sisyphini, Alloscelini and Canthonini. Similarly subfamily Coprinae is divided into seven tribes, viz. Pinotini, Coptodactylini, Coprini, Phanaeini, Onitini, Oniticellini and Onthophagini.

Next, Borror and DeLong (1970) included the subfamilies Troginae, Acanthocerinae, Geotrupinae, Pleocominae, Glaphyrinae, Scarabaeinae, Aphodiinae, Aegialiinae, Hybosorinae, Ochodaeinae, Rutelinae, Melolonthinae, Dynastinae, Cetoniinae and Pleocominae in Scarabaeidae.

Matthews (1972, 1974, 1976) in his 'A Revision of the Scarabaeini Dung Beetles of Australia' considered Scarabaeinae as Sub-family under family Scarabaeidae and indicated that Subfamily name Coprinae is not valid according to article 39 of the 'International Code of Nomenclature'. He considered the tribe Coprini (Type genus *Copris*) as separate equal in rank with Scarabaeini.

Nayar et al. (1976) placed Trogidae, Geotrupidae, Melolonthidae, Rutelidae, Dynastidae and Cetoniidae as independent families and the Scarabaeidae was constituted of only one subfamily the Coprinae.

Arrow's (1931) system of classification is followed in the present work and Coprinae is considered as subfamily under Scarabaeidae.

CHAPTER II

2. OBJECTIVES

1. To explore localities and distribution of different species of dung beetles in various habitats so as to make a comprehensive taxonomic study of the group.
2. To survey different localities extensively and intensively at different seasons to obtain the records of dung beetles, their food preferences, seasonal abundance, habits and other aspects of the insects.
3. To develop easy keys for quick identification of the beetles from Dhanusha district of Nepal.
4. To prepare a check-list of dung beetles recorded from Nepal.
5. To study the male genitalia of recorded species from Dhanusha district.
6. To describe collected genera and species based on certain morphological features including male genitalia.

CHAPTER III

3. REVIEW OF LITERATURE

3.1. Taxonomic part

Some distinct Coprinid taxonomists of western and other parts of world in the past were many. Firstly, Gillet described a British *Onthophagus nouveaux* in 1925 and Janseens studied several species and genera of Coprini and Oniticellini in 1939, 1949, 1953 and gave their systematic account. Next, from the western world was Matthews in 1962 studied *Copris* Muller of this region and revised taxonomy of this genus. In 1966, he carried out the taxonomic and zoogeographic survey of Scarabaeinae of the Antilles, Australia. Then in 1972, 1974, 1976 he studied the Onthophagini, Scarabaeini and Coprini of Australia and revised the taxonomy of these beetles. As a collaborative work Halfter and Matthews described numerous genera and species based on their genitalia from Australia and formed keys for the species identification in 1966. Again, in 1968 Matthews and Halfter presented new data of American *Copris* and described the fossil species.

African dung beetles were also studied by Howden and his associates. In 1987 Howden and Scholtz revised the taxonomy of African dung beetle species of *Odontoloma*, *Epirinus* and Canthonine genera. They described a new species, *Peckolus alpinus* from S. Africa in 1988. Davis (1987) also described three new Afrotropical dung beetles, *Kheper zurstrasseni* from S. Africa, *Gymnopleurus particular* from W. Africa and *Onitis autumnalis* from S. E. Africa and also discussed their relationships.

From the American continent, Kohlmann and Solis (1996) described a species, *Scatimus erinayos* from Costa Rica (S. America). In 2001, Delgado and Kohlmann described a new species and two subspecies of *Copris* from Mexico and other parts of Central America. Again in 2003, Solis and Kohlmann described four species, (*Copris tridentatus*, *Onthophagus notides*, *O. xiphias* and *Trichillum arcus*) from Costa Rica and Panama, then reported *Pedaridium bradyporum* Bouc. from Costa Rica for the first time. In 2003, Kohlmann, Cano and Delgado from Guatemala and Honduras (N. America) described and illustrated the *Copris caliginosus* and *C. nubilosus* as new

species and provided new distributional records of five species and subspecies of the same genus from Guatemala and El Salvador (S. America).

Similarly, in 1945 Ritcher studied whole of the Coprinae from Eastern North America giving description of their larvae and providing a key to the genera and species of the same. In 1987, Howden and Gill described eight new species of Coprinid from Panama and three from Costa Rica and made several new records and transformed the names of several species. Again in 1999, Genier and Howden described two new species (*Onthophagus barretti* and *O. breviconus*) from Central America. Genier alone revised the taxonomy of neotropical genus *Ontherus* and described *O. gladiator* from Brazil in 1998 and described *Ateuchus floridensis* from N America in 2000.

From the Indo-China, Paulian (1945) described few species of dung-beetles. Before that Matsumura in 1936 & '37 from Japan described new species of *Caccobius* and *Onthophagus* and provided a key for their identification. Again in 1937 & '38 Matsumura studied Onthophagid insects of Korea and Formosa and described some new species. In 1955, Nakane and Tsukamoto studied *Copris* Geoffroy in Japan and in 1956 they studied the whole scarabaeines of Japan. In 1956, Nakane alone studied *Onthophagus* Latr. of Japan.

In 1986, Martin Piera reviewed the taxonomy and systematics of the Palearctic species of the subgenus *Parentius* Zunino of *Onthophagus* Latr. and described *O. zuninoi* and *O. rachelis* from Central Asia. Again, in 1987 he described male *O. rachelis* with geographic distribution of this species and reviewed the taxonomy, phylogeny and zoogeography of the Palearctic species of *Chironitis* Lansb.

Indonesian dung beetles were studied by Krikken and his associates. In 1987, he and Huijbregts recorded and made key of seven species including the descriptions of five species of *Onthophagus* Latr. from this country. They also discussed the *Onthophagus palatus* group in brief and described *O. paropalatus* from West Java of this country in 1988. Krikken (1987) also described the *Synapsis cambeforti* from Borneo with notes on its relatives.

From East Asia, Ochi and his associates studied the dung beetles of this region. In 1992, Ochi studied the coprophagous beetles and described two new species *Synapsis*

masumotoi and *Copris (Microcopris) mindorensis* from Taiwan and Philippines. He and Araya revised one species-group of *Copris* Geoffroy and two species-groups of subgenus *Parascatonomus* Paulian of *Onthophagus* Latr. and latter described two new species of *Copris* and nine species of the *rudis* (group of *Onthophagus*) from this region in the same year. Then in 1992, Zelenka described the *Onychotheucus tridentigeris* from Thailand and *Copris novaki* from Malaysia.

From the South-East Asia, initial investigations on the coleopteran group of insects dates back to early decades of 20th century by many western investigators like Gahan (1906), Jacoby (1908), Fowler (1912), Marshall (1916), Maulik (1919, 1926, 1936), Cameron (1930, 1931, 1932) and many others, all published in the "Fauna of British India" series. More specific authority for the coprinid group of this region was G.J. Arrow who made notes on *Oniticellus* Serv. with the description of some its new species in 1908 nineteen species of *Sisyphus* Latr. in 1927, and the Coprids with description of a new genus *Deronitis* with its few species (*D. ephippiatus*, *Pseudopedaria gilleti*, *Copris gladiator*, *C. angusticornis*, *Synapsis yunnanus* and *Gyronotus elongatus*) from the region in 1933. Therefore, earliest work on taxonomic importance of Indian Coprinae comes from the efforts of Arrow in 1931. He published a volume on Indian Coprinae in the series "Fauna of British India". Arrow's work indeed, included all the records from India being brought together with 23 genera and 354 species from Ceylon, Burma, Sikkim, Bhutan and Nepal. Identification was based entirely on phenotypic characters like colour markings, shape and size of the body parts, etc., and therefore, many species are now transformed in next taxa in the present taxonomic system.

Next well known taxonomist on Coprinids from this region was Balthasar who described a new species of *Onthophagus* Latr. in 1937 from Khasi Hills of Meghalaya as well as established many new species of this genus. Then he published a monographs of the 'Palearctic and Oriental Aphodiidae and Scarabaeidae' in 1963. Kushwaha (1961) studied the soil beetles in four small areas of Allahabad (UP, India) and a little later, Vazirani (1966) described a new species of *Sisyphus* Latr. from India. Gordon and Oppenheimer (1975) also described a new species of *Onthophagus* (*O. bengali*) from W. Bengal and placed *O. dichropygus* Gillet as a Junior synonym

of *O. bifasciatus* F. with their ecological notes. Oppenheimer (1977) alone studied the ecology of 35 species of dung beetles in two villages of W Bengal.

Biswas and his associates are next well known personnels who have done great contribution on Coprinids of India in the late 20th century. Biswas alone described *Onthophagus (Strandius) subansiriensis* as new species in 1978 and made notes on other two Indian species of subgenus *Strandius* from NE India. Then, in 1980 he described three new species, *Copris (S.str.) siangensis*, *Onitis assamensis* and *Drepanocerus kazirangensis* and made the first records of two species, *Drepanocerus runicus* Arrow and *D. striatulus* Paulian from India. In 1995, he reported nine species under six genera from the Western Himalaya of UP In 1985, Biswas and Chatterjee recorded 55 species under 13 genera from Namdapha Wild Life Sancturay in Arunachal Pradesh (AP) and in 1986 they again recorded 16 species under 6 genera from the Silent Valley in Kerala in India. Among them seven species from AP and three from Kerala were described as new alongwith 48 species as first record from AP. They also recorded 27 species under 8 genera in 1987 including a new species from Palamou Tiger Reserve in Bihar and 40 species under 16 genera from Orissa in 1991, Chatterjee and Biswas recorded 27 species under 8 genera from Tripura in 2000.

Biswas and Mukhopadhyay in 1991 again recorded *Onthophagus difficilis* Walker from Lakshadweep Islands. Biswas, Chatterjee and Sengupta then in 1997 recorded 3 species under 2 genera from Delhi and five species under four genera with one new species from Andaman and Nicobar Islands in 1999. Again in 2000 Biswas and Ghosh recorded 115 species under 17 genera with 28 new species from Meghalaya.

Other well noted personnel working on Coprinids of India little earlier to Biswas was the great taxonomist Mittal who studied the Scarabaeids of Haryana and surrounding areas in 1981. Sewak also for the first time in 1985 recorded eight species under five genera from Gujarat with *Caccobius meridionalis* Bouc. as the first record. Next he recorded 36 species under 10 genera in 1986 from Rajasthan with *Scarabaeus andrewsi* Felsche and *S.cristatus* F. as first records from India. Sewak and Yadav also reported 36 species under 8 genera from the five districts of Western UP in 1991.

In 1994 and 2000, Veenakumari and Mohanraj also recorded *Onthophagus unifasciatus* F. and *Sisyphus longipes* Oliver for the first time from Andaman Islands. Apart from the taxonomic work in India, Veenakumari and Veeresh from Karnataka (Bangalore) studied some reproductive aspects of *Onthophagus gazella* F. and *O. recticornutus* Lansb. in 1996 and they studied the feeding and nesting behavior of *Heliocopris bucephalus* F., *Oniticellus cinctus* F. and *Sisyphus hirtus* Wied. in 1998.

3.2. Review of works done in Nepal

Knowledge of Nepalese Coprinae is mainly based on the valuable contributions made by Arrow (1931); Balthasar and Chûjô (1966); Shrestha (1982, 1984, 1999, 2001, 2005); Cambefort (1986); Shrestha and associates in 1977, 2001 & 02 but no comprehensive work on this group from Dhanusha district has so far been made. Present work, therefore, would be the first account of Coprinae from this district of Nepal.

Arrow (1931) in his monographic work "Fauna of British India" Series Part III, recorded twelve species under seven genera of dung beetles from this country. Then, in 1966 Balthasar and Chûjô recorded eight species under five genera of these beetles from East Nepal.

Then, Shrestha is the pioneer to record the Nepalese Coprinae. She recorded one species of dung beetle from Gokarna forest (Kathmandu) in 1982 and six species under four genera from Swayambhu in 2001, two species under two genera from Pipar (Kaski) in 1984, seven species under five genera from Dolakha district in 1999 and 89 species under 15 genera from Nepal in 2005. In 2001 she and her associates recorded 17 species under eight genera of dung beetles from the Royal Bardia National Park (Bardia), 21 species under nine genera from lower belt of Karnali region, mid-west Nepal, and 16 species under seven genera from Koshi Zone in 2002. Of these *Scarabaeus sanctus* F., *Gymnopleurus gemmatus* Har. , *Phalops olivaceus* Lansb., *Onitis singhalensis* Lansb. and *O. crassus* Sharp were the first record from Nepal.

Cambefort (1986) of France also described and illustrated a new species, (*Har. ius lassallei*) from Nepal and compared it with the allied taxa. No detail taxonomic work

as such in the present group is carried out in the country, hence no detail review work can be made.

3.3. Genitalia

There are many literatures on male genitalia of dung beetles like in many other insects which could be the basis of genus and species identification in recent taxonomic studies. Indeed, coleopteran taxonomy based on genitalia was started by many authors of different parts of the world. Sharp and Muir in 1912 studied the comparative anatomy of the male genital tube of the Coleopteran insects. Muir (1918, 1919) alone made notes on the ontogeny and morphology of the male genital tube in Coleopteran insects and studied the male abdominal segments and aedeagus of *Harbocerus capillaricornis* Grew. Again, in 1919 he alone studied on the mechanism of attachment of male genital tube in Coleoptera. Snodgrass also in 1935 studied the genitalia of beetles and gave the nomenclature of various genital parts. In 1957, he revised the interpretation of genitalia of different orders. Gilbert in 1952 homologised the male genitalia of *Rhynchophora* and allied types like Wood (1952) who studied the male genitalia of certain families of Coleoptera and homologised them. Lindroth and Palmen (1956) also studied the male genitalia of many beetles of different Coleopteran families and cleared about their origin, morphology and types. In 1957 Lindroth studied the genitalia of all insect orders and compared the terminology used by various workers. Thus the work of Lindroth and Palmen and those of Snodgrass could be satisfactory and valuable basis of species identification. Next, Abdullah et Abdullah (1966) described the abnormal aedeagus (Tegmen + median lobe) of American *Pedilus cyanipennis* (Anthecidae) with the summary of teratological observation in Coleoptera. Smith (1969) stated the evolutionary morphology of insect genitalia and their origin and relation to other appendages. Mittal also studied the male genitalia of *Maladera mulsant* (Sericinae) in 1976, then Mittal and Pajani studied the male genitalia of *Holotrichia freyi* (Melolonthinae) in 1977. In 1999 Lopez-Guerrero made morphological comparison of the male genitalia of two Scarabaeine genera *Eurysternus* Dalman and *Sisyphus* Latr.

In India also Sewak and his associates studied the male genitalia of dung beetles. They considered male genitalia as a good taxonomic character due to its constant nature of structure. They provided simple and reliable keys for the identification of

male dung beetles. Singh, Sewak and Rana in 1983 studied the male genitalia of few species of *Heliocopris* *Burm.* Sewak alone studied the male genitalia of few species of *Copris* Geoffroy in 1984, those of few species of *Catharsius* Hope and *Onitis* F. in 1985, few species of *Onthophagus* Latr. in 1986 and few species of *Oniticellus* Serv. and *Gymnopleurus* Illig. in 1988.

Present system of identification, therefore, is also based on genital characteristics.

CHAPTER IV

4. MATERIALS AND METHODS

The dung beetles for the present study were collected from different localities (Janakpur, Phulgama, Dhalkebar, Godar, Yadukuha, Khajuri, Bahunmara, Chisapani, Dhanushadham) of Dhanusha district, Nepal at different times on different ecological niches pastures, grass-lands, dung heaps, open fields, forests, crop-lands, roadsides, etc.) by different ways. Collections were made during morning, noon and afternoon. Some were, however, collected on light traps during evening in rainy season as well as in pitfall traps. The survey was carried out from March to November (2001 to 2005).

Techniques for collection, killing, preservation, mounting and preparations for study of these beetles were followed as adapted by most specialists, like Arrow (1931), Matthews (1972), Gordon and Oppenheimer (1975), Oppenheimer (1977), Singh, Sewak and Rana (1983), Sewak (1984, 1985, 1986, 1988, 1991), Sengupta and Mukhopadhyay (1990) and Biswas and Ghosh (2000). However, some changes were made as per needed.

Specimens were observed by examining the mammalian excrements (cows, buffaloes, goats, horses, dogs, cats and human beings), carrion, rotten fruits and vegetable matters, baited pitfall and light traps and also from the insect and bird nests.

The excrements were carefully examined and those of wild animals like elephants, rhinoceros, deers, tigers, bears etc. were not found in the forest of the study area. Forceps of different sizes (4x, 10x, 50x) were used for them in old and fresh excrements. Maximum numbers of specimens were observed in one or two days old excrements. Generally more specimens were observed in the soil making tunnels just below the excrements at different depths (up to 25 cm) as well as in the excrements but some were found only in the excrement and not in the soil. Generally the dung beetles were observed making vertical tunnels below the excrement. Beetles were taken out from the tunnels by digging the soil with the help of locally made spade and hoe. Rotten fruits and other vegetable matters were also examined. Few specimens were observed on the carrions of different animals (rats, shrews, snakes, fishes, frogs, crabs, etc). Some dung beetles were observed in pitfall traps at different habitats. The

pitfall traps consisted of a 2 litre plastic jar with an opening of 8 cm in diameter, buried at ground level and protected from rain by a tripod stand carrying a plastic plate of about 20 cm diameter at a distance of about 10 cm above the ground. Each trap was baited with one type of excrement (human, dog, goat, cow and buffalo) or meat (goat, chicken and fish). Traps were set in each habitat in the afternoon and beetles were collected in the following morning as Gordon et Oppenheimer, 1975; Matthews, 1972; Oppenheimer, 1977 followed. Some specimens, however, were also observed on light traps but not in the bird and insect nests.

4.1. Collection

Hand picking and using forceps were the ways of dung beetle collection for a limited number and thereafter they were killed with benzine or potassium cyanide vapour in killing jars. Sometimes dung beetles were killed by dipping them directly into the hot water.

4.2. Cleaning

Proper cleaning of the specimens is very essential for the study of fine structures and sculptures. Therefore, special attention was taken to clean the specimens perfectly before examining. It was done by keeping the specimens in a bowl of water and changing it till the specimens appeared clean. Usually soap- or clean water was used in the laboratory for cleaning them with camel brush (No. 2) or fine needle (Biswas and Ghosh, 2000).

4.3. Preservation

Most of these specimens were pinned as usual, then sun-dried but some specimens were preserved in 70% alcohol for dissection. All the pinned specimens were preserved systematically with their field data and naphthalene balls in the insect boxes.

4.4. Dissection

Both preserved and freshly killed specimens were used to study the male genitalia. The dry preserved specimens were, however, relaxed in boiling water and their

abdomens were treated with 10% KOH solution for few days to dissolve the soft tissues in and around the membranous and sclerotised structure of genitalia. Abdomens were dissected under stereo-binocular microscope to expose the genitalia which were then taken out with the help of forceps and mounted in Canada balsam after dehydration process only (Singh et al., 1983; Sewak 1984, 1985, 1986, 1988 and 1991).

4.5. Identification

Specimens were studied under the German Stereo-binocular microscope using different magnifications (eye pieces- 5X & 10X and objectives- 2X, 4X). Specimens were identified by using taxonomic keys prepared by Arrow (1931), Balthasar (1963), Matthews (1972, 1974 and 1976), Biswas and Ghosh (2000), but with little changes male genitalia were studied by using literature (Snodgrass, 1935; Singh, et al., 1983; Sewak, 1984, 1985, 1986, 1988, 1991). Identified specimens were further confirmed at the Zoological Survey of India, Kolkota (India).

Drawings of the genitalia were made with the help of Camera-lucida and photographs of specimens were taken by digital camera and those of male genitalia were taken by German microphotographic binocular microscope. Photographs of the specimens and male genitalia were developed in the digital colour laboratory.

4.6. Measurements

Measurements (mm) of the specimens were directly taken with the help of divider of mathematical instrument.

Identified species are deposited in the Natural History Museum (Tribhuvan University), Swyambhu, Kathmandu and in the Department of Zology, R. R. Campus Janakpur (Nepal).

CHAPTER V

5. RESULTS AND DISCUSSION

5.1. Systematic contents

The present paper deals with 45 species belonging to 12 genera of sub-family Coprinae under family Scarabaeidae from Dhanusha district of Nepal. The photographs of the reported beetles are shown in the plates from II to XXVII.

5.1.1. List of dung beetles recorded from Dhanusha district (Nepal)

Sub-family - Coprinae (Scarabaeinae)

Division I. Scarabaeini

Genus 1. *Scarabaeus* Linnaeus, 1758

1. *S. devotus* (Redtenbacher), 1848

Genus 2. *Gymnopleurus* Illiger, 1803

2. *G. cyaneus* (Fabricius), 1798
3. *G. parvus* (Mac Leay), 1821
4. *G. gemmatus* Harold, 1871
5. *G. maculosus* (Mac Leay), 1821

Division II. Sisyphini

Genus 3. *Sisyphus* Latreille, 1807

6. *S. longipes* (Olivier), 1789
7. *S. indicus* Hope, 1831
8. *S. hirtus* Wiedemann, 1823

Division III. Coprini

Genus 4. *Heliocopris* Burmeister, 1846

9. *H. bucephalus* (Fabricius), 1775

Genus 5. *Catharsius* Hope, 1837

10. *C. molossus* (Linnaeus), 1758
11. *C. granulatus* Sharp, 1875
12. *C. sagax* (Quenstedt), 1806
13. *C. birmanensis* Lansberge, 1874

- 14. *C. capucinus* Fabricius, 1781
 - 15. *C. pithecius* (Fabricius), 1775
- Genus 6. *Copris* Geoffroy, 1762
- 16. *C. magicus* Harold, 1881
 - 17. *C. sinicus* Hope, 1842
 - 18. *C. repertus* Walker, 1858
- Genus 7. *Phalops* Erichson, 1848
- 19. *P. divisus* (Wiedemann), 1823
- Genus 8. *Onthophagus* Latreille, 1802
- 20. *O. tarandus* (Fabricius), 1792
 - 21. *O. pactolus* (Fabricius), 1787
 - 22. *O. aenescens* (Wiedemann), 1823
 - 23. *O. ramosellus* Bates, 1891
 - 24. *O. sternalis* Arrow, 1931
 - 25. *O. catta* (Fabricius), 1787
 - 26. *O. bonasus* (Fabricius), 1775
 - 27. *O. rectecornutus* Lansberge, 1883
 - 28. *O. atropolitus* Orbigny, 1902
 - 29. *O. armatus* Blanchard, 1853
 - 30. *O. tragus* (Fabricius), 1792
 - 31. *O. sagittarius* Fabricius, 1775
 - 32. *O. purpurascens* Boucomont, 1914
 - 33. *O. mopsus* (Fabricius), 1792
 - 34. *O. duporti* Boucomont, 1914
- Genus 9. *Oniticellus* Serveille, 1825
- 35. *O. pallipes* (Fabricius), 1781
 - 36. *O. spinipes* Roth, 1851
 - 37. *O. cinctus* (Fabricius), 1775
- Genus 10. *Drepanocerus* Kirby, 1828
- 38. *D. setosus* (Wiedemann), 1823
- Genus 11. *Onitis* Fabricius, 1798
- 39. *O. lama* Lansberge, 1875

40. *O. philemon* Fabricius, 1801
41. *O. singhalensis* Lansberge, 1875
42. *O. subopacus* Arrow, 1931
43. *O. virens* Lansberge, 1875
44. *O. castaneus* Redtenbacher, 1848

Genus 12. *Chironitis* Lansberge, 1875

45. *C. indicus* Lansberge, 1875

5.1.2. Check-list of Dung Beetles Recorded from Nepal

Altogether 104 species under 17 genera of dung beetles are recorded from Nepal. For detail see table 2 in appendix first on page number

Sub-family - Coprinae (Scarabaeinae)

Division I. Scarabaeini

Genus 1. *Scarabaeus* Linnaeus, 1758

1. *S. devotus* (Redtenbacher), 1848
2. *S. sanctus* (Fabricius), 1798

Genus 2. *Gymnopleurus* Illiger, 1803

3. *G. cyaneus* (Fabricius), 1798
4. *G. parvus* (Mac Leay), 1821
5. *G. gemmatus* Harold, 1871
6. *G. maculosus* (Mac Leay), 1821
7. *G. dejeani* Castelnau, 1840
8. *G. sinuatus* (Olivier), 1789
9. *G. opacus* Redtenbacher, 1848

Division II. Sisyphini

Genus 3. *Sisyphus* Latreille, 1807

10. *S. longipes* (Olivier), 1789
11. *S. neglectus* Gory, 1833
12. *S. indicus* Hope, 1831
13. *S. hirtus* Wiedemann, 1823
14. *S. denticrus* Fairmaire, 1886

Division III. Coprini

Genus 4. *Synapsis* Bates, 1868

15. *S. brahminus* (Hope), 1831

Genus 5. *Heliocopris* Burmeister, 1846

16. *H. bucephalus* (Fabricius), 1775

Genus 6. *Catharsius* Hope, 1837

17. *C. molossus* (Linnaeus), 1758
18. *C. granulatus* Sharp, 1875
19. *C. sagax* (Quenstedt), 1806
20. *C. birmanensis* Lansberge, 1874
21. *C. quadridentatus* Lansberge, 1885
22. *C. capucinus* Fabricius, 1781
23. *C. pithecius* (Fabricius), 1775

Genus 7. *Copris* Geoffroy, 1762

24. *C. indicus* Gillet, 1910
25. *C. iris* Sharp, 1875
26. *C. sarpedon* Harold, 1868
27. *C. magicus* Harold, 1881
28. *C. sinicus* Hope, 1842
29. *C. repertus* Walker, 1858

Genus 8. *Phalops* Erichson, 1848

30. *P. divisus* (Wiedemann), 1823
31. *P. olivaceus* Lansberge, 1883

Genus 9. *Disphysema* Harold, 1873

32. *D. candezei* Harold, 1873

Genus 10. *Caccobius* Thomson, 1863

33. *C. unicornis* (Fabricius), 1801
34. *C. denticollis* Harold, 1867
35. *C. intermis* Arrow, 1931
36. *C. jassoensis* Harold

Genus 11. *Onthophagus* Latreille, 1802

37. *O. oculatus* Arrow, 1931
38. *O. tarandus* (Fabricius), 1792
39. *O. penicillatus* Harold, 1879
40. *O. gangeticus* Gillet, 1925
41. *O. troglodyte* (Wiesemann), 1823
42. *O. pactolus* (Fabricius), 1787
43. *O. orientalis* Harold, 1868
44. *O. aenescens* (Wiedemann), 1823
45. *O. ramosellus* Bates, 1891
46. *O. cupreiceps* Arrow, 1907
47. *O. sternalis* Arrow, 1931
48. *O. productus* Arrow, 1907
49. *O. catta* (Fabricius), 1787
50. *O. bonasus* (Fabricius), 1775
51. *O. rectecornutus* Lansberge, 1883
52. *O. rubricollis* Hope, 1831
53. *O. marginalis* (Gebler), 1817
54. *O. atropolitus* Orbigny, 1902
55. *O. occipitalis* Lansberge, 1885
56. *O. discedens* Sharp, 1875
57. *O. quaestus* Sharp, 1875
58. *O. lapillus* Arrow, 1931
59. *O. furcillifer* Bates, 1891
60. *O. furcicollis* Arrow, 1931
61. *O. gagates* Hope, 1831
62. *O. dama* (Fabricius), 1798
63. *O. kuluensis* Bates, 1891
64. *O. armatus* Blanchard, 1853
65. *O. triceratops* Arrow, 1913
66. *O. bison* Boucomont, 1919
67. *O. tragus* (Fabricius), 1792
68. *O. sagittarius* Fabricius, 1775

- 69. *O. politus* (Fabricius), 1798
- 70. *O. taurinus* White, 1844
- 71. *O. beelsoni* Arrow, 1931
- 72. *O. purpurascens* Boucomont, 1914
- 73. *O. mopsus* (Fabricius), 1792
- 74. *O. hastifer* Lansberge, 1885
- 75. *O. deflexicollis* Lanaberge, 1883
- 76. *O. ensifer* Boucomont, 1914
- 77. *O. bifasciatus* (Fabricius), 1781
- 78. *O. centricornis* (Fabricius), 1798
- 79. *O. cervus* (Fabricius), 1798
- 80. *O. falsus* Gillet, 1925
- 81. *O. proletarius* Harold, 1875
- 82. *O. duporti* Boucomont, 1914

Genus 12. *Liatongus* Reitter, 1893

- 83. *L. gagatinus* Hope, 1831
- 84. *L. affinis* (Arrow), 1908
- 85. *L. mergacerus* (Hope), 1831
- 86. *L. venator* (Fabricius), 1801
- 87. *L. rhadamistus* (Fabricius), 1775

Genus 13. *Oniticellus* Serveille, 1825

- 88. *O. pallipes* (Fabricius), 1781
- 89. *O. spinipes* Roth, 1851
- 90. *O. cinctus* (Fabricius), 1775

Genus 14. *Drepanocerus* Kirby, 1828

- 91. *D. setosus* (Wiedemann), 1823
- 92. *D. sinicus* Harold, 1868

Genus 15. *Onitis* Fabricius, 1798

- 93. *O. siva* Gillet, 1911
- 94. *O. lama* Lansberge, 1875
- 95. *O. falcatus* (Wulfen), 1786
- 96. *O. philemon* Fabricius, 1801

97. *O. singhalensis* Lansberge, 1875

98. *O. subopacus* Arrow, 1931

99. *O. virens* Lansberge, 1875

100. *O. castaneus* Redtenbacher, 1848

101. *O. brahma* Lansberge, 1875

102. *O. crassus* Sharp, 1875

Genus 16. *Chironitis* Lansberge, 1875

103. *C. indicus* Lansberge, 1875

Division IV Panelini

Genus 17. *Haroldius* Boucomont, 1914

104. *H. lassallei* Cambefort, 1986

Table 1
Total Number of Species of Each Genus Known from World, India and Nepal

S.N.	Genera	Total No. of Species known from the world		Total No. of Species known from India		Total No. of Species known from Nepal	
		Number	Reference	Number	Reference	Number	References
1.	<i>Scarabeus</i> Linnaeus	23	BALTHASAR (1963)	6	Biswas and Ghos (2000)	2	Shrestha, 2005 and the present study.
2.	<i>Gymnopleurus</i> Illiger	94		20		7	Shrestha, 2005 and the present study.
3.	<i>Sisyphus</i> Latreille	34		7		5	Shrestha, 2005 and the present study.
4.	<i>Synapsis</i> Bates	11		3		1	Arrow, 1931; Shrestha, 2005
5.	<i>Heliocopris</i> Burmeister	51		3		1	Shrestha, 2005 and the present study.
6.	<i>Catharsius</i> Hope	124		7		7	Shrestha, 2005 and the present study.
7.	<i>Copris</i> Geoffroy	193		26		6	Shrestha, 2005 and the present study.
8.	<i>Phalops</i> Erichson	Not known		4		2	Shrestha, 2005 and the present study.
9.	<i>Disphysema</i> Harold					1	Shrestha, 2005
10.	<i>Caccobius</i> Thomson	95		16		4	Shrestha, 2005
11.	<i>Onthophagus</i> Latreille	1620		185		46	Shrestha, 2005
12.	<i>Liatongus</i> Reitter	41		8		5	Shrestha, 2005 and the present study.
13.	<i>Oniticellus</i> Serveille	21		3		3	Shrestha (1999, 2005)
14.	<i>Drepanocerus</i> Kirby	7		5		2	Shrestha, 2005 and the present study.
15.	<i>Onitis</i> Fabricius	128		11		10	Shrestha, 2005 and the present study.
16.	<i>Chironitis</i> Lansberge	25		1		1	Shrestha, 2005 and the present study.
17.	<i>Haroldius</i> Boucomont	12		3		1	Present Study
	Total	2467		305		104	Cambeport, 1986

5.2. Detail systematic account of the dung beetles recorded from Dhanusha district, Nepal

Key to the divisions of Coprinae recorded from Dhanusha

- 1(2) Middle coxae not widely separated; middle tibia with one terminal spur. Scarabaeini.
- 2(1) Middle coxae widely separated; middle tibia with two terminal spurs.
- 3(4) Posterior legs extremely long , the tarsi filiform Sisyphini.
- 4(3) Posterior legs not extremely long, the tarsi more or less flat and tapering Coprini.

Division I. SCARABAEINI

Body depressed, clypeus produced into two or more lobes at front margin, ocular lobes more or less produced in front. Legs very slender with middle coxae not widely separated and converge strongly behind, middle and hind tibiae narrow and not dilated at the end, each with one terminal spur only, tarsi filiform, not flattened nor broader at base than at end, first four joints differ little in length. .

Sexes are almost alike, and males without horns.

Beetles of Division Scarabaeini are well known ball rollers.

Key to the genera of Scarabaeini

- Front tarsi absent; elytra not excised behind the shoulders *Scarabaeus* L.
- Front tarsi present; elytra excised behind the shoulders*Gymnopleurus* Illg.

Genus 1. *Scarabaeus* Linnaeus, 1758

1758. *Scarabaeus* Linnaeus, *Syst. Nat. ed.* 10:345

Type species: *Scarabaeus sacer* Linnaeus

Description : Body flat, head flat, clypeus produced into four strong teeth at front margin. Ocular lobes sharply produced in front and not completely fused with clypeus.

Pronotum slightly convex and deeply excised in front. Front angles not produced but are generally sharply toothed. Sides dilated, and hind angles more or less rounded.

Scutellum sometimes visible, sometimes absent.

Elytra flat, with very narrow epipleurae, not sinuate at sides.

Mesosternum very short. Metasternum moderately long.

Legs slender. Front femur long, tibia armed externally with four long teeth, or three long teeth and one short one, occupying almost whole length of outer edge and fringed at inner and outer margins, extremity bearing a strong spur, tarsus absent. Middle coxae strongly converged behind, their posterior extremities only narrowly separated; femur long and narrow; tibia slender, of nearly uniform width, or a little tapered at extremity, fringed at inner and outer edges and with a single strong immovable spur at the extremity; tarsus slender, joints nearly equal in length and breadth. Hind coxae oblique, meeting at their inner extremities; femur long and slender; tibia also long and slender and curved, of uniform width, bearing four fringes, inner, outer, upper, and lower, extremity bearing a single strong immovable spur; tarsus slender, joints are nearly equal in length and breadth.

Antennae 9 - jointed, basal joint long and slender, 2nd small and bead-like, 3rd about as long as 4th and 5th together, 5th extremely short, 8th and 9th partly enclosed by 7th.

Labrum straight at front margin, with a median tongue or tuft at right angles to edge. Mandible narrow, with a short internal, and a long apical, fringe. Maxilla with a sharp terminal angle to chitinous outer edge, inner and outer lobes small, palpus slender, with a long terminal joint. Mentum elongate, with anterior edge rounded, ligula

strongly bilobed, palpi slender, far apart, loosely 3- jointed, basal joint slender, 2nd about as wide as it is long, 3rd about as long as 2nd, but much more slender.

Distribution : Nepal; India; Persia; Arabia; Turkestan; Egypt; Palestine; Cyprus; Tunis; S. Russia; Roumania; Hungary; Spain; S. France; Sri Lanka; Nubia; Abyssinia; Somaliland; West Africa; Uganda; East Africa; Transvaal; Rhodesia; Bhutan; Baluchistan and Afghanistan.

The genus *Scarabaeus* includes only a single species.

1. *Scarabaeus devotus* (Redtenbacher), 1848. (Pl. II, Figs. 1, 2)

1848. *Ateuchus devotus* Redtenbacher, *Hugel's Kaschmir* 4(2) : 515

1931. *Scarabaeus devotus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 44-45. Pl.II, Fig. 2.

1963. *Scarabaeus (Kheper) devotus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 174.

Description : Body black or very deep blue-black or indigo black and opaque. Lower surface, legs and sutural margins of elytra shining and with not very long fringes of nearly black hair.

Body flat, not very broad and sides parallel.

Clypeus, head and ocular lobes are densely and confluent pitted. Anterior edge of clypeus strongly reflexed and armed with four strong teeth separated by round notches. Ocular lobes sharply produced in front into strong teeth and not completely fused with clypeus.

Pronotum very strongly transverse, finely and closely but unevenly granular. Posterior part of median line and an irregular patch on each side being smooth. Sides very strongly rounded, crenulate in front, front angles obtuse, hind angles entirely obsolete, and base margined and not tuberculate.

Scutellum visible but minute.

Elytra lightly striate, and intervals feebly and sparsely punctured.

Pygidium opaque and finely punctured.

Lower surface very smooth. Metasternal shield has a large pit in middle. Sides of metasternum very thinly hairy.

Front femur has a feeble tooth beyond middle of its anterior edge. Front tibia bears three strong outer teeth and a feeble basal one. Middle and hind tibiae have each two feeble teeth at outer edge, and tarsi short, without long fringes.

Male: Fringe on upper surface of hind tibia is dense in its middle part.

Female: Fringe on upper part of hind tibia evenly spaced and not dense.

Length: 21-23 mm.

Breadth: 13-14 mm.

Field data: Chisapani, 2 , 1 , 6-VI-03. Yadukuha, 1 , 20-VI-03. Total = 4 exs. (3 , 1). Coll. Mahto.

Distribution : India : Punjab, Bihar and Bengal; Nepal : Dang and Dhanusha (Chisapani and Yadukuha) districts. It has been reported for the first time from Dhanusha district.

Remarks : This species is found in cattle dung and is found in plains and foot hills and is not found in hills. It is least abundant in Dhanusha district. It is found rolling dung balls during summer season only and is not found during rainy and winter seasons.

Genus 2. *Gymnopleurus* Illiger, 1803

1803. *Gymnopleurus* Illiger, *Mag. Ins.*, 11:199.

1931. *Gymnopleurus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 46-48.

1963. *Gymnopleurus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2:243.

Type species: *Ateuchus flagellatus* Fabricius.

Description : Body broad and depressed.

Clypeus completely fused with ocular lobes, suture only indicated by a sharp raised line on each side. Front margin of clypeus produced into two or four short lobes. Head bears a sharp rounded edge posteriorly which closely fit in excision of pronotum.

Pronotum moderately convex and deeply excised at front margin. Front angles sharp. Hind angles generally blunt, sometimes produced or sometimes almost obsolete. Base feebly rounded or nearly straight.

Scutellum invisible.

Elytra flat, with sides deeply excised behind shoulders, exposing sides of body beneath .

Legs slender, all bearing tarsi. Front femur massive and bears a tooth at front edge : front tibia armed with three sharp teeth, occupying terminal half of outer edge, and serrate between and above them. Middle coxae strongly oblique and converge behind, where they are only narrowly separated; middle and hind tibiae curved, each bearing a strong immovable spur at extremity. All tarsi present, they are filiform, not long and are without fringes.

Mesosternum extremely short. Metasternum not very large. Abdomen not greatly reduced, sometimes with a sharp lateral carina and sometimes with sides rounded at base.

Pygidium transverse.

Antenna 9- Jointed, 3rd joint as long as 4th and 5th together, 6th extremely short.

Labrum nearly straight at front margin and bears a longitudinal tuft of stiff bristles at median line. Mandible long and narrow and is closely fringed at tip. Maxilla bears a sharply angulate tip externally, two terminal lobes are membranous and small, outer one is semicircular; palpus with a long slender last joint. Mentum slightly bilobed at front margin, as long as wide; lobes of ligula far apart, broad and strongly divergent at end; palpi widely separated, basal joint a little longer than it is wide, 2nd globose, 3rd oval, scarcely shorter than 2nd.

Two sexes almost alike, but males can be distinguished by slight differences in legs. Front tibia of male is usually longer, less broad, and more strongly curved than that of female. In certain species spurs of front tibiae of female are long and sharp, but in male they are blunt, generally flat and truncate, or sometimes strongly bent downwards.

Most characteristic feature of the genus is the excision of sides of elytra, which seems to be a means of facilitating instant flight by allowing wings to be slipped out rapidly. Possession of front tarsi is another important difference from the genus *Scarabaeus* L.

Like species of related genus *Scarabaeus* L., they are ball-rollers, but are more social in their habits. The few species that have been carefully observed (Arrow, 1931) work in pairs, which is not the case in other genus so far as has been ascertained.

The genus has been divided by Garreta (as quoted by Arrow, 1931) into three subgenera, *Gymnopleurus*, *Paragymnopleurus*, and *Progymnopleurus*. Till 1963, 94 species have been recorded (Balthasar, 1963) from world of which 20 species are found within Indian limit (Biswas and Ghosh, 2000). Janssens (1949) splitted genus into 4 independent genera, i.e. *Gymnopleurus*, *Paragymnopleurus*, *Allogymnopleurus* and *Garreta* of which he himself created *Garreta* and *Allogymnopleurus* and subgenus *Paragymnopleurus* Shipp, was given independent generic status. Balthasar (op.cit.) considered these genera as subgenera and at present *Gymnopleurus* s. s. contains 46 species as follows : *Garreta* :19, *Allogymnopleurus* : 15, and *Paragymnopleurus* : 12, while other 4 species could not be placed in any of these subgenera and as such kept in *Gymnopleurus* s.l.

Of the species recorded from India, 10 belong to *Gymnopleurus* s.s., 6 to *Garreta* and 2 each to *Allogymnopleurus* and *Paragymnopleurus* (Biswas and Ghosh, 2000).

Distribution : The genus *Gymnopleurus* Illig. is known to be distributed over Oriental, Palaearctic and Ethiopian regions.

Key to species of *Gymnopleurus* Illg. from Dhanusha

- 1(6) Sides of the abdomen not carinate at the base.
- 2(3) Clypeus quadridentate *cyaneus* F.
- 3(2) Clypeus bidentate.
- 4(5) Pronotum with about six shining spots *parvus* Macl.
- 5(4) Pronotum with about fifteen shining spots *gemmatus* Har.
- 6(1) Sides of the abdomen sharply carinate at the base..... *maculosus* Macl.

2. *Gymnopleurus cyaneus* (Fabricius), 1798 (Pl. III, Fig. 1)

- 1798. *Copris cyaneus* Fabricius, *Ent. Syst. Suppl.*, : 34.
- 1840. *Gymnopleurus indicus* Cast., *Hist. Nat.*, 2:73.
- 1923. *Gymnopleurus cyaneus* Arrow, *Rec. Indian Mus.*, 25(2) : 259
- 1931. *Gymnopleurus cyaneus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), : 49-50. Pl. III, Fig. 6.

1963. *Gymnopleurus* (s. str.) *cyaneus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1:207.

Description : Metallic violet, bright and shining with lower surface rather darker, antennae dark, and body above and beneath almost devoid of hairs or setae.

Body broadly oval and not very convex.

Clypeus bears four blunt teeth at anterior margin, inner two are larger while outer two are smaller. Head slightly rugose and asperately punctured in front, smooth and deeply punctured behind. Ocular lobes slightly prominent .

Pronotum very short and convex, smooth, unevenly and very strongly but fairly sparsely punctured, hollowed and very slightly rugose in front angles. Sides strongly rounded, front angles acutely produced, hind angles almost obsolete, base finely margined, with a short longitudinal groove extending a very short distance forward from its middle.

Elytra deeply sulcate at base, but shortly behind base, sulci resolve themselves into series of very large and partly confluent pits. Second interval from suture very broad and shows very large transverse depressions. Lateral margins deeply excised behind shoulders .

Pygidium bears a longitudinal median carina and is a little hollowed on each side and rather rugosely punctured.

Sides of abdomen not sharply carinate at base.

Metasternal shield smooth in middle and punctured at anterior end. Sides of metasternum rugosely punctured.

Legs slender. Front tibia armed with three strong teeth occupying rather less than half the outer edge and remainder of edge is strongly serrate. Front edge of front femur a little hollowed, and bears a tooth situated at two-thirds of its length from base. Middle tibia scarcely serrate while hind tibia distinctly serrate.

Male : Spur of front tibia flat, truncate at end, and strongly bent downwards.

Female : Female not found.

Length: 8 -12 mm.

Breadth: 5 – 8 mm.

Field data: Dhalkebar, 1 , 3 – IX – 03 .Total = 1 ex. (1) Coll. Mahto.

Habitat : Cow dung.

Distribution : India : West Bengal, Uttar Pradesh, Maharashtra, Tamil Nadu, Bihar, Orissa, Madhya Pradesh, Karnataka and Kerala; Nepal : Bardia, Jhapa, Sunsari, Kailali, Kanchanpur and Dhanusha (Dhalkebar) districts and Karnali region; Sri Lanka and Bangladesh. It is reported for the first time from Dhanusha district.

Type species: In Copenhagen Museum, those of *indicus* and *impressus* Cast. in Oxford University Museum.

Remarks : It is a very rare species in Dhanusha district. It was found in sandy soil in cowdung.

3. *G. parvus* (Mac Leay), 1821 (Pl. III, Fig. 2)

1821. *Scarabaeus parvus* Mac Leay, *Horae Ent.*, 1 (2) : 517.

1931. *Gymnopleurus parvus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 52-53. Pl. III, Fig. 2.

1963. *Gymnopleurus* (s.str.) *parvus*, Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 202 -203.

Description : Dark coppery or greenish-black, with upper surface densely clothed with minute greyish setae, leaving a few shining denuded spots, viz. three placed in a transverse row along middle line of pronotum, one between median spot and base, and one on each side between last and lateral spot, a common spot at base of elytral suture, three along basal margin, one on each side of suture a little behind middle, and one upon each apical callus. Posterior part of sutural margin also bare and shining.

Oval in shape and moderately convex.

Head, pronotum, and elytra are finely and densely granular. Clypeus produced into two lobes in front.

Pronotum highly convex, with sides strongly rounded. Front angles acutely produced, hind angles very obtuse and base gently rounded, with a minute impression on each side of middle. Elytra finely striate and lateral margins strongly excised behind shoulders, exposing metasternal epimera.

Sides of abdomen rounded at base.

Pygidium densely granular and setose.

Legs slender. Front tibia armed with three strong teeth occupying terminal half of outer edge, and basal half finely serrate. Front femur flat at its anterior edge and not toothed. Middle and hind tibiae coarsely toothed.

Male : Spur of front tibia flat, truncate at end, with sharp angles.

Female : Spur of front tibia long, slender and sharply pointed.

Male genitalia (Pl III, Fig. 3): Parameres are small and without bristles. The apical ends of parameres are narrow and curved outwards like knife whereas distal ends are broadened. Endophallus is single lobed and flask-shaped.

Length: 7 – 8 mm.

Breadth: 5 – 6 mm.

Field data: Janakpur (Rampur) 1 , 7-IV-05. Total= 1 Coll. Mahto

Distribution : India : Uttaranchal, Bengal, Bihar and Tamil Nadu; Nepal: Dhanusha district (Janakpur, Rampur); and Sri Lanka. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species: In the British Museum.

Remark : Single specimen was found in human faeces.

4. *G. gemmatus* Harold, 1871. (Pl. III. Fig. 4)

1871. *Gymnopleurus gemmatus* Harold, *Col. Hefte*, 8 :117.

1931. *Gymnopleurus gemmatus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 53 – 54 Pl. III, Fig. 1.

1963. *Gymnopleurus* (s.str.) *gemmatus* Balthasar, *Monog. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 204 – 205. Pl. VIII, Fig. 2.

Description : Black and upper surface closely clothed with minute grey setae, bearing numerous shining denuded patches, viz. upon pronotum, a central spot, five adjoining front margin, four adjoining hind margin, and three or four on each side, and ,upon elytra, sutural margins, a common transverse irregular patch at middle and a smaller common patch behind it just before apices, three spots adjoining basal margin on each side, one near the middle of outer margin, and one upon apical callus .

Body oval in shape and not very convex.

Clypeus has two blunt lobes at its front edge. Head densely granular. Ocular lobes slightly prominent.

Pronotum granular except upon smooth elevated patches. Its sides straight in front and strongly rounded behind. Front angles acutely produced and hind angles bluntly prominent. Base feebly rounded with a slight oblique depression on each side of middle.

Elytra irregularly rugose, finely striate and very deeply excised at sides.

Pygidium closely punctured, setose at base and bare at apex.

Sides of sternum and abdomen clothed with recumbent grey setae. Sides of abdomen not carinate at base.

Metasternal shield smooth in middle and clothed with recumbent grey setae at sides. Sides of metasternum also clothed with recumbent setae.

Legs slender. Front tibia armed with three strong teeth occupying terminal half of outer edge and finely serrate in upper half. Middle and hind tibiae feebly toothed externally. Front femur has a flattened anterior edge and is not toothed.

Male : Front tibia long and narrow, slightly bent before end, feebly serrate internally and armed with shorter teeth externally. Terminal spur blunt and bent at end.

Female : Not examined

Length: 6 – 8 mm.

Breadth : 4 – 6 mm.

Field data: Godar, 1, 20 – IX – 02; Total = 1 Coll. Mahto.

Habitat : Cow dung.

Distribution : India : Orissa, West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Karnataka, Maharashtra, Kerala, Pondicherry, Mysore and Tamil Nadu; Nepal : Karnali region and Kailali, Rupandehi, Palpa and Dhanusha (Godar) districts; and Sri Lanka.

This is the first record of the species from Dhanusha district.

Type species : In Copenhagen Museum. Harold renamed this species.

Remarks : This species is very rare in Dhanusha district. A single specimen is collected in sandy soil in the cattle dung.

5. *G. maculosus* (Mac Leay), 1821 (Pl. IV, Figs. 1, 2)

1821. *Scarabaeus maculosus* Mac leay, *Horae Ent.* 1(2) : 517.

1823. *Gymnopleurus exanthema* Wiedmann, *Zool. Mag.* 2(1) : 22.

1931. *Gymnopleurus maculosus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 56 – 57.

1963. *G. (Allogymnopleurus) maculosus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 231.

Description : Bluish- or greenish-black, occasionally coppery, with a clothing of recumbent greyish setae, rather scanty upon lower surface and legs and fairly close upon upper surface, but with numerous small, denuded, shining patches, viz. a short

transverse pit, partially divided in middle, near each lateral margin of pronotum, a small median spot, two at a short distance from it on each side, another just behind, and two contiguous to basal margin, a juxtasutural row of similar spots upon each elytron, and two or three other rather ill-defined rows upon each.

Shape oval and moderately convex.

Head closely granular and setose. Clypeus produced into four blunt lobes. Ocular lobes very bluntly prominent.

Pronotum convex, with a slight longitudinal median groove behind. Sides straight in front and strongly rounded behind, with front angles acutely produced and hind angles very obtuse. Elytra faintly striate, and their lateral margins deeply excised, exposing metathoracic epimera.

Sides of abdomen sharply carinate to base.

Pygidium minutely and not very closely granular and thinly clothed with setae.

Legs fairly slender. Front femur broadly flattened at front edge, with a minute tooth placed at two-thirds of its length from base. Front tibia has three strong teeth occupying not quite half the outer edge, remainder of which is serrate. Middle tibia has three or four teeth, and hind tibia closely serrate along outer edge.

Male : Front tibia long, slightly bent before middle, and exhibits an indentation of inner edge just before extremity, sometimes large, semicircular, and conspicuous. Terminal spur truncate.

Male genitalia (Pl. IV, Fig. 3): Parameres small and without bristles. The apical ends of the parameres are narrow and knob-shaped whereas distal ends are broad. Endophallus is single-lobed and differentiated into three parts. The apical part is small, middle large and slender-shaped while basal is broad.

Length : 13 – 15 mm.

Breadth : 7.5 – 9 mm.

Field data: Yadukuha, 2 , 3 , 20-V-04; Dhalkebar, 1 , 2 , 10-VI-04; Janakpur (Rampur), 2 , 1 , 7-IV-05; Godar, 2 , 1 , 15-IV-05. Total =14 exs. (7 , 7) Coll. Mahto.

Distribution : India : United Prov. (W.Almora, Kumaon), Bombay (Belgaum), C. Prov. (Nagpur), S. India (Malabar); Nepal : Dang and Dhanusha (Yadukuha, Dhalkebar, Janakpur and Godar) districts. This species was recorded from Nepal by Arrow (1931). This is the first record of the species from Dhanusha district.

Type species: In British Museum, and *exanthema* Wiedmann in Copenhagen Museum.

Remarks : Specimens were collected in human faeces. This species has never been collected from dung of herbivorous animals.

Division II. SISYPHINI

Body short and globose. Posterior part of pronotum and abdomen compressed laterally, latter very short. Elytra tapering to apex. Metasternum very broad. Legs extremely long and slender. Middle coxae parallel and very far apart. Middle and hind tibiae slender and not dilated at end. Middle pair have each two terminal spurs, and hind pair one each. Tarsi filiform, not flattened nor broader at base than at end. First joint much longer than next, and 2nd, 3rd, and 4th joints are similar.

Males not horned but in many species show remarkable peculiarities in legs.

Division Sisyphini has only one genus, viz. *Sisyphus* Latr., which is one of the most peculiar and distinctive of all the genera of Coprinae .

Genus 3. *Sisyphus* Latreille, 1807

1807. *Sisyphus* Latreille, *Gen. Crust. et. Ins.*, 2 : 79.

1931. *Sisyphus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 67 – 68.

1963. *Sisyphus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia) 1:233.

Type species: *Scarabaeus schaefferi* Linnaeus, 1758.

Description : Body Spider-like in form, subglobose and laterally compressed. Upper surface of body usually clothed with short, erect and hooked setae while lower surface more or less smooth.

Head broad and flat. Front margin of clypeus bears two or four short teeth. Ocular lobes completely fused with clypeus and are usually slightly prominent. Vertex has a sharply defined horizontal lobe which closely fits in emargination of pronotum.

Pronotum strongly laterally compressed behind. Front angles hollowed beneath. Lateral areas flattened, hollowed and very sharply defined. Lateral margins strongly angulate near middle.

Scutellum not visible.

Elytra very short, tapering to apex and not excised behind shoulder.

Antenna short 8-jointed, 3rd joint very slightly elongated, 4th and 5th very short.

Labrum with front edge nearly straight. Mandible small, forming a narrow membranous lobe, with a highly chitinous broad base. Maxilla membranous internally, with semicircular outer lobe; palpus with long terminal joint. Mentum slightly elongate, parallel-sided, shortly bilobed, thickly clothed with very long bristles, ligula very thick and fleshy, with two long and narrow lobes, labial palpi bearing very long bristles.

Mesosternum broad and flat, separated by a straight suture from metasternum. Metasternum broad and flat between middle coxae, generally hollowed behind. Abdomen laterally compressed. Pygidium long and narrow.

Front legs fairly short, femur massive, tibia armed with three external teeth and serrate between and above them, tarsus short and very slight. Middle legs very long and slender, middle coxae long, parallel and very far apart, femur slender at base, thickened before the end, tibia curved, tarsus longer than tibia, basal joint of tarsus as long as 2nd and 3rd together. Hind legs also very long and slender, femur slender at base and thickened before end, tibia very long and slender, serrate at inner edge, tarsus long, 1st joint as long as 2nd and 3rd together.

This is one of the most distinctive and unmistakable of all the genera of Coprinae. Its rotund body and disproportionately long legs give a spider-like form which contrasts strongly with depressed form of other slender-legged genera, *Scarabaeus* L. and *Gymnopleurus* Illig. Middle and hind legs of many species bear remarkable processes which may be common to both sexes or peculiar to male. Hind trochanters of male of some species also greatly elongated. Peculiar hooked setae clothing body are evidently designed to entangle and retain fibrous excrementitious matter with which the beetles work, either for the purpose of disguise or to facilitate its transport. Owing to the compression of body and loose articulation of very long posterior legs, latter can be brought over back, perhaps to remove and manipulate material retained by hooks, or, to hold it there for transport.

All species of this genus *Sisyphus* Latr. are well known ball-rollers, like the species of related genus *Scarabaeus* L. and *Gymnopleurus* Illig. According to Lacordaire

(quoted by Arrow, 1931), these insects fly without raising elytra. This is rendered possible by reduction of lateral part of latter, which are without epipleurae, although not excised as in *Gymnopleurus* Illig. Specimens of *S. longipes* Oliv. and a few other species are often found with an incrustation of a white chalky matter which seems never to cover the surface but forms a more or less regular pattern at the sides. Its actual nature and significance are not known (Arrow, 1931).

Distribution : The distribution of this genus is remarkable. Majority of the species are known from the Ethiopian region, some from Oriental and Palaearctic regions and two species have been recorded from New World (Mexico). Of 34 species (Balthasar, op, cit.) so far known in this genus, 9 are known from Oriental region and of these 9 species, 7 are found within Indian limit and 4 in Nepal.

Key to the species of *Sisyphus* Latreille recorded from Dhanusha

- 1(2) Basal half of the hind femur forming a slender footstalk. *longipes* Oliv.
- 2(1) Hind femur short-stalked.
- 3(4) Pronotum closely punctured, with median raised line*indicus* Hope.
- 4(3) Pronotum not closely punctured, without median raised line*hirtus* Wied.

6. *Sisyphus longipes* (Olivier), 1789 (Pl. V, Fig. 1)

1789. *Scarabaeus longipes* Olivier, *Entom*, 1(3) : 164, Pl. XIX, Fig. 177.

1792. *Scarabaeus minutus* Fabricius, *Ent. Syst.*, 1:70.

1798. *Copris helwigi* Fabricius, *Ent. Syst. Suppl.*, : 35.

1931. *Sisyphus longipes* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 71-73.

Description : Body black coloured, shining above and beneath, clothed with very minute and inconspicuous erect reddish setae, very scanty upon head, elytra, and lower surface, and fairly close upon pronotum except a small bare patch upon each side of anterior part.

Body broadly oval and highly convex .

Head moderately strongly punctured. Front margin of clypeus produced into two sharp teeth, placed not far apart and separated by an almost semicircular emargination, and the outer teeth are blunt and feeble. Ocular lobes slightly prominent and there is a short but rather sharp oblique ridge on each side at the junction of clypeus and ocular lobe.

Pronotum finely punctured, moderately closely in front and scantily behind. There is a fine longitudinal groove upon the posterior part of pronotum. Front angles acute, lateral margins strongly angulate before middle, and posterior lateral flattened area on each side very sharply defined.

Elytra not longer than their combined width, strongly narrowed to extremities, with fine striae and nearly flat intervals.

Pygidium narrow and bears large and rather close shallow roundish pits.

Metasternum separated from mesosternum by a curved line. Metasternum finely, sparsely and evenly punctured, with a large round depression posteriorly, and almost devoid of setae. Distance from middle to hind coxa equal to half length of middle coxa.

Posterior legs very long and slender. Front tibia has three sharp teeth occupying less than half the outer margin, upper part finely serrate, two terminal teeth very close at base. Middle and hind femora have very slender basal part and strongly swollen terminal part. Swollen part of hind femur confined to outer half. Hind trochanter prominent at extremity.

Tow sexes alike externally.

Length: 4 – 6 mm.

Breadth: 2.5 – 4 mm.

Field data: Dhanushadham, 5 exs., 20-VI-03; Dhalkebar, 3 exs., 10-VI-04; Yadukuha, 3 exs., 20-V-04; Janakpur, 1 ex., 5-I-04; 4 exs., 7-IV-05; Godar, 5 exs., 15-IV-05. Total = 21 exs. Coll. Mahto.

Distribution : India : Orissa, West Bengal, Madhya Pradesh, Maharastra and Tamil Nadu; Nepal : Bardia, Pyuthan and Dhanusha (Janakpur, Dhalkebar, Godar, Yadukuha and Dhanushadham) districts; Sri Lanka and Burma. It is recorded for the first time from Dhanusha district.

Remarks: Specimens were collected from human faeces. Specimens were found making balls of faeces and rolling them for a considerable distance. One specimen was collected on light trap during night. But as quoted by Arrow (1931) late Dr.

Annandale found a specimen in the nest of an ant *Pheidole rhombinoda* beneath a stone.

S. longipes Oliv. differs from most other species of genus in its smooth, shining upper surface. According to Arrow 1931, many specimens have a white encrusting material forming a more or less symmetrical but not constant pattern at the sides of the thorax, elytra and abdomen.

7. *S. indicus* Hope, 1831. (Pl. V, Fig. 2)

1831. *Sisyphus indicus* Hope, *Gray's Zool. Misc.*, : 22.

1848. *Sisyphus kaschmirensis* Redtenbacher, *Hugel's Kaschmir.*, 4 (2) : 516.

1927. *Sisyphus indicus*, Arrow, *Ann. Mat. Nat. Hist.*, (9) 19 : 456 – 465.

1931. *Sisyphus indicus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3: 75 – 76.

1963. *Sisyphus* (s. str.) *indicus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera: Lamellicornia) 1 : 243.

Description : Black and rather opaque, except upon legs and metasternum, which are shining and fairly closely clothed with brown, erect, hooked setae.

Body slightly elongate, oval and highly convex.

Head moderately punctured with round shallow punctures. Front margin of clypeus bears two widely separated teeth, divided by a curvilinear excision, and outer teeth blunt and feeble. Pronotum little wider than it is long and is closely punctured with round shallow punctures. It bears a faint median longitudinal raised line anteriorly. Front angles acute, lateral margins strongly but not acutely angulate before middle, and posterior lateral flattened area very sharply defined.

Elytra scarcely longer than their combined width, very strongly narrowed to tips, with shallow striae and nearly flat intervals.

Metasternum bears very large punctures and a few scattered setae in its anterior angles, and posterior part has a large round depression, smooth, shining and very scantily punctured.

Posterior legs very long and slender. Front tibia armed with three strong teeth occupying less than half outer edge, upper half finely serrate. Four posterior femora very slender at base. Hind femur tapering at each end, and basal part forms a slender but not very long footstalk. Hind trochanters not freely produced.

Male: Male not examined.

Female: Hind femur bears a slight broadly rounded projection in the middle of its hind margin.

Length: 8 – 10 mm.

Breadth: 5 – 6 mm.

Field data: Godar, 1 , 20-IX-02, Total = 1 ex. (1) Coll. Mahto.

Habitat : Cattle dung.

Distribution : India : Kashmir, Punjab, Himachal Pradesh, Sikkim, Nagaland, Meghalaya, Orissa, Assam, West Bengal and Arunachal Pradesh; Nepal : Karnali region (W. Nepal), Kailali, Dolkha (Hat bazaar) and Dhanusha (Godar) districts; Bangladesh; West China; Honkong and Sri Lanka. This species is recorded for the first time from Dhanusha district.

According to Arrow (1931), this species has a close resemblance to the more abundant *Sisyphus hirtus* Wied., whose range is more to south India. Male is easily distinguishable by narrow process upon hind femur, which replaces inconspicuous projecting keel in same position in male *S. hirtus* Wied. Female, in spite of rounded prominence in same part, is sometimes not easily distinguished. There is a light median line upon pronotum, absent in *S. hirtus* Wied, and three teeth of front tibia are a little closer together.

Remarks : The species is very rare in Dhanusha district. Specimens were collected in cattle dung.

8. *S. hirtus* Wiedmann, 1823. (Pl. V, Fig. 3)

1823. *Sisyphus hirtus* Wiedmann, *Zool. Mag.*, 2(1) : 24

1858. *Sisyphus setosulus* Walker, *Ann. Nat. Hist.*, 3(2) : 208.

1931. *Sisyphus hirtus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 76 – 78. Text Fig. 6 .

Description : Black and opaque, except upon legs and metasternum, which are shining, and fairly closely clothed with brown, erect, hooked setae.

Body oval and highly convex.

Head and pronotum moderately strongly and closely punctured with round shallow punctures. Front margin of clypeus bears two widely separated inner teeth, outer teeth blunt and feeble.

Pronotum only a little wider than it is long, with front angles acute, lateral margins strongly but not acutely angulate before middle, and posterior lateral flattened area very sharply defined. Elytra a little longer than their conjoint width, very strongly narrowed to extremities, with shallow striae and slightly convex intervals.

Metasternum has a large round posterior depression, smooth, shining, and almost devoid of punctures, and its anterior angles contain very large punctures and a few scattered setae.

Legs very long and slender. Front tibia armed with three strong teeth, occupying half the outer edge, upper half is serrate. Hind femur tapering at each end and basal part forms a slender but not very long footstalk. Hind trochanters not freely produced.

Length: 6 – 9 mm.

Breadth: 4 – 6 mm.

Field data: Dhanushadham, 1 ♂, 10-IX-02; Godar, 1 ♂, 20-IX-02; Total = 2 exs. (2 ♂) Coll. Mahto.

Distribution: India: Bengal, Maharastra, S. India; Nepal: Bardia, Kailali, Lalitpur and Dhanusha (Dhanushadham and Godar) districts; and Sri Lanka. This is the first record of the species from Dhanusha district.

Remarks: Species is rare in Dhanusha district and is found rolling balls of cattle dung only.

DIVISION III. COPRINI

Genera comprised in this Division differ greatly in form of body. Legs not very slender. Middle coxae widely separated and more or less parallel. Middle and hind tibiae dilated towards extremity, middle ones with two terminal spurs and hind with one. Middle and hind tarsi more or less flattened, and first four joints successively diminish in length and breadth, basal joint being much longer than next.

Greater number of species of Coprinae are comprised in this Division. It includes all those species which bear horns upon head and thorax.

Key to the genera of Coprini recorded from Dhanusha

- 1(14) Pronotum without two basal impressions near the middle.
- 2(11) Scutellum wanting
- 3(6) Elytra with two lateral carinae

- 4(5) First joint of the antennal club shining.....*Heliocopris* Burm.
- 5(4) Antennal club entirely pubescent *Catharsius* Hope
- 6(3) Elytra with one lateral carina.
- 7(8) Pronotum with a strong basal groove..... *Copris* Geoffroy
- 8(7) Pronotum without a strong basal groove
- 9(10) Four posterior tarsi broadly dilated..... *Phalops* Er
- 10(9) Four posterior tarsi not broadly dilated..... *Onthophagus* Latr.
- 11(2) Scutellum present.
- 12(13) Sides of the abdomen exposed above*Oniticellus* Serv.
- 13(12) Sides of the abdomen not exposed above.....*Drepanocerus* Kirby
- 14(1) Pronotum with two basal impressions near the middle.
- 15(16) Scutellum very minute; front tarsi absent
in both sexes *Onitis* F.
- 16(15) Scutellum not very minute ; front tarsi present
in the female..... *Chironitis* Lansb.

Genus 4. *Heliocopris* Burmeister, 1846

1846. *Heliocopris* Burmeister, *Gen. Ins.*, 10:27.

1931. *Heliocopris* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3: 84 – 85.

1963. *Heliocopris* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 1 : 297.

Type species, *Copris Pirmal* Fabricius.

Description : Body large, broad and massive.

Head large. Margin of clypeus rounded or slightly excised in middle. Ocular lobes separated by carinate sutures from clypeus. Eyes not very deeply divided, upper part not very small.

Pronotum bears stiff, erect, lateral fringes and has complete basal groove.

Scutellum wanting.

Elytra with broad epipleurae bearing seven dorsal striae and a sharp longitudinal carina replacing the 8th .

Abdomen completely covered, with a lateral carina continued across the pygidium.

Legs not long. Front coxae prominent. Middle coxae long, nearly parallel, and not very far apart. Hind coxae bear stridulatory ridges at inner end within coxal cavities, which are microscopically striate. Front tibia armed with three external teeth, four posterior tibiae dilating strongly from base to extremity, toothed at outer edge, middle tibia with two, hind with one terminal spur. All tarsi present, posterior ones broad, triangular in shape, with successively diminishing joints, basal joint much longer than 2nd .

Antenna 9-jointed, last three joints long, of which 7th joint smooth and shining on its outer face and partially enclosing the succeeding joints.

Mandible narrow, with short basal and rather long terminal fringe. Maxilla long, palpus slender, with three subequal joints, and 4th rather longer. Mentum deeply cleft, labial palpi very broad, basal joint strongly transverse, 2nd about twice as long as wide, 3rd very minute.

One of the chief distinctive features of this genus is found in the stridulating ridges within the hind coxal cavities. The structure of these stridulating ridges has been described by Arrow (1931). According to him, the chitin at the base of the abdomen lining the cavity is very hard, and a considerable part of its inner end is microscopically striated in a transverse direction. The surface of the coxa in contact with this part is rough and hairy, but the hairs and roughness end abruptly just before the inner edge, at which the membranous attachment occurs. Here, close to the inner end of the coxa, is found a very small patch of very close and regular ridges, exactly like those upon the wall of the cavity and running in the same direction, i.e. transversely to the axis of the body. This small area is not quite flat, but slightly undulated, so that one or two slight prominences occur beyond the general surface. Further according to Arrow (1931), the effect of friction between the opposing surfaces has been described by the late Dr. Annandale, who says, "the male of the dung-beetle, *Heliocopris mouhotus* Sharp, a pair of which was brought to me at

Biserat by an elephant mahout, squeaks like a bat when touched, but is silent when lifted from the ground. The female of this species is dumb." The dumbness of the female must have been temporary only, for both sexes of *H. dominus* Bates, as of the other species of the genus, possess an identical apparatus.

Distribution : The centre of origin of the genus appears to be in Ethiopian region where more than 90% of the known 51 species are found (Biswas and Ghosh, 2000). Only one species is found in Palaearctic region and 4 in Oriental region. Of these 4 species only one is found within the area under study.

The genus *Heliocopris* Burm. contains only a single species.

9. *Heliocopris bucephalus* (Fabricius), 1775. (Pl. VI, Figs. 1, 2.)

1775. *Scarabaeus bucephalus* Fabricius, *Syst. Ent.*, : 24.

1931. *Heliocopris bucephalus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 88 – 90. Pl. V, Figs. 2, 3 .

1963. *Heliocopris bucephalus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 1: 303. Pl. XIII, Fig. 2

Description: Black, with elytra and lower surface usually deep red, parts of lower surface and legs clothed with coarse rust- red hair.

Body broad and somewhat quadrate in shape, with head and pronotum coarsely rugose, and elytra very smooth and shining.

Head rather small and coarsely transversely strigose. Clypeus moderately finely transversely strigose. Its front margin strongly reflexed and feebly excised in middle and lateral margins somewhat serrate behind.

Pronotum very unevenly rugose or reticulate, with a slight depression in middle of basal part, and front angles rather smooth. Sides strongly rounded, front angles not very blunt, and hind angles feebly indicated.

Elytra very finely striate, with intervals minutely and sparsely punctured.

Pygidium unevenly, shallowly and indefinitely punctured.

Metasternal shield smooth in middle, sparsely punctured and hairy in front and at sides, and has, just before the base, an oval impression containing a few hairs anteriorly. Sides of metasternum densely clothed with hair. Basal ventral sternite also clothed with long hairs.

Front tibia armed with three strong outer teeth.

Male: Maximum phase: Posterior narrowed part of head rather produced, so that maximum width of head is not much greater than its length. Head bears a slender pointed horn in centre. Horn slightly curved and nearly erect. Pronotum vertical in front, and upper edge of declivity forms a sharp straight carina rather feebly toothed at each end. From each side extends a sharp, obliquely produced, nearly horizontal process, beneath which is a deep shining excavation, with a small tooth at its outer edge. Anterior angles very smooth and rather sharply produced.

Minimum phase : In small males head is shorter, horn is shorter, broader, and more or less bicuspid at tip. Lateral prothoracic process only traceable as an angular point, and excavation hardly apparent.

Male genitalia (Pl. VI, Fig. 3): Parameres are long and their apical ends are rounded and have sensory bristles on both inner sides. Endophallus is broadened apically, narrow and rounded proximally.

Female: Not examined.

Length: 40 – 50 mm.

Breadth: 24 – 30 mm.

Field data: Dhanushadham, 1, 10-IX-02; Chisapani Churia hills, 2, 24-IX-03. 3, 2-X-04. Total = 6 exs. (6). Coll. Mahto.

Distribution : India : Maharashtra, Madhya Pradesh, Bihar, West Bengal, Assam, Tripura, Uttar Pradesh and Orissa; Nepal : Kathmandu (Swayambhu);Kanchanpur, Gorkha, Sunsari, Chitwan and Dhanusha (Dhanushadham and Chisapani Churia Hills) districts; Burma; Siam; Malay Peninsula; Java; Indonesia and Malayasia. This is the first report of species from Dhanusha district.

Remarks: This is the largest species found in Dhanusha district and may be easily distinguished by its robust size, shining elytra and opaque and rough pronotum. This is found both in plains and in hills but in very few numbers. They frequent dung of

larger herbivorous animals and prefer soft muddy soil or open fields. Males of this species squeak like a bat when touched but females have not observed to produce any sound. These beetles have been reported to tunnel very deep into the soil but specimens have been collected within 60 cm. All the specimens collected here were solitary.

Genus. 5. *Catharsius* Hope, 1837

1837. *Catharsius* Hope, *Col. Man.*, 1:21.

1931. *Catharsius* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 92.

1963. *Catharsius* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamollicornia), 1 : 304.

Type species: *Scarabaeus molossus* Linnaeus, 1758.

Description : Body large, broad, compact, and very convex .

Head broad and semicircular. Ocular lobes united by a carinate suture with clypeus. Eyes not very small nor very deeply divided .

Pronotum completely margined at base.

Scutellum wanting.

Elytra with seven striae and a sharp longitudinal supplementary lateral carina in place of an 8th stria.

Antenna 9- jointed, last three joints long and entirely pubescent.

Abdomen completely covered, with a lateral carina continued across pygidium.

Legs not long. Middle coxae long, parallel, and moderately far apart. Front tibia armed with three external teeth. Four posterior tibiae dilating strongly from base to extremity, each with two transverse carinae at outer edge, middle tibia with two and hind tibia with one terminal spur. All tarsi present, posterior ones broad, with successively diminishing joints, basal joint much longer than 2nd.

Mandible with a long basal molar and small, narrow, terminal ramus. Maxilla stout, palpus with minute basal joint, and terminal one a little longer than 3rd. Mentum transversely rectangular, labial palpi far apart, with basal joint not very large, about as long as wide, 2nd oviform, a little smaller, and 3rd a little shorter, slender.

Genus *Catharsius* Hope differs from *Heliocopriss* Burm. only in entirely pubescent antennal club. But this genus differs from *Copriss* Geoffroy in supplementary lateral carina in place of an 8th stria upon each elytron and additional transverse carina at outer edges of middle and hind tibiae.

Geographical distribution: Majority of species are found in Ethiopian region where 87.3% of known 111 species are found. In Oriental region 11 species are found; of these 11 species 6 have been recorded in area under study.

Key to the species of *Catharsius* Hope recorded from Dhanusha

- 1(6) Elytra entirely opaque.
- 2(3) Head with a small smooth area adjoining each eye *molossus* L.
- 3(2) Head without smooth area adjoining each eye.
- 4(5) Pronotum with lateral prominence on each side..... *granulatus* Sharp.
- 5(4) Pronotum without lateral prominence on each side*sagax* Quens.
- 6(1) Elytra not entirely opaque.
- 7(8) The four posterior tarsi very broad (the 2nd and 3rd joints of the middle tarsus broader than long)..... *birmanensis* Lansb.
- 8(7) The four posterior tarsi not very broad.
- 9(10) Head not very transverse; pronotum of male with four tubercles *capucinus* F.
- 10(9) Head very transverse; pronotum of male with two tubercles *pithecus* F.

10. *Catharsius molossus* (Linnaeus), 1758 (Pl. VIII, Figs. 1, 2)

1758. *Scarabaeus molossus* Linnaeus, *Syst. Nat. ed.* 10 : 347.

1801. *Copriss ursus* Fabricius, *Syst. Eleuth.*, 1 : 43.

1931. *Catharsius molossus* Arrow, *Fauna Brit. India* (Coleoptera: Lamellicornia), 3: 94 – 95. Pl. VIII, Figs. 6, 7.

1963. *Catharsius* (s. str.) *molossus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 307 – 309. Pl. XIV, Fig. 1.

Description : Black, may be brownish when freshly emerged, opaque, and partially clothed with reddish hair beneath.

Body broadly oval and very convex.

Head (Pl. VIII, Fig. 4) broad, with clypeus closely transversely rugulose, and its front margin scarcely perceptibly excised in middle. Ocular lobes densely and coarsely granular. There is a small, smooth, shining area adjoining inner margin of each eye.

Pronotum finely and densely granular, except upon a small shining area upon each side in male. Sides rounded, front angles broadly truncate, hind angles almost obsolete, and lateral scars large and deep .

Elytra very finely and lightly striate, with intervals flat and microscopically coriaceous. Pygidium finely granular at sides and finely punctured in middle.

Metasternal shield acutely angular in front, thinly clothed with erect hairs in front and at sides, and with a median longitudinal groove in its hinder part, finely and rather sparsely punctured, rather smooth and shining. Sides of metasternum very densely clothed with erect hairs.

Front tibia armed with three external teeth, four posterior tibiae broad and crenate at hind margin, and terminal spur of hind tibia truncate at extremity.

Male : Head bears a conical median horn, broad and a little flattened behind at base, sharp-pointed at tip, and inclined a little forward. Pronotum has an anterior steep declivity, upper edge of which has a sharp carina feebly convex in middle. Extremities of carina curved forward and produced into sharp, diverging and widely separated points, beneath each of which is a smooth and shining hollow.

In small males cephalic horn very short, thoracic carina scarcely produced at extremities, lateral hollows absent, and surface uniformly tuberculate.

Male genitalia (Pl. VIII, Fig. 3): Apical ends of parameres are narrow, straight and pointed. Endophallus is broadened apically and having triangular-shaped muscular structure, narrow and pointed proximally.

Female : Head bears a very short, pointed process, base of which is transversely dilated and minutely angulate on each side. Pronotum has a short anterior declivity,

upper edge of which forms a nearly straight carina. Extremities of carina not distinctly produced and without smooth lateral hollows.

Length: 23 – 35 mm.

Breadth: 14 – 22 mm.

Field data: Janakpur 13 , 13 ; 1-VI-02; 5 , 4 , 1-VIII-03; 5 , 7 , 1-V-04; Dhanushadham; 2 , 3 ; 10-VIII-02; 6 , 4 , 15-VI-03; 4 , 7 , 15-IX-04; Godar, 3 , 2 , 10-VII-02; 2 , 2 , 10-VI-03; 6 , 4 , 10-X-04; Yadukuha, 1 , 2 , 20-V-02; 3 , 2 , 20-VI-03; 4 , 5 , 20-IX-04; Dhalkebar, 3 , 2 , 5-VIII-02; 2 , 1 , 5-IX-03; 3 , 4 , 5-VII-04; Bahunmara, 2 , 3 , 23-III-02; 3 , 5 , 23-VII-03; 4 , 3 , 25-X-04; Chisapani, 4 , 5 , 7-III-03; 5 , 3 , 6-VII-04 .Total = 140 exs. (70 , 70). Coll. Mahto.

Distribution : India : Andaman Islands, Kerala, Karnataka, Maharashtra, Uttar Pradesh, Himachal Pradesh, Meghalaya, West Bengal, Sikkim, Assam, Orissa, Bihar, Arunachal Pradesh and Tripura; Nepal : Kathmandu (Gokarna forest and Swayambhu), Kaski (Pipar), Dolkha (Charikot and Jiri), Sunsari, Dang, Tanahu, Makwanpur, Bharatpur, Illam, Chitwan and Dhanusha (Janakpur, Dhanushadham, Godar, Yadukuha, Dhalkebar, Bahunmara and Chisapani) districts; Bangladesh and Sri Lanka. The species is recorded for the first time from Dhanusha.

Remarks: This is one of the commonest species in India and Nepal, found both in hills and plains but the specimens from plains in general were recorded larger in size. It is found almost throughout the year though in lesser numbers in winter months. This is the only species of *Catharsius Hope* in this district which have been collected almost in equal numbers from human faeces as well as from dungs of larger herbivorous animals This beetle prefers sandy or muddy soil and excavates long almost vertical tunnel. Usually this beetle is found singly or in group of 2 to 3 but rarely as many as 6 specimens have been collected from a single spot. This is the dominant species of the genus in Dhanusha district.

11. *C. granulatus* Sharp, 1875 (Pl. VII, Figs. 1, 2)

1875. *Catharsius granulatus* Sharp, *Col. Hefte.*, 13: 41

1931. *Catharsius granulatus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3: 95 – 96 .

1963. *Catharsius* (s. str.) *granulatus*, Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera: Lamellicornia), 1 : 309.

Description : This species is closely similar to *C. molossus* L., but the head is without smooth area adjoining eye. Granules of central region of pronotum are little less close and regular, while granules of anterior declivity are rather larger and less dense.

Male : The size is a little less than in *C. molossus* L., but cephalic horn and lateral processes of pronotum are longer than in specimens of similar size of that form.

Male genitalia (Pl. VII, Fig. 3): Apical ends of parameres are narrow, straight and pointed. The endophallus is broadened apically with flattened muscular structure and club-shaped proximally.

C. granulatus Sharp is intermediate between *C. molossus* L. and *C. sagax* Quens., and seems to suggest that all may really belong to a single species. Arrow (1931) had been unable to distinguish the females of *C. granulatus* Sharp and *C. sagax* Quens., but had seen no intermediate between these and commoner and more widely distributed *C. molossus* L.

Length : 23 – 32 mm.

Breadth : 14 – 17 mm.

Field data: Janakpur, 2 , 1 , 1-VII-02; 3 , 4 , 1-VI-04; Dhanushadham, 3 , 2 , 10-VII-02; 5 , 3 , 14-IX-03; 2 , 4 , 15-VIII-04; Godar, 4 , 3 , 10-VI-02; 5 , 7 , 10-VIII-03; 6 , 4 , 10-IX-04; Yadukuha , 2 , 1 , 15-IX-02; 4 , 5 , 20-VII-03; 4 , 6 , 20-VII-04; Dhalkebar, 2 , 2 , 5-VII-02; 3 , 1 , 5-VIII-03; 6 , 4 , 2-II-04; Bahunmara, 5 , 3 , 23-III-02; 1 , 3 , 23-VIII-03; 4 , 5 , 25-IX-04; Chisapani, Churia hills, 3 , 2 , 6-VI-02; 5 , 3 , 6-VII-03. Total = 132 exs. (69 , 63). Coll. Mahto.

Distribution : India : Bihar, Uttar Pradesh, Sikkim, Kerala, Meghalaya, Orissa, West Bengal and Tripura; Nepal : Bardia, Kathmandu, Lalitpur, Kailali, Sunsari, Rasuwa and Dhanusha (Janakpur, Dhanushadham, Godar, Yadukuha, Dhalkebar, Bahunmara and Chisapani Churia hills) districts; Sri Lanka and Pakistan.

Remarks : The species is very similar to *C. molossus* L. but can be distinguished by absence of smooth area adjoining each eye. This is also one of the commonest species

in Dhanusha district and found both in plains and hills. It is found almost throughout the year though in lesser numbers in winter months. Specimens were collected from human faeces and the dungs of larger herbivorous animals and were found together with closely related and more common species *Catharsius molossus* L. This beetle prefers sandy or muddy soil and excavates long almost vertical tunnel.

12. *C. sagax* (Quenstedt) , 1806 (Pl. IX, Figs. 1, 2)

1806. *Copris sagax* Quenstedt, *Schonh. Syn. Ins.* 1 : 43.

1931. *Catharsius sagax* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 96. Pl. VIII, Fig. 3.

1963. *Catharsius* (s. str.) *sagax* Bathasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 309.

Description : Almost identical with *C. molossus* L., but of rather smaller average size, with elytra generally a little less dull and sooty, and head without smooth shining area adjoining eye on each side.

Male : Rather narrower in shape, with cephalic horn less erect and situated farther forward upon head, and upper margin of thoracic declivity straighter, its lateral angles sharp but not at all produced.

Male genitalia (Pl. IX, Fig. 3): Apical ends of parameres are narrow, pointed and curved inwards. Endophallus is broadened apically and having horn-shaped muscular structure, narrow, pointed and bifurcated proximally.

Length : 23 – 36 mm.

Breadth : 14 – 18 mm.

Arrow (1931) had distinguished the females of *C. sagax* Quens with that of *C. molossus* L. by only one character, viz. the absence in *sagax* of a smooth area adjoining the eye, but metasternum appears to be usually less strongly grooved in this sex.

Field data: Janakpur, 3 ♂, 1 ♀, 1-VI-02; 1 ♂, 1 ♀, 1-IX-03; 4 ♂, 3 ♀, 1-VII-04; Dhanushadham, 2 ♂, 2 ♀, 10-VIII-02; 4 ♂, 3 ♀, 14-IX-03; 3 ♂, 2 ♀, 15-VII-04; Godar, 5 ♂, 3 ♀, 10-VII-02; 1 ♂, 20-X-03; 6 ♂, 4 ♀, 10-VIII-04; Yadukuha, 3 ♂, 2 ♀, 15-VII-02; 2 ♂, 20-VI-03; Dhalkebar, 5 ♂, 4 ♀, 3-VIII-02; 3 ♂, 5 ♀, 5-VII-03 ; Bahunmara Churia hills, 3 ♂, 4 ♀, 23-III-01; 2 ♂, 4 ♀, 23-VII-03 ; Chisapani Churia hills, 3 ♂, 2 ♀, 6-VI-02; 2 ♂, 15-VI-03. Total = 92 exs. (48 ♂, 44 ♀) Coll. Mahto.

Distribution : India : Kerala, Tamilnadu, Maharashtra, Madhya Pradesh, Bihar, West Bengal, Tripura and Orissa; Nepal: Kanchanpur, Chitwan and Dhanusha (Janakpur, Dhanushadham, Godar, Yadukuha, Dhalkebar, Bahunmara Churia hills and Chisapani Churia hills) districts; Pakistan; Bhutan and Sri Lanka. This is the first report of species from Dhanusha district.

Remarks: The species is closely similar to *C. molossus* L. but may easily be distinguished by absence of smooth area adjoining each eye. This is also one of the commonest species in Dhanusha district and found both in plains and hills. It is found almost throughout the year though in lesser numbers in winter months. Specimens have been collected from grassland, uncultivated field in sandy or muddy soil, only from cattle dung. They excavate long almost vertical tunnel.

13. *C. birmanensis* Lansberge, 1874. (Pl. IX, Figs. 4, 5)

1874. *Catharsius birmanensis* Lansberge, *Col. Hefte.*, 12 : 11

1931. *Catharsius birmanensis* Arrow, *Fauna Brit.India* (Coleoptera: Lamellicornia), 3 : 97 – 98. Pl. VIII, Figs. 4, 5.

1963. *Catharsius* (s.str.) *birmanensis* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 311. Pl. XV, Fig. 1.

Description : Black and Shining, with basal part of elytra for about a quarter of their length opaque, and antennae, mouth-organs, and hairy clothing of lower surface and legs red.

Body broadly oval and convex.

Head broadly semicircular. Clypeus finely rugose, and its front margin reflexed and imperceptibly excised in middle.

Pronotum partly () or entirely () covered with closely set minute granules. Front angles obtuse, hind angles completely obliterated, and base gently rounded and finely margined.

Elytra finely but distinctly striate, with scarcely perceptible punctures in striae, and intervals smooth, except near base, and scarcely punctured.

Pygidium lightly, finely, and not closely punctured .

Metasternal shield bluntly angular in front, very smooth and shining, with a median longitudinal groove and a deep pit at base in middle. Sides of metasternum finely and closely punctured and hairy.

Middle and hind tarsi broad, 2nd and 3rd joints of middle tarsus distinctly transverse, and those of hind tarsus almost as broad as they are long.

Male : Clypeus lightly rugose. Head shining, very smooth behind, and bears an erect slender horn arising just in front of eyes, very slightly dilated behind in its basal half, and gently curved at end. Pronotum bears a slight, sharp, conical protuberance on each side of median line and midway between front and hind margins. Surface gently hollowed between two protuberances, flattened, smooth and shining in front of them, and closely covered with minute granules upon posterior part, sometimes with a small, smooth, shining patch behind each protuberance.

In small males cephalic horn short, straight and regularly tapering, and anterior, as well as posterior, part of pronotum closely granular. In large males cephalic horn rather feebly serrate behind on each side.

Male genitalia (Pl. IX, Fig. 6): Apical ends of parameres are narrow, straight and pointed. The endophallus is broadened apically with flattened muscular structure and narrow proximally.

Female : Head more closely and strongly sculptured, ocular lobes covered with granules, and bears a short, transverse, acuminate elevation arising just in front of eyes. Pronotum closely covered with minute granules, and has a feebly indicated, short, transverse elevation a little before middle.

Length : 24 – 32 mm. Breadth : 15 – 19 mm.

Field data: Janakpur, 5, 7, 1-VI-01; 6, 8, 1-IX-02; 4, 5, 1-IV-03; 8, 4, 1-VI-04; Dhalkebar, 3, 2, 5-IV-01; 7, 5, 5-VII-02; 2, 3, 5-VI-03, 5, 3, 5-VII-04; Godar, 4, 6, 20-IX-02; 7, 5, 20-VI-03; 9, 7, 20-VII-04; Yadukuha, 9, 7, 15-VII-01, 3, 2, 15-IX-02; 8, 7, 25-VI-03; 7, 4, 15-IV-04; Dhanushadham, 7, 4, 10-III-01; 6, 4, 10-VI-02; 2, 2,

10-IX-02; 7, 3, 10-VI-03; Khajuri Railway line, 6, 4, 23-VIII-03; Chisapani Churia hills, 4, 6, 23-VI-01, 5, 7, 25-IX-02; 4, 3, 6-VI-03; Bahunmara Churia hills, 11, 8, 27-VII-02; 3, 2, 23-VIII-03. Total : Exs. 250 (132, 118). Coll. Mahto.

Distribution : India : Tripura and West Bengal (Darjiling) ; Nepal : Dhanusha district (Janakpur, Dhalkebar, Godar, Yadukuha, Dhanushadham, Khajuri, Chisapani Churia hills and Bahunmara Churia hills), Bhutan and Burma. This is the first time the species has been recorded from Dhanusha district as well as from Nepal.

Remarks : Species is widely distributed in Dhanusha district and found both in plains and hills. It is found almost throughout year though in lesser numbers in winter months. Specimens were collected from grassland, uncultivated field in sandy or muddy soil, from cattle dung and were also collected in light traps. They excavate long almost vertical tunnel.

14. *C. capucinus* Fabricius, 1781. (Pl. X, Figs. 1, 2)

1781. *Catharsius capucinus* Fabricius, *Spec. Ins.*, 1 : 25

1931. *Catharsius capucinus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 99 – 100. Pl. VII, Figs. 5, 6.

1963. *Catharsius* (s. str.) *capucinus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 312.

Description : Closely similar to *C. pithecius* F., but of rather larger size, with clypeus slightly produced, and differences in secondary sexual characters.

Male : Head bears a horn which is dilated a little on each side at base to form a narrow, transverse, rectangular plate, with well defined upper angles. Horn inclines backward at base and curves gradually forward to tip, which is slender. Like *C. pithecius* F., pronotum bears a tubercle on each side of middle, and in addition, there is another similar tubercle nearer outer margin and a very little farther forward than median pair. Surface gently hollowed between two inner tubercles, flattened, smooth and shining in front of them, and closely covered with minute granules upon posterior part, with a small, smooth, shining patch behind each inner tubercles.

Male genitalia (Pl. X, Fig. 3): Apical ends of parameres are narrow, pointed and curved inwards. The endophallus is apically broadened with club-shaped muscular structure and bifurcated forcep-like proximally.

Female: Head bears a slight transversely triangular elevation, and pronotum has feeble indications of four tubercles found in male.

Length: 18 – 26 mm.

Breadth: 11 – 15 mm.

Field data: Janakpur, 4 ♂, 3 ♀, 1-VI-01; 3 ♂, 4 ♀, 1-VIII-02; 3 ♂, 2 ♀, 1-VI-03; 4 ♂, 3 ♀, 1-III-04; Dhalkebar, 3 ♂, 2 ♀, 5-IV-01; 7 ♂, 4 ♀, 5-VII-02; 2 ♂, 2 ♀, 5-VI-03; Dhanushadham, 2 ♂, 3 ♀, 10-III-01; 1 ♂, 2 ♀, 15-VI-02; 4 ♂, 3 ♀, 10-IX-03; Yadukuha, 3 ♂, 5 ♀, 15-VIII-01; 4 ♂, 2 ♀, 15-X-02; 3 ♂, 3 ♀, 30-VI-03; Godar, 4 ♂, 3 ♀, 20-IX-02; 2 ♂, 3 ♀, 3-VI-03; Chisapani Churia hills, 4 ♂, 6 ♀, 23-V-01, 2 ♂, 1 ♀, 23-VIII-02; 2 ♂, 2 ♀, 6-VI-03; Bahunmara, 5 ♂, 3 ♀, 27-VII-21; 2 ♂, 3 ♀, 23-VIII-03.

Total: 123 exs. (64 ♂, 59 ♀), Coll. Mahto.

Distribution: India : Bengal, Bihar and South India; Nepal : Dhanusha district (Janakpur, Dhalkebar, Dhanushadham, Yadukuha, Godar, Chisapani Churia hills and Bahunmara); and Sri Lanka. This is the first time the species has been recorded from Dhanusha district as well as from Nepal.

Type sepcies: In the British Museum.

Remarks: Species is widely distributed in Dhanusha district and found both in plains and hills. It is found almost throughout year though in lesser numbers in winter months. Specimens were collected from pastures in sandy or muddy soil, from cattle dung only. They excavate long almost vertical tunnel.

Catharsius capucinus F. is extremely closely related to *C. pithecius* F. and is found in same localities. Male is readily distinguished by four tubercles upon pronotum, and these are usually feebly indicated in females. In both sexes head is a very little longer and narrower than in *C. pithecius* F.

15. *C. pithecius* (Fabricius), 1775. (Pl. X, Figs. 4, 5)

1775. *Scarabaeus pithecius* Fabricius, *Syst. Ent.*, : 21.
1781. *Scarabaeus sabaeus* Fabricius, *Spec. Ins.* ,1 : 23.
1792. *Scarabaeus nanus* Fabricius, *Ent. Syst.*, 1 : 42 .
1842. *Copris sinensis* Hope, *Proc. Ent. Soc. Lond.*, : 60.
1858. *Copris cribricollis* Walker, *Ann. Mag. Nat. Hist.* 2(3) : 208.
1931. *Catharsius pithecius* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 100 – 101. Pl. VII, Figs. 1, 2.
1963. *Catharsius* (s. str.) *pithecius* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera; Lamellicornia), 1 : 30. Pl. XV, Fig. 2.

Description : Black and shining, with pronotum partly or entirely opaque, antennae, mouth- organs, and hairy clothing of legs and lower surface reddish.

Body shortly oval and very convex .

Head nearly semicircular in shape, with clypeus closely strigose, and its front margin very feebly excised in middle. Ocular lobes closely granular.

Sides of pronotum strongly and uniformly rounded, front angles generally distinct and hind angles entirely obliterated, and base gently rounded and finely margined.

Elytra finely but distinctly striate, with scarcely perceptible punctures in striae, intervals shining, except close to base, where they are opaque and very minutely punctured.

Pygidium finely and not very closely punctured.

Metasternal shield acutely angular in front, very smooth and shining, with a median longitudinal groove. Sides of metasternum closely and rugosely punctured and hairy.

Male : Head lightly sculptured and shining, and bears a nearly straight slender horn, arising just in front of eyes, and inclined very slightly backwards. Pronotum bears a slight, sharp, conical protuberance on each side of middle line and midway between front and hind margins. Surface gently hollowed between two protuberances,

flattened, smooth and shining in front of them, and closely covered with minute granules upon posterior part, usually with a round, smooth, shining patch behind each protuberance. Two smooth patches may become enlarged and united or, especially in poorly developed specimens, may be very small or entirely absent.

Male genitalia (Pl. X, Fig. 6): Apical ends of parameres are narrow, pointed and curved inwards. Endophallus is broadened apically and having hook-shaped muscular structure, club-shaped proximally.

Female : Head more deeply sculptured and less shining, and a transverse slightly acuminate elevation arises in front of eyes. Pronotum bears a median longitudinal furrow in its basal part, and is closely covered with minute granules, sometimes absent from a smooth basal area on each side of median furrow.

Length : 15 – 23 mm.

Breadth : 10 – 13 mm.

Field data: Janakpur, 3 ♂, 4 ♀, 1-VI-01, 4 ♂, 5 ♀, 1-VII-02; 3 ♂, 4 ♀, 1-VI-03; 3 ♂, 2 ♀, 1-III-04; Dhalkebar, 2 ♂, 3 ♀, 5-IV-01; 6 ♂, 4 ♀, 3-VIII-02; 3 ♂, 2 ♀, 5-VI-03; Dhanushadham, 3 ♂, 2 ♀, 10-III-01; 3 ♂, 4 ♀, 15-VI-02; 6 ♂, 4 ♀, 10-IX-03; Yadukuha, 5 ♂, 3 ♀, 15-VII-01; 2 ♂, 3 ♀, 15-X-02; 4 ♂, 3 ♀, 20-VI-03; Godar, 2 ♂, 3 ♀, 20-IX-02; 4 ♂, 3 ♀, 3-VI-03; Chisapani Churia hills, 5 ♂, 6 ♀, 23-V-01; 2 ♂, 3 ♀, 23-VIII-02; 4 ♂, 4 ♀, 6-VI-03; Bahunmara, 4 ♂, 5 ♀, 27-VII-02; 4 ♂, 3 ♀, 23-VIII-03. Total = 142 exs. (72 ♂, 70 ♀). Coll. Mahto.

Distribution : India : Orissa, Bihar, Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Mysore, Andhra Pradesh, Kerala, Madhya Pradesh, Meghalaya and Tripura; Nepal : Bardia and Kailali districts, Helambu and Dhanusha district (Janakpur, Dhalkebar, Dhanushadham, Yadukuha, Godar, Chisapani Churia hills and Bahunmara); and Sri Lanka.

Type species : *C. pithecius*, *sabaeus*, *sinensis*, and *cribricollis* in British Museum; that of *C. nanus* in the Copenhagen Museum.

Remarks : Arrow (1931) had reported that this is a very abundant species throughout the greater part of India. In Dhanusha district of Nepal, the species seems to be

common and most of the specimens of *Catharsius* Hope collected here, belong to this species. It is found both in plains and hills. Specimens have been collected from cattle dung as well as from human faeces.

Genus 6. *Copris* Geoffroy, 1762.

1762. *Copris* Geoffroy, *Ins. des. Enve. de Paris*, : 87.

1931. *Copris* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 102.

1963. *Copris* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1 : 317.

Type species : *Scarabaeus lunaris* Linnaeus, 1758.

Description : Body compact, convex or a little depressed, without hairy clothing above, black or blackish brown, sometimes chocolate brown.

Head broad, more or less semicircular. Front margin of clypeus often feebly notched in middle. Ocular lobes fused with clypeus.

Pronotum broad and transverse. Its front margin provided with a membranous fringe, usually very narrow but sometimes broad and conspicuous, hind margin with a deep groove. Front angles usually broadly rounded and hind angles obsolete.

Scutellum wanting.

Elytra not very short, having eight striae and a single lateral carina.

Meso-metasternal line angulate in middle, metasternum rather long.

Abdomen very short.

Legs not long. Middle coxae long and nearly parallel. Femora very thick. Front tibia armed with four, or occasionally only three, external teeth. Front tarsi very short. Middle and hind tibiae short, broadly dilated at extremity, middle tibia with two and hind tibia with one terminal spur, and middle tibia without and hind tibia with a strong transverse outer carina. Middle and hind tarsi rather short and broad, with successively diminishing joints, basal joint about twice as long as 2nd .

Antennae 9-jointed. Mandible moderately long, with a long hairy fringe at end. Maxilla not long, with a broad terminal lobe and slender palpus. Mentum more or less transverse, palpi for a part, with basal joint rather long and narrow, 2nd short, 3rd very small.

Genus *Copris* Geoffroy may be distinguished from *Heliocopris* Burm. and *Catharsius* Hope by single lateral carina on elytra.

Geographical distribution : Biswas and Ghosh (2000) has stated that the genus is found both in New and Old World but has not been recorded from Australia. Ethiopian in origin, the genus has its secondary centre of development in south and south east Asia. Of the total of 193 species (Balthasar, 1963) 51 are known from Oriental region and of this 51 species, 26 (Arrow, 1931) species were so far known from India. Twelve species have been recorded from Meghalaya state of India by Biswas and Ghosh in 2000 of which 2 have been described as new to science. Five species are reported from Nepal.

Key to the species of *Copris* Geoffroy recorded from Dhanusha

- 1(2) Sides of the metasternum closely hairy*magicus* Harold
- 2(1) Sides of the metasternum with scanty hair or none.
- 3(4) Elytra deeply striate*sinicus* Hope.
- 4(3) Elytra feebly striate*repertus* Walk.

16. *Copris magicus* Harold, 1881. (Pl. XI, Figs. 1, 2)

1881 *Copris magicus* Harold, *Mitth. Munch. Ent. Ver.*, 5:88.

1931. *Copris magicus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3:112-113. Pl. IX, Figs. 11, 12.

1963 *Copris* (s.str.) *magicus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 1:350. Pl. XX, Fig. 1.

Description : Black and shining, with antennae, mouth-organs, and hairy clothing of legs and sides of body beneath red.

Body broadly oval and very convex.

Head semicircular. Clypeus strongly punctured in male, coarsely rugose in female, and its front margin sharply notched in middle.

Pronotum very shining, with a strong longitudinal groove along middle. Front angles broadly truncate, and hind angles obsolete. Sides straight in front, and strongly rounded behind. Elytra deeply sulcate, sulci finely and closely punctured and intervals gently convex and finely punctured.

Metasternal shield very smooth and has a fine median longitudinal groove and a deep pit near front margin. Sides of metasternum closely punctured and hairy.

Front tibia broad and armed with four external teeth, and terminal spur feebly curved. Front femur rather closely punctured and middle and hind femora very feebly punctured.

Male : Clypeus deeply but not coarsely punctured and shining. Head bears a slender, backwardly curved horn, with a minute posterior tooth on each side at a short distance from base. Pronotum nearly vertical in front and dorsal elevation rather narrow but a little dilated at its front margin, which forms a straight carina interrupted in middle by longitudinal groove. On each side of dorsal elevation there is a deep shining excavation, outer margin of which is produced obliquely forward as a compressed pointed process, at base of which is an erect blunt lamina. In well developed males puncturation is very fine and sparse, except in median and basal grooves. In small males horn is short, dorsal and lateral thoracic processes are feeble, and intervening hollows are shallow and strongly punctured, as well as front declivity and front angles.

Male genitalia (Pl. XI, Fig. 3): The apical ends of the parameres are narrow pointed and slightly curved inwards. The endophallus is broadened apically with a flattened muscular structure and narrow proximally.

Female : Clypeus coarsely and unevenly rugose. Head bears an erect quadrate lamina, with its upper edge emarginate. Pronotum bears a straight carina parallel with front margin and not interrupted by median groove, and a slight tubercle at a little distance

from it on each side. Behind carina, and between it and front angles, surface is strongly and closely punctured.

Length : 18 – 20 mm.

Breadth : 10 – 12 mm.

Field data: Dhalakebar, 2 , 1 , 5-IX-02; 1 , 1 , 9-VI-03; 1 , 3 , 5-VI-03; Godar, 4 , 5 , 15-VI-03; 3 , 3-VI-03; Yadukuha, 5 , 1 , 20-VI-03; Janakpur, 2 , 2 , 1-VI-03; Bahunmara forest, 2 , 2 , 23-VIII-03; Barmajhia, Charnath river, 1 , 2 , 25-IX-04; Chisapani, Churia hills, 4 , 6-VI-03; 1 , 20-X-04. **Total** = 43 exs. (26 , 17). Coll. Mahto.

Distribution : India : West Bengal, Assam, Manipur and Bihar; Nepal : Dhanusha district (Dhalkebar, Godar, Yadukuha, Janakpur, Bahunmara, Barmajhia and Chisapani); Burma; Tonkin; and Yunan. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species : In M. Rene Oberthur's collection.

Remarks : The species is common in Dhanusha district. Specimens were collected from cattle dung. They were found below the dung making vertical tunnel.

17. *C. sinicus* Hope, 1842 (Pl. XI, Figs. 4, 5)

1842. *Copris sinicus* Hope, *Proc. Ent. Soc. Lond.*, : 60.

1886. *Copris sulcicollis* Lansberge, *Tijds. Ent.*, 29 : 10.

1931. *Copris sinicus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 115-116. Pl. IX, Fig. 5, 6.

1963. *Copris* (s.str.) *sinicus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 1 : 342. Pl. XVIII, Fig. 2.

Description : Black and shining, with antennae, mouth-organs, and bristles upon legs red.

Body oval and highly convex.

Head nearly semicircular. Clypeus rugulose and deeply notched in middle, with a slight lobe on each side of notch. Ocular lobes strongly punctured and vertex between eyes lightly punctured.

Pronotum very shining, with a strong longitudinal groove along middle. Front angles truncate, hind angles almost obsolete, and sides strongly rounded.

Elytra fairly deeply striate, striae finely and closely punctured, and intervals almost flat and scarcely perceptibly punctured.

Pygidium not very strongly nor very closely punctured.

Metasternal shield very smooth, and sides of metasternum rather finely punctured and sparsely setose.

Front tibia broad and armed with four external teeth. Front femur closely punctured and middle and hind femora fairly closely punctured upon outer half. Front tibial spur strongly hooked at end.

Male : Head bears a slender compressed horn, with a minute posterior tooth on each side at a short distance from base. Anterior part of pronotum has a sharp declivity and is feebly punctured in middle. Upper edge of declivity bears two minute teeth close together in middle, and a slight tooth on each side, far apart from each other. In poorly developed males median teeth absent. Anterior angles very strongly punctured, and posterior part elevated and lightly punctured at side .

Male genitalia (Pl. XI, Fig. 6): The apical ends of parameres are narrow, pointed and strongly curved inward. The endophallus is broadened apically with a loop-like muscular structure, narrow and curved in the middle and hook-shaped proximally.

Female: Head bears an elevated, short, transverse carina. Anterior part of pronotum has a short, steep declivity. Upper margin of declivity straight and parallel to front margin of pronotum. Pronotum fairly closely punctured immediately behind transverse carina, and very closely and strongly punctured at lateral part to front angles.

Length : 14 – 21 mm.

Breadth : 8 – 11 mm.

Field data: Dhalkebar, 1 , 5-VI-03; Godar, 1 , 15-VI-03 ;Yadukuha, 1 , 20-VI-03; Bahunmara, forest, 1 , 2 , 23-VIII-03.

Total = 6 exs. (2 , 4). Coll. Mahto.

Distribution : India : Madhya Pradesh, Meghalaya and Paninsular India; Nepal : Dhanusha district (Dhalkebar, Godar, Yadukuha and Bahunmara); Burma; Java; Siam; Tonkin and South and East China. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species: In the British Museum.

Remarks : Species is comparatively rare. The species is more common in human faeces than in dung of herbivorous animal.

18. *C. repertus* Walker, 1858 (Pl. XII, Figs.1,2)

1858. *Copris repertus* Walker, *Ann. Mag. Nat. Hist.*, 3(2) : 208.

1877. *Copris claudius* Harold, *Ann. Mus. Civ. Genova*, 10 : 48.

1931. *Copris repertus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 116-117. Pl. IX, Figs. 7, 8.

1963. *Copris* (s. str.) *repertus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia) 1 : 351 – 352. Pl. XX, Fig. 2.

Description : Black and shining, with antennae, mouth organs, and bristles upon legs and lower surface reddish.

Body broadly oval and highly convex.

Head nearly semicircular. Clypeus rugulose and deeply notched in middle of its front margin, with a slight lobe on each side of notch. Ocular lobes rugosely punctured, and vertex between eyes almost smooth.

Pronotum very shining, with a strong longitudinal groove along middle. Front angles truncate, sides strongly rounded, and hind angles almost obsolete.

Elytra lightly striate, except at base and apex, striae minutely punctured, and intervals flat and very minutely and inconspicuously punctured.

Metasternal shield smooth and sides of metasternum moderately closely punctured and sparsely setose.

Front tibia broad and armed with four external teeth, front femur rather closely punctured and middle and hind femora fairly closely punctured upon outer half. Front tibial spur nearly straight.

Male : Head bears a slender, feebly curved, slightly compressed erect horn, with a minute tooth behind near base on each side. Pronotum almost smooth, except in front angles, which are rugosely but not strongly punctured. Anterior part of pronotum has a steep declivity, upper edge of which bears three slight teeth on each side, four innermost are very feeble and equally spaced, two outer ones are sharp and more distant. In small males two innermost teeth are wanting and surface is finely and closely punctured immediately behind edge of declivity.

Male genitalia (Pl. XII, Fig. 3): The apical ends of the parameres are narrow, rounded and curved outwards, and each having a fringe of bristles at the dorsal surfaces. The endophallus is apically broadened and having a sole-shaped muscular structure, furnished with bristles, and narrow proximally.

Female : Head bears an elevated, short, transverse carina, with angles slightly produced. Anterior part of pronotum has a short declivity, upper edge of which is parallel with front margin. Pronotum moderately finely and closely punctured immediately behind declivity.

Length : 16 – 22 mm.

Breadth : 9 – 12 mm.

Field data: Dhalkebar, 1 , 5-VI-03; Godar, 1 , 15-VI-03, Yadukuha, 2 , 1 , 20-VI-03. Total = 5 exs., (3 , 2), Coll. Mahto.

Distribution : India : Orissa, Bihar, Maharashtra, Madhya Pradesh, Karnataka, Tamil Nadu, Kerala and Mysore; Nepal : Dhanusha district (Dhalkebar, Godar and

Yadukuha), Burma and Sri Lanka. This is the first record of the species from Dhanusha District as well as from Nepal.

Type species : In the British Museum; and *C.* in Genoa Museum.

Remark : Specimens were found in cattle dung making vertical tunnel below the dung.

Genus 7. *Phalops* Erichson 1848.

1848. *Phalops* Erichson, *Nat. Ins. Deutschl.* 3 : 764.

1893. *Ephillopus* Reitter, *Verh. Ver. Brunn*, 31 : 168.

1931. *Phalops* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 134.

1963. *Phalops* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 2 : 604.

Type, *Copris divisa*, Wiedemann

Description : Body generally short and broad, not very convex. Legs of moderate length, middle and hind tarsi broad and flattened, with basal joint long and 2nd, 3rd and 4th joints very short and differing little amongst themselves. Ocular lobes of head very prominent laterally.

Male : Clypeus narrowly produced in front. Head more strongly dilated before eyes. Posterior part of head produced backwards as a broad plate cleft in middle. Two halves generally close together, like those of a pen-nib, sometimes diverging at tip.

In other respects characters of genus are those of *Onthophagus* Latr. Genus *Phalops* Er. differs from *Onthophagus* Latr. in its peculiar form of posterior tarsi. Besides this, distinctive features of head in male are of a very peculiar kind.

Distribution : Africa, S.W. Asia, India and Nepal.

The genus *Phalops* Er. includes only a single species.

19. *Phalops divisus* (Wiedemann), 1823 (Pl.XIII, Figs. 1, 2)

1823. *Copris divisus* Wiedmann, *Zool. Mag.* 2(1) : 12.

1883. *Phalops divisus* Lansberge, *Stett. Ent. Zeit.* 44 : 169.

1931. *Phalops divisus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 135 – 136. Pl. 1, Fig. 2

1963. *Phalops divisus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 609.

Description : Bright metallic green, dark blue or coppery, elytra usually decorated with yellow markings, which may consist of a more or less triangular patch at outer edge just behind middle, and a patch in sutural angle extending a short distance forward. Additional yellow spots may appear near base and near middle of suture, and all may unite so that a large part of surface of elytra is yellow.

Upper surface slightly shining and clothed with fine erect yellow setae.

Clypeus transversely rugose and divided by a carina from granulate forehead.

Pronotum fairly closely, finely and evenly granular. Front angles broadly truncate, with a very minute tooth externally. Sides slightly sinuate behind, hind angles feebly indicated, and base very feebly rounded.

Elytra deeply striate and intervals rather closely and finely, and in parts rugosely, punctured or granular.

Pygidium opaque and closely and finely granular or strigose.

Metasternum very smooth in middle, sparingly granulose, punctate at sides, and more closely at sides of shield.

Male : Clypeus smoother in front than behind, it is produced in middle into a reflexed tongue-like lobe, ocular lobes produced outwards in front of eyes into blunt subangular processes, and posterior part of head produced backwards into a broad lamina, terminating in two slightly separate but not divergent points. Front margin of pronotum vertical and more or less smooth and shining. Legs longer than those of female, especially front tibiae, of which external teeth short and feeble, and extremity sharply produced internally.

Female : Clypeus rounded and feebly bilobed in middle, sides rounded but not produced, and posterior margin of head slightly notched. Legs short and front tibia broad and strongly toothed.

Length : 9 – 13 mm.

Breadth : 5 – 7.5 mm.

Field data: Yadukuha, 1 , 1 , 20-VI-03. Total = 2 exs. (1 , 1). Coll. Mahto.

Distribution : India : Madhya Pradesh, Rajasthan, Tamil Nadu, Uttar Pradesh, Orissa and Kerala; Nepal : Dhanusha district (Yadukuha); and Sri Lanka. This is the first record of the species from Dhanusha district as well as from Nepal.

Type : Type in the Copenhagen Museum.

Remarks : This species is very rare in Dhanusha district. Only two specimens were collected from cattle dung.

Genus. 8. *Onthophagus* Latreille, 1802.

1802. *Onthophagus* Latreille, *Hist. Nat. Crust. et. Ins.*, 3 : 141.

1931. *Onthophagus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 159-162.

1963. *Onthophagus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 153.

Type species : *Scarabaeus taurus* Linnaeus.

Description: Usually of rather short, compact form, smooth or clothed closely or sparsely with hairs or setae, sometimes extremely minute and inconspicuous on upper surface.

Clypeus fused with ocular lobes, very variable in shape, rounded, bilobed or acuminate in front.

Pronotum with lateral margins angulate near middle, front angles produced, acute or blunt, hind angles generally obsolete, base rounded, obtusely, angular or lobed in middle.

Scutellum absent.

Elytra covers abdomen and bears a single lateral carina and seven dorsal striae, 7th stria reaches shoulder-prominence but not base, usually strongly curved but sometimes straight. Pygidium generally bearing a transverse ridge parallel with base and continuous with lateral carinae of abdomen, coinciding with margins of elytra, but this is sometimes absent.

Meso-metasternal suture nearly straight, metasternal shield broad, with its anterior part flat, sloping, or sometimes vertical in middle, and occasionally forming a short compressed process. Abdomen short, last (6th) sternite extremely short in male.

Legs usually fairly stout. Middle coxae long and nearly parallel. Femora thick. Front tibia usually armed with four, or occasionally only with three, external teeth, with minute denticles above and sometimes between them. Middle and hind tibiae greatly dilated from base to extremity, with terminal margin generally nearly straight, but sometimes trilobed. Front tarsi slender and short. Middle and hind tarsi a little flattened, with a very close fringe of stiff hairs along inner edge and a looser fringe at outer edge. Basal joint moderately long, 2nd narrower, and generally less than half as long as 1st, 3rd about half the size of 2nd, 4th about half that of 3rd, and 5th slender.

Antennae short, composed of nine, or sometimes of eight, joints, basal joint fairly long, occasionally with a serrate anterior edge.

Mandible rather short. Maxilla with short and broad terminal lobe and moderately long 4-jointed, palpus. Mentum transverse, labial palpus with basal joint small, not dilated, 2nd moderately elongate, and 3rd very minute.

Sexual dimorphism : Members of this genus show prominent sexual dimorphism. Two sexes exhibit every degree of difference. Males usually provided with horns or processes upon head or thorax or both. Females may have same armature as males (*O. tarandus* F.), or may have a distinctive armature of their own (*O. sagittarius* F.), So that in some cases there is very little resemblance between sexes, or they may be unarmed. Very frequently front tibiae are elongate in male, occasionally they are shorter (*O. tragoides* Bouc.) and truncate at end. In some species both sexes are without armature of any kind. In many cases, puncturation on head and pronotum differs in males and females.

It is, however, always possible, to distinguish sex of any specimen by examining last (6th) abdominal sternite. In males middle part of this sternite is excised behind, so that it is very narrow in middle and sometimes only visible at sides. In females this is always large and of nearly equal width, or a little wider in middle. Sternites preceding

the last are also commonly shorter in male, so that abdomen is shorter and less rounded than in female.

Individual variation: Besides sexual differences as already mentioned, many of species show a great deal of variation even in same sex, specially in males. Development of armature on head and on pronotum show every degree of variation from almost negligible to highly developed condition and therefore, description of a particular form will not fit with others of same sex. So in case of highly variable species, large, medium and small forms have been recognized by some authors.

Genus *Onthophagus* Latr. is perhaps one of the largest genera in whole Coleoptera and in present study, it has been represented by largest number of species. Genus is predominant genus of Coprinae, vastly outnumbering all others in most parts of world. It is distributed all over world but number of species found in Old World are more numerous than those in New World. They are also more common in tropics than in temperate climate.

Habits: Members of this group vary greatly in their habits and majority of them are found in dung but some also inhabit in decaying vegetable matters while others may be found in carrion. Present study reveals a high degree of preference of these insects to particular type of dung. Large number of species could be found in dung of herbivorous animals and few number of species could also be found in human or carnivores excrements. In between these two groups, there may be small groups of species which may frequent equally, both types of excreta. Relative scarcity of species in horse dung need special mention. Horse dung is known to attract an array of species in North America but it is inhabited by a very few species in this region and only a single species of *Onthophagus* Latr. occurs in fairly large numbers in horse dung. Small number of species have also been collected in carrion and in fungus.

Present study also reveals co-relation between altitude and occurrence of different species. Species which are common in high altitude are not generally available in low altitude and vice versa. A small number of species, however, are available both in plains and in higher hills though their population may vary to a certain extent in different places.

An enteric disease, Scarabiasis, has been reported from India and some species of *Onthophagus* Latr. and *Caccobius* Thoms. are responsible for this disease. These beetles make their way into the intestine and cause alimentary disorder. Yet, there is no such reason to support that it is anormal habit of any of these species (Arrow, 1931; Biswas and Ghosh, 2000). During this study it has been found that many closely related species occur in human faeces, but no record of Scarabiasis is available from the region.

Distribution : The genus is widely distributed over the world. Centre of origin of genus is in Ethiopian region. Of the 1620 known species (Balthasar, 1963), 750 species are found in Ethiopian region, 650 species are found in Palaearctic and Oriental region with some species being common with Ethiopian region; 200 species in Australian region and 110 species are found in Nearctic and Neotropical regions taken together. Forty six species are recorded from Nepal and fifteen from Dhanusha district.

Classification : Genus *Onthophagus*, established by Latr. in 1802, has generally defied successful fragmentation in spite of its size, its world-wide distribution, and many superficially very different species. Difficulty lies largely in the fact that no one person has been able to consider *Onthophagus* Latr. on a world-wide basis. Large size of genus suggests that it has hit upon a particular formula for success (or at least successful speciation) which combines factors at which we can only guess at present. Important elements may be an abundant food supply, relatively rapid development, a safe but not overly complicated nesting procedure, high mobility, and an unexplained ability to compartmentalize total environment in such a way as to enable many congeneric species to coexist.

It is a matter of very great difficulty to give an orderly classification of multitudinous species of genus *Onthophagus* Latr. No satisfactory natural subdivision has ever been put forward. I have followed the systems of classification adopted by Arrow, G.J., 1931 in his book "The Fauna of British India, including Ceylon and Burma (Coleoptera : Lamellicornia), part III (Coprinae). Nearly all the features by which the species are distinguished are liable to differ also in two sexes of one or other of them, and some of species differ so entirely in sexes that it is difficult to find characters common to both. All characters which are not shared by both sexes are

omitted. Size of eyes, form of hind tibia and a few other structural characters serve to distinguish a few small groups. Character of sculpture of pronotum is relied chiefly, as it rarely differs in male and female and has much greater constancy than structure of head. Other features of especial importance are the exact shape of front angles of pronotum, shape of 7th elytral stria, presence or absence of a basal ridge upon pygidium, etc. Ridges, horns and processes upon head and prothorax so often found in one or both sexes naturally afford, when present, the best means of recognizing the species; but, besides being generally confined to one sex, they are always very variable, and may be highly developed or quite absent in specimens of same sex of a species.

Key to the groups of *Onthophagus* Latreille recorded from Dhanusha

- 1(12) Pronotum wholly or partly granular or rugose.
- 2(3) Pronotum entirely granular or rugose, without distinct punctures..... Group 1. (*tarandus*)
- 3(2) Pronotum partly granular or rugose, with some punctures (or smooth areas).
- 4(5) Base of pronotum strongly produced, in the middle..... Group 2 (*pactolus*)
- 5(4) Base of pronotum not strongly produced in the middle.
- 6(9) Front angles of pronotum not produced, very blunt.
- 7(8) Metasternum not pointed in front. Group 3 (*ramosellus*)
- 8(7) Metasternum pointed in front Group 4 (*sternalis*)
- 9(6) Front angles of pronotum more or less produced .
- 10(11) Elytra more or less opaque..... Group 5 (*catta*)
- 11(10) Elytra very shining..... Group 6 (*atropolitus*)
- 12(1) Pronotum punctured , without granules, asperities, or rugosity .
- 13(14) Upper surface without hair, smooth, or with only very minute, scanty, and inconspicuous setae.Group 7 (*dama*)
- 14(13) Upper surface distinctly hairy or setose.
- 15(16) Pygidium without a basal ridge..... Group 8 (*purpurascens*)
- 16(15) Pygidium with a basal ridgeGroup 9 (*mopsus*)

Group – 1 (*tarandus* group)

This is formed for a single species, *O. tarandus* F.

20. *Onthophagus tarandus* (Fabricius), 1792. (Pl. XIV, Figs. 1, 2)

1792. *Scarabeus tarandus* Fabricius, *Ent. Syst.*, 1 : 48.

1898. *Onthophagus biexcavatus* Orbigny, *l'Abeille*, 29 : 204.

1914. *Onthophagus biexcavatus* Boucomont, *Ann. Mus. Civ. Genova*, 46 : 235.

1931. *Onthophagus tarandus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicorna), 3: 180-182. Text Fig. 17.

1963. *Onthophagus* (s. str.) *tarandus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 548.

Description : Coppery or dark metallic green, with elytra, except a dark sutural band narrowing behind, femora, and antennae bright yellow, head and body beneath brown.

Oval, with pronotum and elytra opaque, densely rugulose, and clothed with fine, rather close, recumbent yellow hairs. Pygidium and abdomen with long erect hairs .

Clypeus short and broad, transversely rugose, with front margin very feebly excised. Ocular lobes roundly prominent. Forehead shining and bears a few punctures, and enclosed between two curved carinae, posterior one stronger than anterior. Vertex very smooth and shining, and produced outward on each side into a sharp pointed process, curving a little upward .

Pronotum (Pl. XIV, Fig. 3) very finely and closely granular, with its anterior border smooth and shining. There is a deep round excavation in this on each side, and intervening space is produced forward as a horizontal process, bifid in front. At outer edge of each excavation is a sharp forward process. Front angles very bluntly rounded and base scarcely angulate.

Elytra feebly striate, with intervals finely and densely punctured .

Pygidium densely and more strongly punctured, without carina near base.

Metasternum very smooth in middle and rather strongly punctured at sides.

Two sexes almost alike, but clypeus of male slightly shining, and that of female more closely rugose and opaque. Median thoracic process of male divided anteriorly into two sharper and more divergent lobes.

Length: 6.5-9 mm

Breadth: 4-5 mm.

Field data: Dhalkebar, 1 ♂, 3-VIII-02; Godar, 1 ♂, 2 ♀, 20-IX-02; Dhanushadham, 4 ♂, 3 ♀, 14-IX-03; Yadukuha 1 ♂, 20-VI-03; Barmajhia (Charnath river), 2 ♂, 1 ♀, 25-IX-04; Chisapani (Churia hills), 1 ♂, 1 ♀, 2-X-04. Total = 17 exs. (9 ♂, 8 ♀). Coll. Mahto.

Distribution : Nepal : Dhanusha district (Dhalkebar, Godar, Dhanushadham, Yadukuha, Barmajhia and Chisapani); India : Uttar Pradesh, Madhya Pradesh, Tamil Nadu, West Bengal, Meghalaya and Assam. The species is first time reported from Dhanusha district as well as from Nepal.

Type species : In the Hope Department, Oxford University Museum.

According to Arrow (1931), Cleghorn M. (1914) has described the curious relation between the beetles of this species and the flowers of an Aroid plant *Typhonium trilobatum* and she thought this species is an effective pollinator and has presumed it to be a carrion-feeder.

Remarks: Specimens were collected from fresh cattle dung as well as from accumulated cattle dung stored for manure. These beetles are very active and unlike most of the species of the genus, try to run away very quickly but do not take to wings easily when disturbed. This species is restricted to lower altitude and is found in grassland and have not been collected from higher hills of the district.

Group 2. (*pactolus* group)

This group contains only a single species, *O. pactolus* F.

21. *O. pactolus* (Fabricius), 1787. (Pl. XIV., Figs. 4, 5)

1787. *Scarabaeus pactolus* Fabricius, *Mant. Ins.*, 1 : 12.

1931. *Onthophagus pactolus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 203 – 204. Pl. 1, Fig. 11.

1963. *Onthophagus pactolus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 466 – 467.

Description : Rich deep metallic green, with sides of prothorax, and sometimes part of head, reddish-golden, elytra reddish-orange, with suture green and antennae pale yellow. Head, legs, and lower surface clothed with moderately long yellow hair, and pronotum and elytra with minute yellow setae.

Rather narrowly oval, convex, with elytra, except sutural margins, and in a less degree middle of pronotum, opaque.

Clypeal margin entire and feebly reflexed. Head, pronotum, and elytra densely punctured or granular, elytra very minutely and evenly, pronotum smooth and shining at middle of front margin, sparingly granular in front angles, and punctured, not very densely, upon basal lobe. Pronotum long, with sides nearly straight, front angles produced, and base strongly lobed and flattened in middle, with a slight apical depression.

Elytra feebly striate, with juxtasutural interval carinate, two carinae meeting at apex and diverging anteriorly.

Pygidium densely punctured and closely hairy at base, moderately punctured and shining at apex.

Metasternum and femora strongly punctured.

Tibiae short and stout.

Male : Clypeus semicircular, and vertex bears a slender horn, erect at base and curving backward a little at tip, with a minute oblique tooth on each side near middle. Pronotum bears a slight tubercle on each side above retuse anterior part, which is produced backwards a little between them. Spur of front tibia nearly straight.

Male genitalia (Pl. XIV, Fig. 6): Parameres are rectangular in shape. Endophallus is broad and rectangular.

Female: Clypeus a little produced but not pointed. There is a strongly arcuate frontal carina and a short straight one upon vertex, inclined a little backwards and bearing a small erect tubercle at each end, and a rather longer process between them. Smooth vertical surface in middle of front of pronotum small and limited above by a short transverse carina on each side. Spur of front tibia bent inwards towards end.

Length: 11 – 16 mm.

Breadth: 7 – 10 mm.

Habitat : Cow dung and goat dung.

Field data: Dhalkebar, 1 ♂, 1 ♀, 5-IX-02; 2 ♂, 1 ♀, 3-IX-03; Chisapani Churia hills, 2 ♂, 24-IX-03; Godar, 2 ♂, 25-IX-03. Total = 9 exs. (5 ♂, 4 ♀). Coll. Mahto.

Distribution : India : Uttar Pradesh, Central India and Mysore; Nepal : Bardia district (Thakurbara), Karnali region, and Dhanusha district (Dhalkebar, Chisapani Churia hills and Godar).

Type species: In Glasgow Museum.

Remarks : The species is rare in Dhanusha district. Specimens were collected from cow dung and goat dung only. They were found below the dungs without making tunnel. The species is found only in the foot hills and hills of lower latitude and not found in plains and higher hills.

Key to Group 3 (*ramosellus* group)

- 1(2) Elytral intervals strongly punctured *aenescens* Wied.
- 2(1) Elytral intervals very lightly punctured *ramosellus* Bates.

22. *Onthophagus aenescens* (Wiedemann), 1823. (Pl. XIV, Figs. 7, 8)

1823. *Copris aenescens* Wiedemann, *Zoll. Mag.*, 2(1) : 13.

1931. *Onthophagus aenescens* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3: 216 – 217.

1963. *Onthophagus* (s. str.) *aenescens* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 264.

Description : Black, fairly shining, with a slight metallic-green or coppery lustre, antennal club and mouth-organs yellow.

Body broadly oval and moderately convex.

Head fairly broad, obtusely angular at sides, with clypeus divided from forehead by a strong curved carina, its margin evenly rounded and reflexed, and with a pair of short, erect horns rising from inner margins of eyes and connected by a straight posterior carina.

Pronotum strongly and fairly closely punctured, punctures becoming confluent in and near front angles. Front angles blunt, lateral margins feebly curved in front and slightly sinuate behind, base evenly rounded.

Elytra strongly striate, 7th stria strongly curved, intervals feebly convex and fairly strongly and closely punctured.

Pygidium opaque, finely and sparingly punctured.

Metasternal shield finely and sparingly punctured, sides of metasternum rather strongly and asperately.

Male : Clypeus short and closely punctured, forehead rather long, strongly punctured, and separated from clypeus by a semicircular carina continued backward to the base of horns. Pronotum has a slight prominence just above front margin in middle.

Male genitalia (Pl. XIV, Fig. 9): Parameres are apically pointed, spine-like and curved inward forming a forcep-like structure. Endophallus is broadened apically and narrow proximally.

Female: Clypeus closely transversely rugose, and forehead strongly punctured, short, and separated from clypeus by a gently curved carina. Pronotum has a strong 2-cusped prominence just above front margin in middle.

The species comes close to *O. ramosellus* Bates, but may be distinguished by its larger size, more closely punctured elytral interval and absence of a tubercle in the middle of forehead.

Length : 10 – 13 mm.

Breadth : 6 – 7.5 mm.

Field data: Mahendranagar, 1 ♂, 18-IX-03; Janakpur, 1 ♂, 1-II-04; 1 ♀, 1-XII-02; 1 ♀, 1-VI-03; 1 ♀, 7-IV-05; Yadukuha, 1 ♂, 1 ♀, 20-VI-03; Chisapani Churia hills, 1 ♂, 2 ♀, 22-II-04; Bahunmara forest, 1 ♂, 23-VIII-03; Total = 11 exs. (6 ♂, 5 ♀), Coll. Mahto.

Distribution : India : Uttar Pradesh, Bihar, Meghalaya, Tripura and West Bengal; Nepal; Bara district (Parwanipur) and Dhanusha district (Mahendranagar, Janakpur, Yadukuha, Chisapani Churia hills and Bahunmara forest); and Pakistan. This is the first record of the species from Dhanusha district.

Type species : In the Hamburg Museum

Remarks : This species occurs in cattle dung as well as in human faeces.

23. *O. ramosellus* Bates 1891. (Pl. XV, Figs. 1, 2)

1891. *Onthophagus ramosellus* Bates, *Entom.*, 24 : 11 Suppl.

1831. *Onthophagus capella* Hope, *Gray's Zool. Misc.*, : 22.

1931. *Onthophagus ramosellus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 217 – 218 .

1963. *Onthophagus* (s. str.) *ramosellus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 496.

Description : Black, opaque above, shining beneath, with antennae bright yellow.

Body broadly oval, compact, and convex and almost without hairs or setae above and beneath.

Head almost semicircular in outline, clypeus and forehead closely transversely rugulose, and separated by a slight rounded carina. Forehead bears a very short, pointed process in middle, and vertex bears a pair of backwardly inclined horns.

Pronotum fairly strongly punctured (except anterior lateral part in male) and entirely margined. Front angles bluntly produced, sides almost straight, and base gently rounded.

Elytra strongly punctate-striate, with intervals very minutely and sparsely punctured (a little more strongly at sides).

Pygidium opaque and finely punctured.

Metasternum has a strong median groove and is well punctured at sides. Middle and hind femora have each a few setigerous punctures near end.

Male : Clypeal margin almost continuous in front. Horns triangular in section, diverging a little from base to apex, nearly straight, and scarcely curved, but feebly bisinuate. Sides of pronotum a little depressed anteriorly from front angles backwards, and smooth and shining in depressed area.

Male genitalia (Pl. XV, Fig. 3): Parameres are broad apically and pointed proximally. Inner margin is furnished with sensory bristles. Endophallus is trilobed.

Female : Clypeus a little produced and its front margin slightly notched, anterior carina and median tooth as in male, but horns very short. Pronotum not smooth nor depressed at sides, but strongly punctured everywhere.

Length : 6.5 – 9 mm.

Breadth : 4 – 5 mm.

Field data: Barmajhia, Charnath river, 3 , 7 , 25-IX-04; Chisapani, Churia hills, 1 , 2-X-04. Total – 11 exs. (4 , 7). Coll. Mahto.

Distribution : India : Punjab, Uttar Pradesh, Madhya Pradesh, Maharashtra, Bihar, West Bengal, Assam, Meghalaya, Tripura, Himachal Pradesh and Tamil Nadu; Nepal: Kathmandu and Dhanusha (Barmajhia Charnath river and Chisapani Churia hills) districts; Pakistan and Burma.

Type species : In the Paris Museum; co-type in the British Museum (Nat. Hist.) London.

Remarks : The species is common at foothills and in plains.

The species inhabits cattle dung and faeces of human and carnivorous animals. It prefers sandy loose soil in open country but may also found in rocky substratum.

Arrow (1931) had reported that a specimen was taken in a rotten *Papaya* stem at Pusa (May). In present study specimens were collected from cattle dung and faeces of man and carnivorous and in light trap but never from decaying vegetation.

Group 4. (*sternalis* group)

This Group includes a single species, *O. sternalis* Arrow.

24. *O. sternalis* Arrow, 1931. (Pl. XV, Figs. 4, 5)

1931. *Onthophagus sternalis* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 222 – 223.

1963. *Onthophagus* (s. str.) *sternalis* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 535.

Description : Black, smooth and shining, with antennae and mouth-parts reddish yellow.

Body oval deeply waisted, and highly convex.

Head short, but minutely bilobed at front margin, eyes not very small above, sides of head bluntly angular in front of eyes, clypeus separated from forehead by a strong, nearly straight carina, and posterior margin elevated into a similar carina.

Pronotum highly convex, finely and evenly punctured, more coarsely and rather rugosely near front angles, and with an oblique depression on each side near hind angles, containing moderately large granules. There is a well-marked median longitudinal groove upon posterior half of pronotum. Front angles blunt, sides almost straight in front, sinuate behind, and base very obtusely angular in middle.

Elytra finely striate, intervals flat, and minutely, numerous punctured .

Pygidium fairly strongly and closely punctured.

Metasternum vertical in front and strongly compressed laterally, forming a blunt process. It is finely and not closely punctured in middle, and more strongly and closely at sides. Front tibiae short and stout.

Male : Clypeus strongly and closely punctured .

Male Genitalia (Pl. XV, Fig. 6): Parameres are broad and rounded apically. Endophallus is rectangular in shape.

Female : Clypeus transversely rugulose.

Length : 7 – 10 mm.

Breadth : 4.5 – 6 mm.

Field data: Janakpur, Rampur, 1 , 1 , 6-IV-05; 1 , 7-IV-05.

Total= 3 exs. (2 , 1). Coll. Mahto.

Distribution : India : Bengal, Bihar (Pusa and Chapra), Uttar Pradesh and Maharastra; Nepal : Dhanusha district (Janakpur, Rampur). The species is recorded for the first time from Dhanusha district as well as from Nepal.

Remarks : Specimens were collected in pit fall trap baited with chicken carrion.

Key to Group 5. (*catta* group)

- 1(4) Pronotum dark green or coppery
- 2(3) Front angles of pronotum not very sharp..... *catta* F.
- 3(2) Front angles of pronotum very sharp *bonasus* F.
- 4(1) Pronotum light brown, with the
punctures black..... *rectecornutus* Lansb.

25. *O. catta* (Fabricius), 1787 (Pl. XV., Figs. 7, 8)

1787. *Scarabaeus catta* Fabricius, *Mant. Ins.*, 1 : 12.

1787. *Scarabaeus gazella* Fabricius, *Mant. Ins.*, 2 : 377.

1798. *Copris metallicus* Fabricius, *Ent. Syst., Suppl.*, : 28.

1798. *Copris antilop* Fabricius, op. cit. p. 32.

1931. *Onthophagus catta* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 230 – 231. Text. Fig. 23.

1963. *Onthophagus (Digintonthophagus) gazella* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 365.

Description : Testaceous yellow, with head, pronotum (except a narrow pale margin at sides and base), median part of metasternum, front tibiae, greater part of middle and hind tibiae, and a large oval spot upon lower surface of four posterior femora, greenish-or coppery-black. Extreme edges of prothorax, elytra, and all segments of body and legs also dark.

Broadly oval and convex, smooth and moderately shining, with a thin clothing of yellow setae upon legs and lower surface.

Head semicircular in shape, with front margin strongly reflexed and extremely feebly sinuate in middle. Forehead finely and closely punctured, and separated from clypeus by a strong, feebly curved carina.

Pronotum bears rather sparse granules in its middle part, replaced behind by fine scattered punctures, and smooth and unpunctured round circumference. There is a complete raised margin, front angles sharply produced, sides nearly straight in front, feebly sinuate behind, hind angles obsolete, and base feebly angulate in middle.

Elytra finely striate, with intervals flat and unpunctured.

Pygidium bears an angulate basal carina and a few scattered punctures. Metasternum bears only a few setigerous punctures.

Male : Clypeus rather feebly rugulose and shining. Vertex bears a pair of slender horns, curving outward and inclined a little backward, a little flattened at base and not united. Front of pronotum very smooth and shining and almost vertical in middle, declivity surmounted by two minute prominences separated by a slight groove. Front tibia elongate, slender and curved, its inner extremity produced into a long spur and its external teeth rather widely separated.

Male genitalia (Pl. XV, Fig. 9): Parameres are broad and round apically and are furnished with sensory bristles on inner margin. The dorsal surface of parameres has a conical sclerotized structure at the middle. Endophallus is an elongated and bilobed structure; the right lobe is broad and segmented apically and narrow proximally while left lobe is tubular.

Female : Clypeus rather closely rugulose and opaque, and vertex bears a strongly elevated straight carina. Front of pronotum vertical in middle and produced on each side, forming a pair of strong, slightly divergent, blunt processes.

Length : 8 – 13 mm. Breadth : 5 – 8 mm.

Field data: Janakpur, 3 , 2 , 1-IV-02 ; 4 , 5 , 1-VII-02; 2 , 4 , 1-VI-03; 5 , 3 , 1-IX-04; Dhalkebar, 3 , 4 , 3-VIII-02; 2 , 3 , 3-IX-03; 2 , 2 , 5-II-04; Dhanushadham, 4 , 3 , 10-IX-02; 2 , 3 , 10-IX-03; 3 , 3 , 10-VI-04; Yadukuha, 1 , 2 , 15-VII-02; 3 , 3 , 20-VI-03; 4 , 3 , 20-IV-04; Chisapani (Churia hills), 6 , 7 , 20-IX-03; 4 , 2 , 23-IV-04; Bahunmara (Churia hills), 3 , 2 , 17-IX-02; 5 , 4 , 23-VI-03; Godar, 4 , 5 , 20-IX-02; 3 , 2 , 24-VI-03; Total = 125 exs. (63 , 62). Coll. Mahto.

Distribution : India : Orissa, Maharashtra, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, Tripura, Himachal Pradesh, Meghalaya and Bihar; Nepal : Karnali region, Bardia (Thakurbara), Kailali, Tanahu, and Dhanusha (Janakpur, Dhalkebar, Dhanushadham, Yadukuha, Chisapani Churia hills, Bahunmara Churia hills and Godar) districts; Pakistan; Arabia; Africa; Madagascar and Sri Lanka. The species is recorded for the first time from Dhanusha district.

Type species : Type of *catta* unknown; those of *gazella*, *metallicus*, and *antilope* in Copenhagen Museum.

Remarks : This is one of the most abundant and widely distributed species of the genus in Dhanusha district. The species were found both in hills and in plains. They were found only in cow or buffalo dung. They inhabit open land or cultivated field of sandy or muddy soil. Adult beetles were found feeding either in dung or in shallow

vertical tunnels beneath the dung. They dug tunnels underneath the dung and filled the tunnels by bringing dung little by little from the surface. These food burrows were made 5 to 6 cm deep. In this fashion the males and females fed separately in their individual food burrows.

26. *O. bonasus* (Fabricius), 1775. (Pl. XVI, Figs. 1, 2)

1775. *Scarabaeus bonasus* Fabricius, *Syst. Ent.*, : 23.

1931. *Onthophagus bonasus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 231 – 232, Pl. XIII, Figs. 5, 6.

1963. *Onthophagus (Digitonthophagus) bonasus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 296. Pl. XII, Fig. 5.

Description : Testaceous yellow, with head, pronotum (except a narrow pale margin at sides and base), elytral suture, median part of metasternum, upper surface of femora and tibiae, and a large patch on lower side of each femur, greenish black, whole surface suffused with a slight metallic lustre.

Very broadly oval and convex, smooth and shining, with a clothing of yellowish hairs upon legs and sides of body beneath.

Head semicircular, with front margin very strongly reflexed and very feebly sinuate in middle. Clypeus finely and closely granulate, and forehead more sparsely granulate. Clypeus divided from forehead by a strong curved carina. Forehead bears a short acute, erect horn in middle. Vertex bears a pair of horns, forming a backwardly directed crescent, a little flattened and granulate at base, and each with a slight basal tooth at inner edge.

Pronotum bears a few scattered granules in its median part, and is very smooth in front and behind. There is a slight median groove, on each side of which, a little before middle, there is a slight tubercle. There is an entire raised margin, sides are nearly straight in front, feebly sinuate behind, front angles acutely produced, hind angles obsolete, and base very feebly angulate in middle.

Elytra finely striate, and intervals bear extremely few and minute setigerous punctures. Pygidium bears an angulate basal carina and similarly sparse and minute setigerous punctures.

Lower surface very sparingly pilose.

Middle and hind femora short and broad, tibiae very strongly toothed externally.

Male : Front tibia elongate, slender, and curved, with rather feeble external teeth, its inner extremity produced as a long slender tooth.

Male genitalia (Pl. XVI, Fig.3): Parameres are broad and rounded apically and are furnished with sensory bristles on inner margin. The dorsal surface of parameres has two segmented glandular sclerotized structure at the middle. Endophallus is bilobed; right lobe is broad and rounded apically while it is narrow proximally, the left lobe is tubular.

Female : Front tibia short, broad, and slightly curved, with rather broad external teeth, its inner extremity is not produced as a long slender tooth.

Length : 12 – 17 mm.

Breadth : 7.5 – 9.5 mm.

Field data : Janakpur, 3 ♂, 3 ♀, 17-V-02; 2 ♂, 1 ♀, 1-III-03; 3 ♂, 4 ♀, 1-IX-04; Dhalkebar, 3 ♂, 1 ♀, 5-VIII-02; 4 ♂, 2 ♀, 5-IV-03; 3 ♂, 5 ♀, 5-IX-04; Dhanushadham, 2 ♂, 3 ♀, 10-VI-02; 5 ♂, 3 ♀, 10-IV-03, 2 ♂, 3 ♀, 10-X-04; Godar, 3 ♂, 3 ♀, 15-IV-03; 2 ♂, 2 ♀, 15-VII-04; Yadukuha, 7 ♂, 5 ♀, 20-VI-03; 4 ♂, 3 ♀, 20-X-04; Bahunmara (Ratu river bank), 3 ♂, 2 ♀, 23-VIII-03. Total = 86 exs., (46 ♂, 40 ♀). Coll. Mahto.

Distribution : India : Karnataka ,Tamil Nadu, Maharastra, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Meghalaya, Orissa, Punjab and Mysore; Nepal : Karnali region, Helambu, Dolkha (Jiri), Sindhupalanchok, Bardia, Kailali, Dhankuta, Sunsari, Dang, Chitwan and Dhanusha (Janakpur, Dhalkebar, Dhanushadham, Godar, Yadukuha and Bahunmara) districts; Pakistan; South Afganistan; Sri Lanka; Myanmar; Thailand; Laos; Burma; Vietnam; Combodia and Campuchia. The species is recorded for the first time from Dhanusha district.

Type species: In the Copenhagen Museum.

This species is closely similar to *O. catta* F., but differs in the important that the cephalic armature is similar in both sexes. The horns diverge more than in the male of *O. catta* F., and the sharp median cephalic horn, and the thoracic groove, are distinctive of *O. bonasus*. F.

Remarks : The species is widely distributed in the district and is found both in hills and plains. They are found only in cow or buffalo dung. They inhabit open land or cultivated field of sandy or muddy soil by the sides of forest near the river banks. They were found feeding either in the dung or in shallow vertical tunnels beneath the dung along with other Coprinae beetles. They dug tunnels underneath the dung and filled the tunnels by bringing dung little by little from the surface. The food burrows were made 5 to 6 cm deep and males and females were found separately in their individual food burrows.

27. *O. rectecornutus* Lansberge, 1883. (Pl. XVI, Figs. 5, 6)

1883. *Onthophagus rectecornutus* Lansberge, *Notes Leyd. Mus.*, 5 : 49.
1907. *Onthophagus rectecornutus* Arrow, *Ann. Mag. Nat. Hist.*, 19(7) : 421.
1931. *Onthophagus rectecornutus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 233 – 234. Text Fig. 24.
1963. *Onthophagus (Serrophorus) rectecornutus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 499.

Description : Testaceous yellow, with a faint metallic greenish lusture and closely mottled with black, except upon pygidium, punctures, margins, and sutures being black.

Oval, very convex, feebly shining, with a clothing of very minute and inconspicuous greyish setae upon upper surface.

Clypeus shortly semicircular in shape, with margin entire and strongly reflexed, forehead very feebly punctured, smooth and shining, and vertex bears a pair of unconnected horns, sloping backwards, rather broad at base, and tapering to a point at tip.

Pronotum rather irregularly and strongly punctured, except at anterior border, which is sloping and rather smooth and shining, with only a very few minute punctures. There is a complete raised margin, front angles rather sharp, sides gently rounded in front, base strongly rounded and not distinctly angulate.

Elytra rather deeply striate and intervals fairly strongly and closely punctured.

Pygidium strongly but not closely punctured.

Metasternum finely and rather sparsely punctured.

Middle and hind femora strongly punctured on their lower surface.

Male : Clypeus moderately closely punctured, anterior carina short and acuminate, and horns divergent, nearly straight, a little curved inward at tip. Front tibia rather elongate and narrowed, with teeth separated.

Male genitalia (Pl. XVI, Fig. 9): Parameres are rectangular in shape and the lower margin is furnished with sensory bristles. The dorsal surface of the paramere has a clavate sclerotized structure at the middle. Endophallus is bilobed apically and narrow proximally.

Female Clypeus closely transversely rugose, anterior carina long, straight, and angulate in middle, and horns nearly parallel. Front tibia broad, and teeth stout and close together.

Length : 7 – 10 mm. Breadth : 5 – 6 mm.

Field data : Godar, 1 , 20-IX-02; 3 , 1 , 15-II-04; Chisapani Churia hills, 3 , 22-II-04; Janakpur, 2 , 1-IX-02; 4 , 1-II-04; Yadukuha, 2 , 20-VI-03; 3 , 20-II-04. Total = 19 exs. (18 ; 1). Coll. Mahto.

Distribution : India : Tamil Nadu, Karnataka, Kerala, Bihar, Nagaland, Nilgiri hills, Malabar, Banglore, Arunachal Pradesh (Namdapha) and Meghalaya; Nepal : Chitwan, Sunsari, Lamjung and Dhanusha (Godar, Chisapani Churia hills, Janakpur and Yadukuha) districts; Bangladesh; Bhutan; Burma; Sri Lanka; North Vietnam and South China. This is the first record of the species from Dhanusha district.

Type species : In the M. Rene Oberthur's collection.

Remarks : The species is common in plains and foot hills. It is found only in dungs of herbivorous animals and occurs in sandy or muddy soil in open country. It is found throughout the year with a peak population during rainy season. It excavates shallow

burrows beneath the dungs which measured 4-5 cm deep. These burrows are inhabited by both sexes separately.

Key to Group 6 (*atropolitus* group)

This group includes a single species.

28. *O. atropolitus* Orbigny, 1902. (Pl. XVII ,Figs. 1 ,2)

1902. *Onthophagus atropolitus* Orbigny, *Ann. Soc. Ent. Fr.*, : 148.

1933. *Onthophagus atropolitus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3: 250 – 251.

1963. *Onthophagus (Serrophogus) atropolitus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 2 : 281.

Description : Smooth, shining black, elytra a little less shining than head and pronotum, and latter with a small opaque area in middle of base; legs and lower surface pitchy red, antennae light red and thinly clothed with light hairs at sides beneath.

Rather narrowly oval in shape.

Head subcircular in shape. Clypeus transversely rugose, with margin entire and reflexed, and separated by a strong rounded carina from forehead.

Pronotum almost unpunctured in male and feebly punctured in female. Pronotum completely and finely margined, front angles blunt, sides nearly straight, and base very obtusely angulate in middle.

Elytra finely striate and intervals flat and not distinctly punctured.

Pygidium shining and thinly, but fairly strongly, punctured, and sides of metasternum similarly punctured.

Basal joint of antenna has a minutely serrate carina in front.

Male : Forehead smooth and shining. A pair of short, erect, and parallel horns arise between eyes. Pronotum vertical in front, and upper edge of declivity forms a sharp

carina. In small males horns are replaced by a strongly elevated carina a little produced at each extremity.

Male genitalia (Pl. XVII, Fig. 3): Parameres are broad and rounded apically. Endophallus is hammer - shaped.

Female : Forehead feebly rugose and vertex bears a straight carina. Pronotum very finely punctured in front and has a very narrow vertical anterior margin.

Length : 8 – 12 mm. Breadth : 5 – 7 mm.

Field data: Bahunmara (forest), 11 , 15 , 23-VIII-03; Dhalkebar (Shripur), 1 , 1 , 3-IX-03. Total = 28 exs. (12 , 16). Coll. Mahto.

Distribution : India : Uttar Pradesh, West Bengal and Meghalaya; Nepal : Dhanusha district (Bahunmara and Dhalkebar); and Burma. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species : In the Paris Museum.

Remarks : This species is normally found in higher hills but very rare in foothills and is not found in the plains. It prefers forest but is also available in the open land or cultivated field near forests. It has been collected mainly from cow or buffalo dung. It usually makes vertical shallow tunnel (8-10cm deep) in sandy or muddy soil. The species is found from August to September.

Key to the Group 7 (*dama* group)

- 1(4) Upper surface entirely dark (sometimes with a variable metallic lustre).
- 2(3) Elytra lightly, not deeply, striate..... *armatus* Bl.
- 3(2) Elytra deeply striate*tragus* F.
- 4(1) Upper surface not entirely dark*sagittarius* F.

29. *O. armatus* Blanchard, 1853. (Pl. XVII , Figs. 4,5)

1853. *Onthophagus armatus* Blanchard, *Voy. au Pole Sud*, : 98, Pl. 7, Figs. 9 & 10 .

1914. *Onthophagus armatus* Boucomont, *Ann. Soc. Ent. France*, 83 : 305.
1883. *Onthophagus luzonicus* Lansberge, *Notes Leyd. Mus.* 5 : 51.
1931. *Onthophagus armatus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 293 – 294.
1963. *Onthophagus* (s. str.) *armatus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 277 – 278.

Description : Black, shining, without hair or setae above, antennae and mouth – organs yellow; and tarsi, and sometimes also tibiae and anterior part of clypeus, reddish.

Broadly oval and compact, moderately convex.

Head large and broad. Eyes rather large, as seen from above, but separated by about three times their length. Clypeal margin straight or feebly excised in middle.

Pronotum finely and not closely punctured. Front angles rather blunt, lateral margins nearly straight in front and very feebly sinuate behind, base gently rounded.

Elytra deeply striate, striae rather strongly punctured, intervals convex and very minutely and sparsely punctured.

Pygidium rather finely and not very closely punctured.

Metasternal shield smooth in middle, and moderately punctured at sides. Sides of metasternum finely and sparsely punctured.

Male : Clypeus finely punctured, with its front margin strongly reflexed and bluntly biangulate in middle. Clypeus separated from flat and feebly punctured forehead by a nearly straight carina. Posterior margin of head (Pl. XVII, Fig.6) produced backward as a broad smooth lamina, gently curving upward, its outer angles forming a pair of short horns, which curve strongly towards each other. Pronotum very convex in front and has a slight smooth depression on each side, leaving anterior middle part slightly prominent.

Female : Clypeus closely transversely rugose and separated by a curved carina from forehead, usually with another feebler carina close to it. Posterior margin of head (Pl. XVII, Fig.7) bears a strongly elevated vertical carina. Front margin of pronotum narrowly but rather abruptly vertical in middle.

Length : 7 – 8 mm.

Breadth : 4 – 5 mm.

Field data: Janakpur (Bela), 2 , 1-IX-02; Dhanushadham (forest), 1 , 1 , 10-IX-02; 2 , 1 , 14-IX-03; Yadukuha, 2 , 15-IX-02; Bahunmara (forest), 3 , 23-VIII-03; Khajuri (Railway lick), 2 , 6-IX-03; Barmajhia (Charnath river bank), 4 , 2 , 25-IX-04. Total = 20exs., (16 , 4). Coll. Mahto.

Distribution : India : Assam, Arunachal Pradesh, Tripura and Meghalaya; Nepal : Dhanusha district (Janakpur, Dhanushadham, Yadukuha, Bahunmara, Khajuri and Barmajhia); Burma; Vietnam; Phillipines; Java and Indonesia. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species : In the Paris Museum.

Remarks : The species is found in the open country, cultivated land and near the river bank in muddy or sandy soil. Specimens have been collected so far only from the cattle dung.

30. *O. tragus* (Fabricius), 1792. (Pl. XVII, Figs. 8, 9)

1792. *Scarabaeus tragus* Fabricius, *Ent. Syst.* 1 : 56.

1914. *Onthophagus tragus* Boucomont, *Ann. Mus. Civ. Genova*, 46 : 229.

1931. *Onthophagus tragus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 303 – 304.

1963. *Onthophagus* (*Colobonthophagus*) *tragus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 2 : 557.

Description : Black and shining, sometimes with head and thorax slightly metallic, antennae and mouth-organs yellow and tarsi red. Upper surface entirely without clothing, and lower surface clothed with extremely scanty pale setae.

Body broadly oval and not very convex.

Head broad, eyes (seen from above) fairly large, sides of head bluntly angular, and clypeal margin feebly bilobed in middle.

Pronotum distinctly, but not very strongly nor very closely, punctured. Front angles blunt, lateral margins nearly straight in front and feebly sinuate behind, and base gently rounded.

Elytra strongly striate, striae contain fairly numerous and distinct punctures, and intervals slightly convex and very sparsely and minutely punctured, except at sides, where punctures are large.

Pygidium opaque and rather finely and sparingly punctured.

Metasternal shield distinctly punctured at sides and almost smooth in middle, and sides of metasternum fairly strongly but not closely punctured.

Male : Clypeus shining and finely punctured and separated from smooth, finely and sparsely punctured forehead by a strongly curved carina. At the inner margin of each eye arises a slightly compressed and nearly straight horn, (Pl. XVII, Fig. 10) inclined a little backward, two horns parallel and entirely separate. Pronotum vertical and nearly smooth at front margin, upper edge of which is rounded. Front tibia armed with four rather short external teeth, terminal one at a right angle to tibia, of which front edge straight. Terminal spur very short, broad, and flat.

In certain males a minute tooth appears between two horns, and in others this is produced into a median process, while lateral horns correspondingly reduced. Occasionally median tooth longer than lateral processes.

Female : Clypeus closely rugose and separated from well-punctured but shining forehead by a nearly straight carina, in front of which a second slighter carina, nearly parallel with it, is present. Vertex (Pl. XVII, Fig. 11) bears a strong median tubercle and a slight tooth on each side adjoining the eye. Terminal tooth of front tibia oblique and long and spur elongate and strongly curved.

Length : 7 – 9 mm.

Breadth : 4 – 5 mm.

Field data: Janakpur, Rampur, 3 , 1 , 7-IV-05. Total = 4 exs. (3 , 1). Coll. Mahto.

Distribution : India : Bengal, Maharashtra and Rajasthan; Nepal : Udaypur, Kailali, Bardia, Chitwan and Dhanusha (Janakpur) districts; Burma; Java; South China and Tonkin.

Remarks : Specimens were collected in pitfall traps baited with chicken carrion.

31. *O. sagittarius* Fabricius, 1775. (Pl. XVIII, Figs. 1, 2 .)

1775. *Onthophagus sagittarius* Fabricius, *Syst. Ent.*, : 24.

1792. *Scarabaeus oryx* Fabricius, *Ent. Syst.*, 1 : 56.

1819. *Copris erecta* Wiedemann, *Zool. Mag.* 1(3) : 157.

Copris obtusa Wiedemann, *Op. Cit.*, : 158.

1931. *Onthophagus sagittarius* Arrow, *Fauna Birt. India* (Coleoptera : Lamellicornia), 3 : 304 – 306. Text Fig. 37.

1963. *Onthophagus (Serrophorus) sagittarius* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* 2 : 509.

Description : Testaceous yellow, closely mottled with dark brown above and less closely beneath, head and pronotum dark brown, with a slight metallic lustre, and latter with sides and base yellow or mottled with yellow, pygidium pale, middle of metasternum and margins of ventral sternites dark.

Oval, moderately compact, fairly convex, not very shining, devoid of hair or setae above, and very scantily hairy beneath.

Head subcircular. Clypeal margin reflexed but not produced.

Pronotum smooth in front and well punctured behind. Lateral margins rounded in front, front angles blunt, and base extremely finely margined and very feebly prominent in middle.

Elytra strongly striate, with minute punctures in striae, intervals flat, finely and sparsely punctured, except at sides, where punctures are stronger and more numerous.

Pygidium finely and sparingly punctured.

Metasternum smooth in middle and fairly strongly punctured at sides.

Male : Head very smooth and shining. Clypeus bears a pair of erect horns upon the line of clypeo-frontal suture, placed near outer margins and rather far apart. Vertex without elevation. Pronotum highly convex, with its anterior part declivous, very smooth at sides and slightly prominent and feebly punctured in middle, usually with a minute median tubercle at top of declivity. Front tibia a little elongate and rather strongly curved.

Small males may show short horns upon clypeo-frontal suture and very minute median tubercle at top of prothoracic declivity.

Male genitalia (Pl. XVIII, Fig. 3): Parameres are conical shaped. Endophallus is flattened and rectangular in shape with two finger-like processes at the proximal end.

Female : Clypeus transversely rugose and separated from forehead by a strongly elevated straight carina. Vertex bears an erect horn, directed a little forward at first, and curving slightly backward. Anterior part of pronotum declivous, smooth, and shining, and top of declivity produced horizontally forward in middle as a tapering pointed process. Front tibia very broad.

Small females may show only a short conical elevation upon head and a feebly prominent transverse ridge upon thorax.

Length : 9 – 11 mm.

Breadth : 4.5 – 6 mm.

Field data: Janakpur (Kurtha), 11 ♂, 9 ♀, 2-I-02; 7 ♂, 9 ♀, 1-III-03; 5 ♂, 4 ♀, 1-VI-04; Dhalkebar (Shripur), 7 ♂, 9 ♀, 5-I-02; 4 ♂, 5 ♀, 5-IX-02; 6 ♂, 5 ♀, 5-VII-04; Dhanushadham (Mangalpur), 5 ♂, 4 ♀, 15-I-02; 3 ♂, 5 ♀, 15-VII-03; 6 ♂, 9 ♀, 15-IX-04; Yadukuha (Gothkuha), 6 ♂, 3 ♀, 15-IX-02; 4 ♂, 4 ♀, 15-VI-03; 5 ♂, 6 ♀, 15-II-04; Godar (Portaha), 4 ♂, 5 ♀, 10-I-03; 6 ♂, 7 ♀, 10-IX-03; 9 ♂, 5 ♀, 10-II-04; 7 ♂, 6 ♀, 10-VII-04; Chisapani (Churia hills), 3 ♂, 3 ♀, 24-IX-03; 8 ♂, 7 ♀, 23-III-04. Total = 211 exs. (106 ♂, 105 ♀). Coll. Mahto.

Distribution : India : Uttar Pradesh, Madhya Pradesh, West Bengal, Meghalaya, Tripura, Orissa, Assam and Bihar; Nepal : Chitawan, Bardia, Sunsari, Tanahu and Dhanusha (Janakpur, Dhalkebar, Dhanushadham, Yadukuha, Godar and Chisapani) districts; Burma; Malaya Peninsula : Java; South China; Malaysia : Indonesia and Bangladesh. This is the first record of the species from Dhanusha district.

Type species: In the British Museum; and *oryx* F. in the Copenhagen Museum *obtusa* () and *erecta* () in the Hamburg Museum.

This is a very remarkable dung beetle, of which the best armed individuals are the females, but not the males, as usual. Strangely, the female (Pl. XVIII, Fig .5) has a short erect horn upon the head and another, directed forward, upon the thorax, while the male (Pl. XVIII, Fig.4) has neither, but carries a pair of short lateral horns upon his head.

Remarks : This is one of the commonest species in Dhanusha district. It is found both in hills and plains. It is found almost throughout the year but population decreases considerable during the winter months. These beetles have been collected from 2 – 3 days old cattle dung as well as from accumulated cattle dung stored for manure.

Group 8 (*purpurascens* group)

This group contains only a single species *O. purpurascens* Bouc.

32. *O. purpurascens* Boucomont, 1914.

1914. *Onthophagus purpurascens* Boucomont, *Ann. Mus. Civ. Genova*, 46 : 215.

1931. *Onthophagus purpurascens* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 326 – 327.

1963. *Onthophagus* (*s. str.*) *purpurascens* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 2 : 490 – 491.

Description : Black or deep brownish-black, not very shining, with head and anterior part of pronotum feebly coppery, antennae yellow, mouth-parts and legs red, and

outer margins of elytra usually vaguely purplish-brown. Upper surface entirely but not densely clothed with minute pale setae.

Body elongate-oval and moderately convex.

Head short and broad, strongly dilated in front of eyes. Clypeus evenly rounded and separated from strongly punctured forehead by a rounded carina.

Pronotum evenly, not very closely, punctured, strongly at sides and less strongly in middle. Front angles fairly sharp, sides nearly straight in front and sinuate behind, and base rounded.

Elytra finely striate, dorsal intervals flat and not very finely punctured.

Pygidium very shining, fairly strongly but not closely punctured, and without a basal ridge. Metasternal shield extremely smooth, with a few punctures in front only, and sides of metasternum bear only a few scattered punctures.

Male : Clypeus rugosely punctured and head bears a well-marked straight posterior carina.

Female : Not examined.

Length : 5 – 6.5 mm.;

Breadth : 3 – 4 mm.

Field data : Bahunmara forest, 1 , 23-VIII-03. Total = 1 ex. (). Coll. Mahto.

Distribution : Nepal : Dhanusha district (Bahunmara, forest); Burma; Toungoo and Indo-China. It is recorded for the first time from Dhanusha district as well as from Nepal.

Type species : In the Genova Museum.

Remarks : Specimens were found in cattle dung.

Key to Group 9 (*mopsus* group)

- 1(2) Pronotum evenly and uniformly punctured *mopsus* F.
- 2(1) Pronotum with a sharp anterior prominence..... *duporti* Bouc.

33. *O. mopsus* (Fabricius), 1792. (Pl. XVIII ,Figs. 6 ,7)

1792. *Scarabaeus mopsus* Fabricius, *Ent. Syst.*, 1 : 58.

1801. *Copris mopsus* Fabricius, *Syst. Eleut.*, 1 : 49.

1813. *Copris gracilicornis* Germar, *Germar's Mag. Ent.*, 1 : 114. (new syn.).

1914. *Onthophagus gracilicornis* Boucomount, *Ann. Mus. Civ. Genova*, 46 : 220.

1931. *Onthophagus mopsus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia),
3 : 328 – 329.

1963. *Onthophagus* (*s. str.*) *mopsus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt.*
Orient., 2 : 441 – 442.

Description : Bronzy or blackish – brown, with a slight metallic green lusture, but not very shining .Upper surface fairly closely clothed with very minute greyish setae.

Body oval, compact, but not very convex.

Head rather broad, with clypeus rugosely punctured, its front margin evenly rounded and strongly reflexed.

Pronotum finely and closely punctured, scarcely impressed at base on each side. Front angles fairly sharp, sides nearly straight in front and feebly sinuate behind, and base gently rounded.

Elytra finely striate, with intervals flat, dorsal intervals minutely granulate, and lateral ones fairly closely punctured.

Pygidium moderately strongly punctured. Metasternum sparsely punctured in middle and a little more closely at sides.

Male : (Long-horned phase, *gracilicornis* Germ.). (Pl. XVIII, Fig.8) Head bears an extremely long and slender thread-like horn, arising in front of eyes and curving backward. Sometimes extending beyond hinder margin of pronotum. Anterior part of pronotum smooth and unpunctured and a little flattened in middle, with a strong tubercle on each side a little behind front margin, two tubercles nearly equidistant from each other and from outer margins.

Male : (Short-horned phase, *mopsus* F.). Clypeus divided from forehead by a curved carina, and between eyes arises a very short, erect, conical horn or tubercle. Smooth anterior margin of pronotum vertical, and there is a short straight carina in middle of its upper edge. This is occasionally divided into two slightly oblique carinae .

Female : Clypeus divided from forehead by a curved carina, and there is a straight carina between the eyes. Smooth anterior margin of pronotum vertical, and there is a short straight carina in middle of its upper edge.

Length : 6 – 8 mm.

Breadth : 4 – 5 mm.

Field data: Janakpur, 4 , 5 , I-VII-02; Dhanushadham, 6 , 4 , 14-IX-03; Yadukuha, 5 , 7 , 20-IV-03. Total = 31 exs. (15 , 16). Coll. Mahto.

Distribution : India : Kashmir, Uttar Pradesh, Bihar and West Bengal; Nepal : Dhanusha district (Janakpur, Dhanushadham and Yadukuha); and Pakistan. This is the first time the species is being recorded from Dhanusha district as well as from Nepal.

Type species : In the Hope Department, Oxford University Museum .

Remarks : The species was collected in the sandy soil from cattle dung.

34. *O. duporti* Boucomont, 1914. (Pl. XIX, Figs. 1 ,2)

1914. *Onthophagus duporti* Boucomont, *Ann. Mus. Civ. Genova*, 46 : 228.

1931. *Onthophagus duporti* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 353

1963. *Onthophagus* (*s. str.*) *duporti* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera: Lamellicornia) 2 : 337 – 338.

Description : Chestnut-brown, with a light coppery lusture, elytra testaceous-yellow, with longitudinal brown or black stripes at inner and outer margins, and upon inner part of 3rd, 5th, and 7th intervals, dark stripes usually more or less fused together in middle line. Pygidium and femora also yellow. Upper surface fairly closely clothed with extremely minute pale setae.

Body oval, fairly compact and convex, smooth and shining.

Head not very broad, and its sides rounded and not angulate in front of eyes. Clypeus feebly produced, with its front margin rounded and strongly reflexed.

Pronotum unequally punctured, with large and small punctures. Front angles a little produced but not very sharp, lateral margins nearly straight in front and feebly sinuate behind, and base rounded .

Elytra deeply striate, intervals slightly convex and not very finely or sparingly punctured. 7th stria strongly curved.

Pygidium unequally punctured with intermixed large and small punctures.

Metasternal shield almost smooth in middle, and its sides, as well as sides of metasternum, distinctly but rather sparingly punctured.

Male : Head (Pl. XIX, Fig. 3) very smooth and shining, with punctures very fine and sparse. Clypeus separated from forehead by a short transverse carina. Close to inner margin of each eye is a short, erect, blunt, conical horn. Pronotum bears a small tubercle just behind front margin in middle and a pair placed a short distance apart midway between front and hind margins, space between three tubercles slightly depressed but not smooth.

Female : Clypeus closely transversely rugose and separated from smooth, sparsely punctured forehead by a strong straight carina, and there is a similar carina between eyes. There is a slight declivity on each side of front margin of pronotum.

Length : 6.5 – 8 mm.;

Breadth : 4.5 – 5 mm.

Field data: Yadukuha, 1 ♂, 20-VI-03; Bahunmara, forest, 1 ♀, 23-VIII-03. Total = 2 exs. (1 ♂, 1 ♀). Coll. Mahto.

Distribution : India : Bihar (Pusa, Chapra), Tamil Nadu (Nilgiri hills), Karnataka (Kanara) and Arunachal Pradesh (Namdapha); Nepal : Dhanusha district (Yadukuha, Bahunmara); and Burma. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species : In the Genova Museum and co-type in M. Boucomont's collection.

Remarks : Arrow (1931) collected the species in a rotten *Papaya* stem at Pusa (Bihar, India). During present study specimens were collected in cattle dung.

Genus 9. *Oniticellus* Serveille, 1825.

1825. *Oniticellus* Serveille, *Encycl. Meth.*, 10 : 356.

1901. *Tiniocellus* Peringuey, *Trans. S. Afr. Phil. Soc.*, 12 : 116 (Type, *O. spinipes* Roth.)

1931. *Oniticellus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 375.

1963. *Oniticellus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 70.

Type species : *Scarabaeus cinctus* Fabricius, 1775.

Description : Body elongate in shape. Scutellum present. Head short and broad. Antennae 8- segmented. Elytra rather flat, not completely covering abdomen and metasternum at sides, and bearing a fringe of stiff hairs just before hind margin. Prosternum extending a little behind front coxae and sometimes rather tumid there (*O. pallipes* F.). Metasternum very long. Middle coxae not very long, diverging a little behind. Abdomen strongly carinate at sides. Legs fairly stout, middle and hind tibiae moderately broad at extremity, tarsi with basal joint much longer than 2nd.

Two sexes alike in their general form, males being without any well-marked armature. In *O. pallipes* F., however, clypeus, in addition to ridge dividing it from forehead, bears in male two strong ridges which are absent in female. In *O. pallipes* F. Female has instead a strong tubercle upon clypeo- frontal carina, a very exceptional feature.

Genus is represented in Nepal by three species.

Geographical distribution : The genus is distributed in Ethiopian, Palaearctic, Oriental and Neotropical regions. Of the 21 species known, majority are Ethiopian while 4 species are endemic to Palaearctic, 3 to Oriental and only one species is endemic to Neotropical region.

Key to the species of *Oniticellus* Serveille recorded from Dhanusha.

1(2) Head bearing one or more transverse carinae*pallipes* F.

- 2(1) Head without carinae.
 3(4) Upper surface opaque*spinipes* Roth.
 4(3) Upper surface very smooth and shining*cinctus* F.

35. *Oniticellus pallipes* (Fabricius), 1781. (Pl. XX, Figs. 1 ,2)

1781. *Scarabaeus pallipes* Fabricius, *Spec. Ins.*, 1 : 33.

1908. *Oniticellus pallipes* Arrow, *Ann. Mag. Nat. Hist.*, 1(8) : 179.

1931. *Oniticellus pallipes* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 375 – 377. Text Fig. 52.

1963. *Oniticellus pallipes* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 74. Pl. X, Fig. 3.

Description : Orange or yellow, speckled with black or brown, usually with a feeble metallic greenish or pinkish suffusion. Clypeal margin and cephalic carinae, a spot a little behind front margin of pronotum in middle, a similar one on each side of last, one on each side of middle and another in same line near outer margin, and a pair near middle of base, base and a median spot upon pygidium, exposed upper margins of abdominal segments, front tibial teeth, and tarsi dark coloured.

Narrowly elongate, subopaque above except upon head, front of pronotum, and small dark spots enumerated above.

Front margin of clypeus straight or very feebly excised, ocular lobes form blunt prominences, and vertex of head hollowed and very finely and sparingly punctured.

Pronotum fairly strongly punctured, but less so in middle, where there is a slight posterior median groove. Front angles almost rectangular, sides strongly rounded in middle, and base distinctly angulate in middle.

Elytra finely striate, with intervals a little convex, coriaceous, finely and sparingly punctured.

Pygidium opaque, impressed at apex, and finely and sparingly punctured .

Metasternal shield finely and sparsely punctured, and sides of metasternum feebly rugose.

Male : Front margin of clypeus thickened, flat and very broad, especially in middle. There is a strong curved carina between clypeus and forehead and an angular carina just behind it. Prothorax a little longer and more convex than that of female. Front tibia less broad and has sharper but shorter teeth.

Male genitalia (Pl. XX, Fig. 3) Apical ends of parameres are broadened. The endophallus is single lobed, narrow apically and broadened proximally.

Female : Clypeus finely rugose and divided from forehead by a carina elevated in middle into a short broad horn. Pronotum strongly transverse. Front tibia very broad and armed with four very strong teeth.

Length : 7 – 9 mm.

Breadth : 3 – 4 mm.

Field data : Godar (Portaha), 3 , 15-VI-03; Yudukuha, 1 , 1 , 20-VI-03; Janakpur, 2 , 2 , Dhalkebar (Shripur), 2 , 3-IX-03; Mahendranagar (River bank), 4 , 5 , 18-IX-03; Barmajhia (Charnath river bank), 2 , 3 , 25-IX-04. Total = 25 exs., (11 , 14) Coll. Mahto.

Distribution : India : Bihar (Palamou), Uttar Pradesh, Maharastra, Tamil Nadu, West Bengal and Kashmir; Nepal : Karnali region, Bardia (Thakurdwara), Makawanpur, Kailali and Dhanusha (Godar, Yadukuha, Janakpur, Dhalkebar, Mahendranagar and Barmajhia) districts; and Bangladesh. This is the first record of the species from Dhanusha district.

Type species : In the British Museum.

Remarks : The species is common in plains and foot hills but is not found in hills. It is found only in dungs of herbivorous animals and occurs in open country, cultivated or in fallow lands of sandy or muddy soil. It is found feeding either in the dung or in shallow vertical tunnels beneath the dung along with other Coprinae beetles.

36. *O. spinipes* Roth, 1851. (Pl. XX, Figs. 4, 5)

1851. *Oniticellus spinipes* Roth, *Arch. f. Nat.* 17(1) : 128 .
1900. *Tiniocellus spinipes* Peringuey, *Trans. Phil. Soc. S. Afr.*, 12 : 116.
1891. *Oniticellus imbellis* Bates, *Entom.* 24 : Suppl. 13.
1908. *Oniticellus modestus* Arrow, *Ann. Mag. Nat. Hist.* 1(8) : 182.
1931. *Oniticellus spinipes* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia),
3 : 378 – 379.

Description : Opaque dark brown, with legs and middle of metasternum shining, head slightly coppery, pronotum sometimes very feebly metallic, its margins and parts of elytra vaguely reddish.

Elongate-oval, very flat above.

Head slightly shining in front and rugose behind, without carinae or elevations, and with rather deep and moderately large punctures sparsely scattered in front and more closely behind. Clypeus feebly emarginate in middle.

Pronotum densely and subrugosely punctured, with an impressed median longitudinal line upon posterior half, rather deep behind. Sides strongly rounded considerably before middle, nearly straight from middle. Front angles blunt, hind angles obsolete and base gently rounded.

Elytra finely striate, with intervals flat and minutely granulate.

Pygidium thinly setose and a little hollowed at apex and on each side of base.

Metasternal shield shining, punctured at sides, and smooth in middle, with a depression behind. Sides of metasternum opaque and sparsely granulate.

Male : Clypeus short, with its margin rounded and extremely feebly excised in middle. Front tibia broad, with four short sharp external teeth almost at right angles.

Male genitalia (Pl.XX, Fig. 6): Apical ends of parameres are pointed. Endophallus is single lobed, narrow apically and broadened proximally.

Female : Clypeus slightly produced and distinctly excised at front margin. Front tibia broad, with very strong external teeth, terminal one very oblique.

Length : 5.5 – 7.5 mm

Breadth : 3 – 4 mm.

Field data : Dhanushadham, 1 ♂, 2 ♀, 10-IX-02; Yadukuha, 1 ♂, 15-IX-02. Total = 4 exs. (2 ♂, 2 ♀). Coll. Mahto.

Distribution : India : Uttar Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Orissa, Punjab, Kerala and Bihar (Palamou); Nepal : Makawanpur and Dhanusha (Dhanushdham and Yadukuha) districts; Africa; Abyssinia; Uganda; Rhodesia and Transval. This is the first record of the species from Dhanusha district.

Type species: In the Munich University Museum; that of *imbellis* Bates in M. Rene Oberthur's collection; that of *modestus* Arrow in the British Museum.

Remarks : The species is rare in Dhanusha district of Nepal. It is found only in plains. It is found only in cow dung and occurs in open country in sandy or muddy soil. It is found feeding either in the dung or in shallow vertical tunnels beneath the dung along with other dung beetles.

37. *O. cinctus* (Fabricius), 1775 (Pl. XXI, Figs. 1, 2)

1775. *Scarabaeus cinctus* Fabricius, *Syst. Ent.*, : 30.

1931. *Oniticellus cinctus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 379 – 380.

1963. *Oniticellus* (s. str.) *cinctus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 2 : 77. Pl. X, Fig. 5 .

Description : Smooth, shining black, head usually with a slight metallic green lustre and each elytron with a pale yellow external border extending from behind shoulder to sutural angle. Pygidium generally yellowish at base and apex.

Oblong–oval, not very convex.

Head without carinae or elevations, moderately shining and unpunctured. Clypeus short, with a slight depression just behind middle of front margin, which is rounded and gently excised in middle.

Pronotum very smooth and unpunctured, with a rather deeply impressed median longitudinal line upon its posterior half. Sides strongly rounded before middle, nearly straight in front and behind, front angles rounded and hind angles almost obsolete.

Elytra deeply striate, striae finely and closely punctured, and intervals convex and very minutely and sparingly punctured.

Metasternal shield very smooth, with a fine longitudinal median stria, and sides of metasternum rugose.

Male : Front margin of clypeus extremely feebly excised in middle. Front tibia produced at extremity into a broad, blunt, and slightly hooked process. Four external teeth short and placed almost at right angles to tibia. Pygidium a little longer than in female.

Male genitalia (Pl. XXI, Fig. 3) : Parameres are triangular and their apical ends are rounded. The endophallus is broadened apically and have two muscular tubes.

Female : Front margin of clypeus a little more deeply excised than that of male. Front tibia not produced at extremity, and external teeth longer and stouter, terminal one distinctly oblique.

Length : 8 – 11 mm. Breadth : 4.5 – 6 mm.

Field data : Janakpur, 4 ♂, 5 ♀, 1-VIII-02; 3 ♂, 2 ♀, 1-VI-03; 6 ♂, 5 ♀, 1-III-04; Dhalkebar, 3 ♂, 4 ♀, 5-VII-02; 4 ♂, 4 ♀, 5-IX-03; 5 ♂, 3 ♀, 5-IV-04; Dhanushadham, 2 ♂, 3 ♀, 10-VI-02; 6 ♂, 4 ♀, 10-VIII-03; 4 ♂, 5 ♀, 10-IV-04; Godar, 2 ♂, 2 ♀, 20-VII-02; 3 ♂, 4 ♀, 20-IX-02; 4 ♂, 4 ♀, 20-VI-03; Mahendranagar, 1 ♂, 1 ♀, 18-IX-03; Khajuri (Railway line), 1 ♂, 6-IX-03; Yadukuha, 3 ♂, 2 ♀, 15-VI-03; Barmajhia (Charnath river bank) 2 ♂, 1 ♀, 25-IX-04; Chisapani (Churia hills), 1 ♂, 2-X-04; Total = 103 exs. (54 ♂, 49 ♀). Coll. Mahto.

Distribution : India : Tripura, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Karnataka, Assam, West Bengal, Maharashtra, Arunachal Pradesh, Mysore, Meghalaya and Bihar (Palamou); Nepal : Karnali region, Tanahu, Kailali, Makawanpur, Chitawan, Sunsari, Bardia and Dhanusha (Janakpur, Dhalkebar, Dhanushadham, Godar, Mahendranagar, Khajuri, Yadukuha, Barmajhia and Chisapani) districts; Bangladesh, Burma, Malaya Peninsula, South China, Siam, Annam, Myanmar, Malaysia, Thailand and Vietnam. This is the first record of the species from Dhanusha district.

Type species: In the Hope Dept. Oxford University Museum.

Remarks : This species is found both in plains and hills but the population is more numerous in plains. This is one of the few species which is found in the accumulated dung heap kept for manure. Many specimens were collected at different depths of the heaps. These beetles are generally found in open country, cultivated fields or in fallow lands and have so far been collected only from cattle dung.

Genus. 10. *Drepanocerus* Kirby, 1828.

1828. *Drepanocerus* Kirby, Zool. Journ. 3 : 521 .

1851. *Ixodina* Roth, Arch. Naturgesch., 17(1) : 128.

1900. (1901). *Drepanochirus* Peringuey, Trans. S. Afr. Phil. Soc., 12 : 17 .

1931. *Drepanocerus* Arrow, Fauna Brit. India (Coleoptera : Lamellicornia), 3 : 380.

1963. *Drepanocerus* Balthasar, Monogr. Scarab. Aphod. Palaearkt. Orient.
(Coleoptera : Lamellicornia), 2 : 61 .

Type species: *Drepanocerus kirbyi* Kirby.

Description : Elongate, flattened above, with a rough dull surface above and beneath, and clothed in parts with coarse erect scale- like hairs.

Head not very broad. Clypeus bidentate. Pronotum very uneven, with base rounded, not margined. Scutellum distinct. Elytra flat, striae rather indistinct, epipleurae narrow, not covering sides of abdomen, which are flat and prominent. Elytra vertical behind, with a prominent horizontal fringe of scales or bristles. Pygidium rather long, very uneven.

Abdomen rather large, very convex beneath. Legs long and slender. Middle coxae very widely separated, more than half length of metasternum. Hind coxae not contiguous. Front tibia armed with four external teeth and serrate at base; front tarsus short. Middle and hind tibiae long, dilating a little to extremity, tarsi long, with slender metatarsus.

Antennae 8-jointed. Labrum rounded at front margin, with a strong median projection. Mandible with short hairy terminal part, basal fringe composed of short hairs. Maxilla not long, with a large semicircular outer lobe, palpus stout. Mentum transversely rectangular, bilobed, 1st joint of palpus small, 2nd large and broadly oval, 3rd extremely minute.

According to Arrow (1931), Lacordaire has incorrectly stated that *Drepanocerus* Kirby is without a scutellum.

The relationship to *Oniticellus* Serv., which is without horns in all its species, is not withstanding, exceedingly close, and it is difficult to find constant differential features except in the very uneven surface and scaly clothing, which probably serve to retain a covering of excrementitious matter, perhaps for concealment. The two common Indian species, *D. setosus* Wied. and *D. sinicus* Harold, are almost always found caked in this way. These two insects, in spite of the entirely different horns of the males, are extremely closely related, and the females are not easy to distinguish.

According to Arrow (1931) in some African forms a long horn occurs upon the head of the male in addition to a pair upon the thorax.

The genus *Drepanocerus* Kirby contains only a single species

38. *Drepanocerus setosus* (Wiedemann), 1823. (Pl. XXII, Figs. 1, 2)

1823. *Copris setosa* Wiedemann, *Zool. Mag.*, 2(1) : 19.

1863. *Ixodina setosa* Motschulsky, *Bull. Mosc.*, 2 : 459.

1931. *Drepanocerus setosus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 381 – 382. Text Fig. 53.

1963. *Drepanocerus setosus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 68.

Description : Black, with antennae and tarsi reddish, and clothed with grey or dirty yellow scale-like setae.

Elongate-oval and a little depressed.

Head narrow, unevenly and unequally punctured, with sides nearly straight and parallel behind. Clypeus bidentate and deeply impressed between teeth.

Pronotum very closely covered with large shallow pits. Sides gently rounded in front and nearly straight behind. Front angles blunt, hind angles almost obsolete, and base obtusely angulate in middle.

Elytra opaque, broadly but very shallowly striate, with a nearly straight setose ridge upon anterior half of 3rd interval, an entire bisinuate setose ridge upon 5th interval, and one upon 7th interrupted behind shoulder.

Pygidium opaque and setose, hollowed at base and apex, and bears a transverse elevation in middle and longitudinal carina upon anterior half.

Metasternum densely and shallowly pitted, coarsely at sides and more finely in middle. Front tibia broad and bears three short blunt lateral teeth and a sharper one upon straight front margin.

Male : Pronotum has a small anterior lateral depression on each side and a large posterior depression. From middle of latter springs a slender dorsal horn, directed obliquely forward, its extremity a little bifurcate, but tips scarcely diverging.

Female : Pronotum has a large median posterior depression, a smaller one in front of it, and an anterior lateral depression on each side.

Length : 4.5 – 5.5 mm. Breadth : 2.5 mm.

Field data : Mahendranagar; 2 , 2 , 18-IX-03. Total = 4 exs. (2 , 2)
Coll. Mahto.

Distribution : India : Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Bihar (Palamou), Orissa, Maharashtra and Meghalaya; Nepal : Makawanpur, Kailali, Chitwan, Lamjung

and Dhanusha (Mahendranagar) districts; Sri Lanka and Peninsular. This is the first record of the species from Dhanusha district.

Type species: In the Copenhagen Museum; and *setosa* in the Leningrad Museum.

Remarks : The species is very rare in Dhanusha district. It is found only in plains at the bank of a river in grass land. It is found in cow and buffalo dung only. Unlike other scarabaeid, it is neither found deep in the soil or in the middle of the dung but prefers the place between the dung and the soil. It is usually found in 2 or 3 days old dung.

Genus. 11. *Onitis* Fabricius, 1798.

1798. *Onitis* Fabricius, *Ent. Syst. Suppl.*, : 2.

1931. *Onitis* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 386 – 387

1963. *Onitis* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 26.

Type : *Scarabaeus inuus* Fabricius (*Onitis sphinx* Fabricius)

Description : Usually rather oblong in shape. Head not very broad. Margin of clypeus rounded or a little excised in middle. Ocular lobes united by a carinate suture with clypeus. Pronotum without process or excavation, base a little prominent in middle, usually without complete margin, but with a pit or impression on each side near middle. Scutellum visible but minute. Elytra with simple narrow epipleurae, delimiting carina very strongly marked and rather straight.

Legs stout and not long (except front legs of male). Front coxae very prominent; middle coxae long, parallel, and far apart. Front tibia armed with four external teeth; middle and hind tibiae strongly dilated at extremity. Front tarsi wanting; middle and hind tarsi with progressively diminishing joints, basal joint more than twice as long as 2nd. Abdomen completely covered, with a continuous carina around sides and pygidium.

Antennae 9- jointed, all joints except basal one very short, club compact, its first joint cup-shaped, smooth and chitinous, enclosing succeeding joint, which, with last, is

spongy in texture. Mandible oval, with long terminal fringe. Membranous lobe of maxilla broad, palpus not very long. Labium and labial palpi clothed with very long bristles, palpi flat, basal joint not much dilated, 2nd long, 3rd minute .

Male : Front legs more or less elongate, tibia generally slender and strongly curved towards end, without an articulated terminal spur, but with tip produced into a finger-like process, external teeth feebler than those of female, and sometimes with one or more teeth on lower face. Front, middle, and hind femora, or some of them, may be toothed at edge, or hind trochanters spinose, and middle tibia may have an angular projection at inner edge a little beyond base. In male genitalia the phallobase is divided into two parts by a ridge, apical small and basal large.

Female : Head sometimes bears a frontal tubercle or short horn, absent or feebler in male. Front tibia always broad, with strong teeth, and provided with an articulated terminal spur.

Genus *Onitis* F. is easily recognized by its various peculiar features, most important of which are the absence of front tarsi, combined with short, dilating, posterior tibiae, basal impression of pronotum, visible scutellum, and strong single lateral carina to elytra. Male usually exhibits curious modifications of legs.

Habits of species of this genus are similar to those of the species of *Copris* Geoffroy.

Distribution : The genus is represented in the old world and found in Ethiopian, Palaearctic and Oriental regions. A total of 21 species are known from the Oriental region and of these, 8 species have been recorded in the area under study.

Key to the species of *Onitis* Fabricius recorded from Dhanusha

- 1 (10) Pygidium smooth, entirely without hair.
- 2(3) Clypeo-frontal carina simple and entire.....*lama* Lansb.
- 3(2) Clypeo-frontal carina interrupted or with a tubercle in the middle.
- 4(7) Metasternum longitudinally grooved in front.

- 5(6) Pronotum without a smooth median line ;
front femur not toothed *philemon* F.
- 6(5) Pronotum with smooth median line; front
femur toothed *singhalensis* Lansb.
- 7(4) Metasternum flat, not grooved.
- 8(9) Clypeo-frontal carina broadly interrupted ; ,
terminal external tooth of the front tibia
projecting in front.....*subopacus* Arrow.
- 9(8) Clypeo-frontal carina narrowly interrupted;
, terminal external tooth of the front tibia
tapering in front*virens* Lansb.
- 10(1) Pygidium more or less hairy..... *castaneus* Redt.

39. *Onitis lama* Lansberge, 1875 (Pl. XXIII, Figs. 1 ,2)

1875. *Onitis lama* Lansberge, *Ann. Soc. Ent. Belg.* 18 : 123.

1931. *Onitis lama* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3
: 389-390. Pl. XI, Figs. 11, 12 .

1963. *Onitis lama* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*,
(Coleoptera : Lamellicornia), 2 : 44 .

Description : Black and shining, with legs and lower surface clothed with reddish hair.

Rather narrowly oval and very convex.

Head bears an entire, strongly elevated, and slightly arcuate frontal carina, a short straight transverse carina upon clypeus, and a trisinate carina upon vertex, extending from eye to eye.

Pronotum is distinctly and moderately closely punctured in front and extremely minutely behind. Front angles rather blunt, sides strongly rounded, and base almost completely margined and rather strongly lobed between deep basal foveae.

Elytra very smooth, with fine striae, sutural interval bearing a few punctures and posterior edge bearing a short fringe of erect yellow hairs.

Pygidium opaque and smooth, with very minute scanty punctures.

Metasternal shield smooth in middle and behind, fairly strongly punctured in front and at sides, and sides of metasternum densely punctured and hairy.

Male : Clypeus not very closely rugulose and its front margin deeply excised in middle. Posterior part of head very finely and sparsely punctured. Front femur has a very sharp oblique tooth beyond the middle of its lower edge, and front tibia elongate, armed with four short external teeth, a strong sharp tooth on lower face before middle and three or four minute tubercles, and an incurved apical process. Hind femur rather long and straight, with a tooth near end of lower edge, trochanter a little produced at tip, and hind tibia finely serrate along its inner edge.

Male genitalia (Pl. XXIII, Fig. 3): Apical ends of parameres are rounded. Endophallus is Y-shaped and it has two muscular tubes, one free ended and another connected.

Female : Clypeus closely rugulose, with its front margin entire and slightly truncate. Pronotum rather more strongly punctured anteriorly than that of male. Front tibia broad, armed with four blunt external teeth and a small articulated terminal spur.

Length : 19 – 24 mm.

Breadth : 11 – 13 mm.

Field data: Janakpur, 4 , 6 , 1-IV-02; 3 , 3 , 1-VII-03; Chisapani (Churia hills), 2 , 3 , 6-VI-02, 3 , 4 , 7-VIII-03; 2 , 2 , 6-IX-04; Godar, 3 , 1 , 10-VI-03; 6 , 4 , 10-IV-04; Dhanushadham, 1 , 3 , 20-VII-02; 5 , 3 , 17-IX-04. Total = 58 exs. (29 ; 29). Coll. Mahto.

Distribution : India : Punjab : Nepal : Kailali and Dhanusha (Janakpur, Chisapani, Godar and Dhanushadham) districts. This is the first time the species is being recorded from Dhanusha district.

Type species: In the M. Rene Oberthur's collection.

Remarks : This species prefers sandy or muddy soil in the open field or grassland. Like all other species of the genus, it is entirely found in the dung of the herbivorous animals, primarily of cows and buffaloes. It is equally common in the fresh and old dung but is not found in the accumulated dung. It makes long vertical tunnel beneath the dung.

40. *O. philemon* Fabricius, 1801 .(Pl. XXIV, Figs. 1, 2)

1801. *Onitis philemon* Fabricius, *Syst. Eleut.* 1 : 30 .

1875. *Onitis distinctus* Lansberge, *Ann. Soc. Ent. Belg.* 18 : 138 (new syn.) .

1931. *Onitis philemon* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 393. Pl. XI, Figs. 3, 4.

1963. *Onitis philemon* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 41. Pl. V, Fig. 2 .

Description : Green, Coppery or bronzy-black, moderately shining.

Oval, not very elongate nor very convex.

Head rugulose, with ocular lobes rather smooth, clypeus parabolic, with an extremely feeble emargination of front edge in middle, and separated from forehead by an interrupted curved carina, with a short transverse carina just before it and a conical tubercle just behind it.

Pronotum fairly strongly and closely but unevenly punctured, without well-marked median line. Front angles rectangular, lateral margin straight in front, strongly rounded in middle, and gently bisinuate behind, and hind angles obsolete. Base obtusely angulate in middle.

Elytra moderately strongly striate and intervals very finely and sparsely punctured. 1st, 3rd, and 5th intervals a little narrower and usually a little more elevated than 2nd and 4th.

Pygidium very feebly and sparsely punctured.

Metasternal shield smooth and feebly punctured, except near anterior angles, where it is thinly hairy. Sides of metasternum densely granulate and hairy.

Male : Clypeus granulate. Front legs elongate, tibia slender, strongly curved in front, strongly produced at apex, armed externally with four feeble teeth, and finely serrate internally in basal half. Middle femur has a sharp tooth near end of lower edge, and sometimes a rounded lobe in middle, and middle tibia slender at base and abruptly dilated near middle. Hind trochanter a little toothed beneath.

Male genitalia: (Pl. XXIV, Fig. 3) Apical ends of parameres are pointed and curved inwards, formed forcep-like structure. Endophallus is H- shaped.

Female : Clypeus closely transversely rugose. Front tibia broad and armed with four strong teeth and an articulated terminal spur.

Length : 14 – 19 mm.

Breadth : 7.5 – 10.5 mm.

Field data: Janakpur, 4 ♂, 5 ♀, 1-IX-02; 5 ♂, 1-XII-02; 6 ♂, 4 ♀, 1-VII-03; 3 ♂, 5 ♀, 1-IV-04; Dhalkebar, 2 ♂, 4 ♀, 3-VIII-02; 4 ♂, 3 ♀, 5-VI-03; 5 ♂, 4 ♀, 4-III-04; Godar, 1 ♂, 17-VII-02; 4 ♂, 1 ♀, 10-VI-03; 3 ♂, 4 ♀, 10-IX-04; Yadukuha, 1 ♂, 15-XI-01; 2 ♂, 2 ♀, 15-IX-02; 3 ♂, 4 ♀, 15-VI-03; 3 ♂, 2 ♀, 14-IV-04; Chisapani (Churia hills), 4 ♂, 1 ♀, 6-VI-03; 6 ♂, 5 ♀, 8-IX-04; Bahunmara (Forest), 2 ♂, 4 ♀, 17-IX-02; 3 ♂, 5 ♀, 18-IV-03; Dhanushadham, 1 ♂, 4 ♀, 20-X-02; 2 ♂, 3 ♀, 21-VII-03; 5 ♂, 4 ♀, 20-V-04. Total = 137 exs. (67 ♂, 66 ♀). Coll. Mahto.

Distribution : India : Uttar Pradesh, Punjab, Maharashtra, Karnataka, Gujrat, Madhya Pradesh, Meghalaya, Assam, Orissa, Bihar, Tamil Nadu and Tripura; Nepal : Dhanusha district (Janakpur, Dhalkebar, Godar, Yadukuha, Chisapani Churia hills, Bahunmara forest and Dhanushadham); and Sri Lanka. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species: In the Copenhagen Museum; that of *distinctus* Lansb. in the Brussels Museum.

Remarks : This is the most common species of *Onitis* F. in this area. It is more common in the foot hills and plains than in the higher altitude. In fact, in plains it is the most common species. The species prefers sandy or muddy alluvial soil and is restricted only to the dungs of herbivorous animals, mainly of domestic cows and buffaloes. It is not common in accumulated dung heap kept for manure. It makes long vertical tunnel beneath the dung.

41. *O. singhalensis* Lansberge, 1875. (Pl. XXIV, Figs. 5, 6)

1875. *Onitis singhalensis* Lansberge, *Ann. Soc. Ent. Belg.*, 18 : 140 .

1931. *Onitis singhalensis* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 394 – 395. Pl. XI, Figs. 5, 6.

1963. *Onitis singhalensis* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, (Coleoptera : Lamellicornia), 2 : 40 .

Description : Coppery or greenish-coppery, not very shining.

Elongate-oval, not very narrow nor very complex.

Head rather closely granular, ocular lobes a little more sparingly. Front margin of clypeus slightly bidentate in middle. Clypeus separated from forehead by a straight carina interrupted in middle, with a short transverse carina just before it and a conical tubercle just behind it.

Pronotum fairly strongly but unevenly punctured, with a well- marked smooth median line. Lateral margin feebly curved in front and gently bisinuate behind, with front angle very blunt and hind angle obsolete. Base strongly rounded.

Elytra moderately strongly striate and intervals very minutely punctured. 1st, 3rd, and 5th intervals a little narrower and more elevated than 2nd and 4th.

Pygidium scarcely perceptibly punctured.

Metasternal shield strongly channelled along the middle, with sides punctured and clothed with long hair, rather closely in front. Sides of metasternum closely granular and hairy and middle very smooth and shining.

Male : Front legs elongate, tibia slender, very strongly bent in front, armed externally with four short teeth, finely serrate basally beneath, and strongly produced at apex. Front femur has a strong but not sharp tooth towards the end of its anterior edge. Middle femur has a sharp tooth near middle of its posterior edge and another at extremity. Middle tibia slender at base and abruptly and angularly dilated before middle. Hind trochanter bears a sharp tooth.

Female : Clypeus a little longer and more rugulose. Front tibia broad and armed with four strong external teeth and an articulated terminal spur.

Length : 19 – 21 mm.

Breadth : 10 – 12 mm.

Field data : Dhalkebar, 1 ♂, 3-VIII-02; Janakpur, 1 ♀, 1-IX-02.

Total 2 exs. (1 ♂, 1 ♀). Coll. Mahto.

Distribution : India : Tamil Nadu and Kerala (Silent Valley); Nepal : Karnali region, Kailali, Bardia, Chitwan and Dhanusha (Dhalkebar and Janakpur) districts. This is the first record of the species from Dhanusha district.

Type species : In the M. Rene Oberthur's collection.

Remarks : This species appears to be very rare in Dhanusha district of Nepal. It is confined mainly to the plains and foot hills. It is entirely found in the dung of the herbivorous animals, primarily of cows and buffaloes. It is found in 2 or 3 days old dung but not in fresh or accumulated dung for manure. It makes long vertical tunnel beneath the dung.

42. *O. subopacus* Arrow, 1931. (Pl. XXV, Figs. 1, 2)

1875. *Onitis philemon* Lansberge, *Ann. Soc. Ent. Belg.*, 18 : 133 .

1931. *Onitis subopacus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 395 – 396 .

1963. *Onitis subopacus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.*, 2 : 38. Pl. V, Fig. 1 .

Description : Black or pitchy-black, with a slight metallic lustre, head and prothorax moderately shining and elytra rather dull.

Oval, rather narrow, smooth, and moderately convex.

Clypeus elliptical, with its margin entire and closely and finely transversely rugulose, separated from vertex, which is granulate and more shining, by a broadly interrupted carina. There is a short transverse clypeal carina in front of interrupted carina, and a conical tubercle behind it.

Pronotum closely but not very strongly punctured, usually with an incomplete smooth median longitudinal line, basal margin with a deep pit on each side of middle.

Elytra finely striate, and 1st, 3rd, and 5th intervals usually slightly convex.

Pygidium opaque and scarcely or not at all punctured.

Metasternal shield smooth and shining behind, and its front angles, as well as sides of metasternum, closely clothed with reddish hair.

Male : Front tibia elongate, slender, and strongly curved, with a single or double tooth near base beneath. It is prolonged into a long blunt spine at extremity, and armed externally with three short teeth and a blunt terminal process, prominent (not tapering) in front. Middle femur bears a rounded lobe near middle of posterior edge and a sharp tooth towards end. Middle tibia slender at base and strongly and abruptly dilated. Trochanter of hind leg sharply toothed.

Male genitalia (Pl. XXV, Fig. 3) Apical ends of parameres are pointed and curved inwards forming a forcep-like structure. Endophallus is single lobed broadened apically and narrow proximally.

Female : Front tibia short, with four stout external teeth, and middle and hind legs not toothed.

Length : 16 – 20 mm. Breadth : 9 – 12 mm.

Field data : Janakpur, 2, 2, 1-VII-02; 3, 4, 2-IX-03; 5, 4, 3-IV-04; Dhalkebr, 2, 2, 3-VIII-02; 5, 3, 5-V-03; 2, 4, 4-VII-04; Godar, 3, 5, 10-IV-02; 2, 4, 10-VI-03; 5, 5, 9-VII-04; Dhanushadham, 2, 3, 20-VIII-02, 1, 2, 18-VI-03; 3, 4, 20-VII-04; Yadukuha, 4, 25-VIII-02; 3, 4, 22-VI-03; 5, 3, 21-IX-04; Chisapani (Churia hills) 2, 3, 6-VI-03. Total = 101 exs. (45, 56). Coll. Mahto.

Distribution : India : Tripura, Madhya Pradesh, Uttar Pradesh, Tamil Nadu, Jammu and Kashmir, Bihar (Pusa), West Bengal, Assam and Darjeeling; Nepal : Karnali region, Sunsari, Makawanpur, Chitwan, Kailali, Dhanakuta, Bardia and Dhanusha (Janakpur, Dhalkebar, Godar, Dhanushadham, Yadukuha and Chisapani Churia hills) districts; Bangladesh; Sri Lanka; Burma; Thailand; Malay – Peninsula; Pakistan; Siam; Tenasserim; Malaysia and Myanmar. This is the first time the species is being recorded from Dhanusha district.

Remarks : Specimens were collected in cattle dung. They make long vertical tunnel beneath the dung.

43. *O. virens* Lansberge, 1875. (Pl. XXV, Figs. 6, 7)

1875. *Onitis virens* Lansberge, *Ann. Soc. Ent. Belg.*, 18 : 135 .

1875. *Onitis amplectens* Lansberge, *I. C.* : 136 (new syn.)

1931. *Onitis virens* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 396-397. Pl. XII, Figs. 20, 21.

1963. *Onitis virens* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 40 .

Description : Black, with a very feeble metallic lustre, and moderately shining.

Body oval, moderately convex and smooth.

Clypeus elliptical with its margin entire, and closely and finely transversely rugulose, separated from vertex, which is less rugulose and more shining, by a carina

interrupted in middle. There is a short transverse clypeal carina just before the interrupted carina and a conical tubercle just behind it.

Pronotum fairly closely and strongly punctured, usually with an incomplete, narrow, smooth median line in front and a slight narrow groove behind, basal margin with a deep longitudinal pit on each side of middle.

Elytra finely striated, dorsal striae rather feeble, external ones a little stronger, intervals flat and not distinctly punctured, except the sutural ones, which are a little elevated and shining.

Pygidium flat, smooth, and feebly punctured.

Metasternal shield smooth and shining behind and front angles, as well as sides of metasternum, rather closely clothed with red hair.

Male : Front tibia elongate, slender, and strongly curved towards end, prolonged into a long blunt spine at extremity, bears a finely serrate carina beneath, and is armed externally with four short teeth, of which the last closely adjoins the preceding one and has a continuation which is not prominent, as in *O. subopacus* Arrow, but slopes gradually to the end. Middle femur bears a strong rounded lobe at middle of posterior edge and a tooth a little before extremity. Middle tibia slender at base and strongly and abruptly dilated. Trochanter of hind leg sharply toothed.

Male genitalia (Pl. XXV, Fig. 10) Apical ends of parameres are pointed and curved inwards forming a forcep-like structure. Endophallus is bilobed, broadened apically and narrow proximally.

Female : Front tibia short and broad, with four stout teeth, and middle and hind legs without teeth.

Length : 18 – 23 mm.;

Breadth : 10 – 13 mm.

Field data : Godar, 1 ♂, 17-VII-02; 2 ♀, 1-VI-03; Chisapani (Churia hills), 3 ♂, 7-VI-02; Janakpur, 1 ♂, 2 ♀, 1-VII-02. Total = 9 exs. (3 ♂, 6 ♀). Coll. Mahto.

Distribution : India : Madhya Pradesh, Karnataka, Maharashtra, Tamil Nadu, Kerala, Uttar Pradesh, West Bengal, Bihar (Pusa), Meghalaya and Assam; Nepal : Chitawan and Dhanusha (Godar, Chisapani Churia hills and Janakpur) districts; Bangladesh; Burma; Vietnam and South China. This is the first time the species is being recorded from Dhanusha district.

Type species: *virens* and *amplectens* Lansb. in the Brussels Museum.

Remarks : Specimens were found in cattle dung making long vertical tunnel.

44. *O. castaneus* Redtenbacher, 1848. (Pl. XXVI, Figs. 1, 2)

1848. *Onitis castaneus* Redtenbacher, *Hugel's Kaschmir*, 4(2) : 517.

1875. *Onitis castaneus* Lansberge, *Ann. Soc. Ent. Belg.* 18 : 144 .

1931. *Onitis castaneus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 398 – 399. Pl. XI, Figs. 7, 8 .

1963. *Onitis castaneus* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 46 .

Description : Deep chestnut-red, with lower surface, pygidium, and legs clothed with erect yellow hair.

Body short, compact and convex, moderately shining, with elytra sub-opaque.

Head bears an entire, strongly elevated frontal carina, acuminate in middle.

Clypeus has its outer margin strongly reflexed and straight in middle, and bears a long transverse arcuate carina; it is very finely and closely transversely rugulose in front of this carina, and less finely and closely behind it. Vertex strongly excavated, almost smooth in middle and tuberculate at sides.

Pronotum very unevenly punctured, its anterior part strongly rugulose, and area between two basal impressions finely tuberculate. Front angles rather blunt, sides bisinuate, and base distinctly lobed in middle, where it bears two deep impressions rather close together.

Elytra finely striate, with intervals flat and feebly punctured, posterior margin bearing a fringe of outstanding yellow hairs.

Pygidium sparsely tuberculate and hairy.

Metasternum closely tuberculate and hairy, but with a smooth longitudinal median groove.

Male : Front femur bears a strong oblique spine near middle of its anterior edge, and front tibia long, slender, and strongly curved, prolonged into a long process at extremity, armed with four short teeth externally, and bearing a strong sharp tooth before middle beneath, preceded by two or three smaller ones and succeeded by one small one near middle. Middle coxa produced into a point behind, and middle tibia bears two strong processes at its outer edge, first sharp and second blunt.

Male genitalia : (Pl XXVI, Fig. 3). Apical ends of parameres triangular. Endophallus is bat-shaped, having two muscular tubes, one free ended and another connected.

Female : Front tibia short and broad and bears four strong external teeth.

Length : 16 – 19 mm.

Breadth : 9.5 – 12 mm.

Field data : Chisapani (Churia hills), 6 , 7 , 2-I-04; Dhalkebar, 8 , 9 , 3-I-04; Godar, 8 , 7 , 15-I-04. Total = 45 exs. (22 , 23). Coll. Mahto.

Distribution : India : Uttar Pradesh, Bihar, Assam, Meghalaya, Arunachal Pradesh, Punjab, Bengal, Haryana and Rajasthan; Nepal : Sunsari and Dhanusha (Chisapani, Dhalkebar and Godar) districts; and Pakistan. The species is being recorded for the first time from Dhanusha district.

Type species: In the Vienna Museum.

Remarks : This species occurs predominantly in the adjoining foot hills. It prefers sandy banks of rivers at foot hills. It is also found in the grassland near the river and like all other species of *Onitis* F., it appears confined to the dungs of herbivorous animals, specially those of domesticated buffaloes.

Genus 12. *Chironitis* Lansberge, 1875.

1875 *Cheironitis* Lansberge, *Ann. Soc. Ent. Belg.*, 18 : 19.

1894 *Chironitis* Reitter, *Verh. Ver. Brunn*, 31 : 98.

1931. *Chironitis* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 401 – 402.

1963. *Chironitis* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 9 – 10 .

Type species: *Scarabaeus furcifer* Rossi (Europe) .

Description : Rather oblong in shape and rather depressed.

Head not long, ocular lobes projecting slightly and united by a carinate suture with clypeus, of which front margin reflexed and excised.

Pronotum transverse, base finely margined, with a small fovea on each side of middle.

Scutellum not very small, sharp- pointed.

Elytra covering the abdomen and smooth or hairy at the extremity, with simple narrow epipleurae.

Legs (except the front pair in male) not long. Front coxae very large and prominent. Middle coxae long, parallel and far apart. Front tibia armed with four external teeth, middle and hind tibiae strongly dilated at extremity, former with two, latter with one terminal spur; middle and hind tarsi with progressively diminishing joints, basal joint more than twice as long as 2nd.

Abdomen with a continuous carina around the sides and pygidium.

Antennae 9-jointed, all but the basal joint very short, club very compact, 7th joint cup-shaped, smooth and chitinous, enclosing 8th, which, with 9th, is spongy in texture.

Mandible rather short. Maxilla with broad terminal lobe and rather short palpus. Labium and palpi thickly clothed with long bristles, ligula strongly bilobed, slightly chitinous, basal joint of palpus small, 2nd elongate, 3rd very small.

Male : Front legs elongate, femora armed with one or more sharp teeth at front edge, tibiae slender, with four slight external teeth, extremity produced, tarsus and terminal spur wanting. Prosternum forms a narrow or broad 2-horned process behind the front coxae.

Female : Front legs stout, with broad tibiae, armed with four strong teeth, not produced at the end, and bearing a very short tarsus and an articulated terminal spur. Pronotum relatively shorter than that of male.

The chief distinctive feature of this genus is the presence of front tarsi in female and their absence in male.

Like species of related genus *Onitis* F., they are found in cattle dung.

Distribution : Genus *Chironitis* Lansb. is known to be distributed over Oriental, Palaearctic and Ethiopian regions. According to Balthasar (1963) 14 species of *Chironitis* Lansb. are found in Palaearctic region, 1 in Oriental region and 10 in Ethiopian region. Arrow (1931) has reported 2 species of *Chironitis* Lansb. in India.

This is the first record of genus from Nepal.

This genus includes a single species.

45. *Chironitis indicus* Lansberge, 1875 (Pl. XXVII, Figs. 1, 2)

1875. *Cheironitis indicus* Lansberge, *Ann. Soc. Ent. Belg.* 18 : 45 .

1931. *Chironitis indicus* Arrow, *Fauna Brit. India* (Coleoptera : Lamellicornia), 3 : 402 - 403. Pl. XII, Figs. 15, 16.

1963. *Chironitis arrowi* Balthasar, *Monogr. Scarab. Aphod. Palaearkt. Orient.* (Coleoptera : Lamellicornia), 2 : 14 – 15. Pl. 1, Fig. 1.

Description : Yellow, speckled with brown, clypeus, ocular lobes, and lateral margins of pronotum yellow, head, pronotum, legs, and lower surface usually suffused with a slight metallic lustre.

Body oblong and rather depressed, opaque, except upon the pale margins of head and prothorax.

Clypeus has the front margin strongly reflexed and feebly bilobed, and bears a short, transverse, posterior carina. It is separated from the forehead, which bears short erect setae, by another carina.

Pronotum considerably broader than elytra, unevenly rugose, with very irregular punctures, which are coarse and partly confluent in middle, fine and sparse at sides. Lateral margins strongly dilated in middle, convergent and nearly straight from there to the front and hind angles, of which former slightly and latter strongly obtuse. Base straight and finely margined and basal foveae narrow and converge a little forward.

Elytra very lightly striate, with 2nd and 4th intervals broad and rather flat and 3rd and 5th narrow, raised, and rather sharply carinate. Outer margins gently sinuated just behind the shoulders. Posterior part rounded and clothed with short erect setae.

Pygidium lightly and sparsely punctured .

Metasternal shield longitudinally grooved and clothed with erect hairs anteriorly, very minutely and sparingly punctured posteriorly, and sides of metasternum and abdomen clothed with fine pubescence.

Male : Clypeus shining, finely and sparingly punctured, and posterior carina feeble. Prosternum produced behind the front coxae into a long, narrow, oblique process, bifid at the end. Front femur bears a very strong sharp tooth near end of its anterior edge, and tibia is long and slender, strongly curved, produced at end and armed with four small external teeth and one beyond middle of its lower face.

Male genitalia (Pl. XXVII, Fig. 3) Apical ends of parameres are broad and pointed on both sides. Endophallus is S-shaped tapering at both sides and broad in the middle.

Female : Clypeus finely and rather closely granular, and clypeo-frontal carina bears a sharp tubercle in middle. Clypeal carina rather strong. Front tibia armed with four strong external teeth.

Length : 11.5 mm. ;

Breadth : 6 – 9 mm.

Field data : Chisapani (Churia hills), 10 , 9 , 24-IX-03. Total = 19 exs. (10 , 9). Coll. Mahto.

Distribution : India : Maharastra, Rajasthan, Tamil Nadu and Uttar Pradesh; Nepal : Dhanusha district (Chisapani); and Pakistan. This is the first record of the species from Dhanusha district as well as from Nepal.

Type species: In the Brussels Museum.

Habitat : Cattle dung.

Remarks : The species is found only in hills in a single locality. It is not found in plains. The specimens were collected from the sandy banks of river in cattle dung. They usually make vertical tunnel beneath the cattle dung.

5.3. Observation

5.3.1. Habit and habitat

Species dealt here were observed as coprophagous, collected from the dungs of various domesticated animals and human faeces. None were found in the rotten fruits or other vegetable matters. Exclusively necrophagous species, were not recorded but few species from the carrion were collected.

5.3.2. Behaviour

Behaviour of the collected species is summarized under the respective species but some general explanatory comments are made here.

Description of characteristic behaviour of the members of *Scarabaeus* L., *Gymnopleurus* Illg. and *Sisyphus* Latr. is to make and roll a ball of animal excreta. The behaviour was also discussed by Halfter and Matthews (1966) in detail in relation to the world fauna. Food ball is made at its food source by a series of standard carving, shaping and rotating movements, so resulting more or less in a perfect shape. This is then rolled for a varying distance over the ground surface and then usually buried. The ball can serve as food either for the adult beetle or for the larva and the ball for the larva is remade into a pyriform shape before oviposition. It is either both sexes or female alone involve in making and rolling the balls during reproductive season. When rolling the ball, a dung beetle adopts one of two positions (quoted by Matthews, 1974). In position one (Pulling position) the beetle comes in front of dung facing backwards, the head is made up and front legs on the upper surface of ball; it rotates the ball by pulling the surface toward itself with the help of front legs and at the same time walking backward with the other legs. In position two (Pushing position), the beetle lies behind the ball, again facing backwards but the head facing down and front legs are kept on the ground while the middle and hind legs are kept on the ball. The beetle rolls the ball by pushing against the ground with the forelegs and rolling the ball with middle and hind legs; progression being backwards as before. These activities are done only during the day time.

All the dung beetles do not roll the dung balls, some of them make tunnels under the dung. Blind end of each tunnel is made packed with dung, either to be eaten by the

adults or stored as food for their future larvae. Members of *Heliocopris* Burm., *Catharsius* Hope and *Copris* Geoffroy fall in this category; these are nocturnal species. Species of *Heliocopris* Burm. were found making tunnels upto 50 cm deep and 2 cm wide, *Catharsius* species make tunnels upto 30 cm deep and 1.5 cm wide and that of *Copris* species make 20 cm deep and 1cm wide tunnels. Similarly, members of *Onthophagus* Latr., *Onitis* F. and *Chironitis* Lansb. were found making tunnels beneath the dung but also harbour in the dung. Species of *Onthophagus* Lansb. make shorter tunnels and those of *Onitis* F. and *Chironitis* Lansb. make comparatively longer tunnels. Similarly, members of *Phalops* Er. *Oniticellus* Serve. and *Drepanocerus* Kirby were found in the dung only without making tunnels; these are also nocturnal species. Usually they prefer comparatively older dung-cakes and live in the dung heap accumulated for manuring purposes.

Specimens of *Heliocopris bucephalus* F. were observed producing sound in living condition. They squeak like a bat when touched but remained silent when lifted up from the ground. Females of this species were observed dump. Members of some genera such as *Catharsius* Hope and *Sisyphus* Latr. were noted to be attracted on light during rainy season. Based on habits, the dung beetles could be identified as:

5.3.3. Coprophagous dung beetles

These beetles may be categorised into three groups: one feeding exclusively on dung of herbivorous animals, next feeding on human faeces or on those of carnivores and the third group having no preference on particular type of faeces. Species of *Heliocopris* Burm., *Scarabaeus* L., *Phalops* Er., *Oniticellus* Serv., *Onitis* F., *Chironitis* Lansb. and *Drepanocerus* Kirby were found to feed exclusively on dung of the herbivorous animals. Of these *Heliocopris bucephalus* F. was observed to be mainly confined on the dung of buffaloes. This species requires large quantity of dung for larval development; huge mass of buffalo dung best serves their purpose. Most of these beetles were found to be restricted to the dung of only herbivorous animals. They prefer to feed on dung of specific animal. By far the maximum number of species were obtained from dungs of the domesticated cattle (cows and buffaloes) and a few species from those of horse and goat dungs. Next group was mostly or entirely confined on to the faeces of carnivores or man and there are still another

smaller group of dung beetles like *Onthophagus sternalis* Arrow and *O. tragus* F. confined only on to the carrion.

Regarding the nature of dung, most of the dung beetle species prefer one or two days old dung but never recorded in dry or few days old accumulated dungs like the *Oniticellus cinctus* F. and *Onthophagus sagittarius* F.

In the district of the six species of *Catharsius* Hope, three species of *Copris* Geoffroy, three species of *Sisyphus* Latr. and four species of *Gymnopleurus* Illig. only the *Catharsius molossus* L. and *C. pithecius* F., *Copris sinicus* Hope, *Sisyphus longipes* Oliv. and *Gymnopleurus maculosus* Macl. were recorded both in human faeces and cattle dungs, and all the rest only in cattle dungs.

Members of *Onthophagus* Latr. however, vary greatly in their food preference. The *O. aenescens* Wied was recorded in cattle dung and human faeces while the *O. ramosellus* Bates was recorded both in cattle dung and in the faeces of man and carnivores. The *O. pactolus* F. was found in cow and goat dungs. Other species were exclusively found in cattle dung.

5.3.4. Carrion feeding dung beetles

Species feeding on carrion include *Onthophagus sternalis* Arrow and *O. tragus* F. and were recorded in the bait of chicken meat.

5.3.5. Species feeding on decaying vegetable matters

This group of dung beetles were not recorded in the district.

5.3.6 Abundance and seasonal occurrence

Dung beetles are predominantly found during monsoon from May to September and if monsoon starts earlier these beetles are found in March and April as well. Some beetles may also be found in October or even up to middle of November. During winter months (December to February), these insects become very rare although some specimens of few species are found throughout the year, specially in plain areas of the district. However, it has been noted that all the specimens collected during winter

moths are older and sign of aging are evident on their forelegs and clypeus which are mostly used for food gathering and digging activity.

Abundance of different species varies greatly in different seasons. Some species such as *Catharsius molossus* L., *C. birmanensis* Lansb., *C. granulatus* Sharp, *C. pithecius* F., *Onthophagus catta* F., *O. bonasus* F., *O. armatus* Bl., *O. sagittarius* F., *O. rectecornutus* Lansb., *O. ramosellus* Bates, *Oniticellus cinctus* F., *Onitis subopacus* Arrow and *O. philemon* F. appeared to be very common, so collected in any trip to suitable localities. Some species such as *Scarabaeus devotus* Redt., *Sisyphus indicus* Hope, *S. hirtus* Wied., *Heliocopris bucephalus* F., *Gymnopleurus cyaneus* F., *G. parvus* Macl., *G. gemmatus* Harold, *Phalops divisus* Wied., *Onthophagus sternalis* Arrow, *O. tragus* F., *O. pupurascens* Bouc., *Oniticellus spinipes* Roth, *Drepanocerus setosus* Wied. and *Onitis singhalensis* Lansb. were not common. And it could be mentioned that not a single species of *Anoctus* Sharp, *Disphysema* Harold, *Phacosoma* Bouc., *Parachorius* Harold, *Cassolus* Sharp, etc. were collected during present study nor were reported by previous workers from Nepal.

CHAPTER VI

6. SUMMARY AND CONCLUSIONS

6.1. Summary

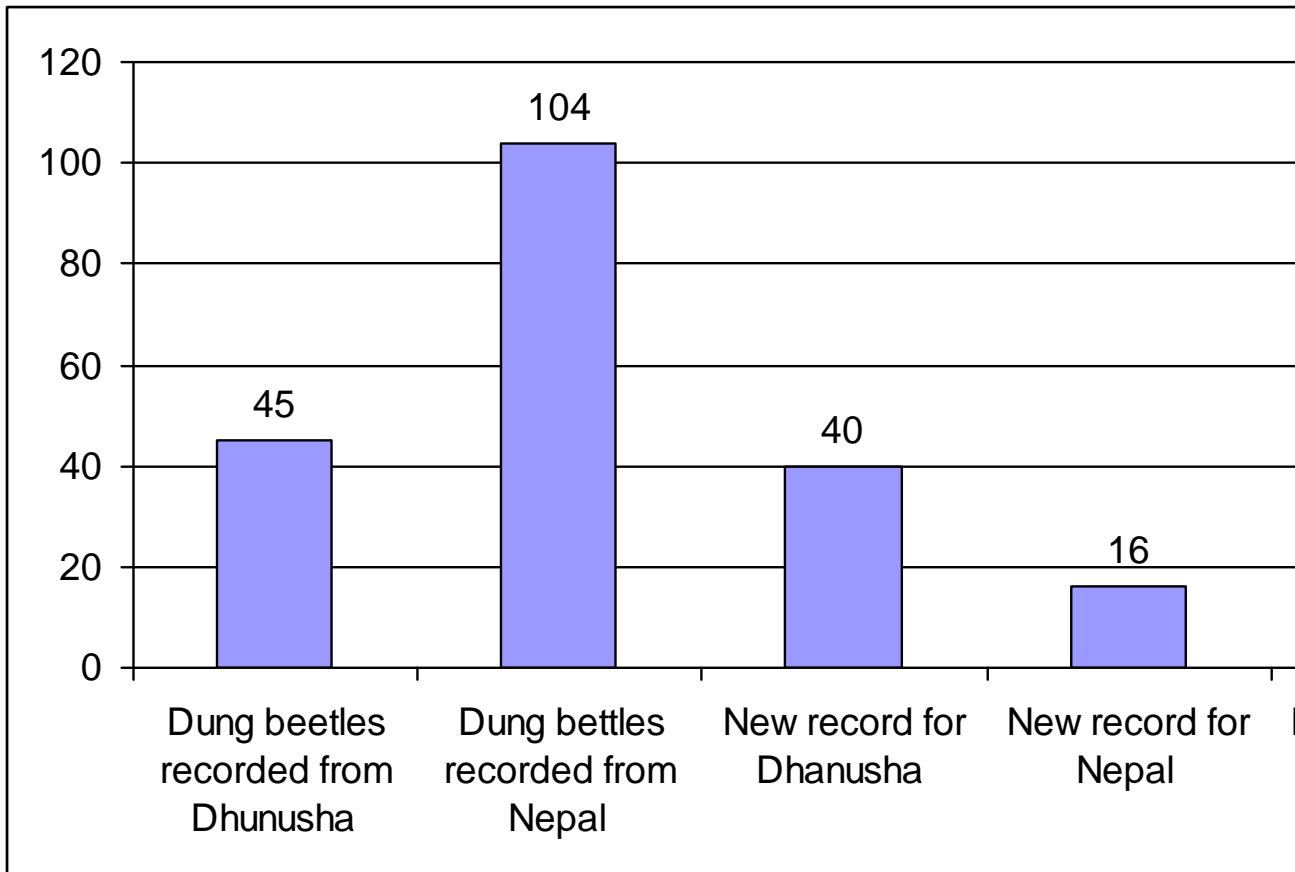
1. The present paper deals with 45 species belonging to 12 genera of subfamily Coprinae under family Scarabaeidae from Dhanusha district of Nepal.
2. A check-list of 104 species under 17 genera of dung beetles is presented from Nepal. Out of 104 species, 88 species under 16 genera are reported from different parts of Nepal by other workers.
3. One genus, viz. *Chironitis* Lansb. is recorded for the first time from Nepal.
4. Out of 45 species 40 species under 12 genera are recorded for the first time from Dhanusha district, viz. *Scarabaeus devotus* Redt., *Gymnopleurus cyaneus* F., *G. parvus* Macl., *G. gemmatus* Harold, *G. maculosus* Macl., *Sisyphus longipes* Oliv., *S. indicus* Hope, *S. hirtus* Wied., *Heliocopris bucephalus* F., *Catharsius molossus* L., *C. sagax* Quens., *C. birmanensis* Lansb., *C. capucinus* F., *Copris magicus* Harold, *C. sinicus* Hope, *C. repertus* Walk., *Phalops divisus* Wied., *Onthophagus tarandus* F., *O. aenescens* Wied., *O. sternalis* Arrow, *O. Catta* F., *O. bonasus* F., *O. rectecornutus* Lansb., *O. atropolis* d' Orb., *O. armatus* Bl., *O. sagittarius* F., *O. purpurascens* Bouc., *O. mopsus* F., *O. duporti* Bouc., *Oniticellus pallipes* F., *O. spinipes* Roth, *O. cinctus* F., *Drepanocerus setosus* Wied., *Onitis lama* Lansb., *O. philemon* F., *O. singhalensis* Lansb., *O. subopacus* Arrow, *O. virens* Lansb., *O. castaneus* Redt., and *Chironitis indicus* Lansb.
5. Sixteen species under 7 genera are recorded for the first time from Nepal, viz. *Gymnopleurus parvus* Macl., *C. birmanensis* L., *C. capucinus* F., *Copris magicus* Harold, *C. sinicus* Hope, *C. repertus* Walk., *Phalops divisus* Wied., *Onthophagus tarandus* F., *O. sternalis* Arrow, *O. atropolis* d' Orb., *O. armatus* Bl., *O. purpurascens* Bouc., *O. mopsus* F., *O. duporti* Bouc., *O. philemon* F., and *Chironitis indicus* Lansb.
6. Out of total of 17 genera, the genus *Onthophagus* Latr. appears to be most predominant in Nepal being represented by 51 species while some of the genera *Scarabaeus* L., *Gymnopleurus* Illig., *Sisyphus* Latr., *Heliocopris*

Burm., *Phalops* Er., and *Drepanocerus* Kirby appear to be extremely uncommon, each being represented by only few species.

7. Detailed descriptions of the genera, species and keys for the identifications have been given in the text along with suitable illustrations.

6.2. Conclusions

1. Taxonomic studies on dung-beetles of Dhanusha district, Nepal was conducted which furnishes useful ecological information in the conservation of insects.
2. Localities and distribution of different species of dung beetles in various habitats were explored so as to make a comprehensive taxonomic study of the insects.
3. Different localities were extensively and intensively surveyed at different seasons to obtain the records of dung beetles, their foods and habits, etc.
4. Detailed biological informations regarding their food preferences, seasonal abundance and other aspects of the insects were studied.
5. Easy keys were developed for quick identification of dung beetles .
6. Check-list of dung beetles of Nepal was prepared.
7. Male genitalia of dung beetles were studied.
8. Genera and species of dung beetles were described on the basis of their certain morphological features including male genitalia.



Source: Shretha (2005) and the present study.

Graoh 1: Showing Number of Species of Dung Beetles

CHAPTER VII

7. RECOMMENDATIONS

1. Nepal is rich in dung beetles fauna but taxonomic studies in this group of insect are virtually neglected. Being their great agricultural importance of dung

beetles many taxonomic works can be attempted in other parts of the countries but no attention is paid till date, so comprehensive work on this group can be done.

2. Localities and distribution of different species of dung beetles in various habitats can be explored to make a comprehensive taxonomic study of the group on different parts of Nepal.
3. Different district localities can be extensively and intensively surveyed at different seasons to obtain the records of dung beetles, their food and habits.
4. Detailed biological informations regarding their food preference, seasonal abundance and other aspects of the groups can also be studied in other parts of Nepal.
5. Regarding above points a clear picture of dung beetles of Nepal can be prepared.
6. Similar studies can be made on other insects of Nepal.

CHAPTER VIII

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APPENDIX

Table 2

Showing habitat, altitudinal preference, food and seasonal occurrence of the species recorded from Nepal

S.N.	Species	Habitat and altitude	Food	Seasons	Status	References
1	<i>Scarabaeus devotus</i> (Redtenbacher),1848	Open grassland (300-400m)	Cow or buffalo dung	June	UC	Shrestha (2005) and the present study
2	<i>S. sanctus</i> (Fabricius),1798	Open grassland (200-700 m)	Cattle dung.	January - June	UC	Shrestha (2005)
3	<i>Gymnopleurus cyaneus</i> (Fabricius),1798	Sandy bank of river (150-1500 m)	„ „	September	UC	Shrestha (2005) and the present study
4	<i>G. parvus</i> (Mac leay),1821	Open grassland (100 m)	„ „	April	UC	„ „ „
5	<i>G. gemmatus</i> Harold,1871	Open grassland (200-700 m)	Cow dung.	September	R	„ „ „
6	<i>G. maculosus</i> (Mac leay),1821	Open country (200-300 m)	Human faeces.	April. - June	C	„ „ „
7	<i>G. dejeani</i> Castelnau,1840	Sandy banks of rivers (200-1900 m)	„ „	January - July	MC	Shrestha (2005)
8	<i>G. sinuatus</i> (Olivier), 1789	Forest and open area (200-2121 m)	Cattle and horse dung	January - July	MC	„ „
9	<i>G. opacus</i> Redtenbacher,1848	Grassland (1700-2121m)	Horse dung	May	UC	„ „
10	<i>Sisyphus longipes</i> (Olivier), 1789	Open country (190-2121m)	Human faeces, goat and horse dung	January - July	C	Shrestha (2005) and the present study
11	<i>S. neglectus</i> Gory, 1833	Forested area (400-1900 m)	Cattle dung.	June	R	Shrestha (2005)

12	<i>S. indicus</i> Hope, 1831	Open grassland (200-2002m)	„ „	September	UC	Shrestha (2005) and the present study
13	<i>Sisyphus hirtus</i> Wiedemann., 1823	Open grassland (200-1600m)	„ „	September	C	„ „ „
14	<i>S. dentricus</i> Fairmaire, 1886	Grassland (430-2000m)	„ „	March	UC	Shrestha (2005)
15	<i>Synapsis brahminus</i> Hope, 1831	Not known.	Not known.	Not known	Not known	Arrow (1931)
16	<i>Heliocopris bucephalus</i> (Fabricius), 1775	Soft muddy soil or open fields (200-1400 m)	Buffalo dung.	September - October	LC	Shrestha (2005) & the present study
17	<i>Catharsius molossus</i> (Linnaeus), 1758	Sandy or muddy soil (200-2001 m)	Human faeces and buffalo dung	Throughout year	MC	„ „ „
18	<i>C. granulatus</i> Sharp, 1875	Sandy or muddy soil (189-1900m)	Buffalo and elephant dung and human faeces	Throughout year	MC	„ „ „
19	<i>C. sagax</i> (Quenstedt), 1806	Sandy or muddy soil (200-600 m)	Cattle dung.	Throughout year	C	„ „ „
20	<i>C. birmanensis</i> Lansberge, 1874	Grassland, sandy or muddy soil (200-600 m)	„ „	Throughout year	C	The present study
21	<i>C. quadridentatus</i> Lansberge, 1885	Forested area (200-3200 m)	„ „	January - July	C	Shrestha (2005)
22	<i>C. capucinus</i> Fabricius, 1781	Grassland, sandy or muddy soil (200-600 m)	„ „	Throughout year	LC	The present study
23	<i>C. pithecius</i> (Fabricius), 1775	Grassland, sandy or muddy soil (100-600 m)	Cattle dung and human faeces	Throughout year	C	Shrestha (2005) and the present study
24	<i>Copris indicus</i> Gillet, 1910	Cleared area of forest (354m)	Cattle dung	March	C	Shrestha (2005)

25	<i>C. iris</i> Sharp, 1875	Grassland (200 m)	„ „	June	C	„ „
26	<i>C. sarpedon</i> Harold, 1868	Grassland below (2001 m)	„ „	June	UC	„ „
27	<i>C. magicus</i> Harold, 1881	Grassland, sandy or muddy soil (600 m)	„ „	June - September	C	The present study
28	<i>C. sinicus</i> Hope, 1842	Grassland, sandy or muddy soil (400 m)	Cattle dung and human faeces.	June	LC	„ „
29	<i>C. repertus</i> Walker, 1858	Grassland, sandy or muddy soil (200 m)	„ „	June	LC	„ „
30	<i>Phalops divisus</i> (Wiedemann), 1823	Sandy banks of river (150 m)	Cattle dung.	June	UC	„ „
31	<i>P. olivaceus</i> Lansberge, 1883	Sandy banks of river (200 m)	„ „	June-July	UC	Shrestha (2005)
32	<i>Disphysema candezei</i> Harold, 1873	Forested area (1400m)	Human faeces	September	UC	„ „
33	<i>Caccobius unicornis</i> (Fabricius), 1801	Grassland, sandy or muddy soil (200-354m)	Cattle dung and faeces of man, monkey and carnivores.	March - October	C	„ „
34	<i>C. denticollis</i> Harold, 1867	Forested area (1900 m)	Human faeces	June	UC	„ „
35	<i>C. intermis</i> Arrow, 1931	Forested area	„ „	September	UC	„ „
36	<i>C. jassoensis</i> Harrold	-----	-----	-----	-----	„ „
37	<i>Onthophagus oculatus</i> Arrow, 1931	Forested area (200 m)	Excreta of monkey	July	R	„ „
38	<i>O. tarandus</i> (Fabricius), 1792	Grassland (200 m)	Cattle dung.	June - July	LC	The present study

39	<i>O. penicillatus</i> Harold, 1879	Forested area (1470 m.)	Attracted to light	July	R	Shrestha (2005)
40	<i>O. gangeticus</i> Gillet, 1925	Grassland (200 m)	„ „	June - July	C	„ „
41	<i>O. troglodyta</i> (Wiedemann), 1823	Sandy banks of rivers (75-400m)	Cattle dung and dog's excreta	Throughout the year	C	„ „
42	<i>O. pactolus</i> (Fabricius), 1787	Grassland, muddy or sandy soil (200 m)	Cow dung and goat dung.	September	R	Shrestha (2005) and the present study
43	<i>O. orientalis</i> Harold, 1868	Forested area (1400-1470m)	Cattle dung	May-June	MC	Shrestha (2005)
44	<i>Onthophagus aenescens</i> (Wiedemann), 1823	Grassland, muddy or sandy soil (400 m)	Cattle dung and human faeces.	February – September	LC	Shrestha (2005) & the present study
45	<i>O. ramosellus</i> Bates, 1891	Sandy banks of rivers (200 - 1400m)	Cattle dung and faeces of human and carnivores.	May-October.	C	„ „ „
46	<i>O. cupreiceps</i> Arrow, 1907	Forested Area (1582-3800m)	Yak dung	June	C	Shrestha (2005)
47	<i>O. sternalis</i> Arrow, 1931	Grassland (100 m)	Chicken carrion.	April	LC	The present study
48	<i>O. productus</i> Arrow. 1907	Forest area, (200 m-1750m)	Cattle dung	November	UC	Shrestha (2005)
49	<i>O. catta</i> (Fabricius), 1787	Open land or cultivated field of sandy or muddy soil (200 - 900m)	„ „	Throughout year	MC	Shrestha (2005) and the present study
50	<i>O. bonasus</i> (Fabricius), 1775	Open land or cultivated field of sandy or muddy soil (200-2000m.)	„ „	March - October	MC	„ „ „
51	<i>O. rectecornutus</i>	Sandy or muddy soil in open	„ „	Throughout	C	„ „ „

	Lansberge,1883	country (200 m-1500)		year		
52	<i>O. rubricollis</i> Hope.1831	Forest area (1400 m-2300m)	Yak and cattle dung	July- October	UC	Shrestha (2005)
53	<i>O. marginalis</i> (Gebler), 1817	Grassland (1400 m)	Horse and cattle dung.	June	R	„ „
54	<i>O. atropolitus</i> Orbigny, 1902	Forest area (up to 400 m)	Cattle dung	August - September	LC	The present study
55	<i>O. occipitalis</i> Lansberge, 1885	Open land (430 m.)	Dog's excreta	July	C	Shrestha (2005)
56	<i>O. descendens</i> Sharp, 1875	Grassland (1050-1500m)	Cattle dung	June- October	UC	„ „
57	<i>O. quaestus</i> Sharp, 1875	Grassland (200 m)	„ „	September		„ „
58	<i>O. lapillus</i> Arrow, 1931	Forest area (1370-1900 m)	Human faeces.	June - July	C	„ „
59	<i>O. furcillifer</i> Bates, 1891	Grassland (100-1900 m)	Cattle dung and faeces of carnivores	March- September	C	„ „
60	<i>O. furcicollis</i> Arrow, 1931	Forest area (300-1700m.)	Cattle dung and faeces of carnivores	February- July	C	„ „
61	<i>O. gagates</i> Hope, 1831	Grassland (200 m)	Cattle dung.	June - July	UC	„ „
62	<i>O. dama</i> (Fabricius), 1798	Open area and river banks (200- 1400m)	Cow dung.	January to August	MC	„ „
63	<i>O. kuluensis</i> Bates,1891	Grassland (1000-1900 m)	Cattle dung	June - July	C	„ „
64	<i>O. armatus</i> Blanchard , 1853	Open country, cultivated land and near the river bank in muddy or sandy soil (300 m)	„ „	Aug. - Sept.	LC	The present study

65	<i>O. triceratops</i> Arrow, 1913	Grassland (200m)	„ „	September	R	Shrestha (2005)
66	<i>O. bison</i> Boucomont, 1919	Sandy banks of river (200-300m)	One-horned rhino and buffalo dung	October-December	C	„ „
67	<i>O. tragus</i> (Fabricius), 1792	Grassland (100-990 m)	Chicken carrion and cattle and rhino dung.	January-October	MC	Shrestha (2005) and the present study
68	<i>O. sagittarius</i> Fabricius, 1775	Grassland (150-1500 m)	Cattle dung.	Throughout year	MC	„ „ „
69	<i>O. politus</i> (Fabricius), 1798	Riverine forest (200-250m)	Dog's excreta	September	R	Shrestha (2005)
70	<i>O. taurinus</i> White, 1844	Open land (200m)	Human faeces	September	R	„ „
71	<i>O. beelsoni</i> Arrow, 1931	Grassland (350-400m)	Cattle and domestic elephant's dung	March-July	C	„ „
72	<i>O. purpurascens</i> Boucomont, 1914	Grassland (300 m)	Cattle dung.	August	UC	The present study
73	<i>O. mopsus</i> (Fabricius), 1792	Grassland (100 m)	„ „	June - September	C	The present study
74	<i>O. hastifer</i> Lansberge, 1885	Forest area, (1400 m)	Human faeces	July	R	Shrestha (2005)
75	<i>O. deflexicollis</i> Lansberge, 1883	Forest area (200m.)	Buffalo dung	September	C	„ „
76	<i>O. ensifer</i> Boucomont, 1914	Forest area (200-2000 m)	Cattle dung, elephant dung and human faeces	March-July	MC	„ „
77	<i>O. bifasciatus</i> (Fabricius), 1781	Grassland, (200-1400 m)	Human faeces, cattle dung and mouse carrion	April-December	C	„ „
78	<i>O. centricornis</i> (Fabricius), 1798	Forest area (300-350 m.)	Domestic elephant's dung	March	R	„ „

79	<i>O. cervus</i> (Fabricius), 1798	River banks (350-400m)	Dog's excreta	March - June	R	„ „
80	<i>O. falsus</i> Gillet, 1925	Forest area, (200 - 1400 m)	Cattle and spotted deer dung	June-October	C	„ „
81	<i>O. proletarius</i> Harold, 1875	Grassland (175m.)	Domestic elephant's dung	March	C	„ „
82	<i>O. duporti</i> Boucomont, 1914	Grassland (below 300 m)	Cattle dung.	June - August	UC	The present study
83	<i>Liatongus gagatinus</i> Hope, 1831	Forest area (1000-1950 m)	„ „	June-July	C	Shrestha (2005)
84	<i>L. affinis</i> (Arrow), 1908	Forest area (1900 m)	Cattle dung.	June	UC	„ „
85	<i>L. mergacerus</i> (Hope), 1831	Forest area (400-1400 m)	„ „	January-July	C	„ „
86	<i>L. venator</i> (Fabricius), 1801	Grass land (2001m)	„ „	June	C	„ „
87	<i>L. rhadamistus</i> (Fabricius), 1775	Forest area (195 m.)	cow dung	February-March	R	„ „
88	<i>Oniticellus pallipes</i> (Fabricius), 1781	Open country, cultivated or in fallow lands of sandy or muddy soil (200 -350 m)	Cattle dung.	March-July	MC	Shrestha (2005) & the present study
89	<i>O. spinipes</i> Roth, 1851	Open country in sandy or muddy soil (200-350 m)	„ „	February	UC	„ „ „
90	<i>O. cinctus</i> (Fabricius), 1775	Open country, cultivated or fallow lands (300-2000 m)	„ „	January-October	MC	„ „ „
91	<i>Drepanocerus setosus</i> (Wiedemann), 1823	Sandy banks of river (100-600 m)	„ „	February-November	UC	„ „ „

92	<i>D. sinicus</i> Harold, 1868	Sandy banks of rivers (350-600m)	„ „	February- November	R	Shrestha (2005)
93	<i>Onitis siva</i> Gillet, 1911	River banks of inner forest (200-400m)	Rhino's and elephant's dung	October- December	R	„ „
94	<i>O. lama</i> Lansberge, 1875	Sandy or muddy soil in open field or grassland (200-500 m)	Cattle dung.	April - September	C	Shrestha (2005) & the present study
95	<i>O. falcatus</i> (Wulfen), 1786	Sandy banks of river	„ „	-----	C	Shrestha (2005)
96	<i>O. philemon</i> Fabricius, 1801	Sandy or muddy alluvial soil (400 m)	„ „	March - December	C	The present study
97	<i>O. singhalensis</i> Lansberge, 1875	Forest area and grassland (172-500m)	Cattle and one-horned rhino's dung	February- December	C	Shrestha (2005) & the present study
98	<i>O. subopacus</i> Arrow, 1931	Grassland and forest area (170-2000m)	Cattle and wild and domestic elephant dung	January- October	MC	„ „ „
99	<i>O. virens</i> Lansberge , 1875	Grassland and sandy banks of rivers (200-400 m)	Cattle dung.	June- October	C	„ „ „
100	<i>O. castaneus</i> Redtenbacher, 1848	Sandy banks of rivers (90-200 m)	Cattle and wild water buffalo's dung	January- July	R	„ „ „
101	<i>O. brahma</i> Lansberge, 1875	Grassland (500m.)	Cattle dung	May	R	Shrestha (2005)
102	<i>O. crassus</i> Sharp. 1875	Forest area, (2000 m)	Yak's dung	July	R	„ „
103	<i>Chironitis indicus</i> Lansberge, 1875	Sandy banks of river (250 m)	Cattle dung.	September	LC	The present study
104	<i>Haroldius lassallei</i> Cambefort, 1986	Not known	Not known	Not known	Not known	Cambefort (1986)

C= Common, LC = Less Common, UC=Uncommon, MC=Most Common, R=Rare

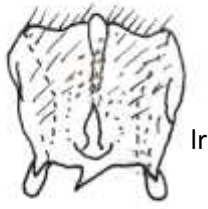


FIG. 2

LABRU



FIG. 3

MANDIBL

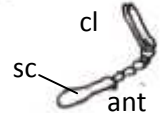


FIG. 4



FIG. 5

MAXILLA

ANTENNA



FIG. 6

LABIUM

Plate XI



Fig. 1: *Copris magicus* Har.



Fig. 2: *Copris magicus* Har.

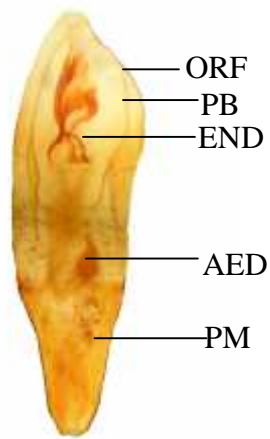


Fig. 3: Male genitalia of *Copris magicus* Har. (Length- 4mm)



Fig. 4: *Copris sinicus* Hope



Fig. 5: *Copris sinicus* Hope

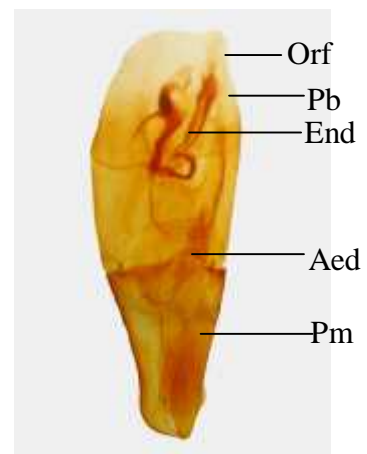


Fig. 6: Male genitalia of *Copris sinicus* Hope

ABBREVIATIONS

Aed: Aedeagus, End: Endophallus, Orf: Orifice, Pb: Phallobase, Pm: Parameres

