

XXVI. *Observations on the Genus OESTRUS.* By Mr. Bracy Clark,
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Read November 1, 1796.

THE following account of the *Oestri* was collected from observations, which were made during a few months residence in a country particularly favourable for remarks of this nature; and though a small part of their history still remains unknown, these observations may perhaps be acceptable to the Linnean Society, from the additional information they contain concerning this genus, and from the correction of some material errors which are, at present, generally admitted as truths by naturalists.

The pain the *Oestri* inflict on the animals that are subject to them particularly entitles them to our notice, and more especially as those are unfortunately the useful and the domesticated. By their continual attacks, these small, yet formidable, enemies interrupt the few moments of repose and enjoyment allowed to these useful slaves during the summer months. Nor does the punishment end here: the *larvæ*, by remaining with them, are frequently supposed the cause of their disease, and even death. These circumstances render the investigation of their natural history an object of some importance; and the extraordinary means they pursue in depositing their eggs, the situations the *larvæ* inhabit, and the very high temperature to which they are exposed, render their history interesting from its singularity.

If the present investigation should prove acceptable to the scientific naturalist, from the species being exhibited with greater perspicuity than they have hitherto been; it is also hoped the description of their economy and manners will render it not less so to the enlightened veterinarian, as tending to point out the most effectual means of removing them when they become the source of disease.

The obscure situation of the *Oestri* in their *larva* state has been a principal cause of their history being less understood than that of other insects; and in some instances the defective parts have been supplied from imperfect observation, or mere conjecture; as the *Æ. hæmorrhoidalis* is said to deposit its eggs "*mirè per anum intrans*," which, though perfectly fabulous, has by frequent repetition on such high authority*, obtained the appearance of an established truth; and from the silence of authors on the subject, it appears that the mode in which the other species deposit their *ova* has not been at all understood.

Since the time of Linnæus the errors of this genus, far from being expunged, have considerably accumulated by the confusion of the species with one another; which in part may be attributed to inattention, but chiefly perhaps to the difficulty of procuring specimens for examination. The inaccessible situations of the *larvæ*, and the impossibility of successfully imitating by artificial means their mode of life when removed, have rendered them scarce; and in their fly state they are not often seen, or easily taken. This difficulty will be in a considerable degree removed, when their history and the most proper time of obtaining them is pointed out.

The errors will be best corrected by means of a plate, representing

* *Linnaei Systema Naturæ*, p. 969. This error appears to have originated with Reaumur, who received it from a Dr. Gaspari. See note on *Æ. hæmorrhoidalis*.

all the species in one view in their various states, taken from the subjects themselves; and this will be the more useful and necessary, as hardly any of the *larvæ*, or perfect insects, have ever yet been intelligibly figured.

The obscure and singular habitations of the British *Oestri* are the stomach and intestines of the horse, the frontal and maxillary sinuses of the sheep, and beneath the skin of the backs of horned cattle. In other parts of the world they inhabit various other animals; but our present enquiry is necessarily limited to those of our own country, which includes all those about which any difficulty or obscurity has arisen.

Of the OESTRUS Bovis.

THIS rare species has been entirely omitted by Linnæus, and appears to have been unknown to nearly all the later writers on Natural History, who, instead of the true *Æ. Bovis*, have described a species peculiar to the horse under that name. Linnæus imagined also that it was the same species which inhabited both the stomachs of horses and the backs of oxen*, which certainly never happens.

The *larva*, tab. 23, fig. 1, taken from the back of the cow, is so unlike the other *larvæ* of this genus, that I did not imagine, till I procured the fly from it, that it was the *larva* of an *Oestrus*. It does not possess the *aculei*, the marginal *setæ*, or the lips, which are the prominent characters of the *larvæ* of the *Æ. Equi* and *hæmorrhoidalis*.

It lives beneath the skin, being situated between it and the cellular membrane, in a proper sack or abscess, which is rather larger than the insect, and by narrowing upwards opens externally to the air by a small aperture.

* Habitat in ventriculo eorum, in boum dorso. Linn. Syst. Nat. 2. p. 969. ed. duodecima.

When young the *larva* is smooth, white, and transparent: as it enlarges it becomes browner, and about the time it is full grown it is totally of a deep-brown colour, having numerous dots on its surface, disposed in transverse interrupted lines, passing round the segments. Two distinct and different kinds of lines are seen on each segment: the uppermost of them is narrower, and consists of larger dots. Underneath this is a broader line, and the dots considerably smaller. The first are easily seen, by using the lens, to be hooks bent upwards, or towards the tail of the insect. See fig. 1, a.

On examining the broader line of small dots (fig. 1, b) with a tolerably powerful magnifier, they are also found to be hooks, but turned in an opposite direction, that is, downwards in the abscess, and towards the head of the insect.

These hooks, it is probable, are occasionally erected by the muscles of the skin, and according to the series of them used by the *larva*, it is raised or depressed in the abscess; and by this motion, and the consequent irritation, a more or less copious secretion of pus is occasioned for the sustenance of the *larva*.

This singular arrangement of hooks round the body of the *larva*, in this instance serves the same purpose as the legs in other *larvæ*, enabling it to move about in the abscess, and to crawl out of it when ripe, and renders the use of the *tentacula* observable in the other species not necessary in this.

Beside these on the surface of the skin, there are a number of rounded unarmed prominent points, which have a minute depression in the centre, and appear to be the *spiracula*, being the external opening of the extreme branches of the air tubes.

In what manner the pus is received by the *larva* for nourishment is not immediately discoverable. In the upper part of the *larva*, or that end which is applied to the external opening in the skin, may be

be observed two small horny plates, which are found on dissection to close the extremities of the trunks of some large air vessels. Near to these plates, and somewhat above them, a minute puncture is discernible by the assistance of a microscope, which was first detected by placing the *larva* recently removed from the beast in warm water, when a considerable column of yellow pus was observed to rise from this aperture, which rendered it sufficiently visible. At other times, when closed, it was discernible with the utmost difficulty. At fig. 20, is represented this aperture (a), together with the two horny plates, which close up the air vessels, being a view, very considerably magnified, of the upper extremity of the *larva* fig. 1.

From a first view, this part would appear to be the head of the *larva*; but as it is found to produce the extremity of the abdomen in the future insect, it must be considered as the tail; and the above-mentioned minute aperture is undoubtedly the *anus*, and is found to be in conformity to the same situation of the *anus* in others of this genus.

At the lower end of the *larva*, fig. 1, a small indentation may, with attention, be observed, which is the mouth of the *larva*. It is a simple aperture, and altogether unprovided with any of the apparatus belonging to the mouths of *larvæ* in general; and near the mouth are seen two black points of horn, which appear to be perforated in the centre, and are found by dissection to be the termination of two considerable branches of the air tubes, and correspond to the two nipples on the last segment of the *larva* of the *Æ. Equi*, seen at fig. 22, a. An enlarged view of the mouth and inferior part of the *larva* of the *Æ. Bovis* is seen in fig. 21. Round the orifice of the mouth are placed some projecting *mamillæ*, which are imperforate, and perhaps serve the purpose of feelers.

The intestinal canal in this *larva* is a simple membranous tube,
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which extends from one extremity to the other, and serves the double purpose of stomach and intestine. The intestinal canal of the *larva* of the *Œ. Equi* is seen represented at fig. 26.

The apparatus of air tubes in this *larva* is very singular, and is represented somewhat magnified at fig. 25. In this species there are only two principal trunks of these air vessels, which are connected near their origin by a lateral trunk. From these, branches are seen passing off in every direction through the substance of the insect, some of them to the intestine, others to the skin, and a greater number appear to terminate by anastomosing with each other. As these air vessels form a much greater part of the structure of the *larva* of the *Œ. Equi*, it will be more proper to suspend our observations on them till we come to the description of that species.

The *larva* having arrived at its full growth, effects its escape from the abscess, by pressing against the external opening, which occasions its enlargement by the points pressed upon being gradually absorbed. When the opening has thus obtained the size of a small pea, the *larva* writhes itself through, and falls from the back of the animal to the ground, and, seeking a convenient retreat, becomes a *chrysalis*.

With considerable difficulty I obtained three *chrysalides* of this insect; one of which is represented at fig. 3.

These *larvæ* never change or throw off their skin, the same serving them through their whole growth; and it at length also serves to form the shell of the *chrysalis*. After leaving the abscess, and previous to their becoming a *chrysalis*, they contract themselves into much less space, and assume a different figure. See fig. 2. The sack which encloses the *larva* beneath the skin, is formed of a tough, thick membrane, and rough on the inside; and the pus secreted by it, is mostly of a yellow colour. After the exit of the caterpillar,

pillar, the wound in the skin is mostly closed up, and healed within a few days.

The *chrysalides* continued in that state from about the latter end of June until about the middle of August, when the fly appeared. I have, notwithstanding, observed full-grown *larvæ* in the backs of the cows as late as September, which must have produced their flies as late as November or December, or, perhaps, in the ensuing spring.

This *larva*, in making its exit, is exposed to imminent danger, if on land, of being trod on by the cattle, or picked up by birds. If in the water, where the cattle stand during great part of the day at this season of the year, it perishes, or becomes the food of fishes.

The perfect insect, on leaving the *chrysalis*, forces open a very remarkable, marginated, triangular lid, or *operculum* (see fig. 4), which may be traced in the skin of the *larva*, and is situated on one side of the small end.

The *Oestrus Bovis*, in its perfect state (fig. 5 and 6), is the largest of the European species of this genus, and is very beautiful. For its description see the conclusion of this paper.

Although its effects on the cattle have been so often remarked, yet the fly itself is rarely seen or taken, as the attempt would be attended with considerable danger. The pain it inflicts in depositing its egg is much more severe than in any of the other species. When one of the cattle is attacked by this fly, it is easily known by the extreme terror and agitation of the whole herd: the unfortunate object of the attack runs bellowing from among them to some distant part of the heath, or the nearest water, while the tail, from the severity of the pain, is held with a tremulous motion straight from the body, in the direction of the spine, and the head and neck are also stretched out to the utmost. The rest, from fear, generally

generally follow to the water, or disperse to different parts of the field.

And such is the dread and apprehension in the cattle of this fly, that I have seen one of them meet the herd when almost driven home, and turn them back, regardless of the stones, sticks, and noise of their drivers; nor could they be stopped till they reached their accustomed retreat in the water.

When the oxen are yoked to the plough, the attack of this fly is attended with real danger, as they become perfectly uncontrollable, and will often run with the plough directly forwards, through the hedges, or whatever obstructs their way. There is provided, on this account, to many ploughs, a contrivance immediately to set them at liberty on such an occasion.

The singular scene attending the attack of this fly on the herd, has often been the subject of poetical description; but no one has more naturally or elegantly delineated it than the bard of Mantua:

*Est lucos Silari circa, ilicibusque virentem
Plurimus Alburnum volitans, cui nomen Aflo
Romanum est, Oestron Graii vertere vocantes:
Asper, acerba sonans: quo tota exterrita sylvis
Diffugiunt armenta; furit mugitibus æther
Concussus, sylvæque et sicci ripa Tanagri.*

GEORG. lib. iii. ver. 146—151.

The heifers, steers, and younger cattle, are the most frequently attacked by this fly, and have in general a greater number of bots than others:—the strongest and healthiest beasts seem constantly to be preferred by it, and this is a criterion of goodness in much esteem with the dealers in cattle*.

* The choice of a sound healthy subject for the deposition of the eggs, is probably caused by the solicitude of the parent for the safety of its offspring.

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And the tanners also observe, that their best and strongest hides have the greatest number of bot-holes in them: for although the skin heals up on the exit of the *larva*, it is not with the same matter as the original skin; which has been remarked by late physiologists, and which this curious fact sufficiently confirms. In the leather, when dry, those holes which were made in the skin the year preceding the death of the beast, cannot be distinguished from the others which were made at any former period, not being in any perceptible degree less filled up. In the dried hide it does not appear a round hole as in the living skin, but as a crack only. This arises from the spongy substance which had filled the aperture, contracting in drying, and bursting, and also from the artificial mode of hammering and preparing the hide.

The female fly is very quick in performing the operation of depositing its egg: she does not appear to remain on the back of the animal more than a few seconds; and I have not observed that the cow ever attempts to lash this insect off with her tail, which she performs so dexterously when attacked by other flies*.

The whole of this genus of insects appear to have a strong dislike to moisture, since the animals find a secure refuge when they get into a pond or brook, where the *Tabani*, *Conopes*, and other flies, follow without hesitation, but the *Oestri* rarely or never; and during cold, rainy, or windy weather they are not to be seen.

The *larvæ* of this insect are mostly known among the country people by the name of *wornuls*, *wormuls*, or *warbles*, or more properly *bots*.

* It has been doubted by Linnæus, and some other writers (I know not why), whether it settles in depositing its egg. The evident suffering of the animal sufficiently evinces this: perhaps the remark was intended for the *Æ. Equi*.

Of the OESTRUS Equi.

THE *larva* of this fly is that which is very commonly found in the stomach of horses, and is represented in fig. 7.

These *larvæ* attach themselves to every part of the stomach, but are generally most numerous about the *pylorus*; and are sometimes, though much less frequently, found in the intestines.

Their numbers in the stomach are very various, often not more than half a dozen, at other times more than a hundred, and, if some accounts might be relied on, even a much greater number than this. They hang most commonly in clusters, being fixed by the small end to the inner membrane of the stomach, which they adhere to by means of two small hooks, or *tentacula*. Of these a representation considerably enlarged is seen in fig. 22.

When they are removed from the stomach they will attach themselves to any loose membrane, and even to the skin of the hand. For this purpose they sheath or draw back the hooks almost entirely within the skin, till the two points come close to each other; they then present them to the membrane; and keeping them parallel till it is pierced through, they expand them in a lateral direction, and afterwards, by bringing the points downwards towards themselves, they include a sufficient piece of the membrane, and remain firmly fixed for any length of time, without requiring any farther exertion.

These hooks, the better to adapt them to this purpose, appear to have a joint near their base. The *larvæ* of *Æ. hæmorrhoidalis* and *ovis*, and probably all those which feed on the mucous membranes lining the internal canals of the body, are also furnished with these *tentacula*; whilst those *larvæ* which inhabit be-
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neath the skins of various animals will be found universally without them *.

The body of the *larva* is composed of eleven segments, all of which, except the two last, are surrounded with a double row of horny bristles directed towards the truncated end, and are of a reddish colour, except the points, which are black. These *larvæ* evidently receive their food at the small end by a longitudinal aperture, which is situated between the two hooks or *tentacula*. See fig. 22, a. The lips of this aperture appear somewhat hard, horny, and irregular.

Their food is probably the chyle, which, being nearly pure aliment, may go wholly to the composition of their bodies without any excrementitious residue, though on dissection the intestine is found to contain a yellow or greenish matter, which is derived from the colour of the food, and shews that the chyle, as they receive it, is not perfectly pure.

* They are wanting in the *Æ. Tarandi*, whose *larva* I have seen; and also in a new and singular species, which inhabits beneath the skin of the rabbits and hares of Georgia in America. This species having never been described by any writer I am acquainted with, I take this opportunity of introducing a description of it, from a specimen in the excellent cabinet of Mr. Francillon.

Æ. cuniculi. Niger, alis fuscis, thorace ad medium nigro, postice, abdominisque basi pilis flavescens.

Habitat in Georgia Americana.

Descr. *Æ. bovino* nostro bis major, caput nigrum, oculis fuscis, fronte vesiculari porrectâ. *Thorax* antice nigricans, angulo obtuso ad medium; postice, lateribus, scutelloque flavis. *Abdomen* nigrum basi et lateribus segmentorum flavis. *Alæ* glaucescentes seu fuscae. *Corpus* subtus nigrum. *Pedes* nigri.

Larva fusca undique muricata aculeis minutissimis, sub cute leporum et affinium habitat.

From the extraordinary size of this *Oestrus*, I should be led to imagine it was originally destined to infest some much larger animal, which perhaps may be extinct.

The slowness of their growth and the purity of their food must occasion what they receive in a given time to be proportionably small; from whence probably arises the extreme difficulty there is found in destroying them by any medicine or poison thrown into the stomach. After opium had been administered to a horse labouring under a case of locked jaw for a week, in doses of one ounce every day, on the death of the animal I have found the bots in the stomach perfectly alive. Tobacco has been employed in much larger quantities in the same complaint, and has been also longer continued without destroying them. They are also but rarely affected by the drastic purgatives which bring away in abundance the *Teniae* and *Ascarides*.

I do not apprehend they are so very injurious to the horses as is generally conceived. When removed from the stomach a deep impression remains where they adhered; but whether they ever irritate it so as to bring on a fatal spasm of the stomach itself, or of the *pylorus*, or, by collecting round this passage, prevent the food from entering the intestine, has, I believe, never been investigated with sufficient accuracy. The ignorant surprise of farriers on opening the stomach after death, and being presented with so singular an appearance as the bots, has, without doubt, very often occasioned the death to be attributed to these, though it is certain but few horses on our commons can escape them. At the extremity of the truncated end are seen two protuberant kind of lips, applied to each other. See fig. 7, a. When these unfold, or are removed with the knife, a plate of horny or cartilaginous consistence is seen, having six semicircular lines, with their points opposed to each other. See fig. 23. These lines are rough, and made up of alternate depressed and elevated spots of black and white.

Through this plate the air is admitted to fill the air tubes; and in
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most of the *larvæ* of this class there are two distinct plates for this purpose, one on each side.

That the air is admitted by these means, is proved by immersing one of the *larvæ* of this class of insects in a vessel of water; when a bubble may be extricated by pressure, and may be distinctly seen forming in the water, and on removing the pressure the bubble will be again entirely re-absorbed.

In the *larvæ* of the *Musca tenax* and *pendula*, instead of a horny plate of this kind, there is provided a slender tail of considerable length, with a perforated cartilaginous tube passing through it; and the extremity of this tube is elevated above the surface of the putrid water in which they live, and conveys air to the *larva* beneath.

On opening the body of the bot, and removing the gelatinous matter, the air tubes are seen of a splendid silvery colour, as though injected with the purest mercury. They remain distended by their own inherent elasticity, and are filled with air to their minutest ramifications. Their appearance is singularly beautiful, especially if the bot be alive, or recently dead. This glittering appearance arises from the air being seen through the semitransparent, refracting coats of the vessel.

In this species the principal trunks of the air vessels are no less than ten in number, which by dissection are found to open with the large ends (see fig. 26, a) into one common reservoir beneath the cartilaginous plate: this being removed with a knife, exhibits the mouths of the tubes as they are arranged at fig. 24. The branches proceeding from these vessels terminate on the viscera and skin, in a similar manner to the air vessels of the former species.

Two considerable trunks or tubes could be traced till they terminated in the two small prominent points on the edge of the first segment. See fig. 22, a.

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The lips at the obtuse end of the bot seem designed to prevent the gastrick and other secretions of the stomach, assisted by its heat and action, from injuring the cartilaginous plate; for we do not discover any apparatus of this nature to cover these plates in the *Œ. Ovis* or *Bovis*, which, though allied in all other respects, are not exposed to these circumstances.

These lips are found, on opening them, to be mere membranous bags, filled with a watery fluid; a convincing proof they do not form any part in the future insect, and are merely for the convenience of the *larva*.

Respiration appears to be the office of these air canals, which are the lungs of the *larva*; and, considered in this point of view, they are much larger than the respiratory organs of any other animal: which is the more extraordinary, if the purpose of respiration in animals be the production of animal heat, as the later chemists suppose, this being altogether unnecessary to *larvæ* that are supplied so abundantly with it from the high temperature of their residence in the living stomach, and have a greater share of it than is probably pleasant to them; nor can these organs be formed for the purposes of the future insect, since they cannot be detected in either the *chrysalis* or fly.

I have since found that air vessels of a similar structure may be detected in the *larvæ* of most insects, as well in those that are not exposed to any extraordinary temperature as those that are; they are therefore not constructed with any view to these singular situations.

From the superior magnitude of the respiratory organs in most of the *larvæ* of insects, one should be almost led to imagine that the respiration in all animals was more intimately connected with the reception of food, and the converting it into living matter, than any other design.

In corroboration of this we may observe, that while the respiratory organs are so large in the *larva*, they are remarkably small in the perfect insect, which also, in general, has occasion for very little food.

Perhaps the superior size of the air vessels of the bot, compared with the *larvæ* of other insects, arises from the greater rarefaction and impurity of the air it is exposed to in the stomach, which may render a larger portion of it necessary. The remaining undecomposed air in the air tubes appears to pass out by means of the *spiracula* principally, and also perhaps by the two horny points observable on the first segment. See fig. 22, a.

Upon this subject it may not be improper to notice the air vessels of the *larva* of the *Musca pendula*, which are constructed in a very different way from any others I have seen. The two principal trunks in this *larva* are made up of semicircular cartilaginous rings or fibres, which are disposed in a spiral direction, so as to form the tube. It is evident by this structure, that the area of the tube may be entirely obliterated, and the sides be brought into contact.

The convenience attending this structure, to a *larva* living in putrid fluids of considerable depth, appears to be, that beside its use in respiration, it may serve the same office as the air bladder in fishes, regulating by its contraction, or expansion, the density or rarity of the included air, and consequently the descent or ascent of the *larva* in those fluids.

The *larvæ* of the *Æ. Equi* attain their full growth about the latter end of May, and are coming from the horse from this time to the latter end of June, or sometimes later. On dropping to the ground they find out some convenient retreat, and change to the *chrysalis*; and in about six or seven weeks the fly appears.

Though this is by far the most common species of the genus, I have

have not been able to obtain a *chrysalis* of it for delineation; but it nearly resembles that of *Œ. hæmorrhoidalis*, except in size.

There is a considerable difference between the male and female fly: a delineation of each is given, fig. 8 and 9; and to prevent unnecessary repetition, they are described, together with the other species, at the conclusion of the paper.

Perhaps it will be hardly necessary to apologize to the Society for the alteration of the Linnæan name *Bovis* to that of *Equi*, as the former, if retained, would continue to convey a very erroneous idea; and it would, without doubt, have been changed by Linnæus himself, had he been in possession of these facts, who considered trivial names not as fetters to the science, but as temporary conveniences, to be altered or retained as time and further discovery might prove them to be just. On the other hand, wanton and unnecessary alteration, on slight pretences, certainly cannot be too much reprobated.

The mode pursued by the parent fly to obtain for its young a situation in the stomach of the horse is truly singular, and is effected in the following manner:—When the female has been impregnated, and the eggs are sufficiently matured, she seeks among the horses a subject for her purpose, and approaching it on the wing, she holds her body nearly upright in the air, and her tail, which is lengthened for the purpose, curved inwards and upwards: in this way she approaches the part where she designs to deposit the egg; and suspending herself for a few seconds before it, suddenly darts upon it, and leaves the egg adhering to the hair: she hardly appears to settle, but merely touches the hair with the egg held out on the projected point of the abdomen. The egg is made to adhere by means of a glutinous liquor secreted with it. She then leaves the horse at a small distance, and prepares a second egg, and,
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poising herself before the part, deposits it in the same way. The liquor dries, and the egg becomes firmly glued to the hair: this is repeated by various flies till 4 or 500 eggs are sometimes placed on one horse.

The horses, when they become used to this fly, and find it does them no injury, as the *Tabani* and *Conopes*, by sucking their blood, hardly regard it, and do not appear at all aware of its insidious object.

The skin of the horse is always thrown into a tremulous motion on the touch of this insect, which merely arises from the very great irritability of the skin and cutaneous muscles at this season of the year, occasioned by the continual teasing of the flies, till at length these muscles act involuntarily on the slightest touch of any body whatever.

The inside of the knee is the part on which these flies are most fond of depositing their eggs, and next to this on the side and back part of the shoulder, and less frequently on the extreme ends of the hairs of the mane. But it is a fact worthy of attention, that the fly does not place them promiscuously about the body, but constantly on those parts which are most liable to be licked with the tongue; and the *ova* therefore are always scrupulously placed within its reach. Whether this be an act of reason or of instinct, it is certainly a very remarkable one. I should suspect, with Dr. Darwin *, it cannot be the latter, as that ought to direct the performance of any act in one way only.

Whichever of these it may be, it is, without doubt, one of the strongest examples of pure instinct, or of the most circuitous reasoning any insect is capable of. The eggs thus deposited

* Zoonomia. Vid. Chapter on Instinct.

I at first supposed were loosened from the hairs by the moisture of the tongue, aided by its roughness, and were conveyed to the stomach, where they were hatched; but on more minute search I do not find this to be the case, or at least only by accident; for when they have remained on the hairs four or five days they become ripe, after which time the slightest application of warmth and moisture is sufficient to bring forth in an instant the latent *larva*. At this time, if the tongue of the horse touches the egg, its *operculum* is thrown open, and a small active worm is produced, which readily adheres to the moist surface of the tongue, and is from thence conveyed with the food to the stomach. If the egg itself be taken up by accident, it may pass on to the intestinal canal before it hatches; in which case its existence to the full growth is more precarious, and certainly not so agreeable, as it is exposed to the bitterness of the bile.

I have often, with a pair of scissors, clipped off some hairs with the eggs on them from the horse, and on placing them in the hand, moistened with saliva, they have hatched in a few seconds. At other times, when not perfectly ripe, the *larva* would not appear, though held in the hand under the same circumstances for several hours; a sufficient proof that the eggs themselves are not conveyed to the stomach.

It is fortunate for the animals infested by these insects that their numbers are limited by the hazards they are exposed to. I should suspect near a hundred are lost for one that arrives at the perfect state of a fly. The eggs, in the first place, when ripe, often hatch of themselves, and the *larva*, without a *nidus*, crawls about till it dies; others are washed off by the water, or are hatched by the sun and moisture, thus applied together.

When in the mouth of the animal they have the dreadful ordeal
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of the teeth and mastication to pass through. On their arrival at the stomach, they may pass, mixed with the mass of food, into the intestines; and, when full grown, on dropping from the *anus* to the ground, a dirty road or water may receive them.—If on the commons, they are in danger of being crushed to death, or of being picked up by the birds who so constantly for food attend the footsteps of the cattle. Such are the contingencies by which Nature has wisely prevented the too great increase of their numbers, and the total destruction of the animals they feed on.

I have once seen the *larva* of this *Oestrus* in the stomach of an ass: indeed there is little reason to doubt their existence in the stomachs of all this tribe of animals.

The perfect fly but ill sustains the changes of weather; and cold and moisture, in any considerable degree, would probably be fatal to it. These flies never pursue the horse into the water. This aversion I imagine arises from the chillness of that element, which is probably felt more exquisitely by them, from the high temperature they had been exposed to during their *larva* state. The heat of the stomach of the horse is much greater than that of the warmest climate, being about 102 degrees of Fahrenheit, and in their fly state they are only exposed to 60, and from that to about 80 degrees. This change, if suddenly applied, would, in all probability, be fatal to them; but they are prepared for it, by suffering its first effects in the quiescent and less sensible state of a *chrysalis*. I have often seen this fly during the night-time, and in cold weather, fold itself up, with the head and tail nearly in contact, and lying apparently in a torpid state, though in the middle of summer.

It is worthy of remark, that the greater part of the *ova* deposited by this fly, are taken up in consequence of the irritations of other flies, as the *Conopes*, *Tabani*, and *Muscae*, who, by settling on the skin,

occasion the horse to lick himself in those parts, and thus receive the *larvæ* on the tongue and lips; and a horse that has had no *ova* deposited on him, may yet have the bots by performing the friendly office of licking another horse that has. The eggs on the shoulder are particularly well disposed for being received in this way.

Whether these *larvæ* can exist in the stomach of a carnivorous animal I am not certain. I gave upwards of a hundred eggs (proved by trials to be ripe, and containing a living caterpillar) to a cat in milk, at various times; and on destroying her at the end of two months after the first portion had been given, no traces of them in the stomach or intestines could be discovered.

The small end of the *chrysalis*, in all the species of this genus, contains the head of the fly, the contrary being the case with almost all other insects.

Of the OESTRUS hæmorrhoidalis.

THE *larva* of this insect needs not to be particularly described, as it resembles in almost every respect that of the *Œ. Equi*. Its habits are the same, being seen in the stomach of the horse occupying the same situation as those of the *Œ. Equi*, from which they can only be distinguished by their smaller size and greater whiteness. See fig. 10.

On dissection it is found to possess similar air tubes and alimentary canal. When it is ripe, and has passed through the intestines, its skin becomes of a greenish-red hue. It generally assumes the *chrysalis* state in about two days after leaving the *rectum*, and is then of a deep-red colour. See fig. 11.

The *larvæ* of this and the preceding species may be obtained from the horse from the beginning of June to the middle of July, being found hanging to the extremity of the *rectum*. None of these *larvæ*

ever appear to change their skin. If they did, it is probable they would lose their hold, as the hooks are principally connected with the skin, and separate with it by maceration, leaving only an indentation where they were lodged.

These *larvæ*, being forcibly squeezed, contract themselves into a smaller space, and become very hard. It is probable they in this way resist the violent pressure they must occasionally sustain, from the weight of the food and the actions of the stomach, and in passing through the intestines and the *sphincter ani*.

After remaining in the *chrysalis* state about two months, the fly appears. See fig. 12 and 13,—the male and female,—and their description in the sequel of the paper.

This species may still retain the name of *hæmorrhoidalis*, without any impropriety, not from the supposed history of its entering the *anus*, but from the termination of the *abdomen* being red, Linnæus having generally chosen to distinguish the insects so marked by that name; also from their resembling the *hæmorrhoids* or *piles*, while hanging to the extremity of the *rectum* *.

It seems hitherto to have been generally believed among naturalists, that the female fly enters the *anus* of the horse in a very extraordinary manner, to deposit its eggs †.

* The idea entertained by the Romans of this appearance is truly singular: Hujusmodi passionis signum est (morbus coriaginosus) cum invenitur humor in ano fabæ coctæ similis: est namque fanies ex illis vulneribus quæ bestiolæ intrinsecus fecerunt. *Flavius Vegetius de Arte Veterinaria*, ed. *Manheim*. p. 63.

† Reaumur, tom. iv. p. 543, relates this circumstance on the authority of Dr. Gaspari. From the account of its getting beneath the tail, I should suspect the fly he saw was the *Hippobosca equina*, which frequently does this. Its getting within the *rectum* appears to have been additional. That a fly might deposit its eggs on the verge of the *anus* is not impossible, though we know no instance of it.

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The objections to this idea are—that the *anus* is rather closed than opened by any irritation externally applied.—The fly would be crushed in attempting to pass the *sphincter* of a horse's *rectum*; and having no means of holding while depositing its eggs, it would be quickly evacuated with the dung.—The whole of the *ova*, to the amount of 2 or 300, must be deposited in one horse, as it is impossible, if the fly survived, that it could undergo this punishment a second time, for the heat and moisture of the *rectum* would at least destroy its wings.

I mention these objections, not as merely relating to this species, but that it may not be credited of the *Æ. nasalis*, or indeed of any of them, that they really enter the body of the animal to obtain for their young a situation there.

I have not seen any writer who has described the mode in which this fly deposits its *ova*; which having had repeated opportunities of seeing, I can speak of with certainty.

The part chosen by this insect for this purpose is the lips of the horse, which is very distressing to the animal from the excessive titillation it occasions; for he immediately after rubs his mouth against the ground, his fore-legs, or sometimes against a tree; or if two are standing together they often rub themselves against each other. At the sight of this fly the horse appears much agitated, and moves his head backwards and forwards in the air, to baulk its touch, and prevent its darting on the lips; but the fly, watching for a favourable opportunity, continues to repeat the operation from time to time; till at length finding this mode of defence insufficient, the enraged animal endeavours to avoid it by galloping away to a distant part of the field. If it still continues to follow and tease him, his last resource is in the water, where the *Oestrus* never is observed to follow him.

The

The teasing of other flies will sometimes occasion a motion of the head similar to this; but it should not be mistaken for it, as it is never in any degree so violent as during the attack of the *Oestrus*.

At other times this *Oestrus* gets between the fore-legs of the horse whilst he is grazing, and thus makes its attack on the lower lip: the titillation occasions the horse to stamp violently with his fore-foot against the ground, and often strike with his foot as though aiming a blow at the fly. They also sometimes hide themselves in the grass; and as the horse stoops to graze they dart on the mouth or lips, and are always observed to poise themselves during a few seconds in the air, while the egg is preparing on the point of the abdomen.

When several of these flies are confined in a close place, they have a particularly strong fusty smell; and I have observed both sheep and horses, when teased by them, to look into the grass and smell to it very anxiously; and if they by these means discover the fly, they immediately turn aside and hasten to a distant part of the field.

The eggs of this species appear of a darker colour than the former, and the circumstances attending their passage to the stomach I am unacquainted with.

The larva of the *Œ. hæmorrhoidalis*, as well as the former species, appears to have been termed among the Romans, *Cossus**, which seems to have been a general expression for any kind of soft imperfect animal, and to have been very analogous, and as extensively applied as the word *grub* is at present in the English language.

The learned Charlton (*Onomasticon Zoicon*, p. 56), and afterwards Dr. Johnson (see Dictionary), have considered *ascarides* as the syno-

* Vide *Flavius Vegetius Renatus de Arte Veterinaria*, p. 62, 64, 69, ed. Manb.

nymous term among the ancients for the bots: that term has always been applied to the thin smooth worms of the intestines, but, I apprehend, never to these.

Our ancestors imagined that poverty, or improper food, engendered these animals, or that they were the offspring of putrefaction. In Shakspeare's *Henry the Fourth, Part I*, the ostler at Rochester says: "Pease and beans are as dank here as a dog, and "that is the next way to give poor jades the bots;" and one of the misfortunes of the miserable nag of Petruchio is, that "he is "so begnawn with the bots."

When the animal is kept from food the bots are also, and are then, without doubt, the most troublesome; whence it was very naturally supposed that poverty or bad food was the parent of them.

They also appear to have gone formerly in this country by the name of *truncheons*. In Blundeville, who wrote on farriery during the reign of Queen Elizabeth, we have the following passage:—"The second sort of worms have great heads and small long tails, "like a needle, and be called bots: the third be short and thick, "like the end of a man's little finger, and be called truncheons."

Of the OESTRUS veterinus.

THIS species seems to have been only well described by Linnæus, who called it *nasalis*, from an idea of its entering the nostrils of the horse to deposit the eggs*, which it could not well do without destroying the wings, and is therefore probably as much a fable as the "*mirè per anum intrans*" of the *Æ. hæmorrhoidalis*. I have seen four

* Habitat in equorum fauce per nares intrans. *Linn. Syst. Nat.* 2. p. 969.

chrysalides of this fly, which I uniformly found under the dung of horses. They produced the flies, male and female, represented at fig. 18 and 19; but not having at that time any idea of writing on this subject, I unfortunately threw away the *chrysalides*. The *larva* I am at present unacquainted with; but if it inhabited the *fauces* of the horse, it would produce such troublesome symptoms as could not easily escape the notice of those whose business it is to attend to the diseases of cattle. Such a disease has, however, never been described by any writer on this science; nor, after an extensive opportunity both in the dead and living subject of observing them, have I ever seen a bot in the *fauces*. Perhaps the bots of the stomach having crawled to the *fauces* in search of food might have given rise to this idea, or they may even have accidentally bred there; for there is little doubt these animals can live in any part whatever of the alimentary canal.

I am induced to suspect they inhabit the stomach, as well as the two former species; but of this we must at present remain in uncertainty, as well as of the manner in which this species deposits its eggs.

I have given it the name of *veterinus*, because beasts of burden are particularly subject to it, in preference to the erroneous one of *nasalis*.

Of the OESTRUS Ovis.

I PROCURED about the middle of June some full-grown *larvæ* of the *Æ. Ovis*, from the inside of the cavities of the bone which supports the horns of the sheep. See fig. 14.

They are nearly as large as those of the *Æ. Equi*, of a delicate white colour, flat on the under side, and convex on the upper; having no spines at the divisions of the segments, though they are provided with *tentacula* at the small end. The other end is truncated with a

prominent ring or margin, which serves the same purpose in an inferior degree as the lips of the *Æ. Equi* and *hæmorrhoidalis*, by occasionally closing over, and cleaning the horny plate. When this margin opens after closing over the plate, it occasions frequently a slight snap from the sudden admission of the air.

When young these *larvæ* are perfectly white and transparent, except the two horny plates, which are black. As they increase in size the upper side becomes marked with two transverse brown lines on each segment, and some spots are seen on the sides.

They move with considerable quickness, holding with the *tentacula* as a fixed point, and drawing up the body towards them. On the under side of the *larva* is placed a broad line of dots, which, on examination with glasses, appear to be rough points, serving perhaps the double purpose of assisting their passage over the smooth and lubricated surfaces of these membranes, and of exciting also a degree of inflammation in them where they rest, so as to cause a secretion of lymph or pus for their food.

I have mostly found these animals in the horns and frontal sinuses, though I have remarked that the membranes lining these cavities were hardly at all inflamed, while those of the maxillary sinuses were highly so. From this I am led to suspect they inhabit the maxillary sinuses, and crawl, on the death of the animal, into these situations in the horns and frontal sinuses.

The breeds of these, like the *Æ. Bovis*, do not appear confined to any particular season; for quite young and full-grown *larvæ* may be found in the sinuses at the same time.

When full-grown they fall through the nostrils, and change to the *pupa* state, lying on the earth, or adhering by the side to a blade of grass. See fig. 15.

The fly bursts the shell of the *pupa* in about two months. See fig.

fig. 16 and 17. The manner in which this species deposits its *ova* has, I believe, not been described; nor is it easy to see, though close to the animal at the time, exactly in what way this is accomplished, owing to the obscure colour and rapid motion of the fly, and the extreme agitation of the sheep; but the motions of the sheep afterwards, and the mode of defence it takes to avoid it, can leave but little doubt that the egg is deposited on the inner margin of the nostril.

The moment the fly touches this part of the sheep, they shake their heads, and strike the ground violently with their fore-feet; at the same time holding their noses close to the earth they run away, looking about them, on every side, to see if the fly pursues: they also smell to the grass as they go, lest one should be lying in wait for them. If they observe one, they gallop back, or take some other direction. As they cannot, like the horses, take refuge in the water, they have recourse to a rut, or dry dusty road, or gravel pits, where they crowd together during the heat of the day, with their noses held close to the ground, which renders it difficult for the fly conveniently to get at the nostril.

Observations on these flies are best made in warm weather, and during the heat of the day, when, by driving the sheep from their retreats to the grass, the attack of the fly and the emotions of the sheep are easily observed.

I imagine the nostril, from repeated attacks, and the consequent rubbing against the ground, becomes highly inflamed and sore, which occasions their touch to be so much dreaded by the sheep.

From the difficult and very precarious mode this species and the *hæmorrhoidalis* pursue in depositing their eggs, they cannot successfully deposit more than half of them.

General Observations on the Oestri.

HAVING traced these animals separately through their various changes, it may not be improper to conclude the account by a general review of their good or ill effects on the animals that are subject to them.

Though the attention of naturalists is at present chiefly occupied with the formation of a nomenclature and descriptions to every object of the science; yet this, though difficult and highly important, is not so much the ultimate aim of natural history as a knowledge of their economy and properties; as from these we are taught the most effectual means of avoiding the consequences of the injurious, and of protecting such as can be usefully applied to the purposes of mankind.

If, after mature enquiry, the existence of the *Oestri* should be proved in a greater degree injurious than any service they can afford, their numbers might be considerably reduced, and a total extirpation of some of the species would, I am disposed to believe, be not altogether impracticable.

The injury derived from their depredations is principally felt by the tanners, whose hides are often so perforated by these animals as to be considerably damaged thereby; and the loss of a horse or a sheep may sometimes perhaps be occasioned by the existence of the other species.

If it were desirable to lessen their numbers, the following, I apprehend, would be the most successful means:

The *larva* of the *Æ. Bovis*, which breeds in the backs of the horned cattle, is so conspicuous that it is more easily destroyed than the others: the injection of any corrosive liquor into the *sinus*

would

would kill it; or by puncturing the *larvæ* with a hot needle, introduced through the apertures in the skin, or even by simple pressure, they may be destroyed, afterwards extracting them, or leaving them to slough away, which I have frequently observed they do when crushed by a blow from the horn of the beast, or by any other accident, without any material injury to the animal. A man employed for this purpose might, in half a day, in this manner destroy every bot on a large common.

In regard to the *Œ. Equi* and *hæmorrhoidalis*, those who have horses which have been much out to grass the preceding year, in countries where these flies are prevalent, might considerably diminish their numbers by examining the horses occasionally for the bots during the months of May and June, when they will be found hanging to the extremity of the *rectum*, where they remain for some time before they fall to the ground.

The destruction of a single one at this season of the year is not only the death of an individual and its effects, but the almost certain destruction of a numerous family; at the same time it is also highly useful in preventing the irritation which the spines of the bot occasion to the *anus*. If the horse is used on the road while the bot is adhering to this part, the irritation becomes distressing, and causes him to move very awkwardly and sluggish, as though tired; and if severely beaten he soon relapses again into the same awkward action. As this most frequently happens during warm weather, it is in general attributed to mere laziness.

These symptoms I have been a witness to several times, to the severe chastisement of the horse and vexation of the rider: on the removal of the bot the cure is instantaneous.

If this mode of removing them was generally complied with, but few could escape, and their numbers would be very much reduced;
and

and those who wish to obtain them for cabinets of natural history, or for examination, will also find this the most effectual way.

We know of no medicine that will detach them from the stomach or intestines, though there are not wanting abundance of infallible nostrums among the very numerous professors of this art.

Another both easy and effectual mode, at least for the *Æ. Equi*, is to destroy the eggs which are deposited on the hairs of the horse, and are easily seen and removed by a pair of scissars, or by means of a brush and warm water.

In the sheep it will be much more difficult to prevent or destroy them by any of these means; particularly if they are seated in the maxillary sinuses: in this case trepanning would be insufficient, as they would probably be concealed among the convolutions of the turbinated bones.

Perhaps the removal of the sheep to a distant pasture, during the months of June and July, while greatest part of the bots are yet on the ground in the *chrysalis* state, and not bringing them on the pasture again till the setting in of the winter, would be the means of destroying them most effectually; and if repeated for two or three years successively, when they are particularly troublesome, the farmers might eventually find their account in it.

On the other hand, notwithstanding the apparently unnecessary existence and cruel effects of the *Oestri*, they are probably not altogether without an use, or were designed by Providence to add, without a recompense, to the numerous sufferings of these useful and laborious creatures.

A physiological view of their effects will, perhaps, best justify their existence, and save them from such an imputation.

The *larvæ* of the *Oestri*, when applied under proper restrictions, and to a certain extent, may be of greater utility than from our present

present very limited knowledge of them we are able to discover; but we may venture to remark, that their effect in keeping up a considerable degree of irritation in the membranes on which they are situated, may, perhaps not inaptly, be compared to that of a perpetual issue or blister. Nor is there wanting abundant proof of the utility of local irritations in preventing the access, as well as in curing disorders. We often see a formidable disease quickly removed by blistering the skin, or by irritating the mucous membrane of the stomach or intestines by a vomit or purge. The appearance of exanthematous eruptions on the skin, and the formation of local abscesses, from the same cause of partial irritation, often relieve a general disorder of the system. The mucous membranes and the skin possess this power when irritated in the most eminent degree, and to these the *larvæ* of the *Oestri* are applied. Irritating the membranes of the stomach in other animals would excite nausea and vomiting; but the horse not possessing this power, his stomach is peculiarly fitted for the stimulus of such inhabitants.

It has also been remarked in hospitals, that a patient afflicted with a wound, ulcer, or other severe local complaint, is not so susceptible of the contagion of a fever or other general disorder.

How far the access of those dreadful disorders which sometimes arise of themselves in cattle and horses, and afterwards become contagious, as the murrain, glanders, farcy, &c. may be prevented by these peculiar irritations, it will not be easy to discover; nor whether that singular tendency or disposition in the horse to inflammatory complaints, as the *caligo* of the eyes, termed moon-blindness, inflammations of the lungs and of the bones, as spavins, splints, &c. may be in any degree checked or subdued by the application of these local *stimuli*.

In confirmation of this suggestion I may remark (although I am aware

aware other reasons may be also assigned for it), that those horses which are not exposed to the bots, more frequently are infected with the glanders, farcy, &c. as those of the army, post-coaches, post-waggons, and dray-horses, these being rarely spared, from the nature of their work, to graze on the commons, and thus be exposed to receive them.

If, after a more minute research into their effects on the system, the utility of these native *stimuli* of animals should be established, and, like the leech, or the *cantharides*, they should be called in to the aid of veterinary medicine, it would not be impracticable to administer them artificially by means of their *ova*.

If the stimulus is considered as of too gentle a nature, it is in some measure atoned for by its permanency, and the unlimited power of increasing their numbers; at least, by the administration of them in this way, we might accurately ascertain their real effects, and whether they are so fatal as has been imagined.

Linnaeus has also observed of the *pediculus*, “rodendo caput exciat achores, apud puerulos voraces incarceratos, indeque strumofos, sicque præservat a coryza, tussi, cæcitate, epilepsia,” &c.

In the same way the worms in children, I am induced to believe, are wholesome to them in a certain quantity, by constantly irritating the membranes of the intestines, and preventing the access of worse disorders. But however useful a few of these natural *stimuli* of animals may be, the increase of their numbers, by producing bad consequences, should at all times be prevented.

The sheep are particularly subject to disorders attended with *ver-tigo*, probably arising from an affection of the brain; and the *larvæ* of the *OE. Ovis* are certainly very favourably situated on the neighbouring membranes of the maxillary sinuses, and may perhaps tend to divert the attack of this disorder, or render it less fatal.

Remarks

Remarks on the generic and specific Characters of the OESTRI.

THE characters which distinguish this genus have been described so very oppositely by various writers, that I cannot well conclude this paper without taking some notice of these also; and having many specimens of them in my possession I was induced to dissect them for this purpose. The result of the enquiry has been the discovery of characters considerably different from those which have hitherto been assigned them.

The excellent *Scopoli*, conscious of the obscurity of this genus, has altogether omitted giving any account of them in the *Entomologia Carniolica*.

And if we except the mistake of the *Œ. Equi* for *Bovis*, the clearest and best account of the species is still to be seen in Linnæus.

Fabricius, in his *Species Insectorum* *, has nearly copied the Linnæan account of the *Oestri*; but in a subsequent work of this author, the *Mantissa Insectorum* †, a species under the title of *Equi* is introduced, and the species *Œ. hæmorrhoidalis* and *veterinus* are considered as varieties α and β ! while the error relating to the true *Equi* is continued under the name of *Bovis*.

The most extensive enumeration of the species of this genus may be seen in Professor Gmelin's ‡ new edition of the *Systema Naturæ*; but the errors relating to the species have been in that work considerably increased. Instead of placing the *Equi* in the name of *Bovis*, as his excellent original had done, we find the *hæmorrhoidalis*; and by placing the *Equi* again in the name of *hæmorrhoidalis*, and mixing the references to each, an almost inextricable labyrinth of confusion is the consequence, while the true *Bovis* still escapes undescribed, unless as being the same as *hæmorrhoidalis*.

* *Species Insectorum*, vol. ii. p. 398. † *Mantissa Insectorum*, vol. ii. p. 321.

‡ *Gmelin. Syst. Nat. par. iv. p. 2810.*

The mistake of *hæmorrhoidalis* for *Bovis* arose probably from their similarity in description, in which they certainly interfere very much; though no two species can be more distinct when seen together than these. This will ever be the bane of compilation in natural history.

It has been doubted whether these animals possess any mouth: Linnæus expressly says, "*Os nullum punctis tribus;*" but when the hairs are removed, which in every species very much obscure the parts of the mouth, two clavated *palpi* are seen, and between them the opening of the mouth; and by laying open the vesicular or inflated part of the face, the continuation of it is visible in the form of a membranous *haustellum*, which is generally coloured with some dark brown matter lodging on the inside; though I confess, after repeated dissections, I have not been able to trace this *haustellum* farther than the inside of the inflated part of the head, where it appears to enlarge and terminate.

Fabricius has minutely described *labia* to the *haustellum*, and other apparatus to the mouth, which I have not been fortunate in obtaining a sight of. At the same time, I cannot help being surprised that he should have overlooked the *palpi*, which he expressly denies the existence of, though tolerably visible even without the aid of glasses*.

What farther circumstances I have observed, in regard to the generic characters of these insects, I have stated in the following Latin descriptions of them, and have also added there what was farther necessary to complete the foregoing account, with some alterations in the specific descriptions of them.

I have, since writing the above, been enabled to collect the *synonyma* more fully, and to examine all the authors who have treated on this subject, from the invaluable library of Sir Joseph Banks,

* *Fabricii Genera Insectorum.*

whose

whose generous liberality in promoting useful research by this indispensable aid can never be too much admired.

The result of this enquiry has induced me with the greater readiness to offer these remarks to the Society, from the irreconcilable descriptions and difficulties which will be found in the best writers, who have endeavoured to describe the present genus.

I have omitted the reference to Ray, because the description, if meant for the *Œ. Equi*, is hardly worth preserving. From the "*alis crebris punctis*," one should suppose the *Tabanus pluvialis* was intended by this description.

From the observations of *Wohlfarbt*, "*De vermibus per nares excretis*," it appears not improbable that the *Œ. Ovis*, under a favourable opportunity, and perhaps deprived of its usual *nidus*, had deposited its eggs in the human nostril, as I know of no other *larva* of this kind that could sustain the temperature of that situation; yet the figures given of the flies observed by him do not much resemble *Oestri* *.

J. Leonhard Fischer (*Disputatio Inauguralis. Lipsiæ 1788*) has given an elaborate description of the *Œ. Bovis* and *Ovis*.

In the *Anfangsgründe der Naturgeschichte* of *Leske*, the *larva*, tab. 9, fig. 19, is that of the *Equi*; while the fly (fig. 21) is the *Œ. Bovis*.

De Geer, who for excellent descriptions and general accuracy surpasses, in my opinion, nearly all the writers on these subjects, has rightly corrected Linnæus by not confounding the *Bovis* and *Equi*, but has unfortunately fallen into the error of considering the *Bovis* and the *hæmorrhoidalis* as the same. *Histoire des Insectes*, p. 297. *Genera et Species Insectorum*, p. 192.

* Since the above was committed to the press, Dr. Latham has informed me of a case related in the first volume of the Medical Communications, in which insects were removed from the *antrum maxillare* of a woman, and are evidently, as Dr. Latham has supposed, the *larvæ* of the *Œ. Bovis*.

In the *Fauna Etrusca* of Ross, the *Bovis* is described "*alis maculatis*," which must be the *Equi*; and a species under the name of *Equi* is described "*alis immaculatis*." The *synonyma* are also mixed in a very extraordinary manner; tom. i. p. 268. In a subsequent volume he has proposed to reconcile these very various descriptions by referring them to a sexual difference.

In the *Entomologia* of Villers, the Linnæan account and references are copied, tom. iii. p. 345; and at the conclusion is very properly stated the perplexity attending the contradictory descriptions of these insects.

The references to Sultzer and Frisch, as their figures afford no idea of the insect intended, I have omitted.

Modeer, in the Swedish language, *Act. Stockholm*. 1786, p. 125, has given *Equi* for *hæmorrhoidalis*, and *hæmorrhoidalis* for *Bovis*.

Geoffroy, *Histoire des Insectes*, in the three species described by him, has nearly followed the arrangement given by Linnæus, tom. ii. p. 445.

Fabricius, in his last work, the *Systema Entomologica Emendata*, has obscured this genus in a way that it will not be easy to unravel. He has given an *Oestrus Bovis*, with a description nearly corresponding to the true one, "*alis immaculatis*," &c. but immediately refers to the Linnæan *Bovis* "*alis maculatis*," and continues the Linnæan references. Under the title of *Equi* is described the *Æ. veterinus*, under which the *hæmorrhoidalis* is introduced as a variety β ! So that a description of the true *Æ. Equi*, the most frequent and strongly marked of this genus, is altogether omitted, as a distinct species; at the same time the variety of it β of my account and of the Linnæan *Fauna* is presented as a distinct species, under the extraordinary title of *Æ. Vituli*; and beneath it is a reference to the true *Equi* in Geoffroy. The *Æ. Pecorum* of this author is most probably a dark-coloured variety of the *Æ. veterinus*, or it may be altogether a new species.

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The commission of errors like these, in a genus whose species had been more numerous, might have defied the possibility of detection, while the patient investigator might endeavour to understand them with unavailing labour.

Nor can I observe without regret, in this respectable work, such a direct abuse of the intention of *Synonyma*, which, far from assisting as auxiliaries to the description, which they ought always to do, serve only to perplex by their perfect disagreement.

Vallisneri has given in the Italian language a very extensive account of the *Æ. Bovis* and *Ovis*, with many curious quotations from the Italian poets and the ancients. *Ragionamento intorno all' Estro de Buoi. Opere*, tom. i. p. 225.

Reaumur has also been very copious in his account of the *Æ. Bovis* and *Ovis*, and has given a description of the *hæmorrhoidalis*, but appears not to have been acquainted with the *Æ. Equi. Histoire des Insectes*, tom. iv. p. 503.

OESTRUS. *Antennæ* articulis tribus, ultimo subgloboso setâ anticè instructo, in foveis duabus frontis demersæ.

Os apertura simplex, neque ullo modo exsertum.

Palpi duo, biarticulati, apice orbiculares in depressione oris utrinque siti *.

1. *Bovis.* *Æ.* alis immaculatis fuscis, abdomine fasciâ atrâ mediâ: apiceque pilis fulvo-flavis.

Vallisneri Opere, tom. i. tav. 28. f. 10. *Larva* 1, 2, et seq.

* Facies hujus generis muscarum omnino peculiaris est, lata, depressa, vesiculosa, glauca, et antennis in capite altè immerlis. Frons etiam faciem quadrupedis nonnihil simulat, præsertim Simiæ; hoc in *Æ. hæmorrhoidali* maximè conspicuum est.

Reaumur, Hist. Inf. tom. iv. p. 503. tab. 38. f. 7, 8.

De Geer, Hist. Inf. tom. vi. p. 297. pl. 15. fig. 22.

Schaeffer, Inf. Ratisbon. tab. 89. f. 7.

Fischer, Dissert. inaug. tab. 3. fig. 5.

Anglis, Breeze, Brize, or Gad-fly.

Habitat in pascuis, inter armenta, in quorum dorso deponit ova.

Descr. *Æ.* Equo vix major, fronte albâ, undique tomentosâ. *Thorax* anticè flavescens, in medio ater, lineis denudatis longitudinalibus quatuor, posticè cinerea. *Abdomen* basi cinereum fasciâ f. cingulo in medio atro, apiceque pilis fulvo-flavis. *Squamæ Halterum* magnæ nivæ convexæ. *Pedes* nigri, tarsis pallidis.

Fæminæ abdomen, stylo attenuato atro, compressione evolvendo.

Larva subcutanea, apoda, fusca, undecim segmentorum, lineis transversis, scabris, interruptis.

2. *Equi.* *Æ.* alis albidis, fasciâ mediâ punctisque duobus nigris.

Æ. Bovis. Alis maculatis thorace flavo fasciâ fuscâ, abdomine flavo apice nigro. *Linn. Syst. Nat. p. 969. 1. Faun. Suec. 1730.*

Æ. Bovis. Fabricii Species Insect. p. 398.

Æ. hæmorrhoidalis. Gmelin. Syst. Nat. p. 2810.

De Geer, Hist. Inf. p. 291. pl. 15. fig. 16.

Geoffroy, Hist. Inf. 2. p. 456. n. 3.

Habitat inter jumenta in pratis, deponit ova in genubus et lateribus equorum.

Descr. *Frons* alba, tomentosa, vertice fusco. *Oculi* nigri,

nigri, distantes. *Thorax* fuscus, in medio obscurior. *Abdomen* flavo-fuscum maculis punctisque incisurarum nigris. *Scutellum* fasciculis duobus pilosis. *Alæ* basin versus puncto minimo atro, fasciâ mediâ, apiceque maculis duabus nigris.

Mas flavo, foemina fusco colore saturatior, apiceque abdominis elongatâ incurvatâ atrâ, stylo bifido terminali.

β varietas. Apice alarum maculâ unâ tantum oblongâ et abdomine tecto pilis densis, fusco-ferrugineis. Specimen vidi in Museo Linneano quod certè varietas *β* Faunæ Suec. 1730.

Æ. Vituli. *Fabricii Syst. Ent.* 6. p. 231.

Larva teres, viridis, caudâ obtusè truncatâ, capite attenuato ore longitudinali corneo labiis duobus. Unguiculis duobus utrinque oris recurvatis atris. Marginibus segmentorum spinis rigidis deorsum spectantibus duplici serie obfatis. In ventriculo equorum nutrita, et ad maturitatem perducta, tandem ano emissâ, in humum decedit.

3. *hæmorrhoidalis.* *Æ.* Alis immaculatis fuscescentibus abdomine atro, basi albo apiceque fulvo.

Æ. hæmorrhoidalis. Alis immaculatis thorace nigro: scutello pallido, abdomine nigro, basi albo apiceque fulvo. *Linn. Syst. Nat.* 2. 970. *Faun. Suec.* 1733.

Æ. Equi β Fabricii Syst. Ent. 1. 6. p. 232.

Æ. Bovis

Œ. Bovis. Gmelin. *Syst. Nat.* 4. p. 2809.

Reaumur, *Hist. Inf. tab.* 35. f. 3. *Larva*, t. 34. fig. 14.

Geoffroy, *Hist. Inf.* 2. p. 455. n. 1.

Habitat in pascuis, deponit ova in labiis equorum.

Descr. *Œ.* Equo dimidio minor. *Frons* alba tomentosa. *Thorax* pilis fuscis spatium inter alas atro. *Abdomen* atrum basi albis apiceque pilis fulvis. *Subtus* pilosus, cinereus, femoribus nigris, pedibusque rufis.

Fœminæ abdomen apice elongatum, incurvatum, atrum.

β variat squama halterum majori lacteâ magnâ ac facie magis depressâ.

Larva minor aliter simillima priori.

4. *veterinus.*

Œ. ferrugineus alis immaculatis, lateribus thoracis, abdomineque basi pilis albis.

Œ. nasalis. Alis immaculatis, thorace ferrugineo, abdomine nigro pilis flavis. *Linn. Syst. Nat.* 969. 3. *Faun. Suec.* 1732.

Œ. Equi. *Fabricii Syst. Ent.* 6. p. 232.

Œ. nasalis. Gmelin. *Syst. Nat.* 4. 2811.

Habitat in pascuis. *Larva* in Equis aliisque veterinis.

Descr. *Œ.* Equo minor. *Caput*, *thorax*, et *abdomen* pilis ferrugineis tecta. *Alarum* ortus abdominisque basis pilis albis obsita. *Abdomen* quam in reliquis magis gibbosum segmento secundo



Clark, Bracy. 1797. "XXVI. Observations on the Genus OESTRUS." *Transactions of the Linnean Society of London* 3, 289–329.

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