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Contribution of different groups of necrophagous insects, in the process of decomposition of a pig corpse (*Sus scrofa domesticus* L.) exposed to the open air, in the guinean zone of Côte d'Ivoire.

Alexandre Franklin KOFFI [(1,3)*], Louis R. N. ABOUA [(1)], Mathurin DJODJO [(2)], Hassane DAO [(1)], Joëlle D. E. KOFFI-TEBELE [(3)], Carine Y. E. YAPO [(1)].

[1] Félix Houphouët-Boigny University of Cocody,
Biosciences Formation and Research Unit, Laboratory of Zoology and Animal Biology,
[2] Medical Sciences Formation and Research Unit, Forensic Medicine Institute of Abidjan
22 BP 582 Abidjan 22, Côte d'Ivoire.
[3] National Institute of Public Hygiene, Disease Vector Control Service.
B.P. V 14 Abidjan, Côte d'Ivoire.

*Corresponding Author : koffialexandref@yahoo.fr

Abstract

When a corpse is exposed to the open air, it is an important source of nutrients for bacteria and insects, both for juvenile stages and for adults. In the process of decomposition of the dead organism, insects occupy a preponderant place by helping to considerably reduce the body mass of the corpse. The objective of this work was to evaluate the contribution of different groups of necrophagous insects in the process of decomposition of a corpse exposed to the open air. To do this, nine pigs, including three controls, were tranquilized and euthanized. The cadavers were exposed to insects (except controls) at three experimental sites at a rate of three per site. During the complete decomposition process, the cadavers were weighed every seven days, from March 17 (d_0 = day 0) to June 30, 2016 (d_{105}). Between d_0 and d_7 post mortem, the early arrival of the Calliphoridae, Muscidae and Sarcophagidae Diptera on cadavers, caused them to lose, on average, between 46.70 and 54.75% of their initial mass. At the end of the post-mortem period, cumulative rates amounted to 56.95 to 67.79% loss of body mass. Between post mortem d_{14} and the end of the advanced decomposition phase of the cadavers, the Diptera Piophilidae and Stratiomyidae appeared in the same way as the Coleoptera. During this phase, rates ranged from 71.24 to 93.93% loss, while controls lost only 24.96% of their initial mass. From the results obtained, the loss of body mass of the corpses is mainly due to the necrophagous activity of the different groups of insects which succeeded each other.

***Key words**: Body mass loss, Cadaveric decomposition, Post mortem interval, Necrophagous insects, Calliphoridae, Guinean zone of Côte d'Ivoire.*

1. Introduction

The human organism, once dead, constitutes an enormous reserve of nutrients for bacteria and insects. The cells of the body are no longer protected by the immune system, are then the prey of voracious necrophagous insects. The decomposition of a body and its colonization by insects are two closely related phenomena and are influenced by many factors intrinsic and extrinsic to the corpse (Mann *et al.*, 1990, Campobasso *et al.*, 2001). Intrinsic factors directly related to the deceased are age, body mass, cause of death (drugs, infection), personal hygiene, body integrity (wounds, sores), and the presence of clothing (Campobasso *et al.*, 2001). Among the external factors, the most important factor is the bio-climatic zone, including habitat, vegetation, soil type and weather conditions (temperature, wind, atmospheric humidity etc.) of the place where the body is located (Anderson and VanLaerhoven, 1996, Campobasso *et al.*, 2001). Other parameters have a significant influence on the rate of decomposition of a body; we can cite the season, the location of the body (shaded or sunny) and finally, the accessibility of the body to living organisms, whether they be mammals (domestic or wild animals) or insects (Anderson and VanLaerhoven, 1996; Campobasso *et al.*, 2001). Moreover, decomposition processes and the fauna of corpses vary greatly depending on where the corpse is located. Underground or submerged bodies will undergo changes different from those left in the open air (Anderson and VanLaerhoven, 1996). Among all these factors, two are predominant in the decomposition of a body, namely the ambient temperature and the accessibility of the body to insects (Campobasso *et al.*, 2001).

In Côte d'Ivoire, the literature mentions very little work on necrophagous insects, notably those of Adou (2014) on forensic anthropology, Dao *et al.* (2017) and Yapo *et al.* (2017) on the biology, respectively of *S. carnaria* and *L. sericata*, and those of Koffi *et al.* (2017), dealing with the process of colonization by necrophagous insects, of a pig corpse exposed to the open air in the southern forest zone of Cote d'Ivoire. As for the degradation of the corpses by the necrophagous fauna, it has not been the subject of any study. Moreover, the contribution of necrophagous insects in the process of decomposition of the corpses in Côte d'Ivoire is not known. The present study, which is part of the establishment of the repertory of the necrophagous insects of Côte d'Ivoire, aims to highlight the contribution of the different groups of insects involved in the process of decomposition of a corpse exposed in the open air, in the Guinean zone of Côte d'Ivoire, in particular in the city of Abidjan.

2. Materials and methods

2.1. Study site

The experimental set-up and the data collection were carried out in the Guinean zone of Côte d'Ivoire, in particular in the city of Abidjan (5°20'11"N - 4°1'36"W). The experimental sites chosen were the “Centre National de Floristique” (CNF / 5°20'50.41"N - 3°59'01.92"W - Altitude 49m) from the Félix Houphouët-Boigny University of Cocody, the “Zoo National d'Abidjan” (ZNA / 5 ° 22'48.90"N - 4 ° 00'18.41"O - Altitude 57m) and the “Centre National de Recherche Agronomique” (CNRA, Adiopodoumé Km 17 / 5°19'40.13’’N - 4°07'54.80"W - Altitude 17m). As the crow flies, the distance between the CNF and the ZNA site is 4.52 km. The distance between the ZNA and the CNRA is 15.26 km. The distance between CNF and CNRA is 16.53 km. These three sites constituted the three repetitions of the experiments carried out. They show the characteristics of the subequatorial, hot and humid climate (Fig. 1).

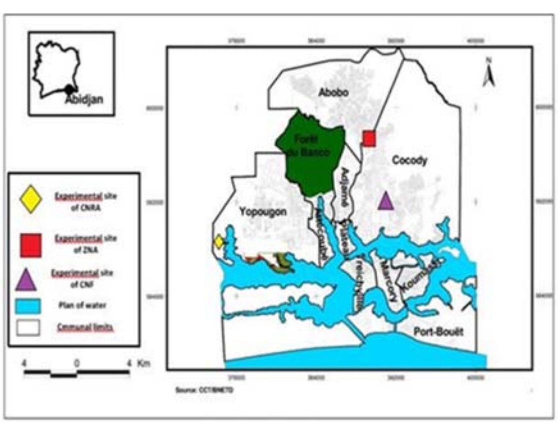

Fig. 1 Location of the experimental sites of the “Centre National de Floristique” (CNF), the “Zoo National d’Abidjan” (ZNA) and the “Centre National de Recherche Agronomique” (CNRA) in the city of Abidjan (Source: http // www. google.com/).

2.2. Experimental equipment

The experimental device installed on each site, comprises three metal grids G_0, G_2 and G_3. The first grid G_0, inside which the control corpse is placed, gives no access to necrophagous insects (Fig. 2A). The second grid G_2 is a device for trapping the Necrophagous Diptera, inspired by the improved trap of Upton (1991). It gives access to necrophagous Diptera and other small insects by means of cones (15 cm diameter / top 1.5 cm diameter) placed on its walls (Fig. 2B). As for the third G_3, it gives access to all necrophagous insects of all possible sizes thanks to a large-mesh metal grid approximately 3.5 to 4 cm diameter (Fig. 2C). In the vicinity of each grid, a device for weighing corpses was set up. It includes a wooden stem, a load cell in kg, a single pulley and a rope to lift the corpse (Fig. 2D). The three grids are spaced from each other, 300 meters. On each site, a "IHM - 0172SI" thermo hygrometer recorder was installed to record daily atmospheric temperatures and relative humidity. Rainfall data were provided by the Meteorological Service of “SODEXAM – Abidjan” (Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique). The choice of domestic pigs as biological material is explained by the fact that it is considered an excellent model for the decomposition of the human corpse (Anderson and Van Laerhoven, 1996, Rodriguez and Bass, 1983, Catts and Goff, 1992). The pigs used in this study were nine (09), three (03) per site and one (01) per grid.

Fig. 2 / A - Grid G_0 containing the control pig corpse. B - Grid G_2 serving as a trap and containing a pig corpse as a bait. C -

G_3 Grid containing a pig corpse accessible to all insects. D - Device for weighing pig carcasses.

2.3 Methods

2.3.1 Slaughter and exhibition of pig carcasses

The pigs used in these experiments were obtained from a conventional commercial farm and weighed an average of 60 kg each. They were examined by a veterinarian before being tranquilized with a sedative. They were then euthanized. The slaughter of pigs was carried out on the morning of March 17, 2016 (d_0 = day 0). Pigs were exposed to the open air, at each site, just after slaughter.

2.3.2 Harvesting and identification of insects associated with dead bodies

The necrophagous insects were directly harvested from decaying pigs. At grid G_3, eggs laid on the carcass by some species were harvested and incubated on a substrate in the laboratory for hatching. The larvae that emerged from it were followed until the emergence of adults. For other species, adults were obtained from larvae or nymphs taken from or near the decaying corpse. For others, adults were directly harvested inside the decaying corpse, using soft pliers. For the capture of small Diptera such as Piophilidae and other flying insects, a netting was used. Catches were taken three times a day (morning at 7 am, noon and 6 pm) during the first seven post mortem days (d_7) and once daily from day 7 to skeletal stage. To diversify the catches at the level of the beetles, a harvest with the use of pliers was made and four "pittfall trap" were placed around the corpses of the grids G_3: one on the ventral side, one on the dorsal side, one on the level of the head and one at the level of the anus. These are glass jars, 15 cm high and 8 cm in diameter, filled with a third of soap and water. These are exposed to the surface of the soil and placed at an average distance of 15 cm from the carcass. In the case of large adult Diptera, such as Calliphoridae, Sarcophagidae, Muscidae and Stratiomyidae attracted by corpses, a reservoir bucket was placed above the G_2 grid. This device is inspired by that of Upton (1991) and allowed to trap the Diptera present on the carcass thanks to a cone which facilitates the access to the bucket reservoir and which prevents them from coming out. The contents of the buckets and glass jars were emptied weekly from d_7 post mortem (March 24, 2016). Some of the larvae, nymphs and insect adults harvested were stored in labeled pills containing 60 ° alcohol. The identification of harvested necrophagous insects was done using a "Optika LAB20" binocular lens and various identification keys (Prins, 1982; Smith, 1986; Delvare and Alberlenc, 1989; Regina, 2002; Wyss and Chérix, 2006; Couri, 2007; Claudio and Cátia, 2008; Szpila, 2009; Whitworth, 2010; Irish, 2014; Rochefort *et al.*, 2015). Most of the insects harvested have been identified up to the taxonomic level of order, family and genus.

For the quantification of necrophagous species, adults harvested through various trapping, hunting and gathering techniques were sorted and grouped by Order, Family and Gender to be counted. The post-mortem follow-up period extended from March 17, 2016 to June 30, 2016, i.e. over 105 days.

2.3.3 Contribution of different groups of insects in the process of decomposition of a corpse exposed to the open air

The assessment of the contribution of different groups of insects to the decomposition process was made from the calculation of the cumulative rate of loss of body mass of the corpse. Thus, from the date of slaughter d_0, the pig carcasses were weighed every 7 days. The weighing device consisted of a net under the corpse, a rope, a single pulley and a mechanical load cell capable of supporting up to 120 kg of weight. Each week, the body mass of the corpse is recorded on a technical sheet, until the skeletal phase, that is to say, until the skin and other soft tissue disappear completely. The mean post mortem interval for the end of the experiments was 105 days.

The cumulative rate Rc of loss of body mass (in percentage), for a given post mortem interval, is obtained from the following formula:

$$\mathbf{Rc\,(df)} = \left(\frac{\mathbf{Mi - Mf\,(df)}}{\mathbf{Mi}}\right) \mathbf{x\,100}$$

- **Rc (df)** represents the cumulative rate of loss of body mass expressed in percentage (%) for a given post mortem interval (PMI);
- **Mi (in Kg)** represents the initial body mass of the pig corpse just before its abatement;
- **Mf (df) (in Kg)** represents the final mass corresponding to a given post mortem interval (PMI).

Since a non-colonized control body P_0 (Grid G_0) is also observed, a cumulative rate of body mass loss Rc0 (Jf.P_0) is also observed, the Abbott Formula (1925) used to correct the cumulative rates of body mass loss of the other two P_2 (Grid G_2) and P_3 (G_3 Grid) pig carcasses:

$$\mathbf{Rcc\,(df.Pn)} = \left(\frac{\mathbf{Rc\,(df.Pn) - Rco\,(df.Po)}}{\mathbf{100 - Rco\,(df.Po)}}\right) \mathbf{x\,100}$$

- **Rcc (df.Pn) (in %)** represents the corrected cumulative rate of loss of body mass expressed as a percentage (%) for a given Pn pig corpse (n = 2 for Grid G_2 or n = 3 for Grid G_3) for a given post-mortem interval.

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- **Rc_0 (df.P_0) (in %)** represents the cumulative rate of loss of body mass of the control pig corpse P_0.
- **Rc (df.Pn), (in %) n = 2, 3 ...** represents the cumulative rate of loss of body mass of the other two pig carcasses. The pig corpse placed in the cone grid G_2 is called P_2. The one placed in the grid giving access to all the insects G_3, is called P_3.

The abatement of tranquilized pigs and their placement in the different grids on the three sites took place on March 17, 2016. The weekly weighings of the corpses began at the three sites on March 24, 2016 and ended on June 30, 2016, when the corpses reached the skeletal phase.

2.4. Data processing

The enumeration of the adult individuals of the different groups of insects, made it possible to obtain their respective numbers. The cumulative rates of loss of body mass obtained from the pig carcasses of the three experimental sites were analyzed using ANOVA, using Statistica software version 7.1. The Newman-Keuls test at the 5% probability threshold allowed to separate the different homogeneous groups. In addition, a correlation analysis was performed using the Statistica version 7.1 software to check for correlation between the main climatic parameters such as atmospheric temperature, relative humidity, rainfall, body mass of the different pig carcasses. Daily climatic data were used to calculate the weekly averages of temperature, humidity and rainfall, corresponding to the weekly weighing periods of pig cadavers.

3. Results

3.1. Groups of insects involved in the decomposition of pig carcasses

The identification of adult insects harvested by trapping, mowing and gathering allowed them to be distributed within 5 orders: Diptera, Coleoptera, Hymenoptera, Orthoptera and Dictyoptera. Of these, only Diptera and Coleoptera are effectively necrophagous. Hymenoptera mainly represented by the Family of Formicidae (red ants and black ants) were predators feeding on the larvae of necrophagous Diptera. Orthoptera and Dictyoptera were classified as omnivores and opportunists appearing during the advanced decomposition phase when the corpse was completely dried and was close to the skeletal phase. These last three orders are generally not used for the dating of deaths in forensic entomology expertise. Their representatives were therefore not counted (Table 1).

Table 1. Evolutionary numbers of the various Families of adult necrophagous insects trapped on all CNRA, Zoo and CNF experimental sites.

Post Mortem Interval (Days)	State of the corpse	Diptera					Coleoptera						Others		
		Calliphoridae	Sarcophagidae	Muscidae	Piophilidae	Stratiomyidae	Cleridae	Histeridae	Dermestidae	Tenebrionidae	Trogiidea	Scarabidae	Hymenoptera	Orthoptera	Dictyoptera
1	Fresh / Bloating	916	115	50	-	-	-	-	-	-	-	-	-	-	-
3	Active Decomposition	1363	499	199	-	-	-	-	-	-	-	-	+	-	-
7		669	266	163	-	-	-	-	-	-	-	-	+	-	-
14		200	68	59	11	-	33	-	-	-	-	3	+	-	-
21	Advanced Decomposition	21	3	1	83	-	122	-	-	-	-	2	+	-	-
28		5	1	2	216	-	192	-	-	-	-	-	-	-	-
35		-	-	-	262	-	177	4	-	-	-	-	-	-	-
42		-	-	-	280	13	182	7	-	-	-	-	+	-	-
49		-	-	-	405	21	262	9	-	-	-	-	+	-	-
56		-	-	-	363	105	263	18	2	-	-	-	+	-	-
63		-	-	-	380	186	253	5	15	-	-	-	+	-	-
70		-	-	-	174	299	324	4	11	3	5	-	+	+	-
77		-	-	-	78	196	269	-	22	10	12	-	-	+	+
84		-	-	-	38	121	177	-	20	12	8	-	-	+	+
91	Skeletonization	-	-	-	11	29	114	-	12	12	6		-	+	+
98		-	-	-	-	28	25	-	3	9	4	-	-	+	+
105		-	-	-	-	21	17	-	3	9	8	-	-	+	+
Total Specimens by Order		7903 (74,9%)					2648 (25,1%)						+		

Note: Insects other than Diptera and Coleoptera are necrophiliac, omnivorous and opportunists who have not been trapped and counted. Their presence or absence was indicated by the + or - signs.

3.2 Loss of body mass of cadavers exposed to the open air

3.2.1 Effects of climatic conditions on loss of body mass of pig carcasses

The weekly climatic conditions varied from 26.5 to 29.0 ° C for the temperature, 78.5 to 86.2% for the relative humidity and 0.1 to 36.5 mm for the rainfall (Fig. 3 and 4).

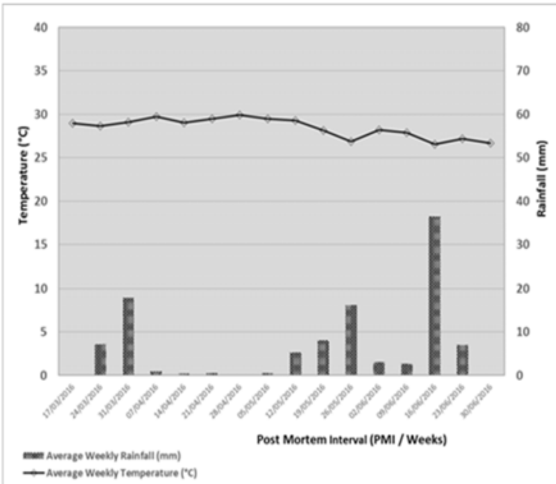

Fig. 3 Mean atmospheric temperatures and weekly rainfall recorded during the experiments carried out from March 17, 2016 to June 30, 2016.

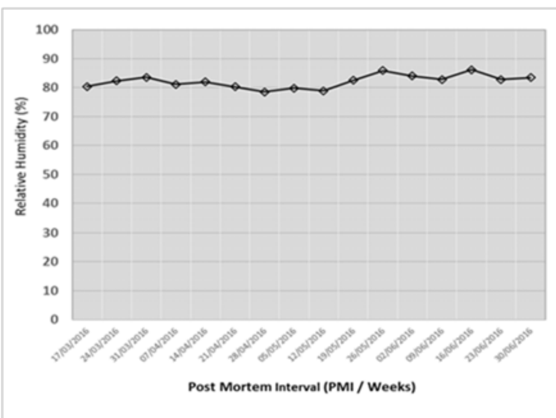

Fig. 4 Average weekly relative humidity recorded during the experiments carried out from March 17, 2016 to June 30, 2016.

Statistical analysis of the correlation between temperature, relative humidity, rainfall, and loss of body mass of cadavers, noted that there is no correlation between these three parameters and the cumulative rate of loss of body mass of the latter (Figs 5, 6 and 7).

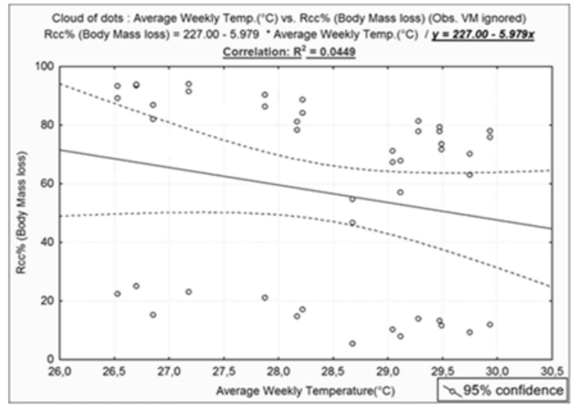

Fig. 5 Correlation between mean atmospheric temperatures recorded from March 17, 2016 to June 30, 2016 and the cumulative rates of body mass loss of pork carcasses.

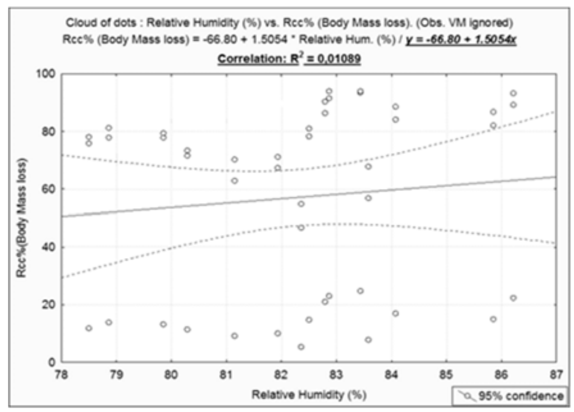

Fig. 6 Correlation between the relative humidity levels recorded from March 17, 2016 to June 30, 2016 and the cumulative rates of loss of body mass of pork carcasses.

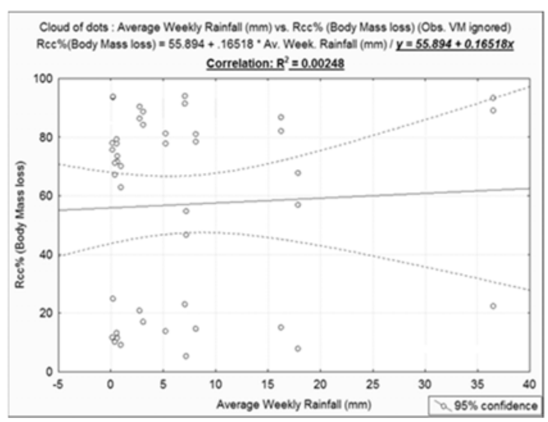

Fig. 7 Correlation between the amounts of rainfall recorded from March 17, 2016 to June 30, 2016 and the cumulative rates of loss of body mass of pork carcasses.

3.2.2 Effects of necrophagous insect activities on loss of body mass of pork carcasses

The cadaveric evolution of pigs exposed to the open air was influenced by several environmental factors. These include temperature, relative humidity, rainfall, sunshine, insects and other invertebrates, vertebrate scavengers of all kinds, etc. In this study, technical arrangements have been made to allow only the natural climatic factors and biological factors related to the action of microorganisms and invertebrates associated with dead bodies to prevail. The evolution of the body mass recorded throughout the process of decomposition of the three types of cadavers is expressed as cumulative rates of loss of body mass.

The cumulative rates of body mass loss of the two cadavers P_2 (Grid G_2) and P_3 (Grid G_3), to which insects had access, showed an abrupt exponential growth during the first week after death, reaching 46.70 and 54.75% loss of the initial body mass. While at the same time, the control corpse to which the insects did not have access lost 5.29% of its initial body mass (Fig. 8). This exponential growth in body mass loss rates at P_2 and P_3 cadavers continued up to 14 days (d_{14}) after death to 56.95 and 67.79%, respectively, of initial body weight loss, whereas at the same stage, the control corpse P_0 lost only 9.22% of its own. From the 21st day post mortem, the cumulative rates of body mass loss of P_2 and P_3 cadavers continued to increase, but much less rapidly. The P_2 corpse lost at this stage, 62.97% of its initial body mass and progressed slowly to 93.58% loss on the 105th day after death. The corpse P_3 has undergone almost the same evolution. From the 21st to the 105th day post mortem, it lost between 70.19 and 93.93% of its initial body mass. Throughout this process, a cadaveric evolution similar to that of the corpses P_2 and P_3 was noted. The cumulative rates of loss of body mass recorded by the latter showed no significant differences. On the other hand, these cumulative rates of loss of body mass of the P_2 and P_3 cadavers were significantly different from those recorded at the level of the control corpse P_0 to which the insects did not have access. Indeed, throughout the decomposition process, the cumulative rates of loss of body mass of the control cadavers P_0 were much lower than those recorded at the corpses P_2 and P_3 (Fig. 8).

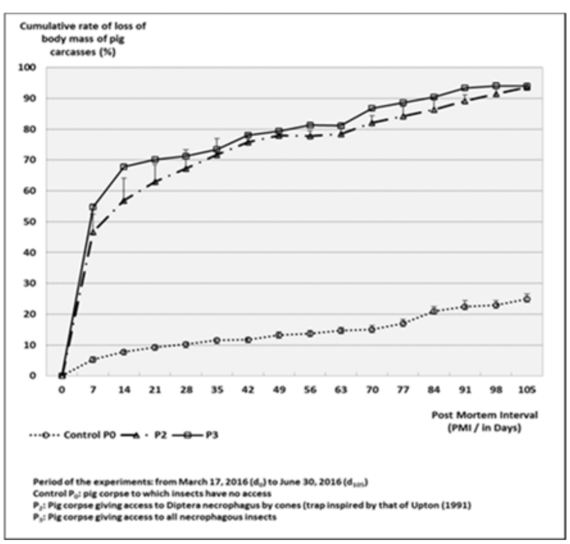

Fig. 8 Comparative cumulative rates of loss of body mass of pig carcasses by post-mortem interval (PMI) from March 17, 2016 to June 30, 2016.

4. Discussion

In our study, there was no correlation between changes in body mass loss and temperature, relative humidity, and rainfall (Pearson Correlation Tests). The rate of decomposition of pig corpses appears to be influenced by the presence of necrophagous insects, whose reproductive and nutritional activities have been favored by the recorded climatic conditions. The latter are the direct cause of the presence of Calliphoridae, Sarcophagidae and Muscidae in the first week after death (Table 1). These results join those of Charabidze *et al.* (2012) on the weekly and seasonal dynamics of necrophagous insects in France. These authors noted that summer temperatures favored the numerical abundance of most trapped necrophagous insects. In general, they observed a correlation between the numbers of Calliphoridae Diptera and the average summer weekly temperatures. More specifically, Charabidze *et al.* (2012) observed that seasonal numbers of *Lucilia sericata* were significantly higher in spring-summer than in winter. In addition, Koffi *et al.* (2017), demonstrated in their work on the process of colonization by necrophagous insects of a pig corpse exposed to the open air in the southern forest zone of Côte d'Ivoire, that the Diptera Calliphoridae, Sarcophagidae and Muscidae, were the first to appear and lay eggs on the bodies of exposed pigs. Thus, under the climatic conditions recorded during this study, the strong and brutal growth of the cumulative rate of loss of body mass of P_2 and P_3 pig carcasses, as of the first week (IPM = 7 days / 46.7 % for P_2 and 54.75% for P_3), is due mainly to the activity of the first arrivals. This result is consistent with that of Dekeirsschieter (2007), who also observed that, Calliphoridae were the first Diptera to colonize exposed bodies in both forest and urban environments, as well as in open environments. This colonization was very early and takes place from the first post mortem day. It resulted in the egg-laying of numerous clusters of eggs at the orifices (snout, mouth, ear, anus) and the face in contact with the ground. Similarly, the Sarcophagidae laid their larvae of stage L1 at the level of the mouth and the anus. The hatching of the eggs took place a few hours after the eggs were laid. It is the larvae of this first group of Diptera which caused by their voracity, this impressive loss of body mass from the first week (0 to 46.70% for P_2 and 0 to 54.75% for P_3). These findings join those of Payne (1965) and Payne and King (1968), who have also shown that the larvae of these first Diptera, took four days to cause 70% body mass loss of a pig corpse. They also are consistent with those of Nazni *et al.* (2011), who compared in Malaysia, the entomological fauna that colonized monkeys, placed in an open and closed environment. In the same climatic conditions as ours and in open conditions, they noted that between 5 and 10 days after mortem, the remaining body mass of open-exposed monkey carcasses was about 40%.

In our experimental conditions, the state of dryness of the corpses and the rarefaction of the soft tissues, observed one to two weeks after the death, no longer favored the egg laying of the Diptera of this first group. In the course of his work, Dekeirsschieter (2007) made the same observation on openly exposed pig cadavers. This explains the abrupt digital fall of larvae and adults of this first group of necrophagous Diptera after two weeks post mortem. This resulted in a slowing of the loss of body mass between the end of the second post mortem week and the skeletonization of the P_2 and P_3 corpses. This slowing down of the body mass loss of pig carcasses was also observed by Nazni *et al.* (2011). The slow growth of the cumulative rate of loss of body mass between the second post mortem week and the skeletonization could be explained, according to the work of Koffi *et al.* (2017), by the absence of the Diptera of the first group and the appearance of other groups of insects. These included Diptera belonging to the Families of Piophilidae and Stratiomyidae. The individuals of the juvenile stages of the latter have been less numerous and less voracious. Additionally, their larvae may have been prey to predators such as Hymenoptera and Coleoptera which were also present within the dried bodies during the same period. The Hymenoptera were essentially represented by the individuals of the Family of Formicidae. Cleridae, Histeridae, Dermestidae, Tenebrionidae, Trogiidae and Scarabeidae were the main families of Coleoptera harvested. Nazni *et al.* (2011) also observed, during their experiments, the presence of these Hymenoptera and Coleoptera Families during the advanced decomposition phase of the monkey corpses.

5. Conclusion

It emerges from this work that, when a corpse is exposed to the open air, it is rapidly colonized by different groups of necrophagous insects. The first to arrive on the carcass and lay their eggs and larvae, were Diptera belonging to the families Calliphoridae, Muscidae and Sarcophagidae. From the first week of the active decomposition phase, the larvae's voracity produced a rapid increase in the cumulative rate of loss of body mass, about 50% of the initial body mass. Between 10 and 15 days post mortem, marking the beginning of the advanced stage of decomposition, the Diptera of the first group mentioned above, were gradually replaced by other necrophagous Diptera, notably Piophilidae and Stratiomyidae. Not only, their juvenile stages have been less voracious but they may also have been the prey of many predatory insects such as the Coleoptera (Families of Cleridae, Histeridae, Dermestidae, Tenebrionidae, Trogiidae and Of the Scarabeidae) and Hymenoptera (Family of Formicidae). The cumulative rate of loss of body mass thus slowed down from the beginning and end of the advanced decomposition phase (which lasted an average of 85 days) to about 94% initial mass loss.

As part of an entomological investigation to date a death, when discovering a corpse, the method most commonly used today is that based on the cycle of development of the necrophagous Diptera found on the remains. The most commonly used Diptera for the estimation of a short post mortem interval (PMI) belongs mainly to the Calliphoridae family. However, the old method, which was based on the composition of the squads, is still useful in locating species over time. In this study, the loss of body mass, resulting from the consumption of soft tissues, by necrophagous insects, results in a cadaveric state associated with one or more groups of insects. If it is not possible to use Calliphoridae as part of a long PMI, the condition of the corpse, in relation to loss of body mass, may very well help to establish a chronology of death, especially if the victim is known by persons who can provide ante-mortem information about their body mass commonly known as "weight". Although, other factors may interfere with the loss of body mass, this study has demonstrated, through a control pig corpse, that the main actors in the decomposition of an exposed corpse on the soil and in the Guinean zone of Côte d'Ivoire, remain necrophagous insects. Since the latter are largely involved in the recycling of organic matter into the ecosystem, the estimation of the post-mortem interval cannot be completely separated from the examination of the decomposition of the corpse. Consequently, changes in cadaveric state and the species of insects collected must be correlated with the environmental conditions of the exposure site and with all factors that may influence the decomposition of the body and the development of insects. This could possibly help to reinforce the results of an expertise based on entomological methods.

Declaration of interests

The authors declare that they have no conflicts of interest in relation to this article.

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First Author : Alexandre Franklin Koffi is an Entomologist, working at the National Institute of Public Hygiene (NIPH) since 2002. He holds the "Diplôme d'Etudes Approfondies" (DEA = Master) of General Entomology obtained in 1997 at the Félix Houphouët-Boigny University of Cocody-Abidjan (Côte d'Ivoire). After training as an Entomologist-Curator at the Natural History Museum of Basel (Switzerland) in 1998, he coordinated two research and development projects at the Swiss Center for Scientific Research in Côte d'Ivoire (SCSR/CSRS) from 2000 to 2001. From 2002 to today, he coordinated numerous projects within the NIPH in the field of the control of vectors of human diseases. Since 2014, he is the principal researcher and in charge of thesis project n ° 130 funded by the Strategic Support Program for Scientific Research (SSPSR/PASRES). While waiting to defend his thesis in 2017, he is already credited with an article as first author, a communication as 2nd author and two publications as 3rd author, in the field of forensic entomology.

Second Author : Since 2004, Louis Roi Nondenot Aboua is a Teacher-Researcher, Lecturer Entomologist at the Laboratory of Zoology and Animal Biology at the Félix Houphouët-Boigny University of Cocody-Abidjan (Côte d'Ivoire). Dr. Aboua obtained his Ph.D in 2004 in Agricultural Entomology at the Félix Houphouët-Boigny University of Cocody. He has published numerous articles in the field of insect pest control and forensic entomology. After having already supervised two theses, he is currently the thesis director of Alexandre Franklin Koffi.