INSECTS IN THE COMMODITIES STORED IN THE ABIDJAN PORT AUTHORITY AND THE RISKS OF ACCIDENTAL INTRODUCTION OF NEW SPECIES IN COTE D'IVOIRE

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Abstract

The inventory and the identification of the insects in the commodities stocked at the abidjan port authority (apa), one of the most popular in west africa, have been carried out in order to know the flow of insect fauna in the inbound and outbound farm products. Three (3) kilogramme samples have been selected and kept in polypropylene bags and labelled. In order to identify the insects, the selected sample has been poured into a sieve exposed to a 100 watt lamp to incite the insect to come out of the grains. The insects have been selected and examined by means of a magnifying glass in the insectary of the laboratory of zoology and animal biology of félix houphouët-boigny university. Overall, 924 insects were inventoried. They were of three natures (coleoptera, lepidoptera and heteroptera). The coleoptera were 985 individuals; they are predominant with 11 families encompassing 15 species. The lepidoptera that have been listed represent 18 individuals and grouped into 2 families and consist of 3 species. Then, the heteroptera composed of 33 individuals within the same family and represented by only one species. At the export, a total of 924 have been recorded with a slight predominance of coleoptera (95.1%), followed by the heteroptera (3.1%) then the lepidoptera (1.7%). By the time of export, the proportion of coleoptera recorded was 91.04%. The insects in all the inbound commodities such as *s. Ozyzae* (linné) curculionidae, *s. Zeamais* (motchulsky) curculionidae, *s. Cerealella* (oliver) gelechiidae, *p. Flavipes* (review) anthocoridae, have been noted, thus confirming the potential risks of introducing new species in the commercial exchanges.

Keywords: Insects, stocks, risks, accidental introduction, port exchanges

Introduction

Agriculture occupies an important position in the economic development of sub-saharan countries. It represents an average of 70% of total employment, 40% of the outbound goods and about one third of the gross domestic products (gdp). In addition, nearly two-third of the manufacturing value added depends on the agricultural raw materials (Jaffee, 1992). The income of the nation on exports is in proportion with the seasons of coffee and cocoa (Esso, 2009). The various international transactions of farm product are carried out at the apa. That port is privileged by its geographical location in the gulf of Guinea. It has all exceptional assets and is the most popular in west africa. It is an important commercial crossroad and an outstanding business centre also. It is the way in and out for 80% of agricultural product exchange of côte d'ivoire and a substantial part of the external trade with landlocked countries of the sahel region such as burkina faso, niger and mali. However, the commodities stocked in the port are attacked by insects, thereby depreciating them. In fact, the stocked commodities are most of the time the ideal environment for the development of those insects, because the storing conditions make room for their development. In fact, the loss occurred during the storage and the conservation is estimated at about 42 million tons per year in the world (ratnadass, 1987). According to estimates, for a world production of 1.800 tons of cereals, the loss scan be estimated at 100 million tons (Kodio, 1989 ; Bulot, 1990 ; Johnson 2009). Following sub-saharan countries, in Côte d'Ivoire the products are harvested and kept in condition of heat and moisture that make room for the development of harmful insects. Indeed, the storing conditions make room for the invasion of the commodities by rodents, mushrooms and arthropods (mites and insects) causing the loss of 30 %, 26 %, et 44 % respectively (g.a.s.c.a, 1978; Huignard, 1985; Foua-Bi, 1989). In fact, during the storage period, the most significant attacks can be imputed to the insects. (Johnson *et al.,* 2012). Those insects feed themselves on seeds and depreciate their nutritive quality (Surtess, 1963; Gundu et Wilbur, 1972). Some insects resist to various treatments applied to the products. They resist and reproduce themselves as well in those inbound and outbound commodities.

The objective of this study is to list the various insects in inbound and outbound commodities in the port of Abidjan and to point out the ones likely to be introduced in Côte d'Ivoire. For this purpose, the insects in the commodities stored in the port have been listed and identified.

Materials and methods

Materials

The biological vegetable materials consisted of commodities exchanged during the imports and exports in the port of abidjan. The concerned exports commodities are the cherries of coffee (*coffea canephora*) ; beans of cocoa (*theobroma cacao*) ; copra (*cocos nucifera*) ; grains of rocoa (*bixa spp*) ; palm kernel (*eleais guineenis*) ; grains of sesame (*sesamun indicum*) ; cashew (*western anacardin*) ; crabs cotton (*gossypium spp*) and crab of palm kernel (*elias guineensis*).the inbound ones are rice (*oryzasativa*) ; corn (*zea mays*) and potatoes (*salanum tuberosum*). The biological animal materials consisted of all the insects listed from the various products. The materials used to collect consisted of a 30-cm conical probe, polypropylene bags, a 100 watt lamp, 2 sieves with a mesh of 2 square mesh sieve of 2 mm and 4 mm in diameter of 4 and soft pincers. The conservation materials for the insects consisted of pillbox containing alcohol of70°.

Methods

The sampling collection has consisted in perforating with a probe the various commodities stored and collecting 3 kilograms of commodities from 4 faces each storage pallet. Each sample was put in a bag and labelled. The sample was then skinned by means of a sieve placed over a 100 watt lamp so as to incite the insect to come out. The collected insects are studied with binoculars enlarging them from 7 to 45 x10, and determined by means of keys and tables of identification (widener and rach, 1982 ; gwinner *et al.*, 1991 ; delobel and tran, 1993). The insects of each sample are counted and arranged in pillboxes containing 70° alcohol and labelled.

Statistical analysis

The analysis of variance (anova) and the test of comparison made by students and newman-keuls ($p < 0.05$) has been carried out with statistica software (version7.0) (ihaka et gentleman, 1996). They permitted to compare the average number of collected insects in the various commodities and to classify them. Stimate software (version 7.0) (Colwell, 2004) helped calculate the index of shannon (h') and of simpson (si) so as to determine from the inbound and outbound stocks the ones with more species of insects.

Results

Composition of the collected insect fauna

The insects collected at the port of abidjan belong to three natures: the coleoptera, the lepidoptera and the heteroptera (**table i**). The coleoptera consisted of 11 families and include 15 species. The lepidoptera are divided

into 2 families with 3 species. The heteroptera consists of one family and one species (**table i**).

Proportion of insects per commodity

As a whole, 934 insects have been listed in the outbound commodities and 57 in the inbound ones. In the outbound stocks, the average number of recorded insects on the annatto and the crab of cotton is significantly different from that of other stocks with p = 0.04238 (**figure 1)**.

The most infested inbound commodities stocks are: annatto, the cotton seed and the sesame, they contain 28.9% (267), 26.6% (227) and 15.6% (144) respectively of total collected insects (**table i**). These three products contain 69% of insects in the exports warehouses, i.e. 638 insects out of a total of 924 collected. Cocoa 4.4% (41 insects) and copra 4.3% (40 insects) are part of the least infested commodities.

In the imports warehouses, rice, corn and potato contain 50.7% (34 insects), 49.3% (33 insects) and 0% (0) insects respectively (**table i**). No insect has been collected in the inbound stocks of potatoes (**figure 1**).

Rate of abundance of the various groups

The coleoptera host 94.1% of the insects, i.e. 879 collected specimens in the outbound commodities. As for the inbound commodities stocks, the rate of the coleoptera is 91% (61/67 individuals). The stocks of rice host 41.8% of individuals, i.e. 28 insects. The proportion of collected insects in the corn is 49.3%, i.e. 33 insects and 0% of insects in the stocks of potatoes. The lepidoptera are less represented in the exports warehouses. They host 1.7% (16 individuals) of all the individuals collected. The representatives have been listed only on the cocoa 0.5% (5 insects) and on coffee1.2% (11 insects). In the collected commodities, the lepidoptera are 3% with just 2 individuals collected from the rice.

Although the group of heteroptera consists of only one species, they represent 3.1% of individuals counted in the export warehouse (table 1). That group consists of 6% of collected insects in the inbound commodities, i.e. 4 insects only in rice.

Table i: inventory of insects in stocks

		Exports										**Importation**				
Nature	**Families, types, species**	**Coffee**	**Cacoa**	**Cashew**	**Sesame**	**Annatto**	**Copra**	**Cotton**	**Palm k**	**Total**	**%**	**Rice**	**Corn**	**Pot**	**Total**	**%**
Coleopteres	**Anobiidae**															
	Lasioderma serricorne (fabricus)	6	4	0	8	0	0	28	6	52	5,6	0	0	0	0	0,0
	Stegobium paniceum (linné)	0	0	0	6	0	0	14	0	20	2,2	0	0	0	0	0,0
	Bostrychidae															
	Rhyzopertha dominica (fabricus)	5	2	0	0	0	0	0	0	7	0,8	3	0	0	3	4,5
	Antribidae															

	Araecerus fasciculatus (degeer)	3	1	0	0	0	0	0	0	4	0,4	0	0	0	0	0,0
	Cleridae														0	0,0
	Necobia rufipes (degeer)	0	0	0	0	0	3	0	0	3	0,3	0	0	0	0	0,0
	Cucujidae															
	Cryptolestes ferrugineus (stephens)	6	**6**	0	2	0	2	0	0	16	1,7	0	0	0	0	0,0
	Curculionidae															
	Sitophilus ozyzae (linné)	0	0	0	0	0	0	0	0	0	0,0	**15**	0	0	**15**	22,4
	Sitophilus zeamais (motchulsky)	0	0	0	0	0	0	0	0	0	0,0	0	**11**	0	**11**	16,4
	Dermestidae															
	***Thorictodes heydeni* (reitter)**	0	0	0	0	**78**	20	3	29	**130**	14,1	0	0	0	0	0,0
	Nitudilidae														0	0,0
	Carpophilus hemipterus (linné)	0	0	0	3	0	2	4	0	9	1,0	0	0	0	0	0,0
	Ostomatidae															
	Tenebroïdesmauritanicus(linné)	0	2	0	3	0	0	14	0	19	2,1	0	0	0	0	0,0
	Silvanidae														0	0,0
	Ahasverus advena (waltl)	**24**	3	0	0	0	4	0	0	31	3,4	0	0	0	0	0,0
	Oryzaephilus surinamensis (linné)	0	0	0	11	0	5	2	0	18	1,9	5	2	0	7	10,4
	Tenebrionidae															
	Tribolium castaneum (herbest)	**10**	**8**	36	50	**122**	4	**98**	11	**339**	36,7	3	**12**	0	**15**	22,4
	Tribolium confusim (duval)	**8**	4	10	61	**67**	0	**64**	17	**231**	25,0	2	**8**	0	**10**	14,9
Lepidop-teres	**Gelechiidae**															
	Sitotrogacerealella(oliver)	0	0	0	0	0	0	0	0	0	0,0	2	0	0	2	3,0
	Pyralidae															
	Ephestia elutella (hubner)	3	5	0	0	0	0	0	0	8	0,9	0	0	0	0	0,0
	Plodiaunter punctella (hubner)	2	**6**	0	0	0	0	0	0	8	0,9	0	0	0	0	0,0
Heter	**Anthocoridae**															
	Piezostethus flavipes (reuter-review)	0	0	0	0	0	0	0	29	29	3,1	4	0	0	4	6,0
	Total	67	41	46	144	267	40	**227**	69	**924**	**100**	**34**	33	0	67	100
	Rate of insects (%)	**7.3**	4.4	**5.0**	**15.6**	**28.9**	4.3	**27.53**	**7.42**	**100.00**		**50.7**	**49.3**	**0.0**	**100.0**	

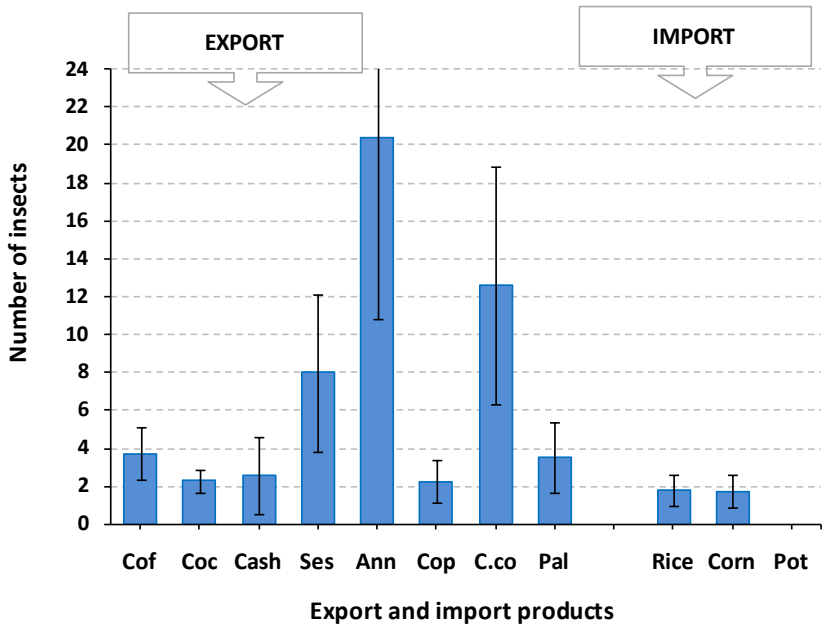

Figure 1: the average number of collected insects in the inbound commodities and in the inbound commodities, p_{exp} = 0.04238 and p_{imp} = 0.13363
nb: values followed by the same letters are not significantly different at the level of 5% according the test of newman-keuls.

Diversity and specific richness of insect in the import and export products

According to the indexes of shannon, the stocks of coffee and cocoa, although they belong to the less affected commodities, contain more insect species compared to commodities to be inbound. The shannon indexes (Shannon indexes (ish)) are 1.91 for coffee and 2.16 for cocoa with specific riches of 9 and 10 percent respectively (**table ii**).

Table ii: abundance and specific richness of insect in the import and export products in the abidjan port authority

	Exports warehouse								**Imports warehouse**		
	Coffee	**Coc**	**Cash**	**Ses.**	**Ann**	**Cop**	**C.co**	**Pal**	**Rice**	**Corn**	**Pot**
Population of species (n)	67	41	46	144	267	40	227	92	34	33	0
Specific content (s)	9	10	2	8	3	7	8	5	7	4	0
Simpson index (si)	0.82	0.89	0.34	0.69	0.64	0.72	0.71	0.75	0.76	0.71	0
Shannon index (ish)	**1.91**	**2.16**	0.52	1.44	1.06	1.56	1.49	1.47	1.65	1.24	0

N.b : coc : cocoa, **cash** : cashew, **ses** : sesame, **ann** :annatto , **cop** : copra, **c.co** : crab of cotton, **pal** : palm kernel , **pot** : potatoes

The stocks of cashew and of annatto for exports recorded the lowest indexes of 0.5 and 1.06 respectively and the lowest number of species 2 and 3. The stocks of annatto however contain the most numerous number of insects, 267 individuals, i.e. 28.7%of all the species collected.

the simpson index (is) follows the variations of the specific riches between 0.34and 0.89 (**tableii**).

The insects collected in the stocks of coffee and of cocoa belong to 2 groups. The group of coleoptera and that of lepidoptera divided into 8 families and 10 species. The species : *lasioderma serricorne* (fabricus) anobiidae, *rhyzopertha dominica* (fabricus) bostrychidae, *araecerus fasciculatus* (degeer) antribidae, *cryptolestes ferrugineus* (stephens) cucujidae, *tenebroïdes mauritanicus* (linné) ostomatidae, *ahasverus advena (*waltl) silvanidae, *tribolium castaneum* (herbest), *tribolium confusim* (duval) tenebrionidae, belong to the group of coleoptera and the species *ephestia elutella* (hubner), *plodiaunter punctella* (hubner) pyralidae, to the groups of lepidoptera. All these species are present at various proportions and are common to the stock of coffee and of cocoa, except *tenebroïdes mauritanicus* (linné) that has not been collected in the cocoa.

The coléoptèreantribidae,*araecerus fasciculatus* (degeer) and the lepidoptera, *ephestia elutella* (hubner), *plodiaunter punctella* (hubner) belonging to the family of pyralidae have been have been collected in the export warehouse only in coffee stocks and cocoa. They are not present in inbound commodities.

The species tribolium castaneum (herbest) and *tribolium confusim* (duval), the coleoptera of the family of tenebrionidae, are present in coffee and cocoa, and also in other commodities for export and import except in the potatoes. Those 2 species were the most present. *Tribolium castaneum* (herbest) and *tribolium confusim* (duval) represent in the export warehouse 36.5% (339 insects) and 24.8%(231 insects) respectively of the insects collected, for 22.4% (15 insects) and 14.9% (10 insects) in the inbound commodities. *Thorictodes heydeni* (reitter) (dermestidae), is the third of the most abundant species with a presence rate of 14% i.e. 130 individuals for a total of 934 insects. It is not in the stock of coffee, cocoa and in the inbound commodities, but highly infested annatto with 78 individuals out of 130 collected.

The most numerous in the inbound commodities are the *sitophilus ozyzae* (linné) (22.4 %),*tribolium castaneum* (herbest) (22.4%), *sitophilus zeamais* (motchulsky) (16.4%) and the *tribolium confusim* (duval) (14.9%), all are coleoptera. *Sitophilus ozyzae* (linné) is the major infestor of rice at a rate of 22.4% while the *tribolium castaneum* (herbest) and *sitophilus zeamais* (motchulsky) are most present in the corn at the rate of 17.9 and

16.4% respectively in relation with a total number of collected insects in the inbound stocks. Nearly all the rice is imported from china, thailand, while corn is imported from sub regional countries (burkina faso, mali and guinea) that have almost the same insect fauna as in côte d'ivoire.

Potential accidental introduction of insects

The species of insects in the inbound commodities (rice and corn) are *s. Oryzae* (linné)**,** *s. Zeamais* (motchulsky)**,** *s. Cerealella* (oliver)and *p. Flavipes* (review).those species that we can find only in the inbound commodities may represent a risk of accidental introduction in the environment of côte d'ivoire (**table iii**), if they are not present now and if the conditions are favourable for their development.

Coffee and cocoa are the top export products of côte d'ivoire in terms of quality and level of export to the northern industrialized countries that concentrate more than 80% of the consumption of products from the cocoa beans. (Anonymous, 2014) and coffee cherries netherland (20.6 %), the USA (18.5 %), Malaysia (10.8 %), Germany (8.3 %), Belgium (6.0 %), France (4.7 %), United Kingdom (4.2 %) and Spain (2.4 %) are the top importers of cocoa beans from the farms (Anonyme, 2014). The commodities are infested from the farms and the infestations are accentuated during the storage. Insects such as *l. Serricorne* (fabricus), *a. Fasciculatus* (degeer), *n. Rufipes* (degeer), *c.* Ferrugineus (stephens), *t. Beydeni* (reitter), *t. Mauritanicus* (linné), *a. Advena* (waltl), *o. Surinamensis* (linné), *e. Elutella* (hubner), *p. Unterpunctella* (hubner) may find themselves in the ports of those importers (**table ii**), and the landscape if the conditions are favourable.

Tableau iii: insects likely to be introduced in the ports of countries involved in exchanging commodities

Species present only in the outbound commodities	**Species present in two types of commodities**	**Species present only in inbound commodities**
- *l. Serricorne* (fabricus) **anobiidae** - *a. Fasciculatus* (degeer) **antribidae** - *n. Rufipes* (degeer) **cleridae** - *c.*ferrugineus (stephens) **cucujidae** - *t. Heydeni* (reitter) **dermestidae** - *c. Hemipterus* (linné) **nitudilidae** - *t. Mauritanicus* (linné) **ostomatidae** - *a. Advena (*waltl) **silvanidae** - *e. Elutella* (hubner) **pyralidae** - *p. Unterpunctella* (hubner)**pyralidae**	- *r. Dominica* (fabricus)**bostrychidae** - *t. Castaneum* (herbest)**tenebrionidae** - *t. Confusim* (duval) **tenebrionidae** - *o. Surinamensis* (linné) **silvanidae**	- *s. Ozyzae*(linné) **curculionidae** -*s. Zeamais*(motchulsky) **curculionidae** - *s. Cerealella*(oliver) **gelechiidae** - *p. Flavipes*(review) **anthocoridae**

Discussion

During the inventory of insects in the stored commodities at the port of abidjan, 991 insects were collected, 924 of them in the export warehouses and 67 in the imports warehouses. Those insects belong to three groups. The coleoptera were the most represented with 15 species, followed by the lepidoptera, 3 species and the heteroptera, 1 (one) species. Individuals belonging to the groups of the coleoptera were the most numerous with a proportion of 95.1 % in the exports warehouse and of 91.04% in the imports warehouse. It is followed by the group of the heteroptera with the insect percentages of 3.1% and 6% respectively in the exports and imports warehouses. Finally, the group of lepidoptera revealed a relatively lower share with a percentage of 1.7% in the exports warehouse and of 3% in the import warehouse. Those investigations also revealed the presence of *thorictodes heydeni* (reitter). It is being noted for the first time in côte d'ivoire and will be under a particular study in our next works. It has certainly been introduced accidentally. With the exception of the *thorictodes heydeni* (reitter) all the other species have already been noticed in the markets of abidjan (Agbaka, 1990). Our remarks during this study are similar with those of appert (1985), delobel and tran (1993) which emphasized the large variety and a higher number of species of coleoptera among the devastators of the stored commodities. However, we did not meet species of bruchidae in that port while it belongs to the devastators of stocks of, any doubt, because this production is lower on nationwide, therefore offering less opportunity for exports. The absence of this insect could confirm the fact that it has been put together with the vegetables which are not concerned with the exchange at the port of abidjan (Delobel et Tran, 1993).

Moreover, the insects in the exports warehouse were ten (10) times more numerous in the export warehouses than in those imports warehouses. This is due to the recent warehousing of commodities that have not been treated by phytosanitary chemicals; but they will be treated before being shipped in accordance with actual policy. Moreover, the number of insects in the grains of annatto stored can be explained by the fact that, this commodity is not consumable but is just used for dyeing, and was treated especially by the time of harvest. The massive infestation of the product may be explained by the duration of storage due to the fact that since annatto is not a staple product, it is not exported rapidly. Also, the presence of insects in the crab of cotton may be linked to the structure of some of the commodities that favour the concealment of insects.

The extent of the damage is certainly not due to the number of insects, but to their food preference and their ability to attack full seeds (primary devastators) or already attacked (secondary devastators). The presence of secondary insects and other in the commodities may be

explained by the fact that those products are not automatically exported. Therefore, they host insects for a long period of time, making room for the development in this environment of other primary and tertiary insects which development is favoured by environmental conditions, thereby favouring naturally the commodities deterioration as time goes on.

The lower proportion of insects recorded in the coffee and the cocoa is the consequence - before the harvest - of chemical treatment that these two major cash cropsof côte d'ivoire undergo. They are cared for and treated with great rigor in order to meet international standards required for exports. Besides, they are not under much attack from the insects.

By the time of import, the lower rate of insects in the stocks may be explained by the fact that the treatments used for these commodities and the efforts undertaken by the exporting nations to meet the phytosanitary requirements. This policy encourages the absence of living insects in the commodities for the promotion of those products on external markets (Gwinner *et al.*, 1991).

The presence of lepidoptera in the beans of cocoa and of coffee is all the more justified asit is reported to be on the commodities. It is *ephesia elutella* (borer of cocoa) which usual host are dry seeds, especially the beans of cocoa. We also find it on the beans. The closeness of those two products since they are always stocked in the same warehouses could justify its presence in these two products. Currently, *plodiaunter punctella* lives on the almond, nuts and dry fruits. *Sitotraga cerealella* has been collected in the stocks of rice and wheat.

Moreover, a comparative analysis of the insects collected during the study shows that this entomocenose is dominated by the *tribolium* that represents 60.04%of all the insects. We also note that they are relatively more present in the exports warehouse with a proportion of 61.68%than in the import warehouses, i.e. 37.31%because of their strong desire to eat and sometimes because of their oligophagy. It is the same with *thorictodes heydeni*. The extent of the damage they cause is not due to the number of insects, rather to the food preference and to their ability to attack the whole seed or the seeds already damaged. On the other hand, the results reveal that the presence of some insects in the commodities is not casually even if they do not feed themselves from the commodities in presence. In fact, they can live on other substances as it is with the *prezosthethus flavipes.* In 1993, delobel and tran noted that this species that we find in the crab of cotton and in the seeds of palm kernel belong to the groups of insects that prick and suck. So it cannot depend on that commodity for life. The presence of that species has been reported in the stocks of yams by foua-bi (1985), but they do not feed themselves on yams. Foua-bi states that they are predators of some insects like the larva of the coleoptera. It is reported to be hosted in the

crab where we find a high number of *thorictodes heydeni* which larva is their food. That species could also be a parasitoid and develops at the expense of other insects.

This situation has revealed that the insects we met are from farms and they were inside the ripe grains by the time of harvest. However, after the harvest and drying of the grains, several grains from various places, either by donations or by sale, are gathered in the same storing facilities. This is therefore a potential source of secondary infestations at various levels. Besides, that rice and corn, which are the main staple food in africa and in the world are trafficked between departments and between nations. These exchanges, both internal and external are carried out without any phytosanitary protection. This fact naturally creates rooms for the exchange and the propagation of many pests both inside and outside the country. Donations of cereals following famine or in prevention of situation of exodus of populations following natural disasters, wars of other problems are source of contaminations and also a source of propagation of pests. It is the case of *prostephanus truncates* (horn) (foua-bi, 1989). It could be the case with *thorictodes heydeni* (reitter) from the family of dermestidae which presence has been revealed in this study. In fact, during the year 1981, the corn from the stocks bound for east africa were temporarily stored in tanzania, and those bound to west africa were stored in togo. The insects escaped from the temporary stocks to invade the host country then later spread beyond the frontiers. The accidental introduction of species during international exchange is not new. We are aware of the case of *aspidiella hartii* (cockerell), which, originated from the islands of Central America in 1895, and was observed in 1914 in the islands of the pacific after the opening of the suez canal. It was then introduced in asia, then in ghana in 1955 and finally in côte d'ivoire in 1956 (foua-bi, 1982). This is also the case with the white cochineal in the cassava, *phenacoccus manihoti* (matile-ferrero), from brazil which was reported in Congo in 1972 than in the Central epublic of Congo and invaded all west and Central African countries (Bekon, 1998).

In this study, inbound commodities have a parasit load of 4 species of insects (*s. Ozyzae* (linné) and *s. Zeamais* (motchulsky) from the family of the curculionidae, *s. Cerealella* (oliver) from the family of gelechiidae and *p. Flavipes* (review), anthocoridae not present in the outbound stocks. These insects, although they were not collected during this study in the warehouses of the port of Abidjan, are already present in Côte d'Ivoire. That clearly shows that if one of these insects was not present in côte d'ivoire, it would represent a potential danger of accidental introduction of new species in the country. As for outbound commodities, they have a parasitic load twice important (10 species) than the ones in the inbound commodities. This can be explained by the fact that only the pair coffee-cocoa, the main outbound

commodities undergoes careful phytosanitary treatment before exportation. Therefore, although this parasitic load is high and nearly eliminated before exportation, the species inventoried in the stocks of coffee and cocoa may have existed in the importing countries.

Conclusion

This study has helped to carry out the inventory of the species encountered in the warehouses of the Abidjan port authority. On the whole 934 insects have been inventoried in the outbound commodities for 67 in the inbound commodities. The insects collected in the apa are of three natures. The coleoptera, consisting of 11 families containing 15 species. The lepidoptera are divided into 2 families with 3 species. The coleoptera consists of one family and one species. If it is true that the majority of insects collected are the ones we usually meet in the commodities, the study has unfortunately helped to note, for the first time, the presence of one species, *thorictodes heydeni reuter* 1875 (Gweidner et Rach, 1984) among the stock predators in côte d'ivoire. Its presence therefore confirms the risk of introducing new devastators during the exchange. Actually, that insect is known as being from southern asia (Delobel et Tran, 1993) but it has not been under study in africa. It is now under a special study to establish its itinerary and to describe its morphological characteristic to know more about it.

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