

# The Efficient Role of Dermestes in Damage of Fish in Bangui (Central African Republic)

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## Abstract

A bad conservation of food is recognized as being one of the critical constraints upon food security among resource poor population across Africa. We have evaluated the traditional management of pests in fish in Central African Republic. The data were analyzed by a factor analysis of correspondence. The Group I contained sensitive species of fish to the attacks of *Dermetes frishii*, *Dermetes lardarius* and *Dermestes carnivorus*. There were: *Labeocoubie*, *Mormyrus deliciosus*, *Polydactylus quadrifilis*, *Auchenoglanis occidentalis*, *Synodontis nigrita*, *Hydrocynus forskalli*, *Districhodus rostratus*, *Hydrocynus goliath* and *Mormyrus rume*. The group II contained sensitive species of fishes to the attacks of *D. maculatus*. There were: *Cyprinus carpio*, *Malapterurus electricus*, *Oreochromis mossambicus*, *Barbus occidentalis* and *Oreochromis mossambicus*. *Clarias gariepinus* is the most sensitive of dried fish to the attacks of Dermestes. *Oreochromis mossambicus*, *Mormyrus rume* and *Synodontis nigrita* are the last sensitive of dried fish to the attacks of Dermestes. The results showed that the traditional management of dried fish in Central African Republic couldn't be efficient for reducing the development of Dermestes.

## Keywords

Traditional Management, Pests, Dried Fish

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Teacher-Researchers of University of Bangui. *D. maculatus*, *D. frishii*, *D. lardarius* and *D. carnivorus* were collected on 20 species of fish (**Table 1**) selling in the different markets of Bangui. The insects were reared respectively on 30 g of dried fish in laboratory at  $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and  $10 \pm 70$  r. h. After 7 days of the spawning, adults are eliminated and eggs have evolved to give the first generation of adults from 50 to 60 days after infestation. Insects were characterized by microscopic and identified by using the key of identification [8].

A factorial analysis of correspondence with the software R (R version 2.15.1) was used to identify the relation between species of dried fish and species of insects. Diagrams were also constructed to evaluate the specific abundance per insects and the dried fish used.

### 3. Results

#### 3.1. Insects Damage on Dried Fish

**Figure 2** shows some insect damage on dried fish in CAR. In general in this case of insects damage, the fish lose its market value.

**Table 1.** Fish codification.

Fish' species	Codification
<i>Protopterus annectens</i>	Pa
<i>Auchenoglanis occidentalis</i>	Ao
<i>Mormyrus rume</i>	Mr
<i>Distichodus mossambicus</i>	Dm
<i>Mormyrus deliciosus</i>	Md
<i>Labeo coubie</i>	Lc
<i>Oreochromis mossambicus</i>	Om
<i>Barbus occidentalis</i>	Bo
<i>Hydrocynus forskalli</i>	Hf
<i>Malapterurus electricus</i>	Me
<i>Clarotes laticeps</i>	Cl
<i>Districhodus rostratus</i>	Dr
<i>Clarias gariecilus</i>	Cg
<i>Lutjanu ssp</i>	Ls
<i>Synodontis nigrita</i>	Sn
<i>Gnatonemus tamandua</i>	Gt
<i>Polydactylus quadrifilis</i>	Pq
<i>Channa obscuris</i>	Co
<i>Cyprinus carpio</i>	Cc
<i>Hydrocynus goliath</i>	Hg



**Figure 2.** Insects damage on dried fish (Aba Toumno, 2014). *Clariasgariecilus* is the most sensitive of dried fish to the attacks of *Dermestes* (**Figure 3**). *Oreochromismossambicus*, *Mormyrusrume* and *Synodontisnigrita* are the most sensitive of dried fish to the attacks of *Dermestes*.

### 3.2. Fish Species and Insects Species Relation

The eigen values of the principal axes extracted from the factor analysis of correspondence indicated that the first two factors explained 80% of the matrix dried fish/Insects species information (Figure 4). The factorial plane formed by these two axes (Dim 1 and Dim 2) defined two groups of dried fish/Insects species (Figure 4). The Group I contained sensitive species of dried fish to the attacks of *D. frishii*, *D. lardarius* and *D. carnivorus*. There were: *Labeocoubie*, *Mormyrus deliciosus*, *Polydactylus quadrifilis*, *Auchenoglanis occidentalis*, *Synodontis nigrita*, *Hydrocynus forskalli*, *Districhodus rostratus*, *Hydrocynus goliath* and *Mormyrurume*.

The group II contained sensitive species of fish to the attacks of *D. maculatus*. There were: *Cyprinus carpio*, *Malapterurus electricus*, *Oreochromis mossambicus*, *Barbus occidentalis* and *Oreochromis mossambicus*.

### 4. Discussion

The worked hypothesis was that the traditional management of dried fish in CAR could or not promote the

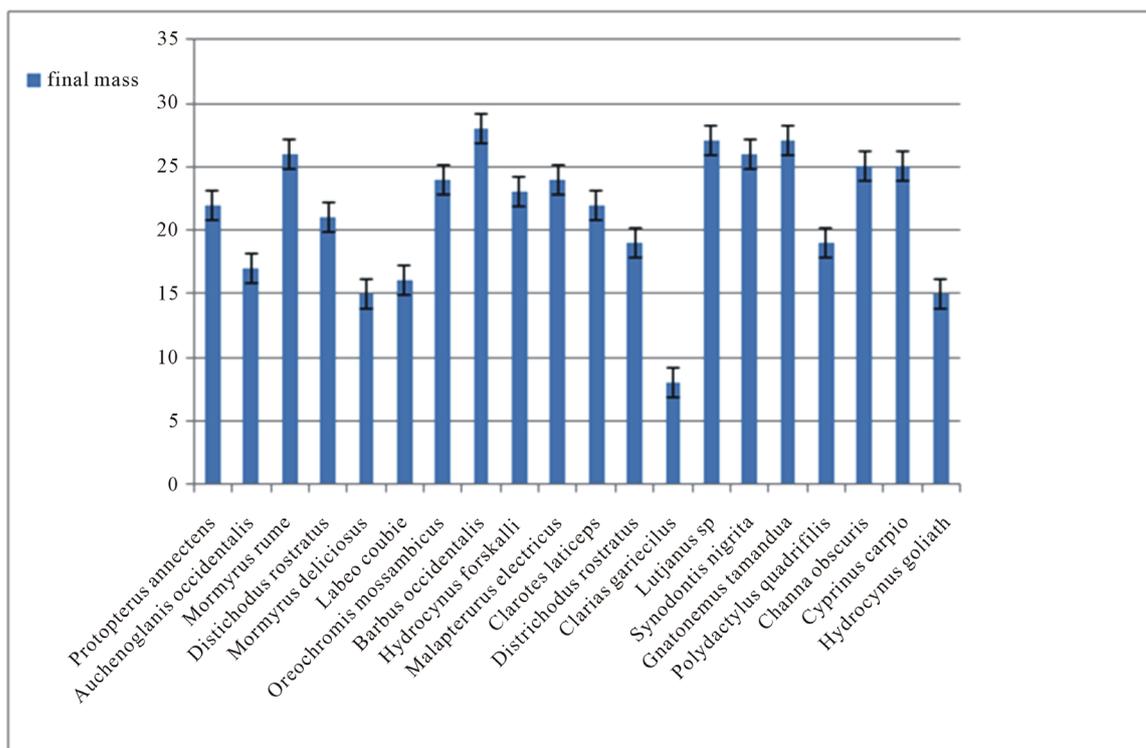


Figure 3. Final mass of fish' species after rearing according to Excel version 2003.

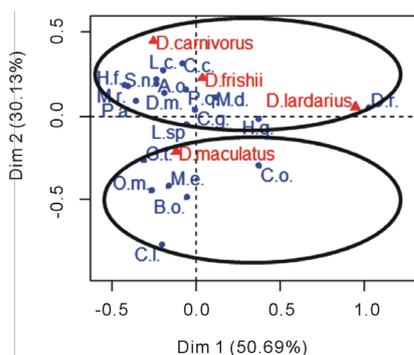


Figure 4. Fish species/insects by a factorial analysis of correspondence (FAC).

development of the insects of the genus *Dermestes*. The study was performed on 20 dried fish species. Ten days after the livestock development, insect larvae have emerged in the various jars and two types of morphologically different larvae were identified. Some larvae are brown and have hair less developed unlike others that are black and carry a lot of well-developed hairs and showed that the larvae of insects *Dermestes* kind are hairy [3]. The observation by the microscope of the first larval form highlights the presence of a head with an elongated body left in several segments. We also note the presence of three pairs of thoracic legs and appendages. Abdominal pseudopods are absent; this is an elateriform type of larva. The larvae belong to the family of *Dermestes*. Some adult of insects are oval, slightly flattened and approximately 5/16- to 7/16-inch long. It is unmistakable because of its brilliantly colored, metallic green body and wing covers (elytra), which vary from copper (red-pink) to bronze (yellow-brown). Elytra do not cover the entire abdomen, leaving five distinct tufts of white hair visible along each side. Another pair of tufts adorn the back of the last abdominal segment. Fine grey hairs appear on the underside of the body [9]. Some authors [10] [11] reported that it's possible emerging of *Dermestes ladar-mius* adults to pair and kept under the same conditions when their fecundity and longevity were recorded. Complete development of some larvae occurred under all conditions except 12.5°C but 12 of the 13 adults produced at 15°C were deformed and mortality at 32.5 C was very high. The period from egg hatch to emerge adult ranged from about 145 days at 15°C to about 48 days at 25°C and above [12]. At 25°C most rapid development was found at the highest humidity used. Adults lived from up to 61 days at 15°C to over 300 days at the higher humidities at 25°C. Above this temperature life was shorter, up to 169 days at 3°C and up to only 23 days at 32.5°C.

On the 30 g of each species of dried fish weighed for some species almost half was consumed by *Dermestes*, for others more than half. Nutrition of larvae and adults of *Dermestes* spp. causes considerable quantitative loss of dried fish and fragmentation [8] [2] [13] [14]. The importance and value of quantitative losses caused to dried fish by *Dermestes* spp were evaluated by different researchers and estimates range from insignificant (20% to 50% weight loss) depending on the duration of storage, the salt content, humidity, weather conditions and general conditions of hygiene during treatment storage [15] [16]. Our results showed that some of these dried fish species (*Districhodus mossambicus*, *Clarias garieculis*, *Polydactylus quadrifilis*, *Cyprinus carpio* and *Hydrocynus goliath*) are favor to the development of *Dermestes*.

Beetles of the genus *Dermestes* L. have long been recognized as pests of animal products, particularly hides and skins. The annual loss caused by *Dermestes* attack on hides and skins in South Africa amounted was estimated to £ 750,000 [17]. The worth of damage per year to hides and skins in the U.S.A. is estimated in \$1,000,000 [18]. The problem is, therefore, both serious and widespread. In each of these countries the main pest was *Dermestes maculatus*. Larvae of *Dermestes* also infest dried fish [19]. There appear to be few published evaluations of the resultant losses, but another work [16] estimated that the financial loss from insect damage to dried fish produced on the Nigerian shores of Lake Chad may amount to £ 500,000 annually. Other commodities that hide beetles can damage include stored animal products such as dried fish, cheese, hide, fur, bacon, and dog treats. The larvae can cause considerable damage to timber, cork, plaster, linen, and cotton when they bore into these materials to pupate [20].

*Oreochromis mossambicus*, *Mormyrus rume* and *Synodontis nigrita* are the most sensitive of dried fish to the attacks of *Dermestes* in our work.

After twenty-one (21) days, observing the microscope reveals the presence of nymphs. This would be a chrysalis or pupa mummy. The appendices are glued to the body. They appear whitish, motionless, locked in a cocoon with appendices glued to the body.

Some works [10] [21] [22] showed that the nymphs or pupae are *Dermestes* mummy, whitish and enclosed in a cocoon with appendages stuck to the body.

From 31 days after the livestock development, adult insects begin to emerge. Adults who have emerged are of two types. There are differences in their color, shape and mobility, but all have a pair of antenna, three pairs of legs, two pairs of wings according the key of identification [8]. *D. carnivorus*, *D. frischii*, *D. maculatus*, are characterized by dense hair (chalky, whitish, yellowish orange or brown) on the ventral side of the abdomen, which mask the chitine. The pronotum is massive and is 1/3 the length of the elytra. Pronotum almost completely covered in brown silk and red, or long, very characteristic. Elytra black, speckled with fine short whitish hairs gray-blue, lying and more or less forming waves or zigzag. The ventral surface of the abdomen covered with hairs with white bristles, each sternum, two lateral black spots. The last sternum is almost entirely black, but there are 2 isolated white spots adjacent to the front edge of the segment.

## 5. Conclusion

The results showed that the traditional management of dried fish in Central African Republic could be efficient for some dried fish as *Oreochromis mossambicus*, *Mormyrus rume* and *Synodontis nigrita* but not for another species as *Clarias gariepinus*. The traditional management of dried fish in Central African Republic couldn't reduce the development of some species of Dermestes (*D. carnivorus*, *D. frischii*, *D. maculatus*).

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